

TÜRKMENISTANYŇ BILIM MINISTRLOGI  
TÜRKMEN POLITEHNIKI INSTITUTY

**Kafedra:** Çyzuw we materiallaryň garýşylygy

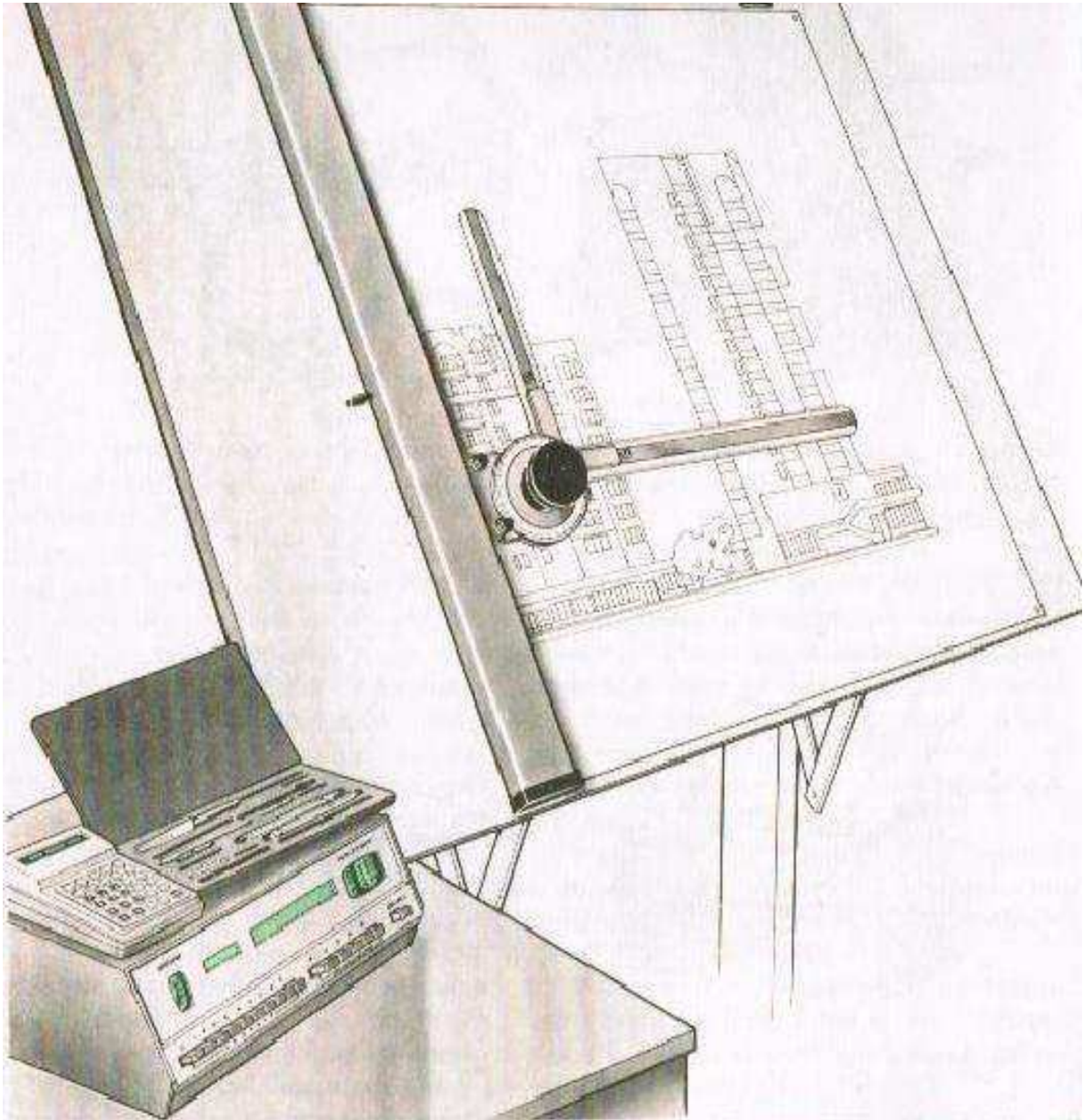
A.Süleýmangulyýew

# Çyzuwly geometriya şahsy ýumuşlar

Inžener-tehniki hünärleri  
üçin okuw gollanmasy

AŞGABAT – 2010

A.Süleýmangulyýew



*Çyzmaly geometriýa we  
çyzuw dersi boýunça şahsy  
ýumuşlar*

## Sözbaşy

Garaşsyz, baky Bitarap Türkmenistan özüniň ösüşinde täze basgançaga-Beyik Galkynyş eýýamyna gadam basdy. Ol Türkmenistanyň hormatly Prezidenti Gurbanguly Berdimuhamedowyň parasatly we öňdengörüjilikli syýasatynyň netijesinde ösüşiň ähli ugurlary boýunça düýpli özgertmeleri başdan geçirýär. Bu işler ýurdumyzy dünýäniň in ösen döwletleriniň hataryna goşmak, olar bilen deň gadam urmak, olaryň öňdebaryjy tejribesini öwrenip, aýakdaş gitmek üçin edilýär. Bu düýpli özgertmeleriň özenini ylym, bilim tutýar.

Hormatly Prezidentimiz döwlet baştutanlygyna saýlanan ilkinji günlerinden: **“Güýçli döwletde ylym esasy orny eýeleýär, diýmek, biz ylmyň in täze gazananlary bilen aýakdaş gitmelidir”** – diýen beýik şygary öňe sürmek bilen Garaşsyz Türkmenistanda ylymy bilimi özgertmekligiň ýoluna düşdi.

Hormatly Prezidentimiz Bilim reformasyny ygylan etmek bilen ýurdumyzyň bilim we ylym ulgamlaryny dünýä derejesine çykarmak, ýaşlarymyzyň sazlaşykly ösmegi, dünýägaraýşlarynyň giňelmegi üçin ähli şertleri döredýär hem hemişe üns merkezinde saklaýar.

Bu bolsa ähli pudaklarda we ugurlarda ýokary taýýarlykly hünärmenleriň taýýarlanmaklygyna uly badalga berdi.

Häzirki wagtda Milli bilim ulgamyny mundan beýläkde ösdürmek we dünýäniň ösen döwletleriniň derejesine çykarmak üçin ygtybarly binýat döredilýär. Şondan ugur alynyp ýokary mekdepleriň inžener tehniki hünärleri üçin “Çyzmaly geometriýa we çyzuw” dersi boýunça düýpli bilim berilýär.

Çyzgy biziň bilşimiz ýaly giňişlikdäki islendik ýagdaýdaky geometrik figuralaryň şekilini dogry we takyk gurmak ýa-da şol figurany – predmeti dogry ýasamak hem-de gözegçilik etmek üçin zerur bolan başga-da gerekli maglumatlary özünde jemleýän esasy gural bolup hyzmat edýän resminamadyr.

Biziň Garaşsyz, baky Bitarap ýurdumyzda, Mähriban Prezidentimiz Gurbanguly Berdimuhamedowyň taýsyz tagallasy bilen biziň bu Diýarymyzda Täze binalarda, Gara ýollarda, zawot fabriklerde, Beyik asyryň uly desgalary bolan Türkmen kölünde, Türkmen Hytaý gaz geçirijisinde ýene-de asyryň dürli gurluşyklaryny amala aşyrmakda “Çyzmaly geometriýa we çyzuw” dersiniň zerurlygy aýdyňdyr.

Hormatly Prezidentimiziň ýaşlara ilkinji sargytlaryndan biri hem her bir türkmen ýaşlarynyň azyndan üç dili bilmekleridir.

Hormatly Prezidentimiziň bilim ulgamynda amala aşyran reformalarynyň netijesinde okuw jaýlarynda Çyzmaly gemetriýa we çyzuw dersine bolan üns has-da güýçlendirildi. Çyzmaly geometriýa we çyzuw dersiniň düýbünü tutujylardan biri, fransuz alymy Gaspar Monžun aýtmagyna göre **«Çyzgy-tehnikanyň dilidir»**. Bu aýdylan sözlemiň asyl manysy çyzgy dünýädäki dürli dilde gepleýän halklar üçin **internasional** dildir.

Ösüşler hem özgertmeler zamanasynda garaşsyz Türkmenistan döwletimizde bilim alýan her bir inžener hünärmeniniň bu dili kämillik derejesinde öwrenmekligi zerurdyr.

Hormatly Prezidentimiziň dünýäniň meşgur kompaniýalarynyň taýýarlan taslama çyzgylary esasynda olar bilen düşünişip, olaryň başarnyklaryny görüp

bilmekligi başarmak bilen şol gurluşugyň tamamlanandan soň onuň berjek netijesini görmekligi başarýar. Hormatly Prezidentimiziň şahsy mysaly, ösüşler we özgertmeler zamanasynda zähmet çekýan her-bir inžener üçin, aýratyn hem gelejekde inžener boljak talyp yaslara görelde alarlyklydyr. Çünki Hormatly Prezidentimiziň ýolbaşçylynda ýurdumyzy dünýäniň ösen ýurtlarynyň derejesine galdyrmak üçin abraýly daşary ýurtly inženerlerden ýüzlerçesi diýarymyzda zähmet çekýärler. Çyzuw dersini gowy bilmek bilen türkmen inženerleri dünýäniň ösen tejribesini täze tehnikalary-tehnologiýalary ýurdumyzda tiz ornaşdyrýarlar.

**Çyzmaly geometriýa**-geometriýanyň bir bölümi bolmak bilen daş töweregimizdäki geometriki figuralaryň (predmetleriň) giňişlikdäki formalaryny hem-de olary degişli kanunalaýyklykda proyeksiýalar tekizlikleriň şekillendirmek usuly bilen meşgullanýar.

Çyzmaly geometriýa-çyzuwyň nazary esasydyr, ýagny grammatikasydyr. Ol geometriki figuralaryň häsiýetlerini - gurluşlaryny öwredýän esasy gural bolup hyzmat edýär. Her bir çyzgy dürli şekillendirilmegiň usullarynyň kömegi bilen gurulýar. Şonuň üçin-de çyzmaly geometriýanyň esasy meseleleri şu aşakdakylardan ybaratdyr:

Ozal bar bolan, şeýle hem täzeden döredilýän şaýlaryň - gurallaryň şekillerini dogry we takyk çyzmagyň usullaryny öwrenmek.

Çyzgynyň kömegi bilen predmetiň formalaryny hem-de ölçeglerini kesgitlemegiň usullaryny öwrenmek /çyzgyny okamak/.

Giňişlikdäki geometrik formalara degişli meseleleri tekizlikde şekillendirip çözmegiň usullaryny öwrenmek.

Diňe bir tehnikada ulanylýandygyndan başga-da, hakyky dünýäni-giňişlikdäki jisimleriň gurluşyny öwrenmekdäki in bir gymmatly serişdeleriň biri hökmünde çyzmaly geometriýanyň-çyzuwyň ylmy hem-de umumy bilim ähmiýeti örän uludyr.

Täzeligiň döredijilikli gözlenilýän ýerinde, täze tehniki çözgütler barada erjel pikir edilýän hem-de kabul edilýän mahalda, konstruktirlenilýän hem-de proyeksion çyzgyny we onuň nazary esasyny - çyzmaly geometriýany oňat bilmeklik talyplara örän zerurdyr.




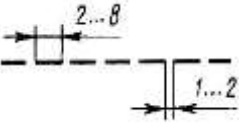
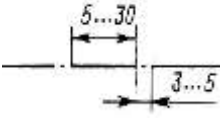
Dersiň aýratynlyklary maşynlary, mehanizmleri şeýle hem häzirki zaman jaýlary we binalaryň taslamalaryny, taýýarlamaklyk we ulanmaklyk olaryň şekilleri bilen baglanşyklydyr. Ol bolsa “Çyzmaly geometriýa we çyzuwyň” öwredýän okuw dersleriniň önünde örän möhüm meseleleri: maşyn gurluşygynda we gurluşykda çylşyrymly keşbi bolan üstleri taslamak üçin köp sanly inžener-geometriki meseleleri işlemekligi, maşyn gurluşygynyň binagärligiň we tehniki estetikanyň häzirki talaplaryna laýyk gelýän keşplerini şekillendirmegi başarmagy, tehniki resminamalaşdyrmagyň usullaryny bilmekligi, grafiki usullar bilen inženerlik meseleleri çözmegi başarmaklygy, çyzgylary ýerine ýetirmegiň we okamaklygyň endiklerini gazanmaklygy goýýar.

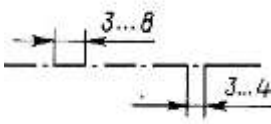
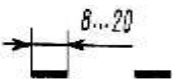




## 1. Çyzyklar we ýazgylar

Konstruktorçylyk resminamalary ýerine ýetirilende dürli ýogynlykda we görnüşde çyzylan çyzyklar ulanylýar. Çyzyklaryň ýerine ýetiriliş düzgünleri TDS 2.303-68 boýunça ykrar edilen, çyzgynyň çyzyklarynyň galyňlygy çyzgynyň ölçeglerine, çylşyrymlylygyna we niýetlenişine baglydyr. TDS 2.303-68 tarapyndan tassyklanan we çyzygyda giňden ulanylýan çyzyklaryň hasiýetnamasyna aşakda seredilen we olaryň ulanylýan ýerleri barada maglumat berilen. 1-nji suratda dykynyň şekilinde we 2,3-nji suratlarda çyzgynyň çyzyklarynyň ulanylýan mysallary görkezilen.

### Çyzgy çyzyklary

№	Atlary	Şekili	Esasy çyzygyň ýogynlygy-na baglylykda çyzyklaryň ýogynlygy
1	2	3	4
1.	Esasy tutuş (üznüksiz) çyzyk		S
2	Tutuş inçe çyzyk		S/3-den S/2 çenli
3	Tutuş tolkun çyzyk		S/3-den S/2 çenli
4	Ştrih çyzyk		S/3-den S/2 çenli
5	Inçe ştrih-punktir çyzyk		S/3-den S/2 çenli

6	Ýognasyrak (ýogynrak) ştrih-punktir çyzyk		S/2-den 2S/3 çenli
7	Üzülen çyzyk		S-den (3/2) S çenli
8	Döwükli inçe tutuş çyzyk		S/3-den S/2 çenli
9	Iki nokatly Inçe ştrih-punktir çyzyk		S/3-den S/2 çenli

**1. Esasy tutuş (üzüksiz) çyzyk** görüňän suduryň çyzyklary, üstleriň kesişme çyzyklarynyň görüňänleri, kesigiň suduryň çyzyklary (çykarylan hem-de ýarygyň düzümine girýänleri) ýerine ýetirilende (şekillendirilende) ulanylýar.

**2. Tutuş inçe çyzyk** üstüne goýulan kesigiň suduryň çyzyklary, çykaryş we ölçeg çyzyklary, ştrihleme şyzyklar, çykarma çyzyklar, çykarma çyzygyň tekjesi we ýazgylaryň aşagyny çyzýan çyzyk, göz önüne getirilýän geçiş çyzyklar, tekizlikleriň yzlary, ýörite gurluşlarda esasy (häsiýetli) nokatlary gurýan çyzyklar, araçäk şaýlary şekillendirýän çyzyklar, görnüşlerde, ýaryklarda we kesiklerde çykarylýan elementleri çäklendirýän çyzyklar şekillendirilende ulanylýar.

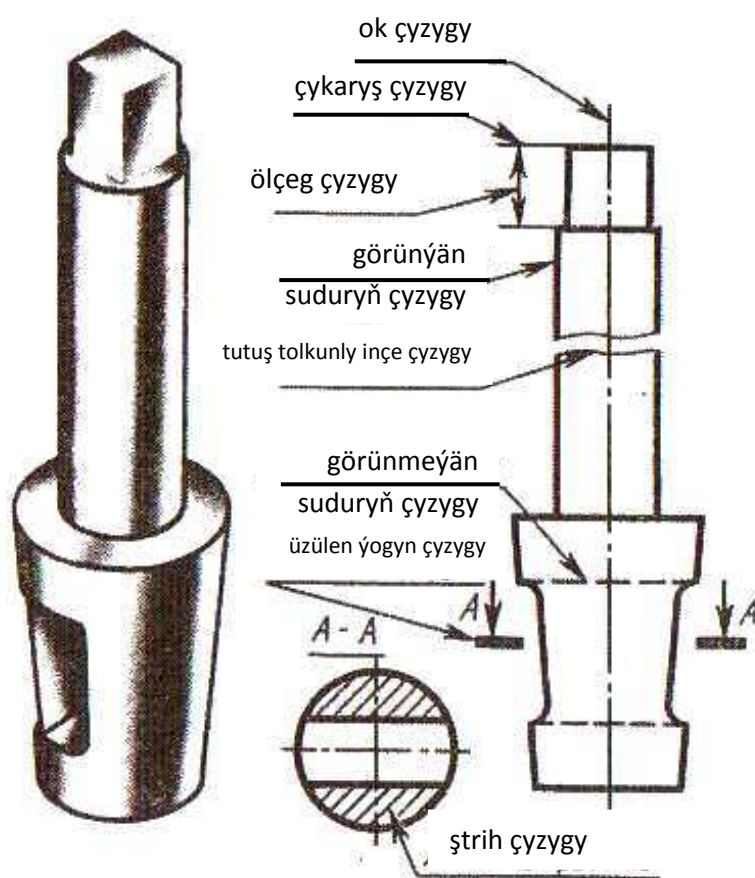
**3. Tutuş tolkun çyzyk** üzülme çyzyklar, görnüş bilen ýarygy çäklendirýän çyzyklar şekillendirilende ulanylýar

**4. Ştrih çyzyk** görünmeýän suduryň çyzyklary, görünmeýän geçiş çyzyklary şekillendirilende ulanylýar

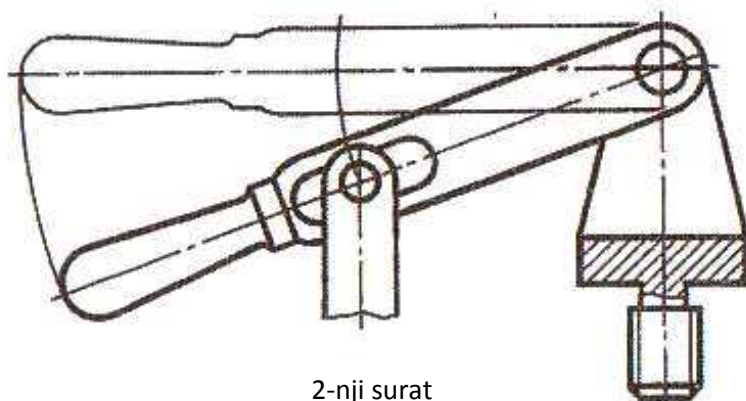
**5. Inçe ştrih-punktir çyzyk** ok we merkezi çyzyklar, üstüne goýulan we çykarylan kesikler üçin simmetriýa oklary bolan kesiji çyzyklar şekillendirilende ulanylýar.

**6.Ýognasyrak (ýogynrak) ştrih-punktir çyzyk** örtme we ýylylyk bilen işlemäge (termiçeskiý) deňişli üstleri görkezýän (belleýän) çyzyklar, kesiji tekizligiň önündäki ýerleşen elementleri (üstüne goýulýan düşürme) şekillendirmek üçin ulanylýar.

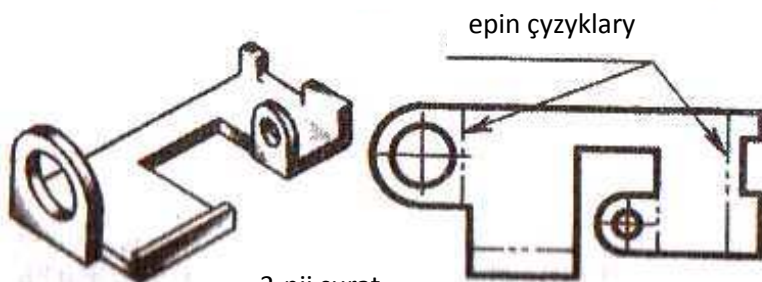
**7.Üzülen çyzyk** kesikleriň çyzyklary şekillendirilende ulanylýar.



1-nji surat



2-nji surat



3-nji surat

dogry çykarmaklyga (ýitilemeklige) bagly. 4-nji suratda galamyň ujunyň dogry

**8.Döwürli inçe tutuş çyzyk** uzyn üzülmä çyzyklar şekillendirilende ulanylýar.

**9.Iki nokatly inçe ştrih-punktir çyzyk** ýazgynlardaky çyzyklar,önümleriň şaýlarynyň iň çetki we aralykdaky ýagdaýlaryny şekillendirmek üçin , görnüş bilen utgaşan ýazgyny şekillendirmek üçin ulanylýar.

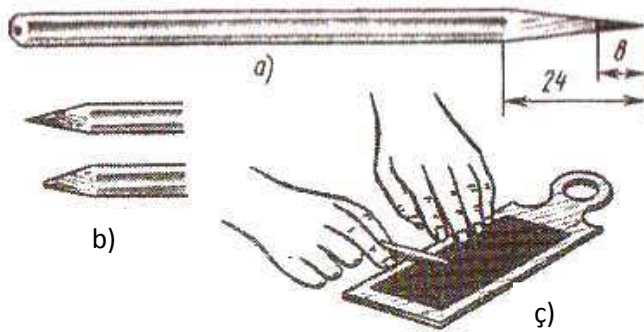
TDS 2.303-68

tarapyndan çyzygyň has kiçi ýogynlygy (0,3 mm) we çyzyklar arasynda has yakyn aralyk (0,8 mm) belenilýär. Şol bir çyzyklar bilen ýerine ýetirilýän ştrihler deň uzynlykda bolmalydyr we şekiliň ölçeginiň uzynlygyna baglylykda alynmalydyr. Ştrihleriň aralary çyzygyň bütin uzynlygy boýunça deňdir. Ştrih-punktir çyzyklar özara kesişmelidir we ştrih çyzyk bilen tamamlanmaly.

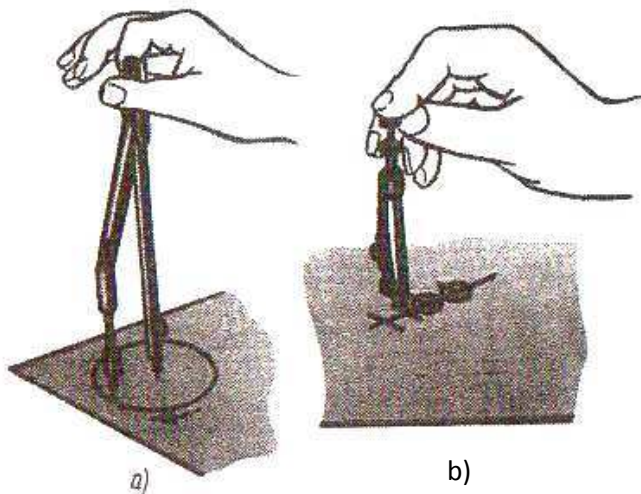
Bir çyzygydaky çyzyklar olaryň galyňlygyna bagly bolmazdan açyk görünmekligi deň saklanmalydyr. Ony bolsa,dürli gatylykdaky galamlary ulanmak bilen berjaý etmek mümkin. Çyzygyny arassa we takyk ýerine ýetirmek köp halatlarda galamyň ujuny

çykarylyşy görkezilen. Galamyň kömrüni uşak daşly dogry timarlaýja salyp ýitilemek bolar.

Talyplar hökmany üç hilli galam: M (ýumşak), TM (gaty – ýumşak) we T (gaty) ýa-da “Konstruktor” galamlar ýygynyndysyny edinmelidir. Mysal üçin, inçe çyzyklar T-gaty galam bilen geçirilmeli, tutuş esasy çyzyk TM-ýumşak-gaty galam bilen, töwerekler M-ýumşak galam bilen ýerine ýetirilýär. Bu diýildigi

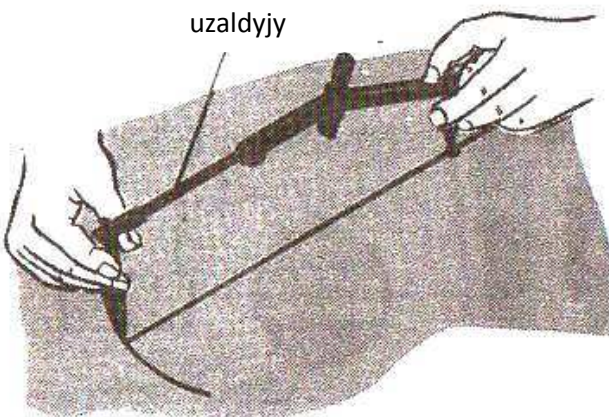


4-nji surat



5-nji surat

uzaldyjy



6-njy surat

çyzgy ýerine ýetirilende ilki bilen T galam bilen inçe çyzyk arkaly çyzmak maslahat berilýär, soňra TM ya-da M galam bilen üstünden geçirilýär. Sirkulda işlemek üçin M galamyň grifeli (kömri) oturdylýar.

#### Maşyngurluşyk

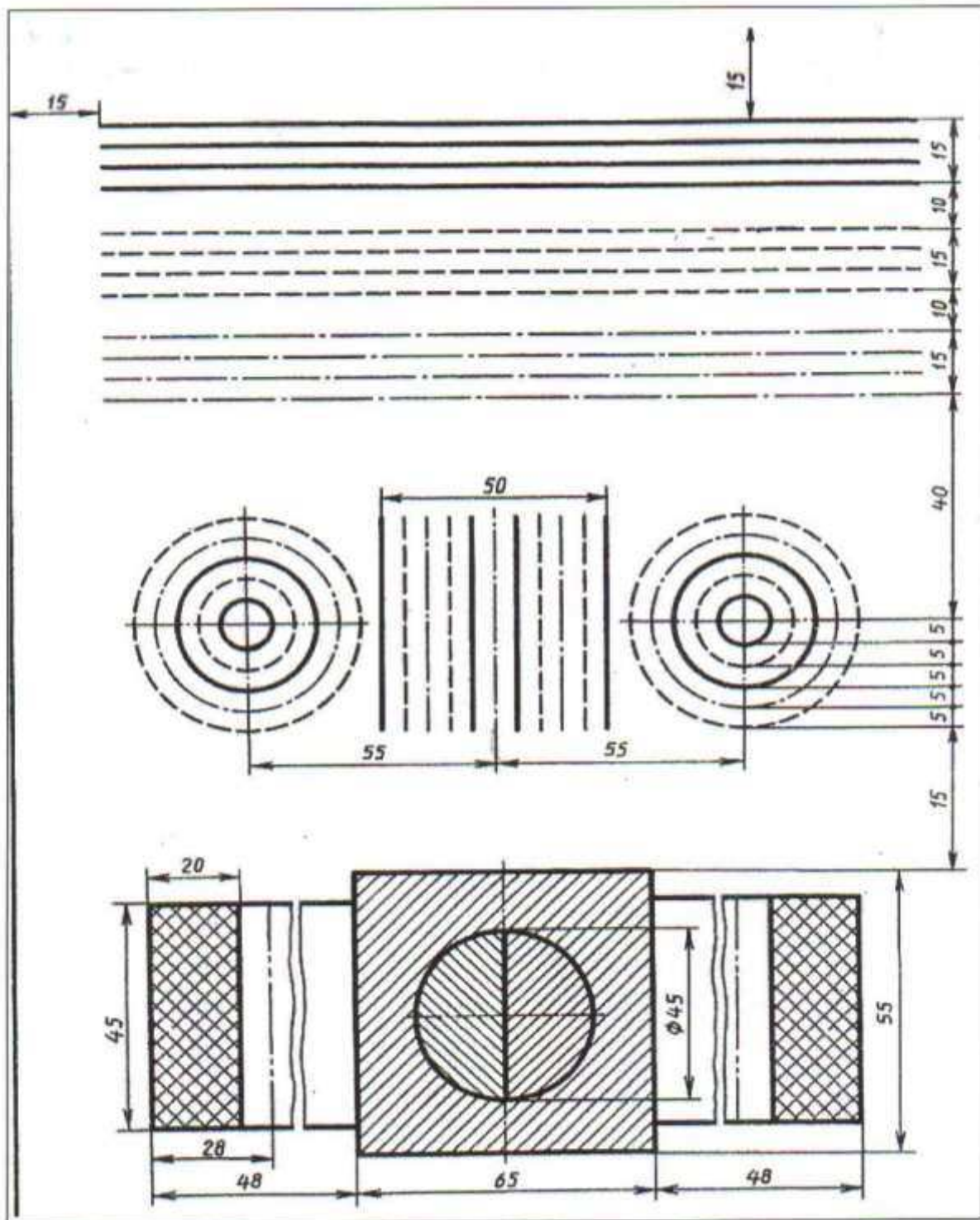
çyzgylarynda ahli yazgylary esasy şriftler bilen TDS 2.304-68 laýyklykda, tor gurmazdan, el bilen, harplaryň ölçeglerini, ýagtylyklaryny saklamak bilen, harplaryň, sözleriň, sanlaryň we belgileriň arasyndaky aralyklary berjaý etmek bilen ýerine ýetirilmeli. Harplaryň we sifrleriň beýikliklerini saklap ýazmaga kömek üçin, kömekçi inçe çyzyklar geçirmek bolar.

Çyzgyda ýazgylar yumşak galam bilen ýerine ýetirilýär, şol bir wagtda harplary we sifrleriň çyzyklarynyň ýogynlygy berjaý edilmeli.

Köp halatlarda çyzyklarda we konstruktorçylyk resminamalarda ýazgylar setir harplar bilen ýerine ýetirilýär, sözlemiň başlangyç harpy baş harp bilen ýazylýar.



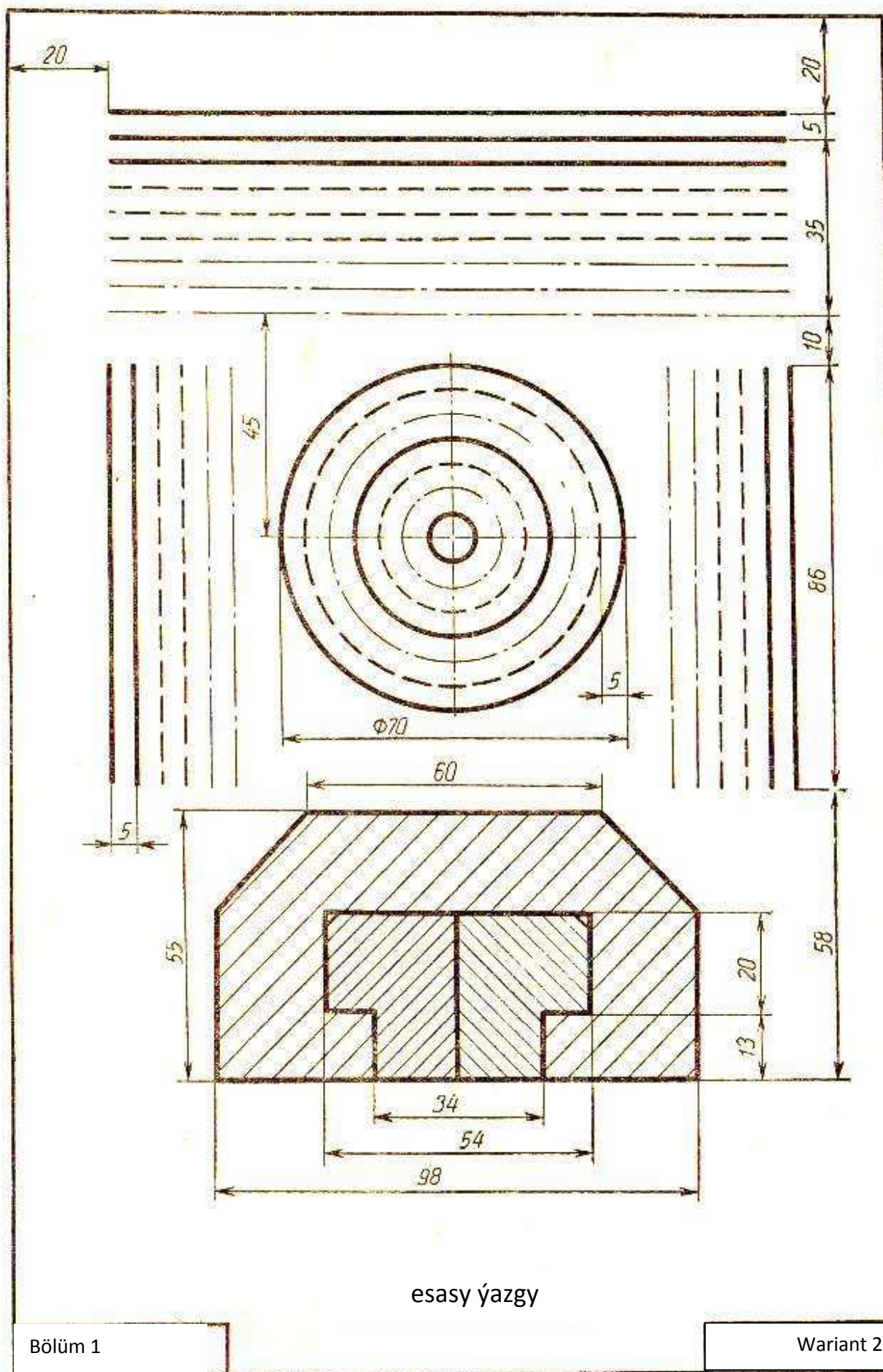
# ÝUMUŞ 1



TDS 2.303-68 talaplaryny berjaý etmek bilen berlen çyzyklary we şekili çyzgydaky ýerleşşi ýaly çyzmaly, ölçegleri goýmaly däl





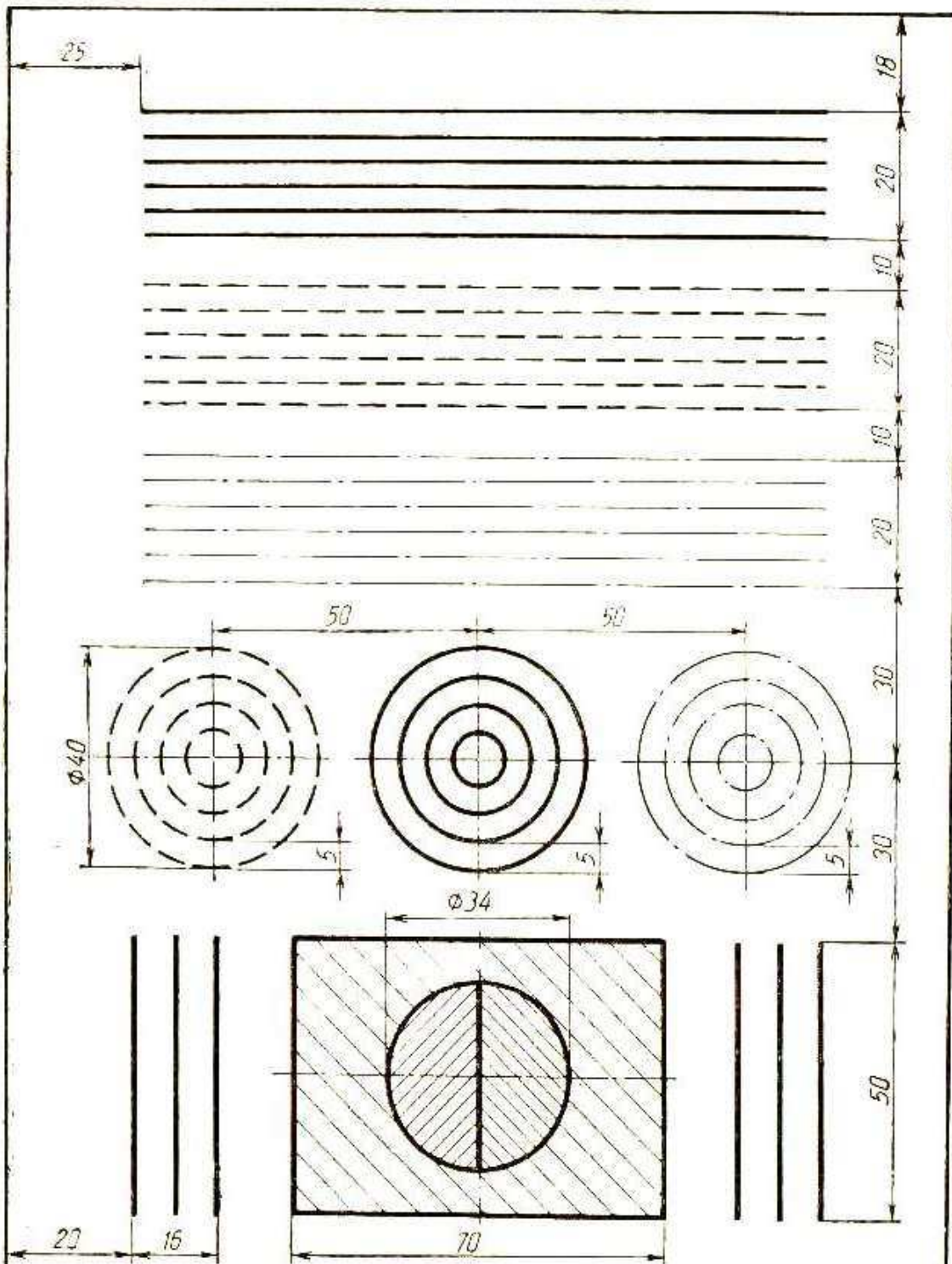


esasy ýazgy

Bölüm 1

Wariant 2

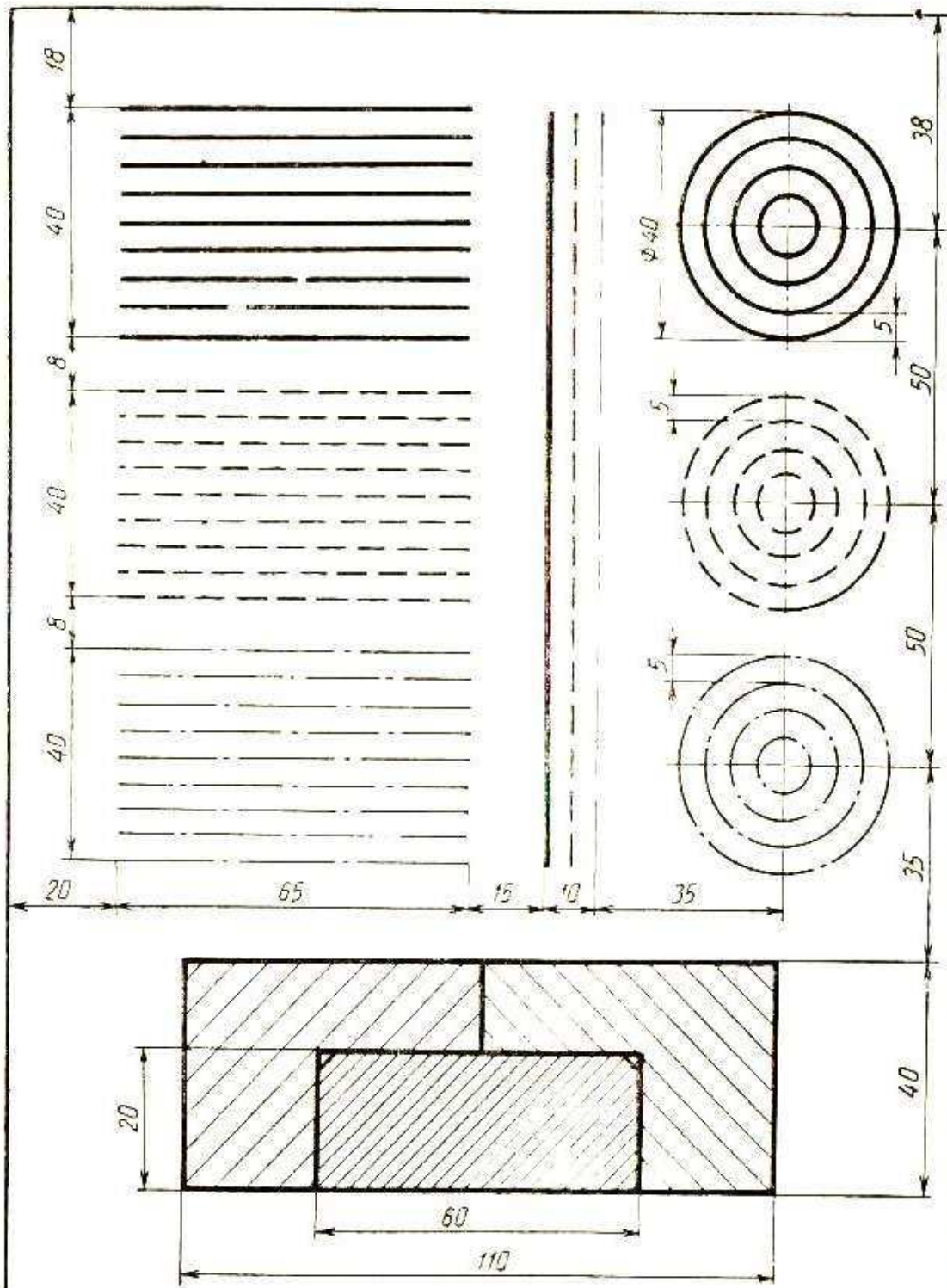




esasy ýazgy

Bölüm 1

Wariant 3

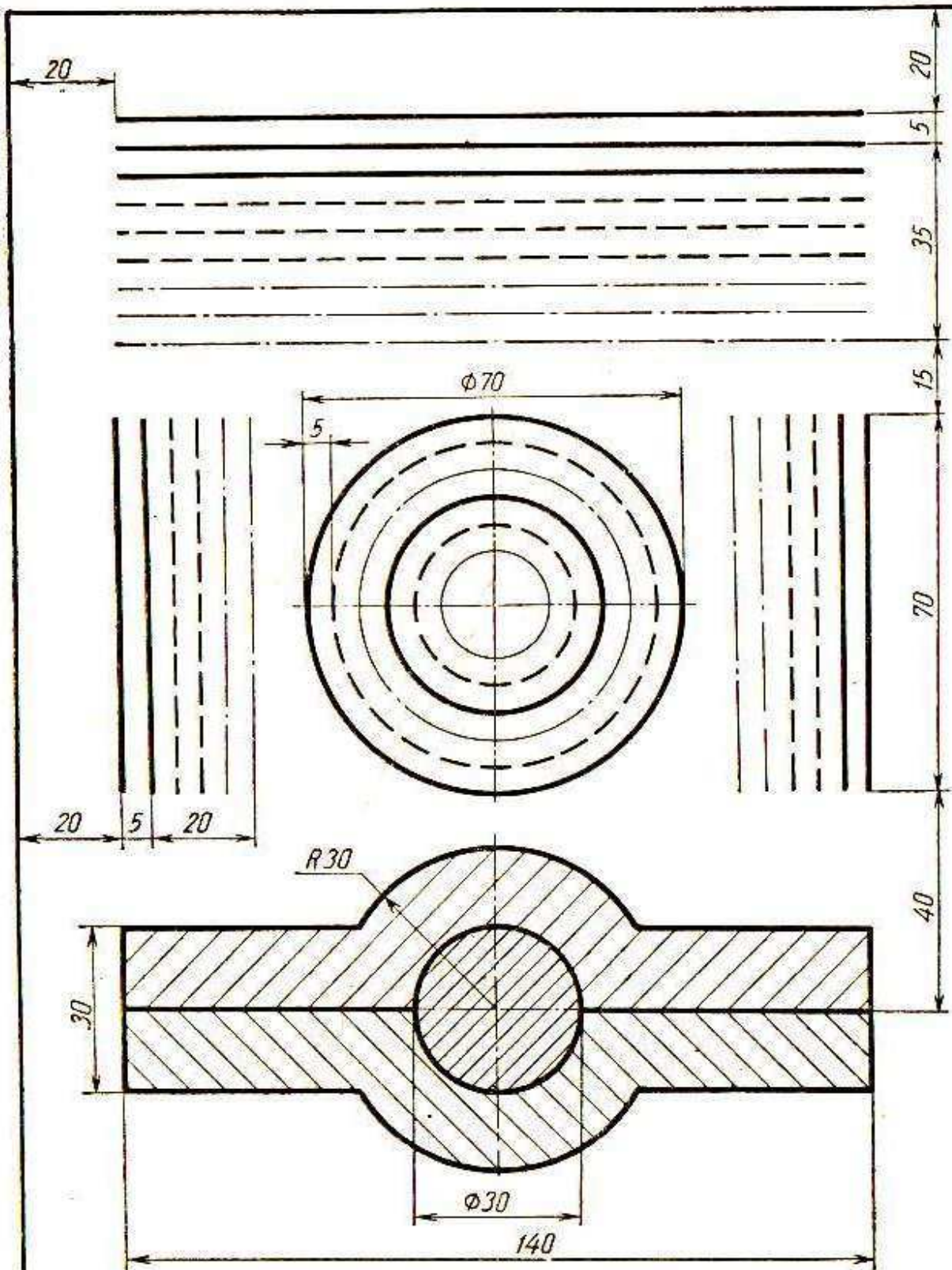


esasy ýazgy

Bölüm 1

Wariant 4

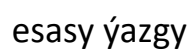




esasy ýazgy

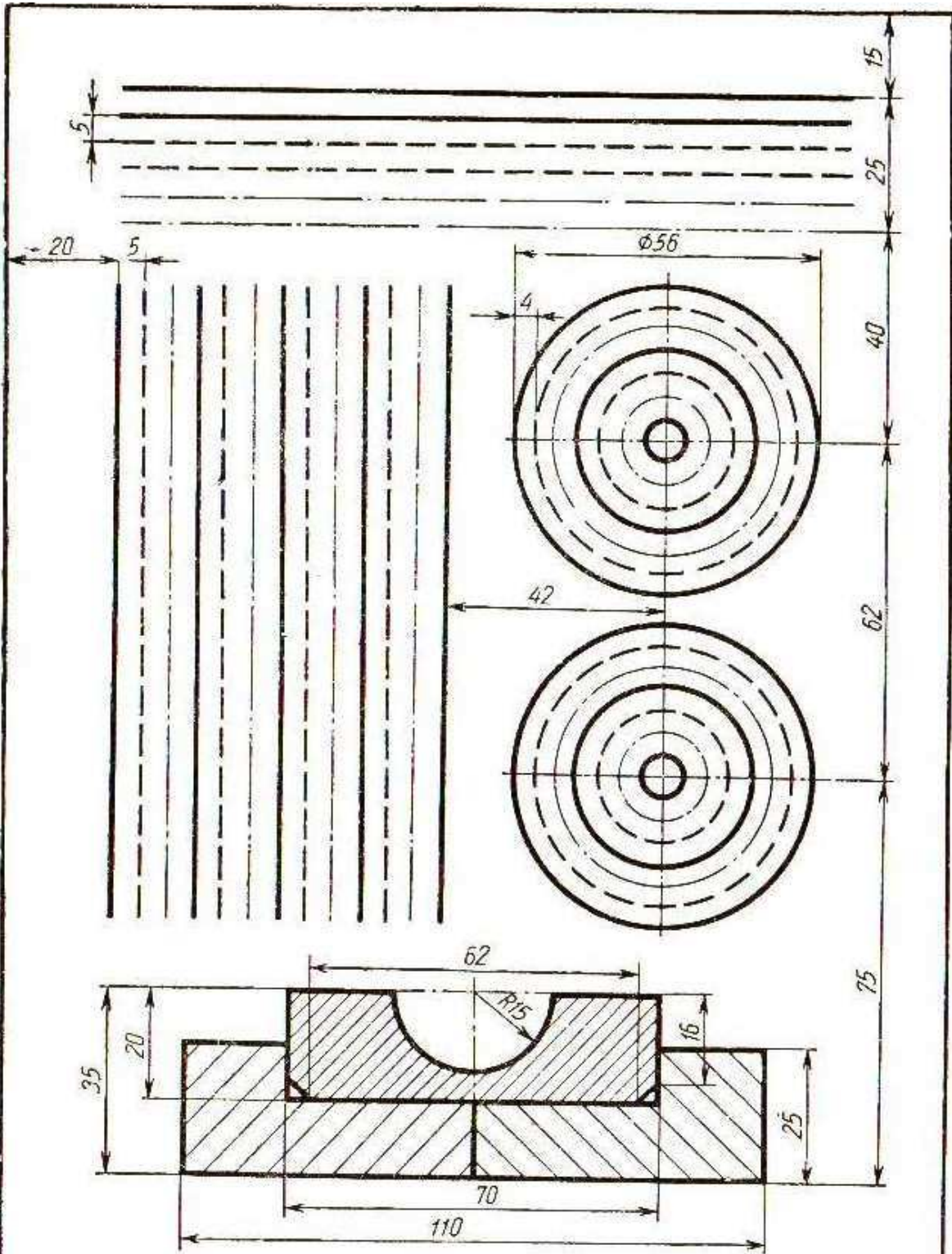
Bölüm 1

Wariant 5



### Warant 6

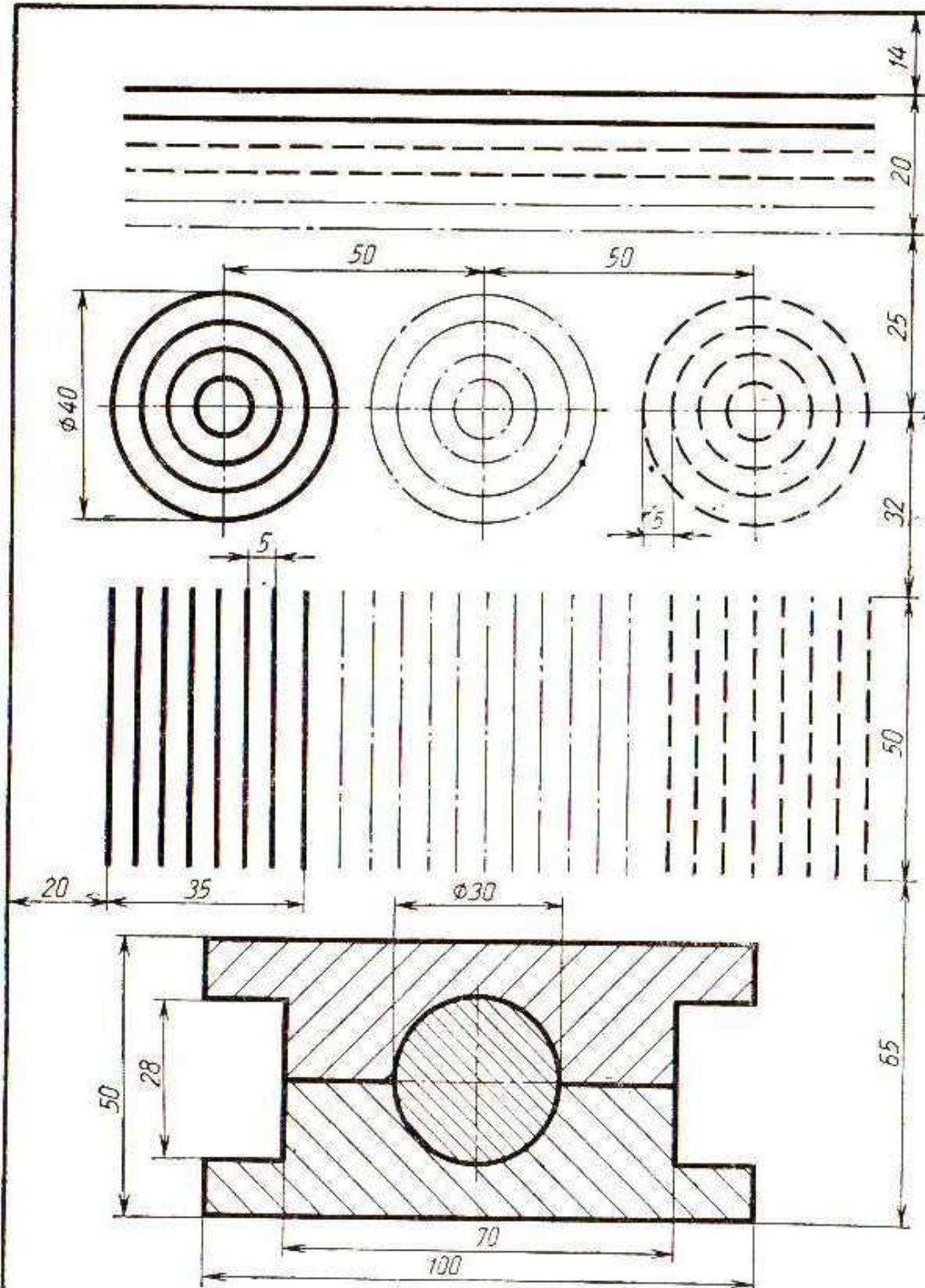




esasy ýazgy

Bölüm 1

Wariant 7

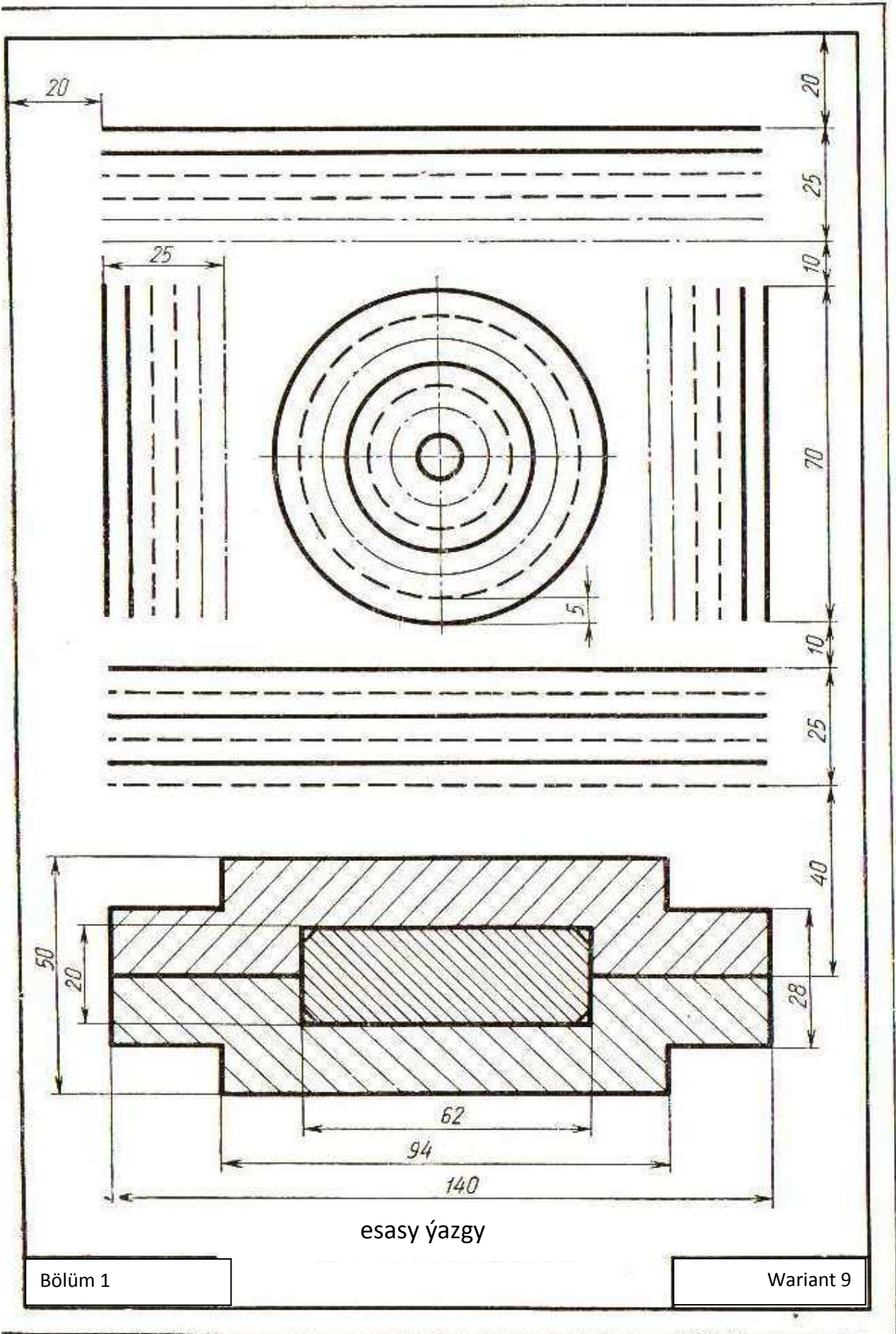


esasy ýazgy

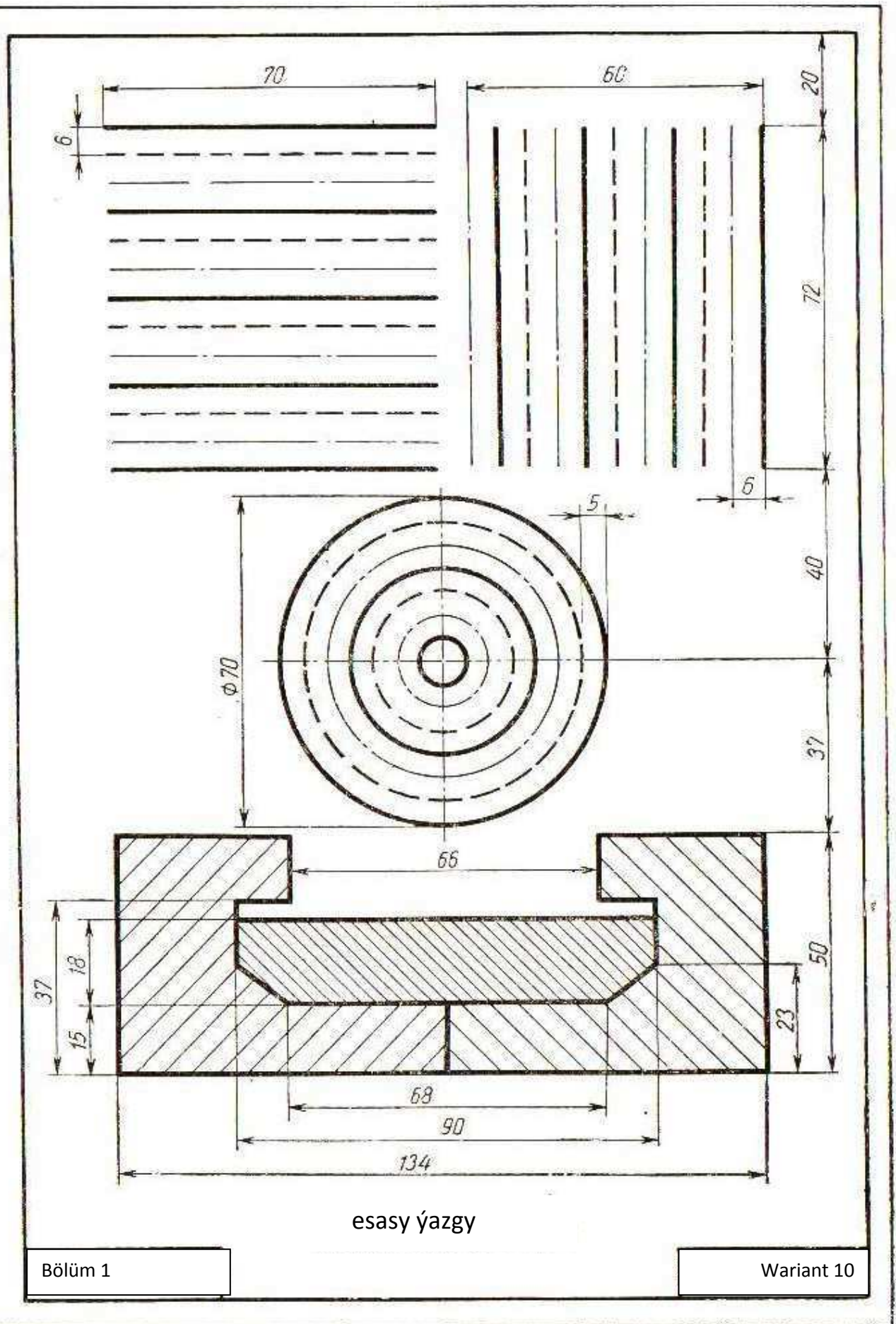
Bölüm 1

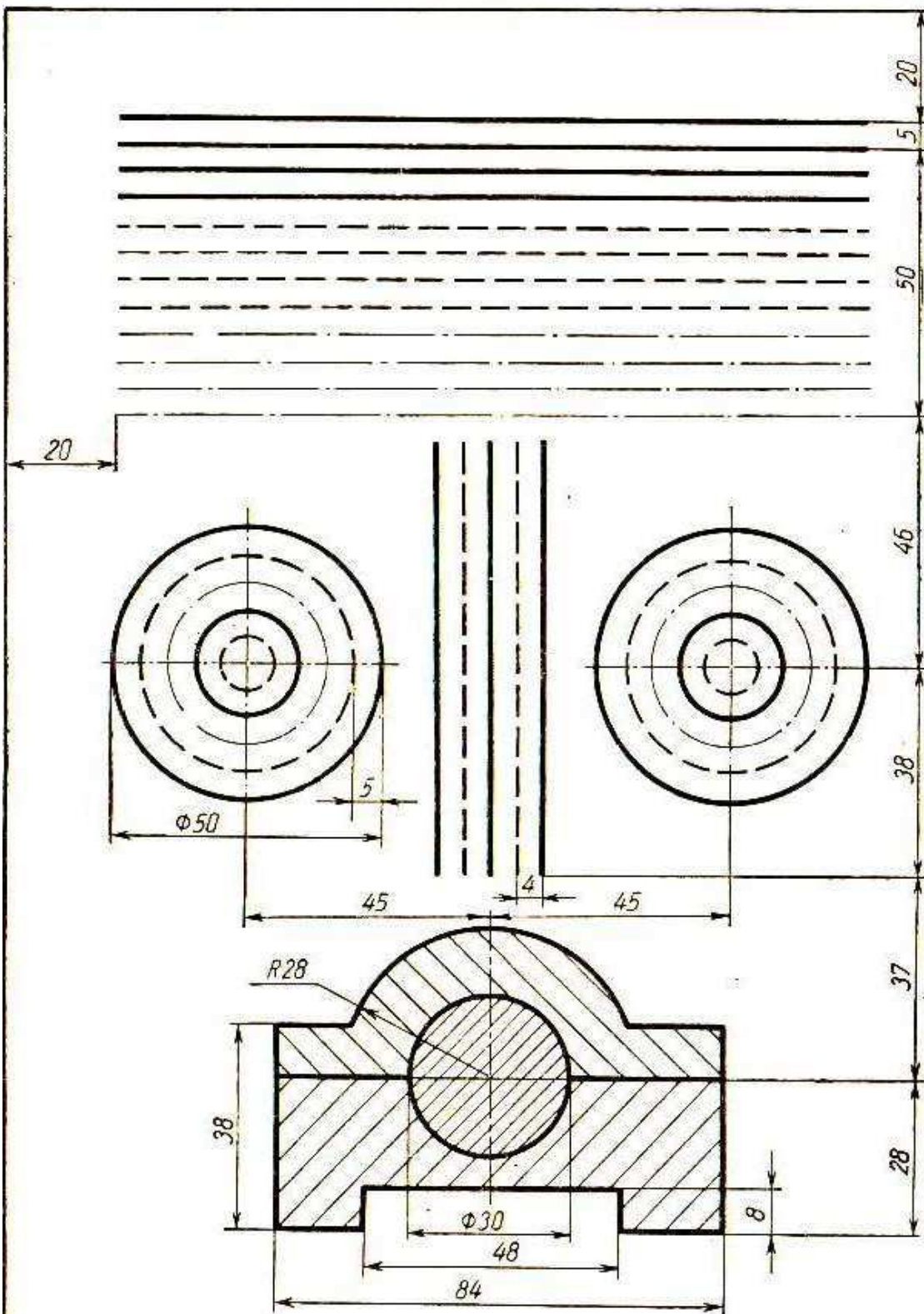
Wariant 8









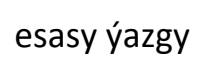


esasy ýazgy

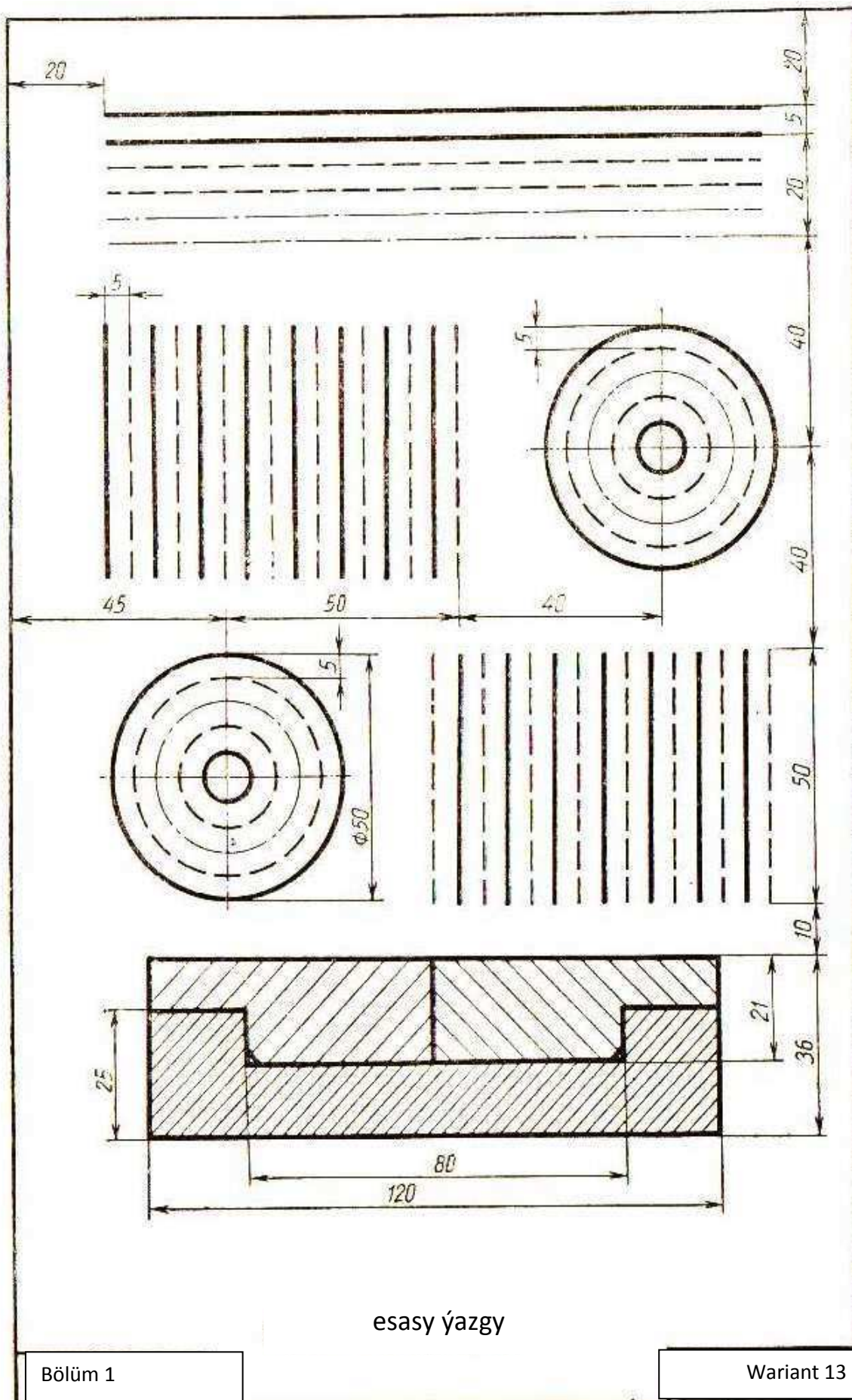
Bölüm 1

Wariant 11

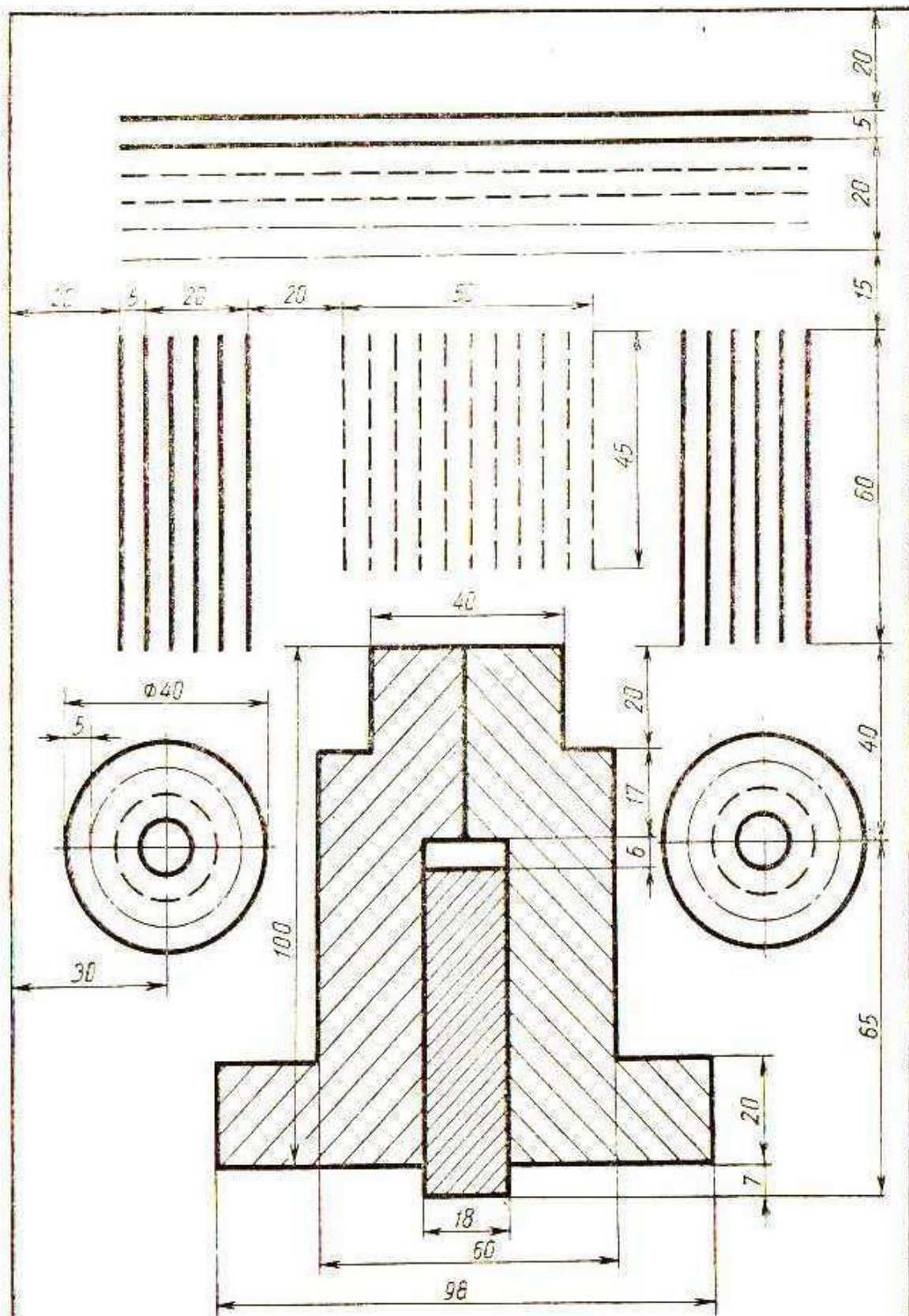




## Warient 12



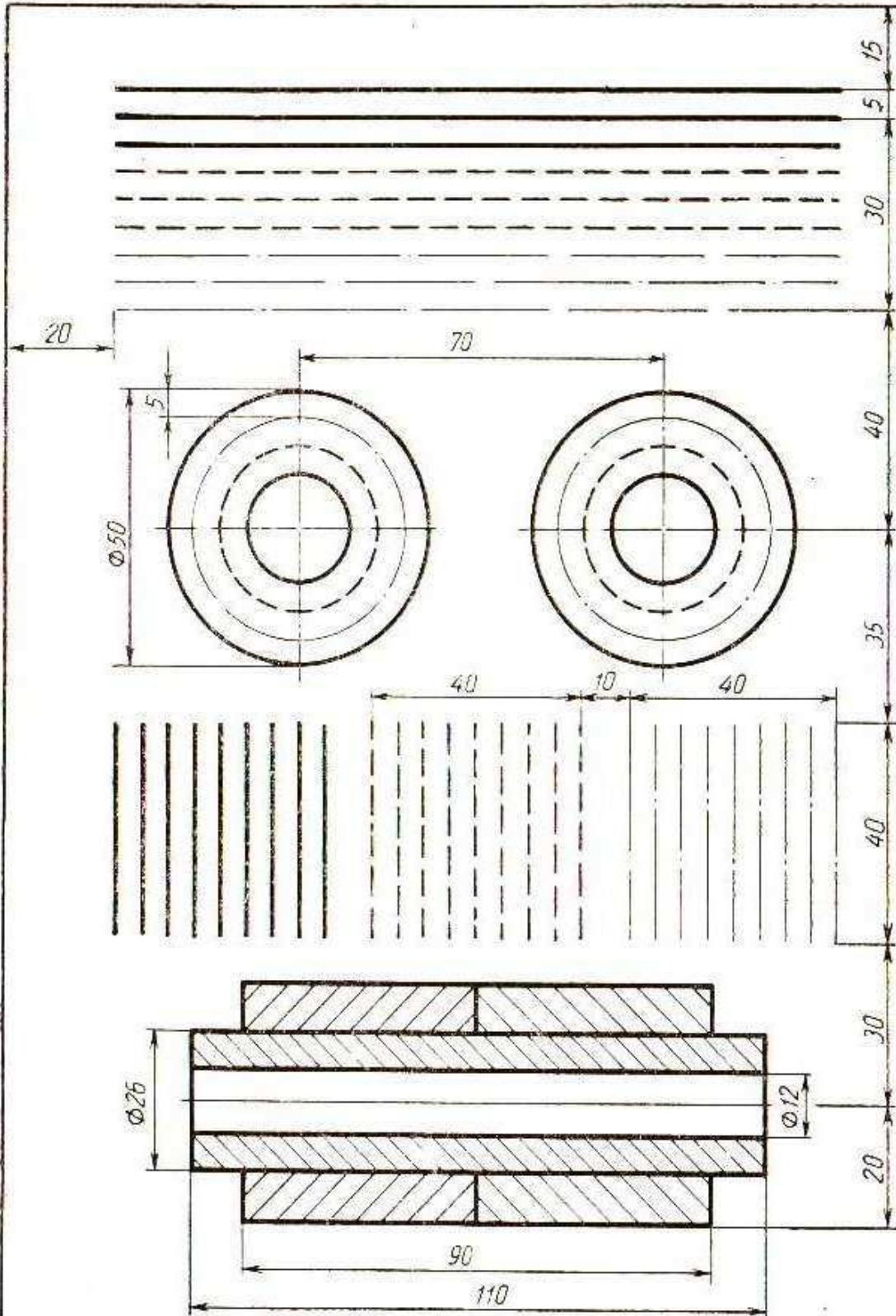




esasy ýazgy

Bölüm 1

Variant 14

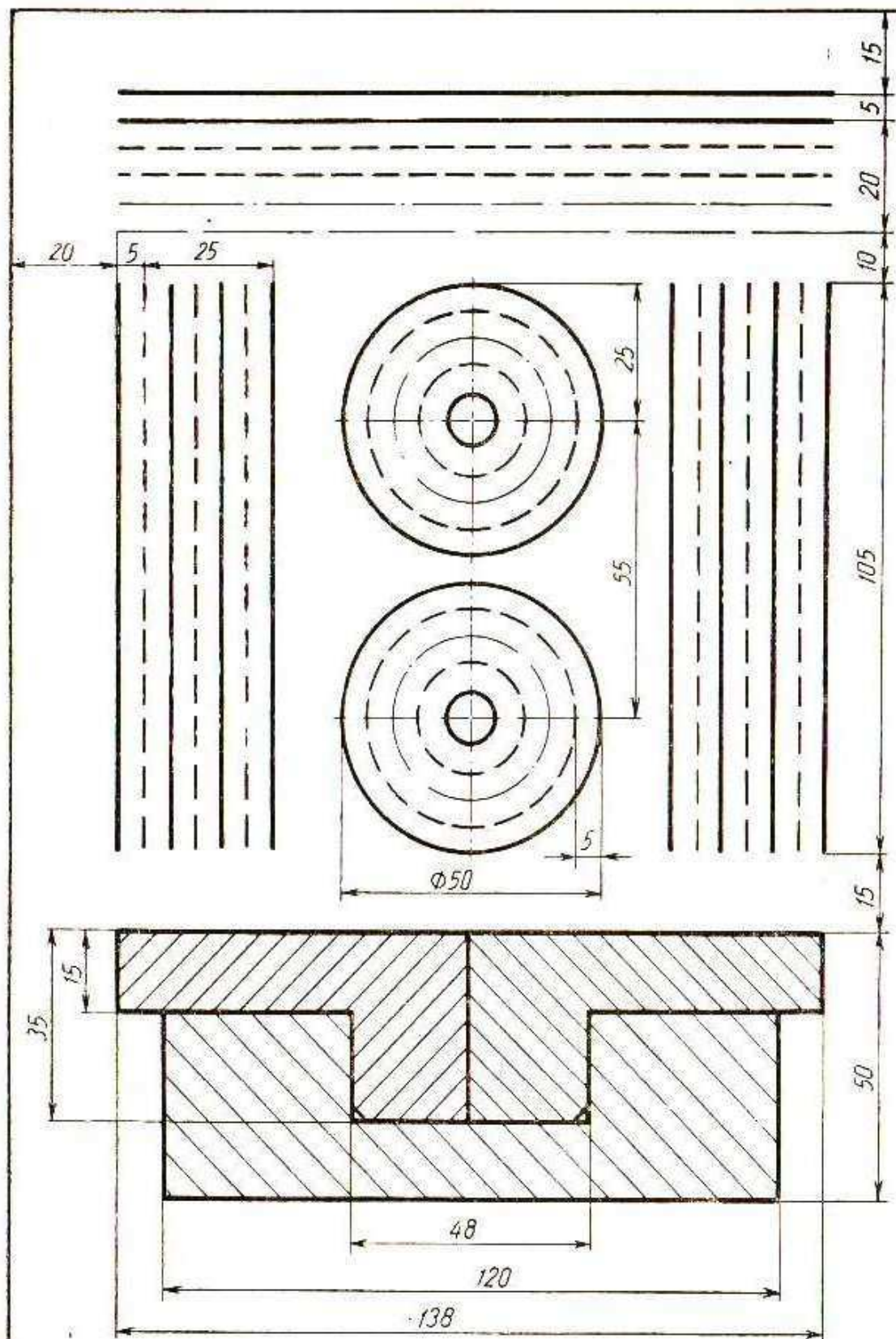


esasy ýazgy

Bölüm 1

Wariant 15





esasy ýazgy

Bölüm 1

Wariant 16



## 2.Çyzgydaky şriftler

**Şrift** nemes sözi bolup <<Schift>> - hat diýmekdir. Çyzgynyň şriftleri, bu çyzgydaky ýazylýan ýazgylar, has takygy **çyzgydaky harplar we sifrlar diýmeklikdir.**

Senagatyň we gurluşygyň ähli pudaklarynda çyzgylar TDS-2.304-81 talaplaryny berjaý etmek bilen ýerine ýetirilýär.

Aşakda, şu standarta laýyklykda adalgalar, kesgitlemeler, ýazgylaryň görnüşleri we ölçegleri getirilendir, Türkmen, rus, latyn we grek elipbiýleri, arap we rim sifrleri we ýörite belgiler görkezilendir.

Ýazgylaryň, (harplaryň we sifrleriň) ölçegleri (h) - baş harplaryň millimetrde kesgitlenen beýikliginiň ululygydyr. TDS tarapyndan şu aşakdaky ölçegler berkarar edilen: (1,8) 2,5; 3,5; 5; 7; 10; 14; 20; 28; 40 we ş.m.

Ýazgynyň çyzygynyň ýogynlygy (d)-ýazgynyň tipine (görnüşine) we beýikligine baglylykda kesgitlenýän ýogynlykdyr.

Şriftleriň çyzygynyň ýogynlygyna baglanyşygy esasynda TDS tarapyndan şu aşakdaky görnüşler berkarar edilen:

A- görnüşli şriftleriň çyzygynyň ýogynlygy-  $d=1/14 h$

B- görnüşli şriftleriň çyzygynyň ýogynlygy-  $d=1/10 h$

Şriftleriň iki görnüşü hem  $75^0$  ýapgytlykda ýa-da ýapgytsyz (göni şrift bilen) ýerine ýetirilýär.

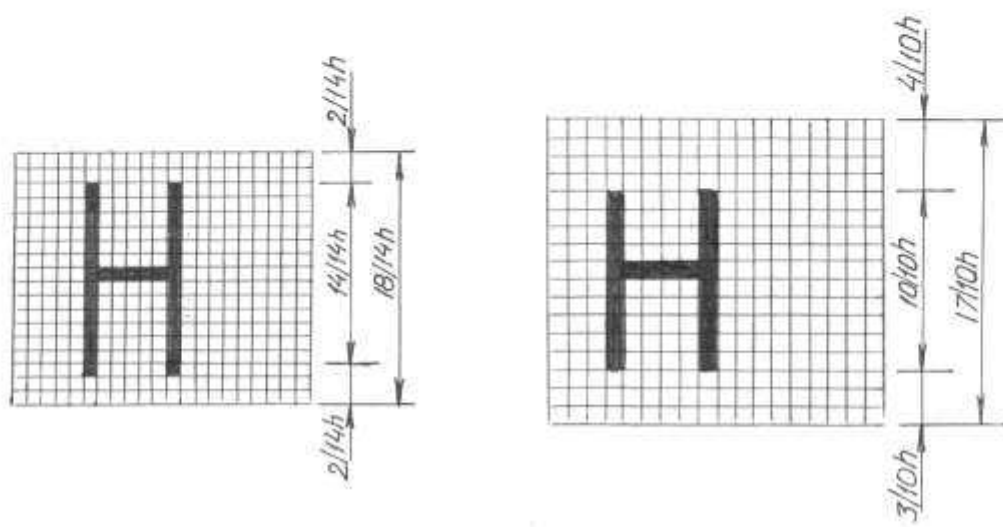
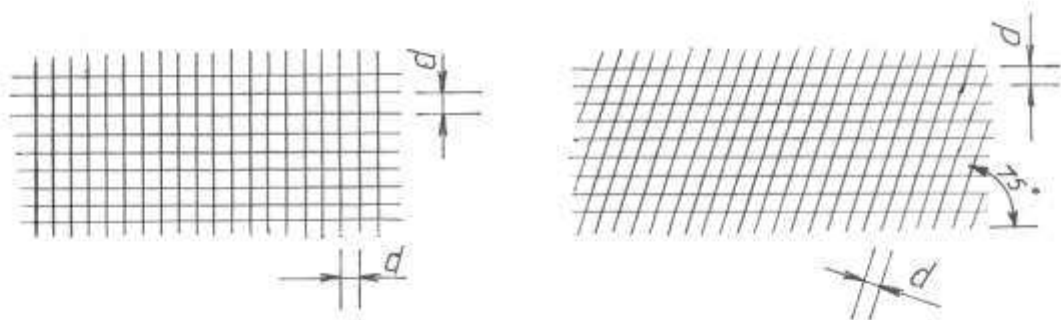
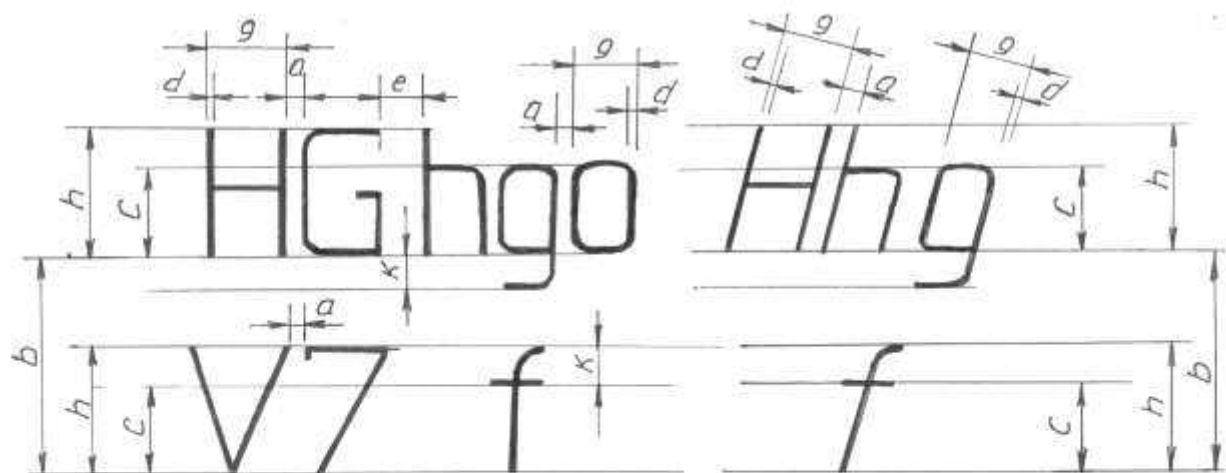
Baş harplaryň beýikligi “h” setiriň esasynda perpendikulýar ýagdaýda ölçenilýär.

Setir harplarynyň beýikligi “c” (çykyndysyz) şriftiň “h” ölçegine görä kabul edilýär, mysal üçin  $c=7/10 h$

“g”- harpyň ini şriftiň “h” ölçegine görä kabul edilýär, mysal üçin  $g=6/10 h$  ýa-da

“d”- şriftiň çyzygynyň ýogynlygynyň gatnaşygyna görä kesgitlenilýär.

*Kömekçi tor* - kömekçi çyzyklaryň esasynda emele gelen tor, özem şol tora harplaryň ýazylmagy bilen häsiýetlendirilýär. Toryň kömekçi çyzygynyň ädimi “d”- şriftiň çyzygynyň ýogynlygyna görä kesgitlenilýär.



Şriftiň A görnüşi ( $d=h/14$ )

Ýazgynyň görkezijileri	Bel-gile-nişi	Deňeşdiriji ölçegler		Ölçegler, mm-de						
1	2	3	4	5	6	7	8	9	10	11
Baş harplaryň beýikligi	h	(14/14)h	14d	2,5	3,5	5,0	7,0	10	14,0	20,0
Setir harplaryň beýikligi	S	(10/14)h	10d	1,8	2,5	3,5	5,0	7,0	10,0	14,0
Harplaryň arasyndaky aralyk	a	(2/14)h	2d	0,35	0,5	0,7	1,0	1,4	2,0	2,8
Setirleriň iň kiçi ädimi (kömekçi toruň beýikligi)	b	(22/14)h	22d	4,0	5,5	8,0	11,0	16,0	22,0	31,0
Sözleriň arasyndaky iň az aralyk	e	(6/14)h	6d	1,1	1,5	2,1	3,0	4,2	6,0	8,4
Ýazgynyň çyzygynyň ýogynlygy	d	(1/14)h	d	0,18	0,25	0,35	0,5	0,7	1,0	1,4

Şriftiň B görnüşi ( $d=h/10$ )

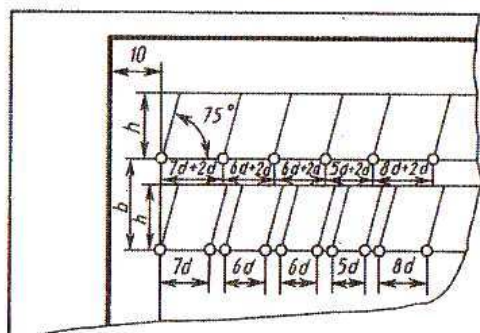
Ýazgynyň parametr-leri	Bel-gile-nişi	Deňeşdiriji ölçegler		Ölçegler, mm-de							
1	2	3	4	5	6	7	8	9	10	11	12
Baş harplaryň beýikligi	h	(10/10)h	10d	1.8	2.5	3.5	5,0	7.0	10.0	14.0	20.0
Setir harplaryň beýikligi	s	(7/14) h	7d	1.3	1.8	2.5	3,5	5.0	7.0	10.0	14.0
Harplaryň arasyndaky aralyk	a	(2/10) h	2d	0,35	0,5	0,7	1,0	1.4	2,0	2,8	4.0

Setirleriň iň kiçi ädimi (kömekçi toruň beýikligi)	b	(17/10) h	17d	3.1	5.5	6,0	8.5	12.0	17.0	24.0	34.0
Sözleriň arasyndaky iň az aralyk	e	(6/10) h	6d	1,1	1,5	2,1	3,0	4,2	6,0	8,4	12.0
Ýazgynyň çyzygynyň ýogynlygy	d	(1/10) h	d	0,18	0,25	0,35	0,5	0,7	1,0	1,4	2.0

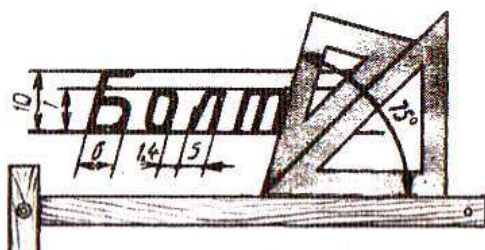
ALBOM



11-nji surat



12-nji surat

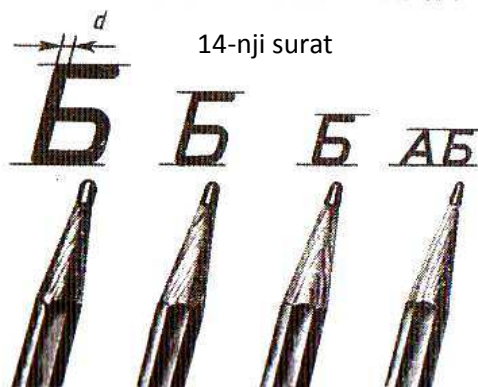


13-nji surat

КРАН Кран

Подшипник

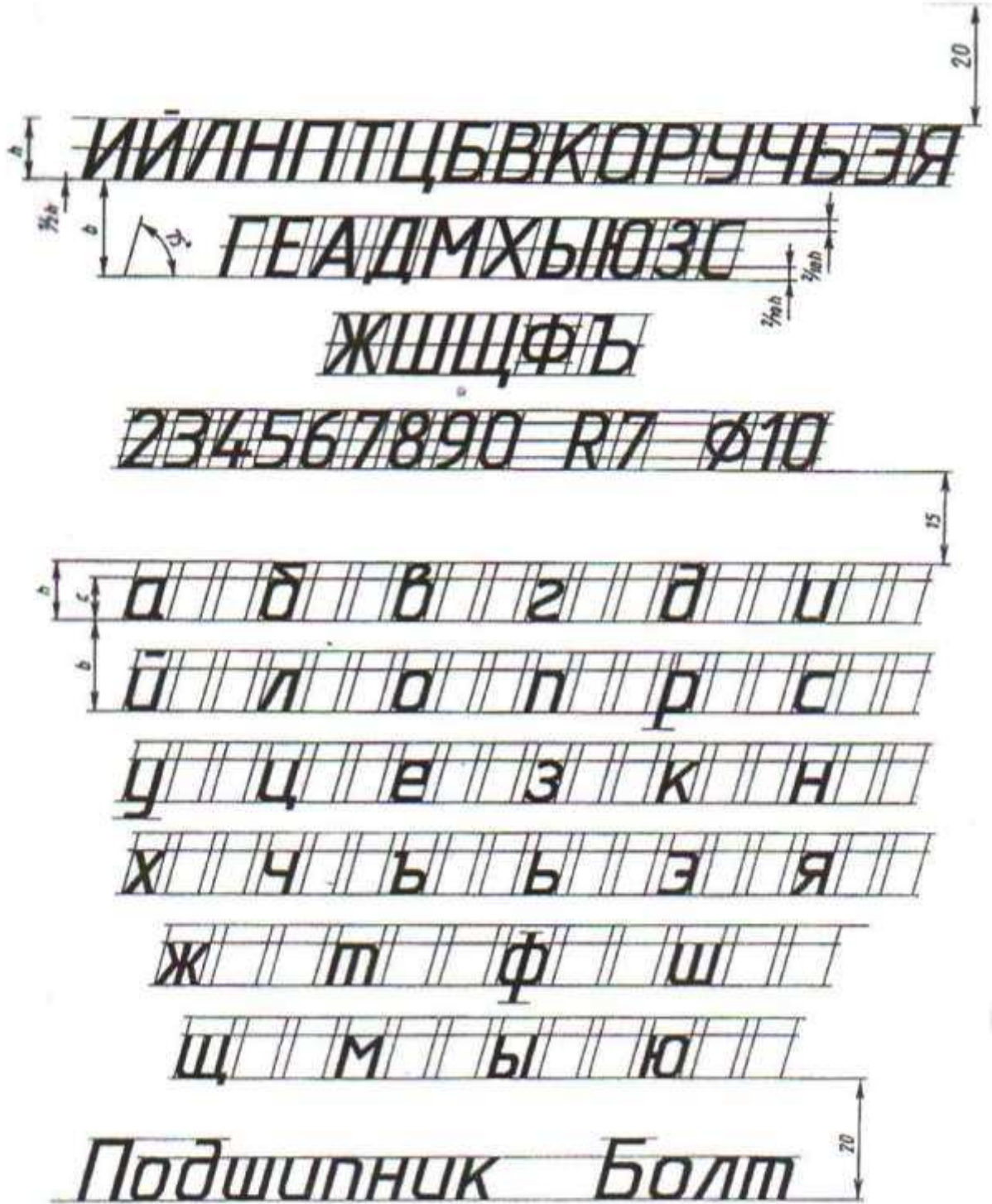
14-nji surat



15-nji surat



## ЎМУШ 2



Harplaryň, sifrleriň we sözleriň şekillerini 10 ölçegdäki B hilli şriftler bilen ýazmaly. Her bir setir harpyny 3 gezek ýazmaly. Ýumuşy ýerine ýetirmekligi tutuş inçe çyzyklar bilen goşmaça torlary çyzmak bilen ýerine ýetirmeli.



АБВГДЕЖЗИЙКЛ

МНОПРСТУФХЦЧ

ШЩЪЫЬЭЮЯ

абвгдежзийклм

нопрстуфхцчш

щъыьэюя

1234567890 3

КРАН Кран Подшипник

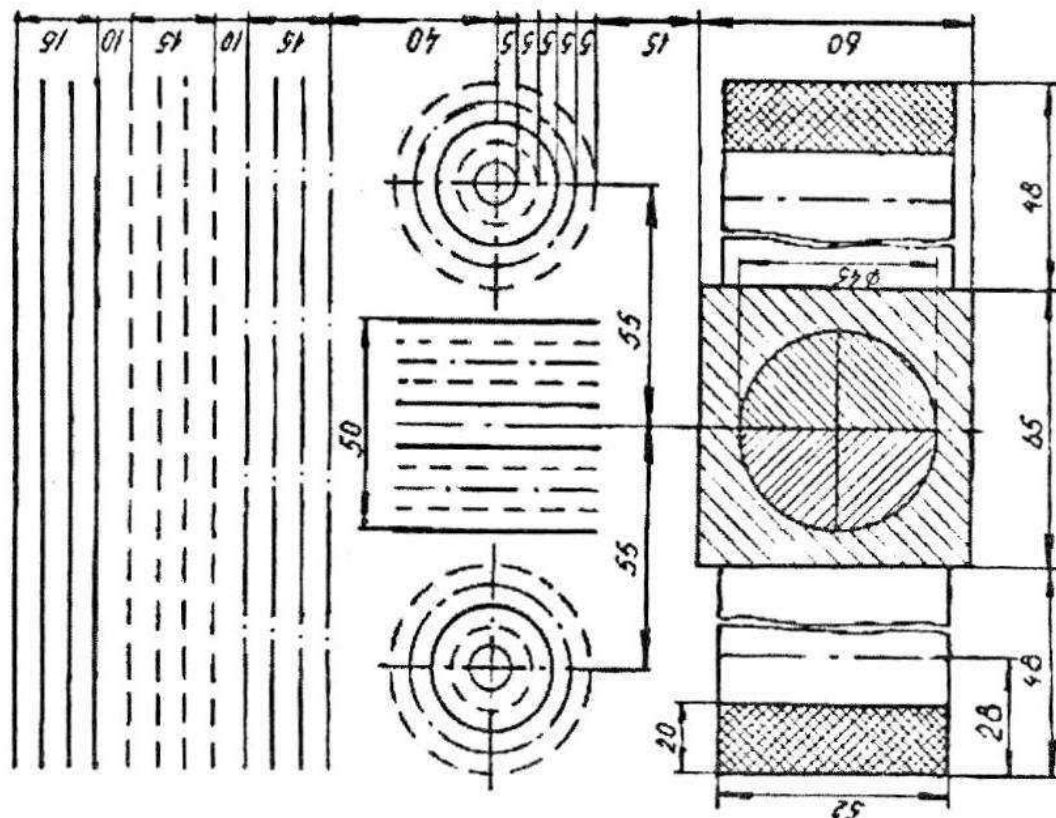
Harplaryň, sifrleriň we sözleriň şekillerini 10 ölçegdäki B hilli şriftler bilen ýazmaly. Her bir setir harpyny 3 gezek ýazmaly. Ýumuşy ýerine ýetirmekligi tutuş inçe çyzyklar bilen sadalaşdyrylan torlary çyzmak bilen ýerine ýetirmeli



ABCDEÄFGHIJZKLMNÑOÖPRS  
 ŞTUÜWYŸZ abcdeäfghi jzklmn  
 ñoöprsştuüwyŸz

1234567890 3

АБВГДЕЖЗИЙКЛМНОПРСТУФХ  
 ЦЧЩЬЫЬЭЮЯ абвгдежзийкл  
 мнорстфхцчщьыьэюя



Gyzyklar we harplar

### 3. Çyzgy masşablary

Durmuşda öran uly detallary, samalyotyň, korablyň, awtomasynyň şaýlarynyň, beýik binalaryň, dünýä kartalarynyň, şonun yalyda örän ownuk şaýlaryň sagat mehanizminiň, käbir ölçeg abzallarynyň şaýlarynyň we ş.m. çyzgylaryny ýerine ýetirmeli bolýar.

Uly şaýlary hakyky ululygynda çyzgy kagyzyňa geçirmek mümkin däl, uşak şaýlar bolsa çyzgy kagyzynda kiçi ölçegde bolýandygy sebapli çyzgyny okamaklykda kynçylyk döredýär. Şolar ýaly ýagdaýda uly ölçegdäki nusgalary çyzga geçirmek üçin onuň ölçegini kiçeldip, kiçi ölçegdäki nusganyň çyzgysyny amatly ýagdaýda okap bolar ýaly ölçegini ulaldyp çyzmaly bolýar.

**Nusganyň (şaýyň) ya-da binanyň hakyky ölçegi bilen onuň çyzgydaky ölçeginiň arasyndaky gatnaşygyny görkezyän sana masştab diýilýär.**

Masşabyň üsti bilen biz şekiliň hakyky ululygynyň çyzgyda näçe esse köpeldilip çyzylandygyny ýa-da näçe esse ulaldylyp çyzylandygyny bilip bileris. Egerde şekiliň ululygy çyzgy tagtasyna laýyk gelen ýagdaýynda ony öz ululygynda hem çyzmak bolar.

TDS 2.302-68 tarapyndan üç görnüşli masşablary saýlap almaga rugsat edilýär.

1. Hakyky ölçegde: 1:1

2. Kiçeltmek üçin: 1:2; 1:2,5; 1:4; 1:5; 1:10; 1:15; 1:20; 1:25; 1:40; 1:50; 1:75; 1:100.....

3. Ulaltmak üçin: 2:1; 2,5:1; 4:1; 5:1; 10:1; 20:1; 40:1; 50:1; 100:1.....

Çyzyklarda masşablar şeýle ýazylýar:

M 1:2, M 5:1, M 1:1 we ş.m.

Eger masştab çyzgydaky esasy ýazgynyň ýörite bellenen sütüninde görkezilse, onda masştab belgisiniň önünden M harpy ýazylmaýar.

Çyzgyda şekil nähili masşabda ýerine ýetirilsede, ölçeg goýulanda, detalyň natural (hakyky) ululygyndaky ölçegleri ýazylýar.

#### 4. Formatlar

Çyzgylary islendik ölçegdäki kagyza ýerine ýetirmek bolmaýar. **Belli bir ölçegdäki çyzgy iş tagtasyna format diýilýär.**

Senagatyň ahli pudaklarynda we gurluşykda çyzgylar we başga konstruktorçylyk resminamalar berk kesgitlenen format kagyzlarda ýerine ýetirilmelidir. Standart formatlary ulanmaklyk kagyzlary tygşytlamaga, ýeňil ýygnamaga we çyzgylary hem-de başga resminamalary çatmaga, ulanmaga şeýle-de olary saklamaga amatly şert döredýär.

TDS 2.301-68 tarapyndan çyzgynyň esasy formatlary berkarar edilýär.

Farmadyň belgilenişi	Farmadyň taraplarynyň ölçegleri mm-de	Farmadyň belgilenişi	Farmadyň taraplarynyň ölçegleri mm-de
44	1189 x 841	12	297 x 420
24	594 x 841	11	297 x 210
22	594 x 420		

Listiň formatlary, listi inçe tutuş çyzyk bilen bölege bolýan daşky ramkanyň ölçegleri bilen kesgitlenilýär.

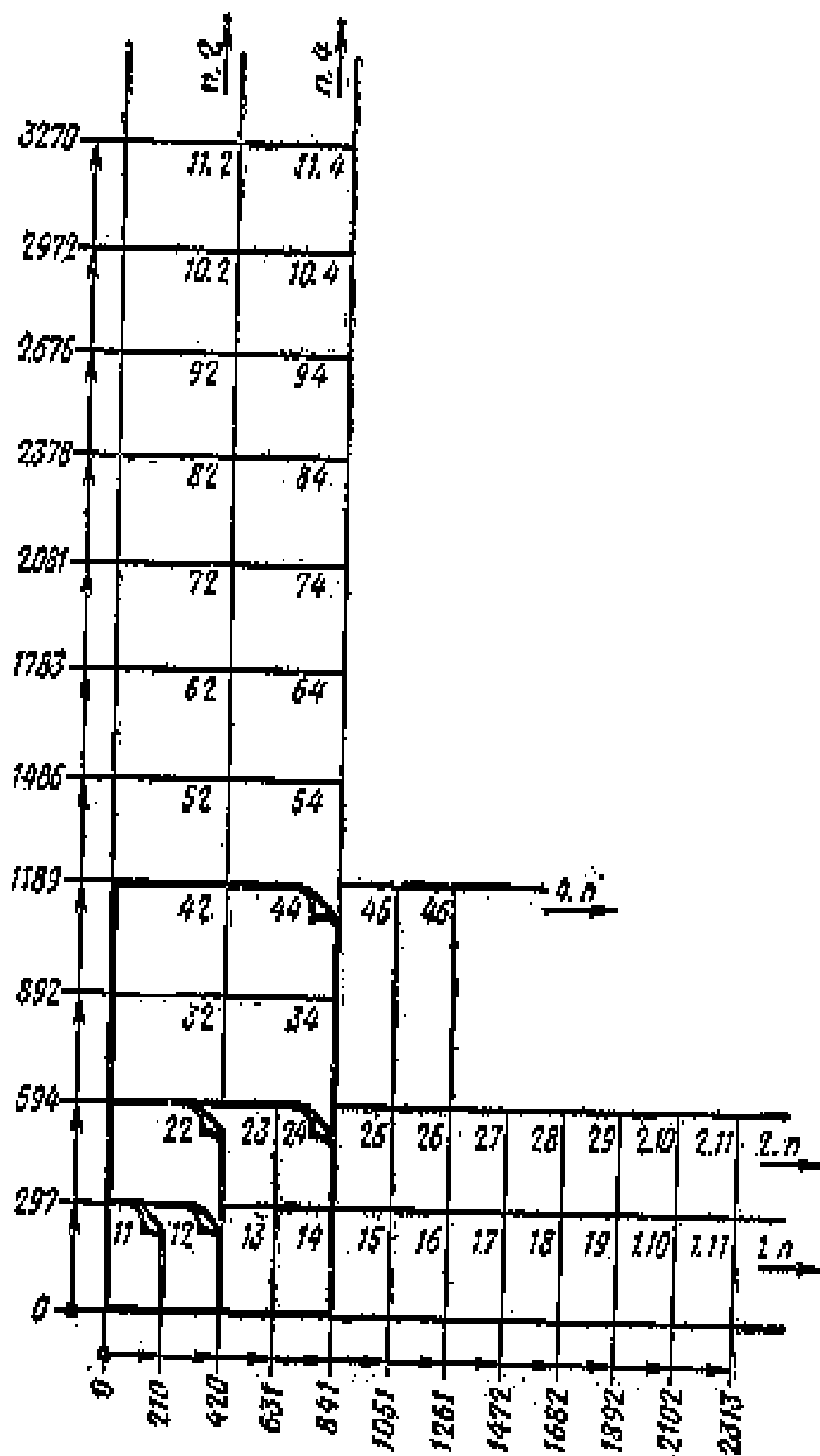
Aşakdaky jedwelde goşmaça formatlaryň emele gelşi görkezilen.

In uly esasy format 44, onuň meýdany 1 m<sup>2</sup> deň, başga formatlaryň ölçegleri şol esasyda döreýär, indiki formaty almak üçin 44 formatyň kiçi tarapyna parallel edip deň ikä eplemeli we şolar ýaly dowam edip 44-den 24-i, 24-den 22-ni, 22-den 12-ni, 12-den 11 farmady almak bolar.

**Farmadyň ölçeg birligi hökmünde 11-lik format, ölçegleri 297x210 kabul edilýär.** Formatlaryň ölçeglerini almaklyk üçin 11-lik farmadyň taraplaryna esse köpeltmek bilen tapmak bolar. Şeýlelik bilen islendik farmadyň birinji san belgisi 11-lik farmadyň bir tarapynyň uzynlygyna 297 mm-e, ikinjisi bolsa ikinji tarapynyň uzynlygyna 210 mm-e bölünme sanyny aňladýar, başgaça aýdylanda şol formatda näçe sany 11-lik farmadyň bardygyny görkezýär.

Mysal üçin 24-lik formatda 2x4, yagny 8 sany 11-lik format bar. Şoňa meňzeşlikde 13-lik format 1x3, yagny 3 sany 11-lik formatdan durýar. Aşakdaky jedwelde formatlaryň döreýşi görkezilen:





## 5. Materiallaryň ýaryklarda we kesiklerde şertli grafiki belgilenişleri

Tejribede (praktikada) dürli materiallardan taýýarlanylýan predmetleriň kesiklerini we ýaryklaryny ýerine ýetirmeli bolýar. Materiallary biri-birinden tapawutlandyrmak üçin Döwlet standartlary olaryň her birini kesgitli görnüş-de ştrihlemegi göz önünde tutýar.

**TDS-2.306-68 Materiallary grafiki belgileme (alamatlandyрма) we olary çyzgylarda goýmagyň (belgilemegiň) düzgünleri.** Şu standart materiallaryň kesiklerde we fasadlarda (fasade fransuz sözi bolup jaýyň daşynyň ýüz tarapy diýmekdir) grafiki alamatlandyrylyşyny, şeýle hem olary senagatyň we gurluşugyň ähli pudaklarynda çyzgylarda belgilemegiň düzgünlerini berkarar edýär.

### Şu standarta laýyklykda:

Materialyň görnüşine bagly bolman materiallaryň kesiklerde umumy grafiki alamatlandyrylyşy 5.1-nji suratdaky ýaly bolmalydyr.



Materiallaryň kesiklerdäki grafiki alamatlandyrylyşy materialyň görnüşine baglylykda 1-nji jedwelde görkezilenler ýaly bolmalydyr.

5.1-nji surat **Bellik.** Materiallaryň atlary aşakdakylardyr:

### 1-nji jedwel

1	
2	
3	
4	
5	
6	

1. Metallar we eredilen gaty metal garyndylary (splawlar);

2. Aşakda görkezilenler başga metal däl materiallar, şol sanda süýümlü monolit we preslenen (basylan) plita;

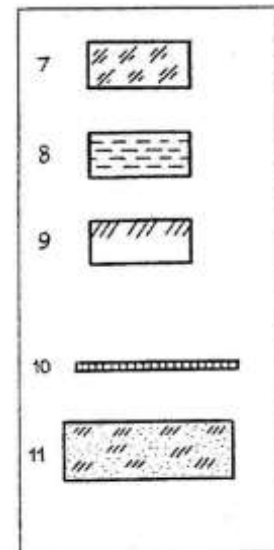
3. Agaçlar;

4. Tebigy daşlar;

5. Keramika we örmek üçin silikat materiallar;

6. Beton

7. Aýna we başga ýagty geçiriji materiallar;
8. Suwuklyklar;
9. Tebigy toprak;
10. Islendik materialdan örülen torlar (setkalar);
11. Islendik materialdan ýasalan dökünler.



Şu standartlarda göz önünde tutulmadyk materiallara olary çyzgyda düşündirip, goşmaça alamatlandyrmalary hem ulanmaga ýol berilýär.

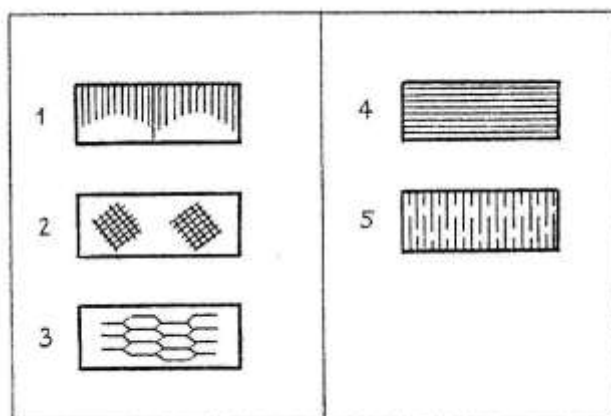
**Bellik. 1.** Metal we metal däl materiallardan düzülen kompozisiýa materiallary metallar ýaly alamatlandyrýarlar.

**2.** Jedweldäki 3-nji punktdaky grafiki alamatlandyrlany haçan-da süýümiň ugruny görkezmäge zerurluk ýok bolanda ulanmalydyr.

**3.** Jedweldäki 5-nji punktdaky grafiki alamatlandyrmany kerpiç önümleri (çig we bişen), odaçydamly materiallary, gurluşyk keramika, elektro-tehniki farfor, şlakobeton bloklar we ş.m. alamatlandyrmak üçin ulanmalydyr.

Materiallar we önümler görnüşde (fasadda) tapawutdyrylanda, olaryň grafiki alamatlandyrylyşlary 2-nji jedwelde görkezilenlere degişli bolmalydyrlar.

**Bellik.** Materiallaryň atlary aşakdakylardyr: 1. Metallar. 2. Būdūr-sūdūr polat. 3. Kesilen polat. 4. Gurluşyk ýa-da ýörite kerpiçden, klinkerden (odaçydamly we çyg geçirmeýän), keramikadan, terrakotdan (bişirilen toýundan), islendik sypatdaky (görnüşdäki) tebigy we emeli daşlardan we ş.m. kerpiçlerden örmek. 5. Aýna.



2-nji jedwel

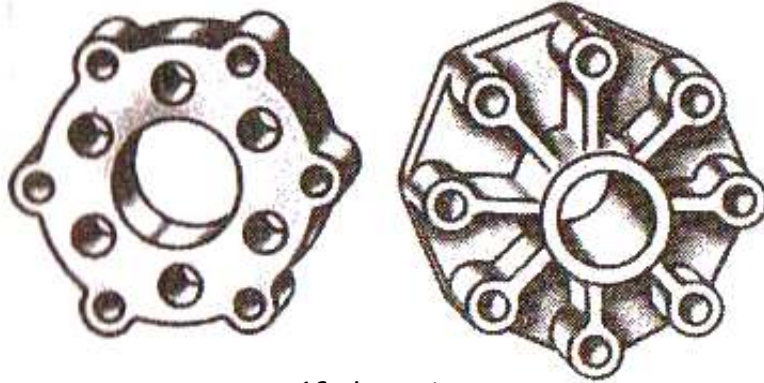


## 6. Geometriki gurluşlar

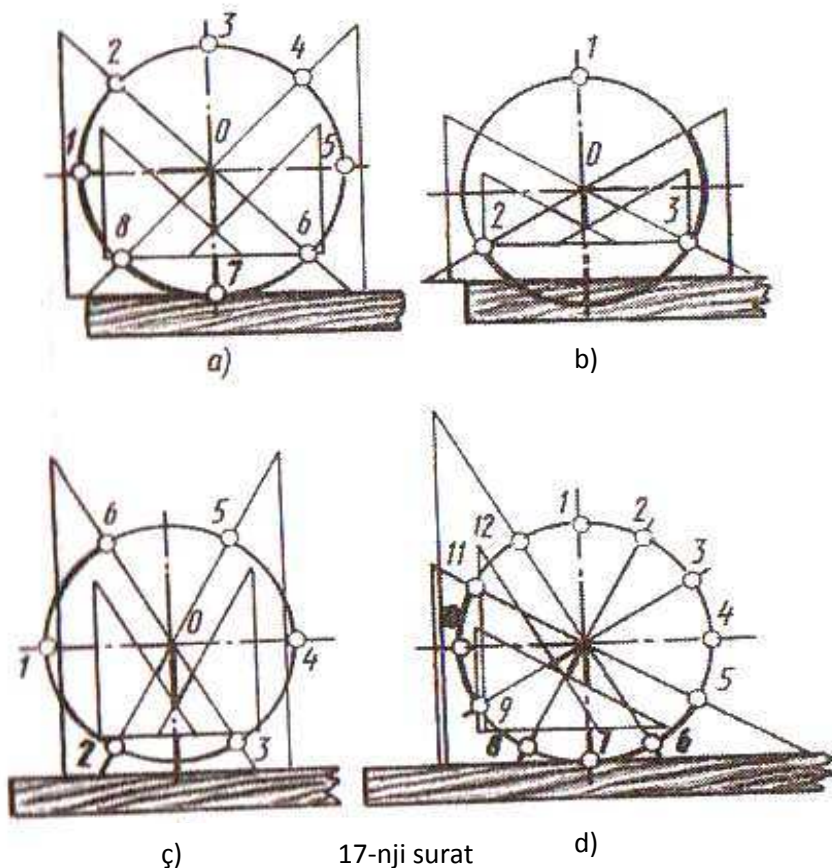
### Töwregiň deň böleklere bölünişi we çatrymlar

**Yumuş 3.** Durmuşda (16-njy suratda) görkezilen meseledäki şaýlaryň çyzgylaryny ýerine ýetirmeklik gabat gelýär, şonda töwregi deň bölege bölmeklik talap edilýär, şeýle meseleler  $45^0$ ,  $30^0$  we  $60^0$  burçlary bolan üçburç çyzgyjyň we

sirkulyň kömegi bilen ýerine ýetirilýär.



16-njy surat



17-nji surat

(17-nji a, suratda)  $45^0$  burçly üçburç çyzgyjyň kömegi bilen töwregi sekiz bolege bölünişi görkezilen.

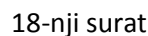
Munuň üçin töwregi çyzansoň, ilki bilen töwregiň wertikal hem-de gorizont al ok çyzyklaryny geçirmeli we olaryň kesişmesinde O töwregiň merkezini belgilemeli. Töwregiň wertikal merkezi okuny, töwregiň aşaky galtaşma 7 nokadyna

perpendikulýar edip göni çyzgyjy ýerleşdirmeli. Şondan soň burçlary  $45^0$  bolan üçburç çyzgyjy şol göni çyzgyjyň üstünde ýerleşdirilip üçburçlygyň gipetenuzasyny

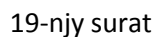
töwregiň merkezine galtaşdyrmaly, şol gipetenuzanyň töwerek bilen iki umumy

nokadyny 4 we 8 nokatlary bellemeli. Şu ýagdaýy gaýtalap üçburçly çyzgyjy  $180^0$  öwürüp, ýene-de şol göni çyzgyjyň üstünde gipetenuzasy O merkeze galtaşdyryp goýmaly, üçburçly çyzgyjyň gipetenuzasynyň töwregiň galtaşýan ýerindäki 2 we 6 nokatlary bellemeli. Şeýlelikde, töwregiň merkezi oklarynyň töwerek bilen 1,3,5 we 7 umumy nokatlaryň we  $45^0$  üçburç çyzgyjyň kömegi bilen tapylan

# hordanyň ululygydyr.



## Yumuş 4.Şaýlaryň



**Göni çyzygyň egri çyzyga, ýa-da egri çyzygyň başga bir egri çyzyga endigan geçmegine çatrym diýilýär.** Bir göni çyzygyň, beýleki çyzyga geçýän ýerine **çatrym nokady** diýilýär.

44

20-nji suratda berlen ýiti, kütek we göni burç emele getirýän iki göni çyzygyň çatrymyny gurmaly. Meseläni ýerine ýetirmek üçin  $R$  radýusly ölçeg ululygyny alýarys.

Üç halyň üçüsini hem birmeňzeş usuldan peýdalanyp çatrymlar gurulýar.

1. O nokady-çatrym merkezini tapmaly. Şonuň üçin berlen göni çyzyklardan  $R$  radýusyň ululygyna deň aralykdan, şol göni çyzyklara parallel çyzyklary geçirmeli, olaryň kesişmesi  $O$  merkezi berer.

2. O merkezden berlen göni çyzyklara perpendikulýarlary geçirmeli we perpendikulýarlar bilen göni çyzygyň umumy nokatlary, çatrym nokatlaryny berer.

3. O merkezden  $R$  radýusly dugany çatrym nokatlaryna galtaşýança geçirmek bilen çatrymlary gurarys. Göni çyzykdan duga endigan geçişlik, diňe göni çyzyk şol duganyň galtaşma çyzygy bolanda amala aşýar. 19-njy a suratda görkezilişi ýaly duganyň  $O$  merkezinden göni çyzyga perpendikulýar geçirilip  $A$  galtaşma nokady tapylýar. 19-njy b suratda görkezilişi ýaly bir dugadan ikinji duga endigan geçmeklik, haçanda  $C$  nokat  $OO_1$  galtaşýan dugalaryň merkezlerini birikdirýän gönide ýereleşende bolar.

4-nji ýumuşda dürli görnüşli meseleler berlen,olar ýerine ýetirilende şu aşakdakylary (20-nji a,b suratdan) peýdalansa bolar, 5-nji ýumuşdaky çyzgylar ýerine ýetirilende (20-nji b, ç suratlardan) peýdalansa bolar. Göni çyzygyň töweregiň dugasy bilen endigan geçişini, duganyň içinden galtaşmasynyň (20-nji ç surat) kömegi bilen, we (20-nji b suratda) daşyndan galtaşma bilen ýerine ýetirmek bolar.

20-nji b suratda  $R$  radýusly töweregiň dugasynyň we  $AB$  göni çyzygyň  $r$  radýusly töweregiň dugasynyň daşky galtaşmasynyň çatrymy görkezilen. Şular ýaly endigan geçirmäni gurmak üçin  $R$  radýusly töwerek (20-nji b suratda) we  $AB$  göni çyzyk çyzylýar. Berlen  $AB$  göni çyzyga parallel edip  $r$  radýusa deň daşlykdan  $ab$  göni çyzyk çyzylýar.

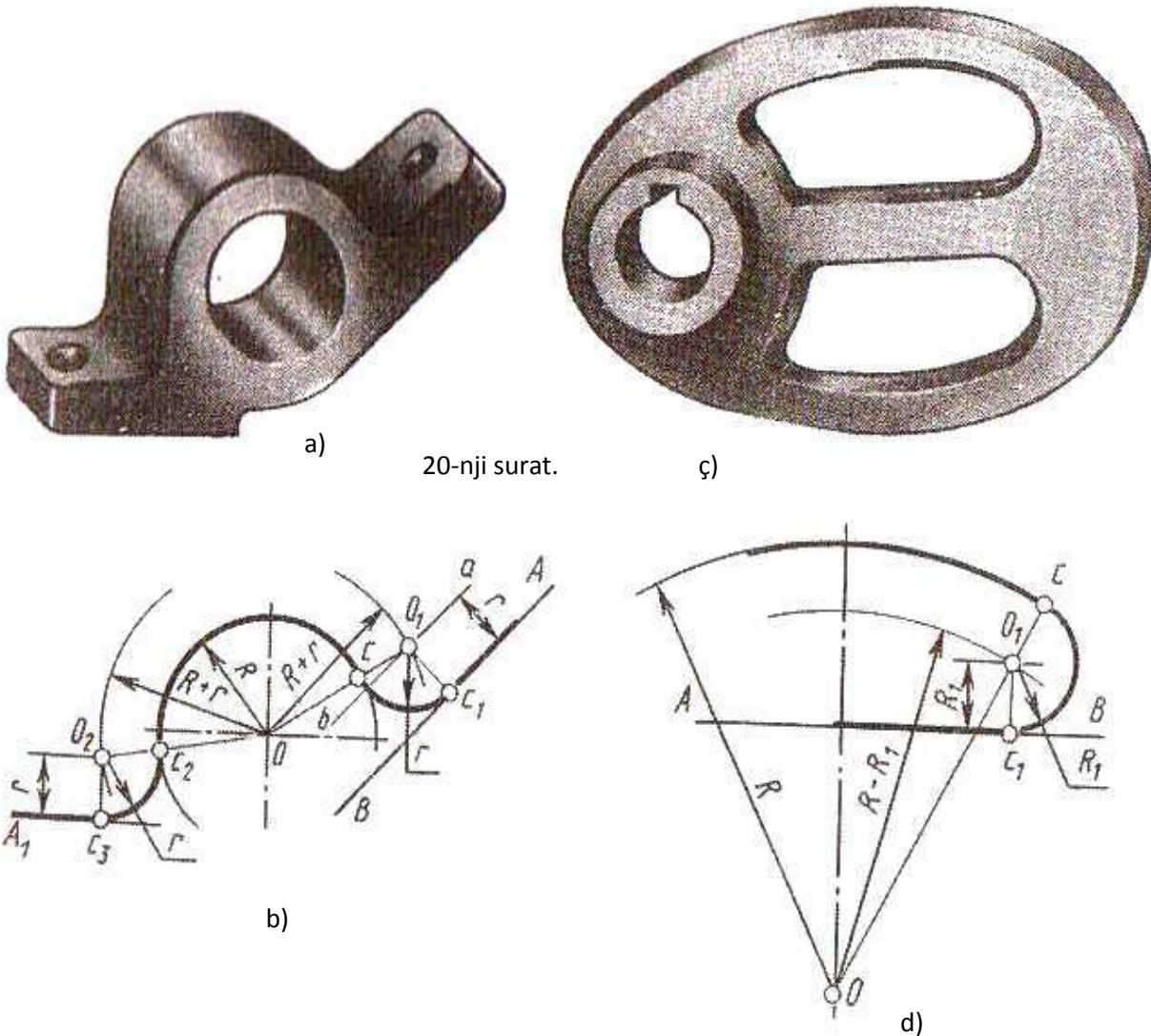
Töweregiň  $O$  merkezinden  $R$  we  $r$  radýuslaryň jemine deň radýusly duga geçirilýär we  $ab$  göni çyzyk bilen kesişmäni  $O_1$  bilen belgilenýär.  $O_1$  merkez çatrym geçirilmeli duganyň merkezi bolar. Ç çatrym nokady  $OO_1$  merkezleriň üstünden geçýän göni çyzyk bilen  $R$  radýusly duganyň kesişmesinden tapylýar.  $\dot{C}_1$  catrym nokady  $O_1$  merkezden  $AB$  göni çyzygyna geçirilen perpendikulýaryň netijesinde tapylýar.

Şu getirilen meseläniň çözügüne esaslanyp 20-nji a, suratdaky görkezilen kranşteýniň şekiliniň suduryny gurmak bolar. 20-nji r suratda  $R$  radýusly duganyň  $AB$  göni çyzyk bilen  $R_1$  radýusly duga arkaly içki galtaşma arkaly çatrymy ýerine ýetirilen. Çatrym merkezi  $O_1$   $AB$  göni çyzyga  $R_1$  radýusyň ululygyna deň bolan aralykdan geçirilen parallel göni çyzygyň we  $O$  merkezinden geçirilen  $R-R_1$  radýusa deň bolan duganyň umumy kesişme nokadyndan tapylýar. Çatrym nokady



$\dot{C}_1$ ,  $O_1$  merkezden AB göni çyzygyna geçirilen perpendikulýaryň galtaşmasyndan alynýar. Çatrym nokady  $\dot{C}$  bolsa  $OO_1$  merkezleriň üstünden geçýän göni çyzyk bilen R duganyň galtaşmasyndan alynýar.

Şeýle çatrymlar 20-nji b suratda görkezilen mahowigiň sudury çyzylanda ýerine ýetirilýär.

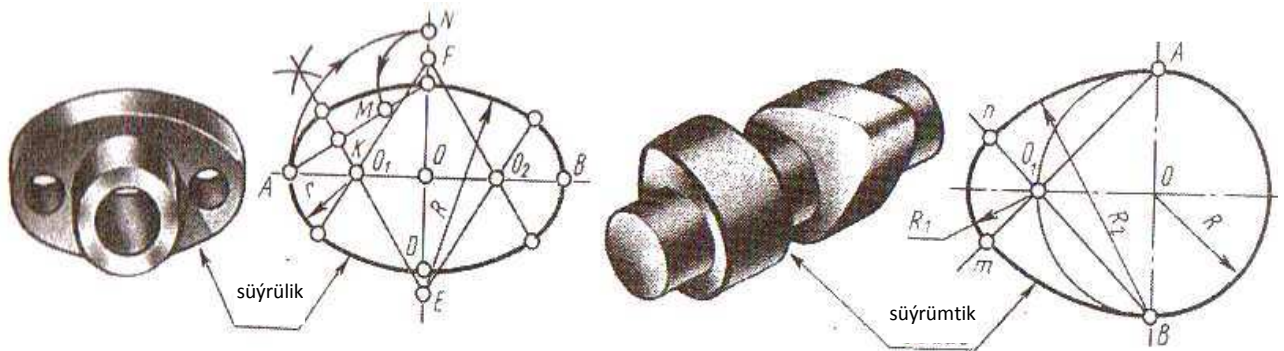


21-nji suratda görkezilen şaýlar, flýanesler, kulaçoklar ýapyk egrilerden durýar. Ýapyk egriler dürli diametrler boýunça özara galtaşýan töweregiň dugalaryndan gurulandyr. Şolar ýaly egrilere owallar, ovoidler, aýlawlar degişlidir.

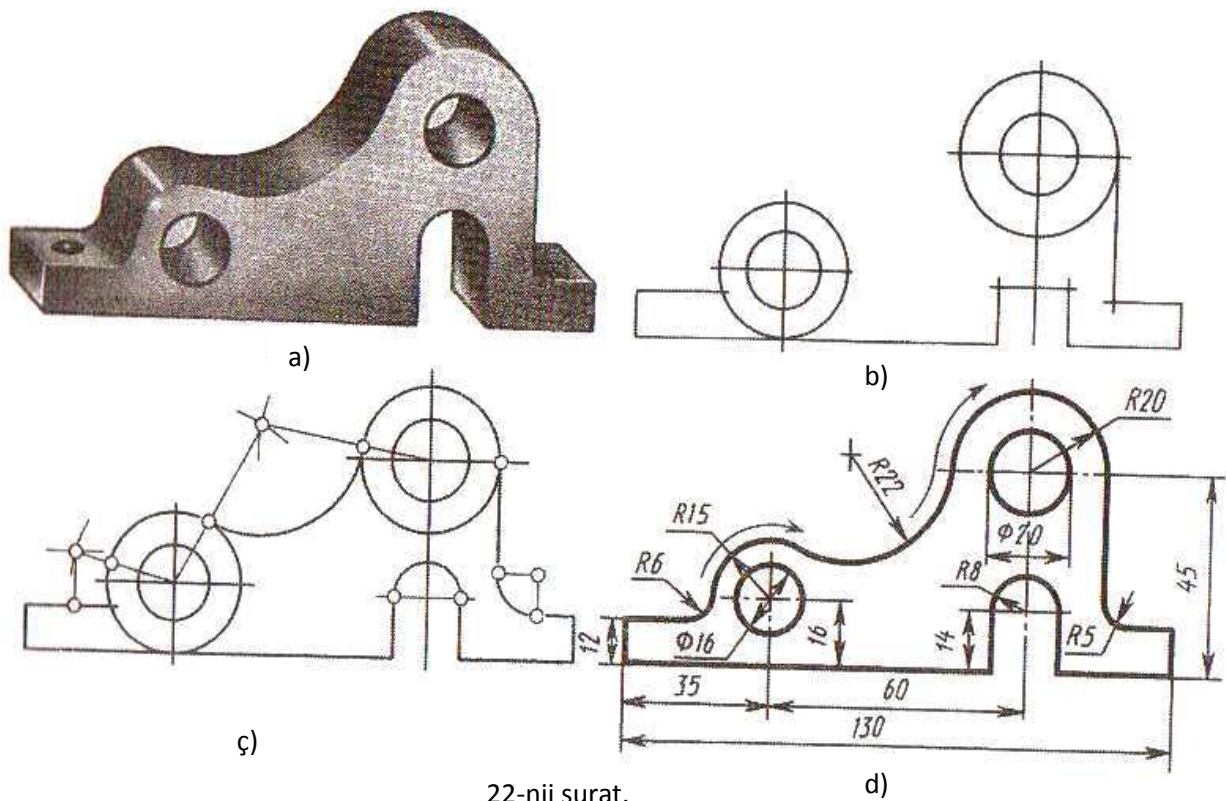
**Ýumuş 5.** Bu ýumuşda töweregiň duga bilen çatrymyň gabat gelýän käbir görnüşleri berlen.

**Ýumuş 6.** 30 sany dürli wariantdan durýar. Bu ýumuşda galtaşmalary düzgüne laýyk ýerine ýetirmek, şonuň ýalyda töweregi deň böleklerge bölmegiň usullaryny berjeý etmeklik talap edilýär. Her bir mesele çözüleninde geometriki

gurluşlary ýerine ýetmegiň belli bir yzygiderligi berjaý edilmeli. 22-nji suratda kronşteýn şekillendirilen, 22 b, w, ç suratlarda bu şaýyň sudurynyň çyzylyşynyň we dürli galtaşmalaryň gurluşynyň yzygiderligi görkezilen.



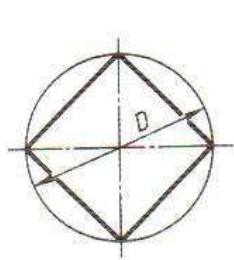
21-nji surat.



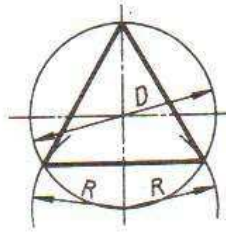
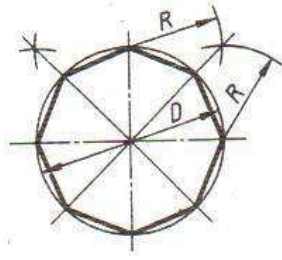
22-nji surat.

## TÖWEREGI BÖLMEK

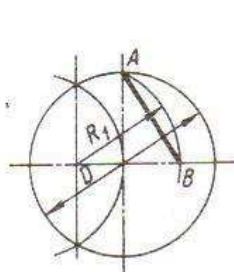
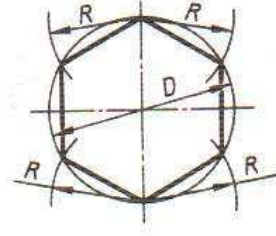
Töweregi sirkulyň kömegi bilen deň böleklere bölmek



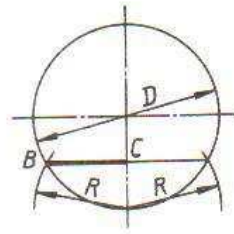
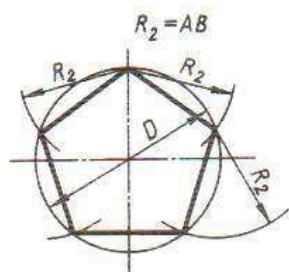
Töweregi 4 we 8 deň böleklere bölmek



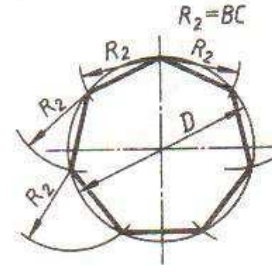
Töweregi 3 we 6 deň böleklere bölmek



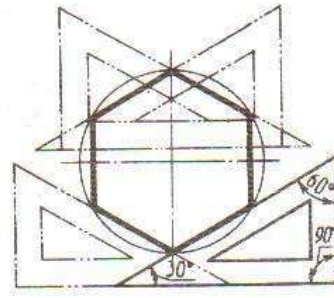
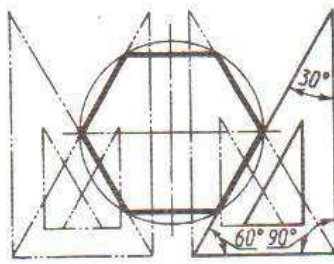
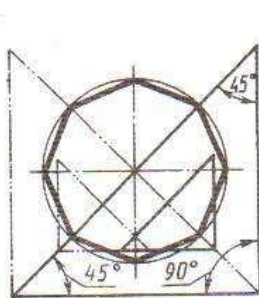
Töweregi 5 deň böleklere bölmek



Töweregi 7 deň böleklere bölmek



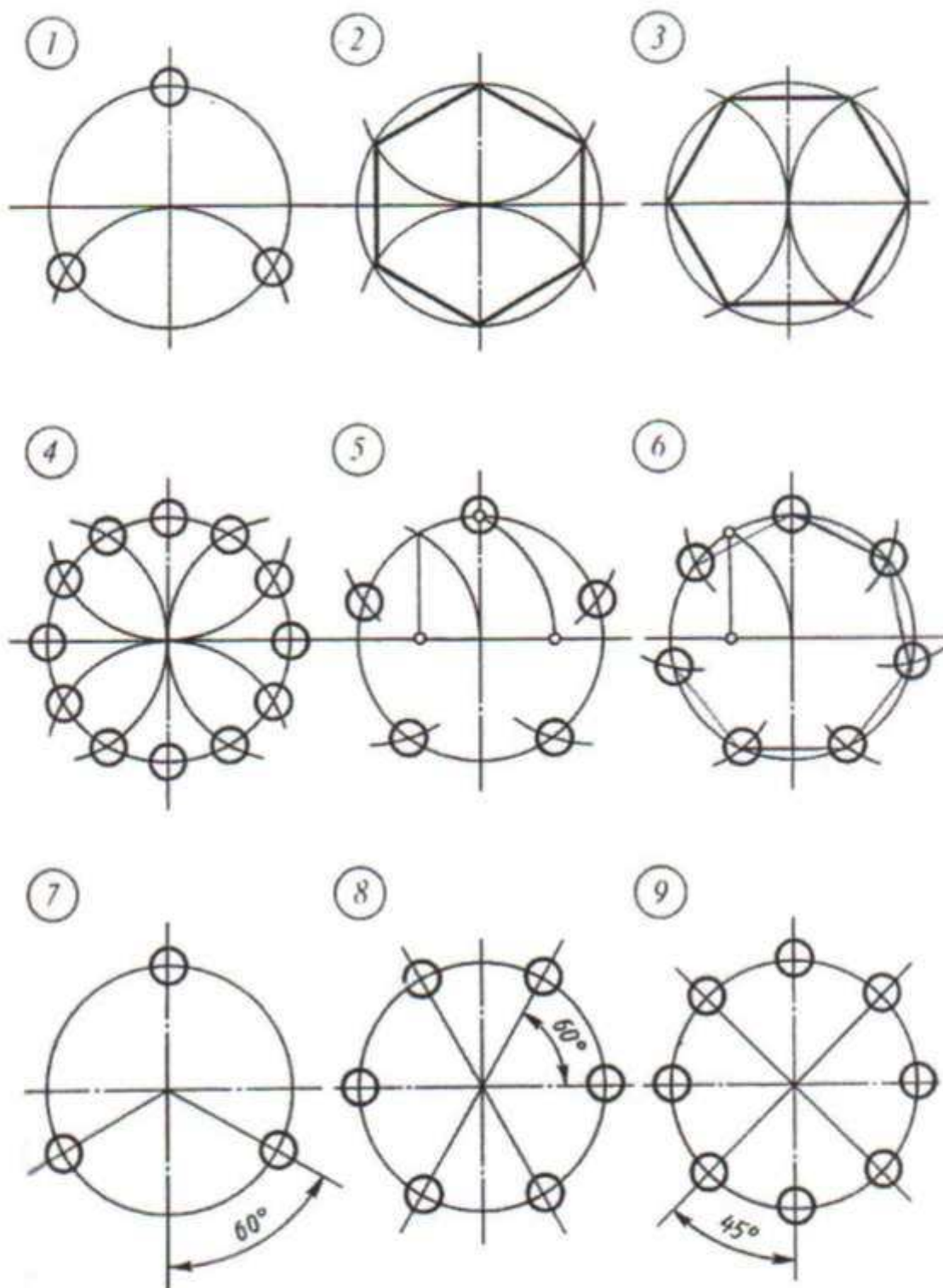
Töweregi üçburçlegiň kömegi bilen deň böleklere bölmek



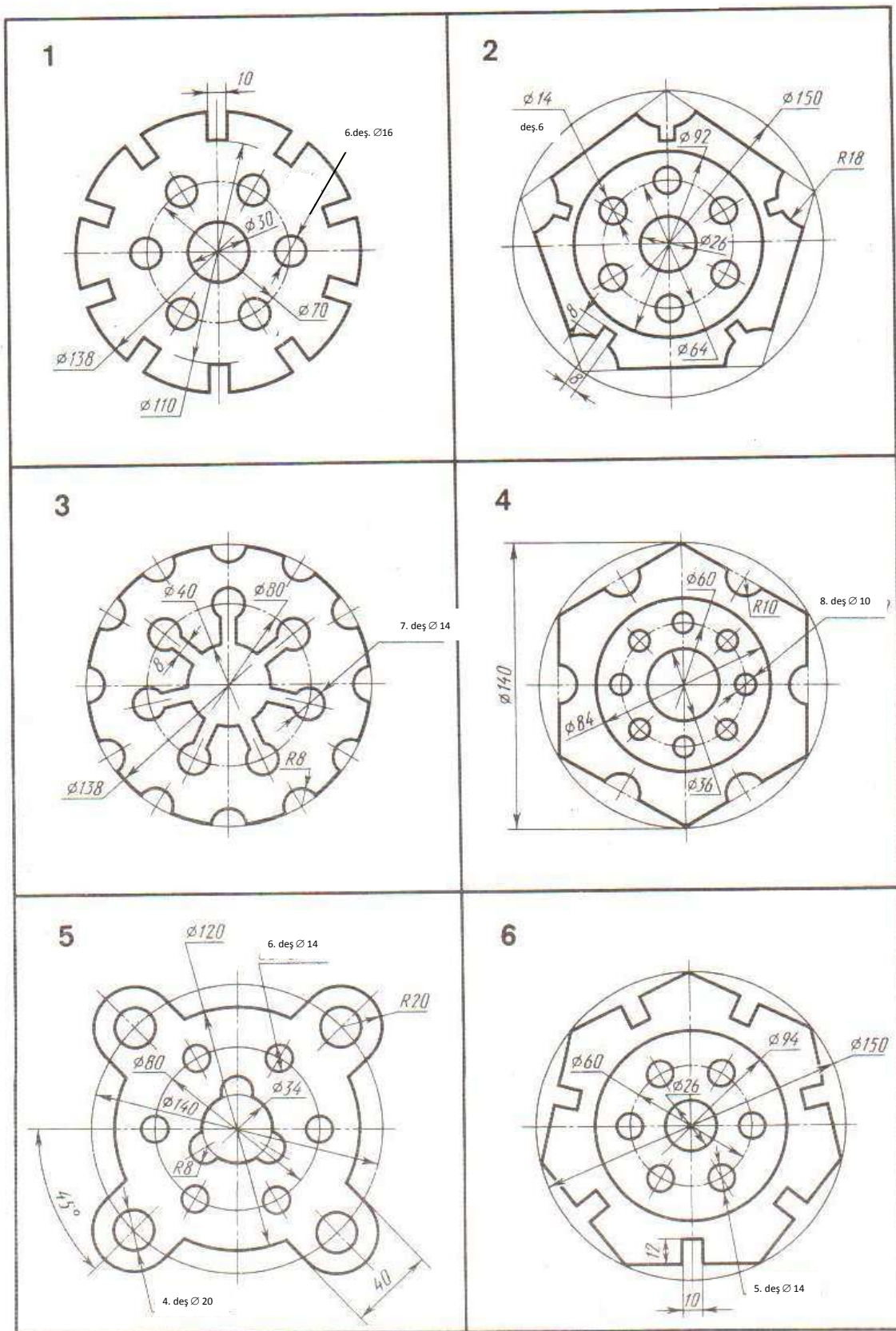
Töweregi 6 we 8 deň böleklere bölmek



### ÝÜMUŞ 3

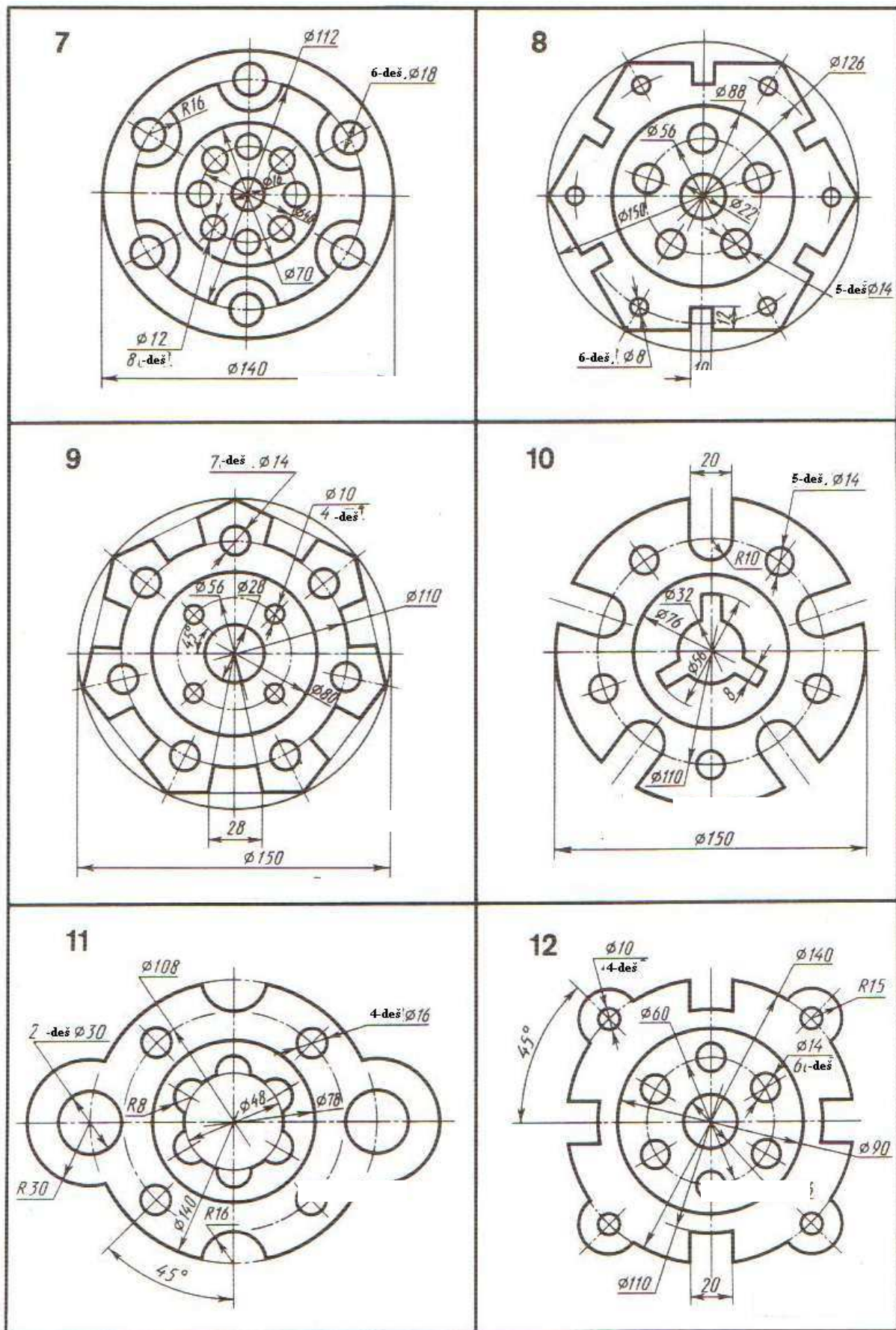


**Meseleler 1...6** Sirkulyň kömegi bilen töweregi 3, 6, 12, 5 we 7 deň böleklere bölmeli  
**Meseleler 7...9** Üçburç çyzgyjyň kömegi bilen töweregi 3, 6 we 8 deň bölege bölmeli



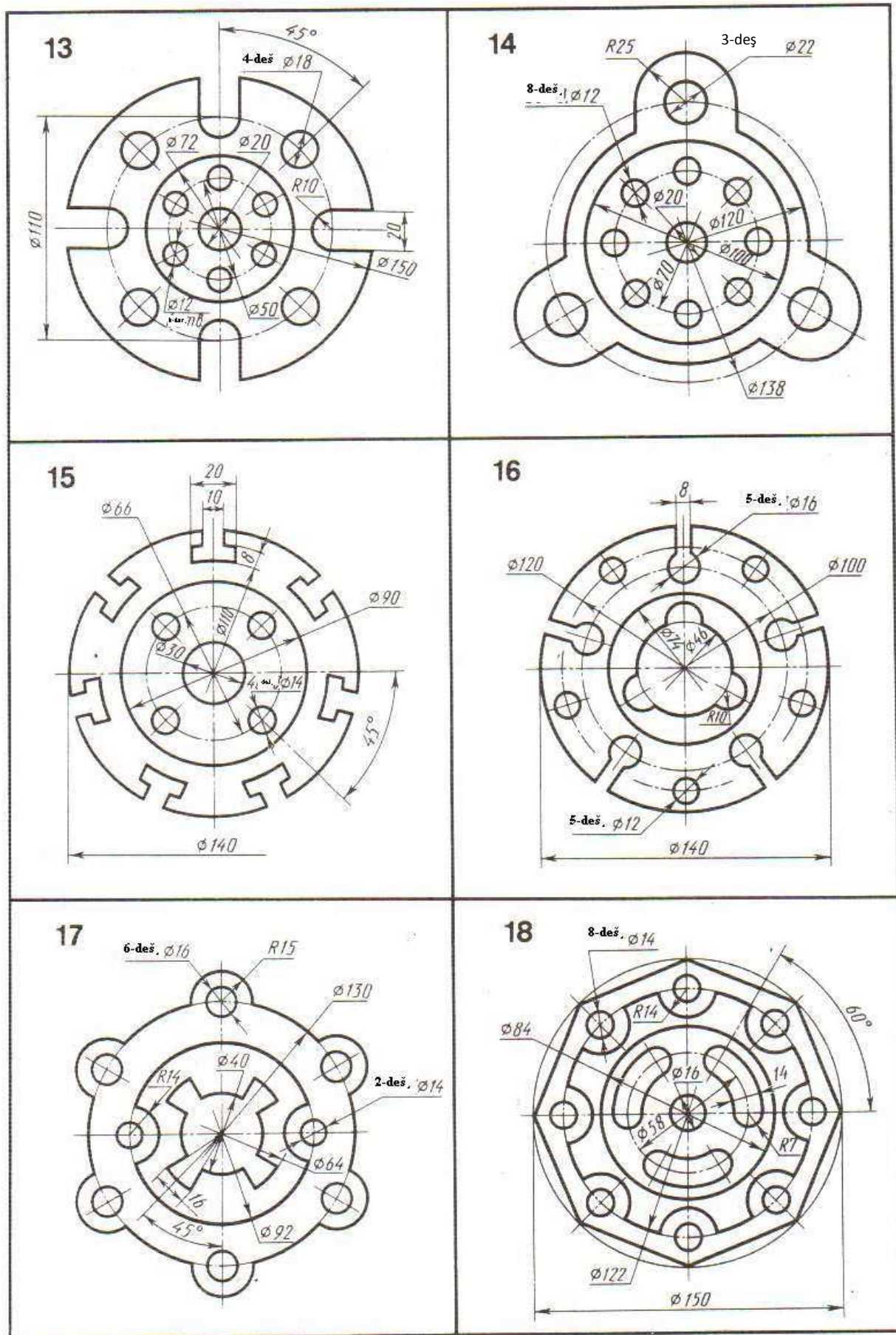
Şaýyň suduryny töweregi deň bölege bölmek düzgüninden peýdalanyp çyzmaly.





Şaýyň suduryny töweregi deň bölege bölmek düzgüninden peýdalanyp çyzmaly.

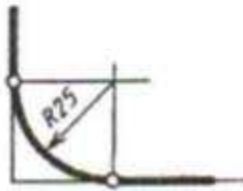




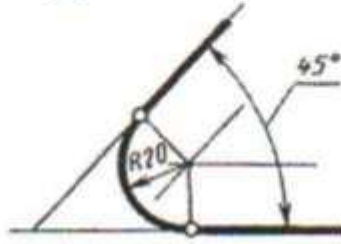
Şaýyň suduryny töweregi deň bölege bölmek düzgüninden peýdalanyp çyzmaly.

## ÝUMUŞ 4

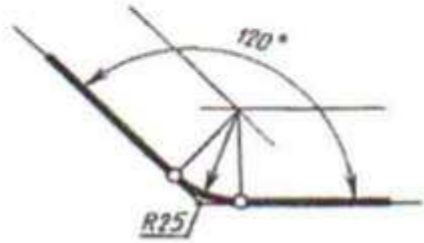
1



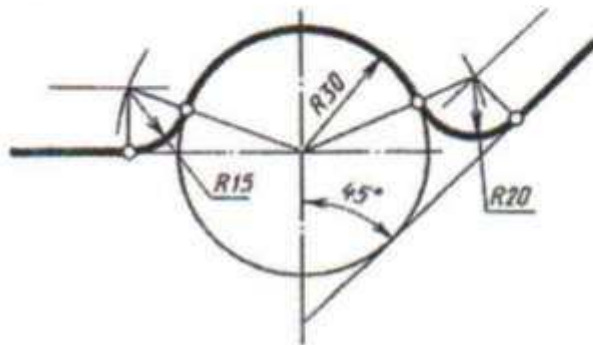
2



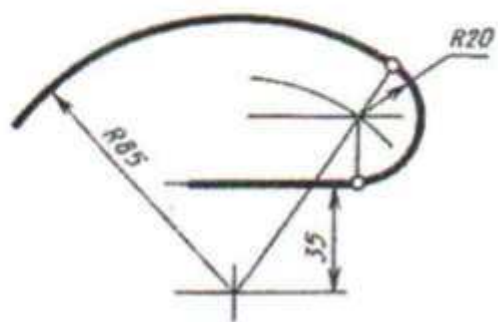
3



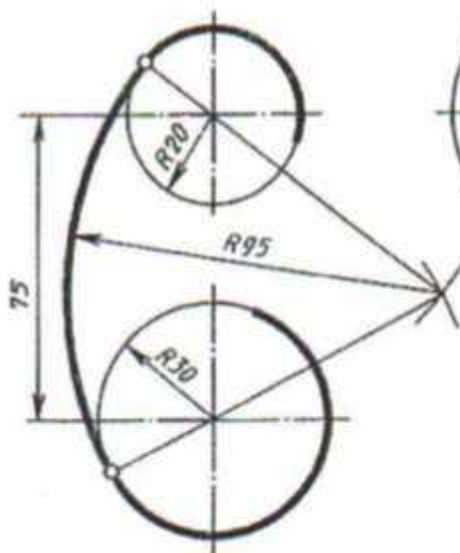
4



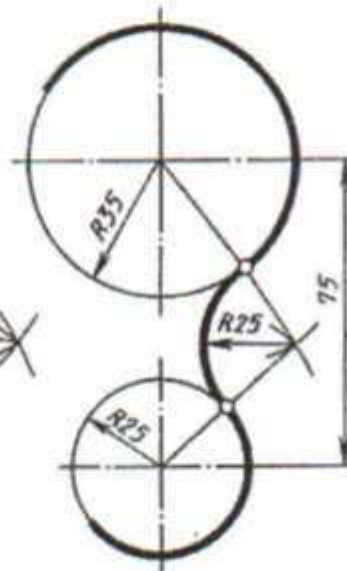
5



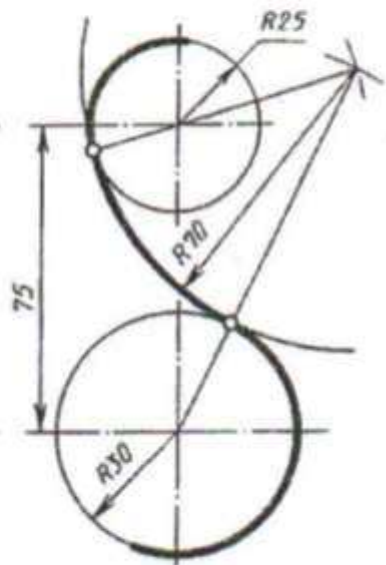
6



7

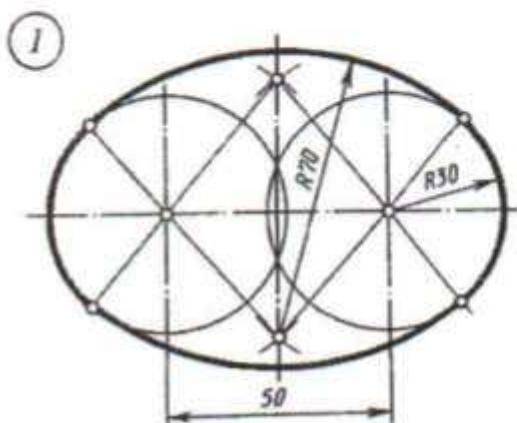


8

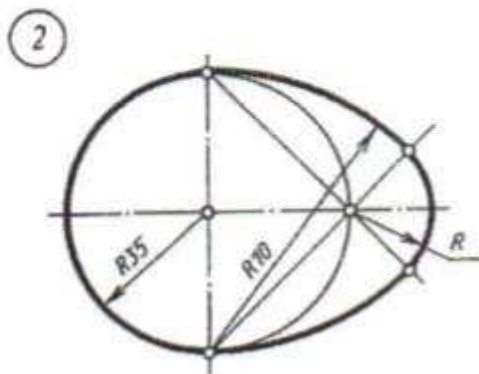


Galtaşmalary gurmagyň mysallaryny ýerine ýetirmeli we ölçeglerini belgileme

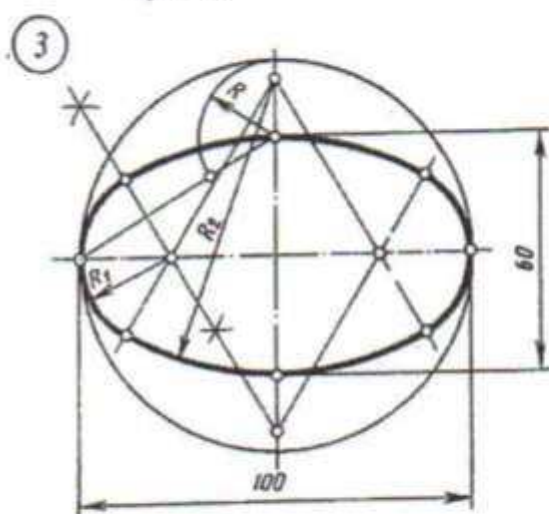
## ÝUMUŞ 5



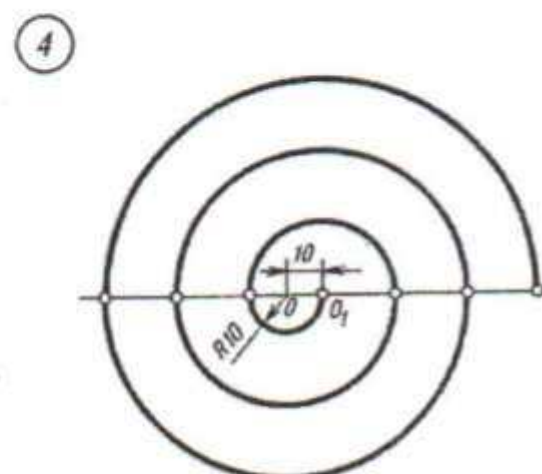
süýnmek



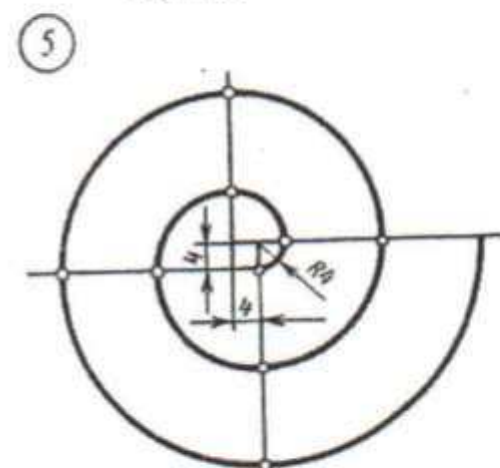
owoid



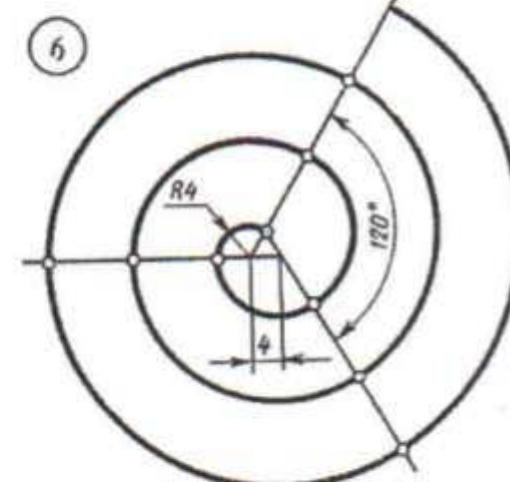
süýnmek



burum



burum

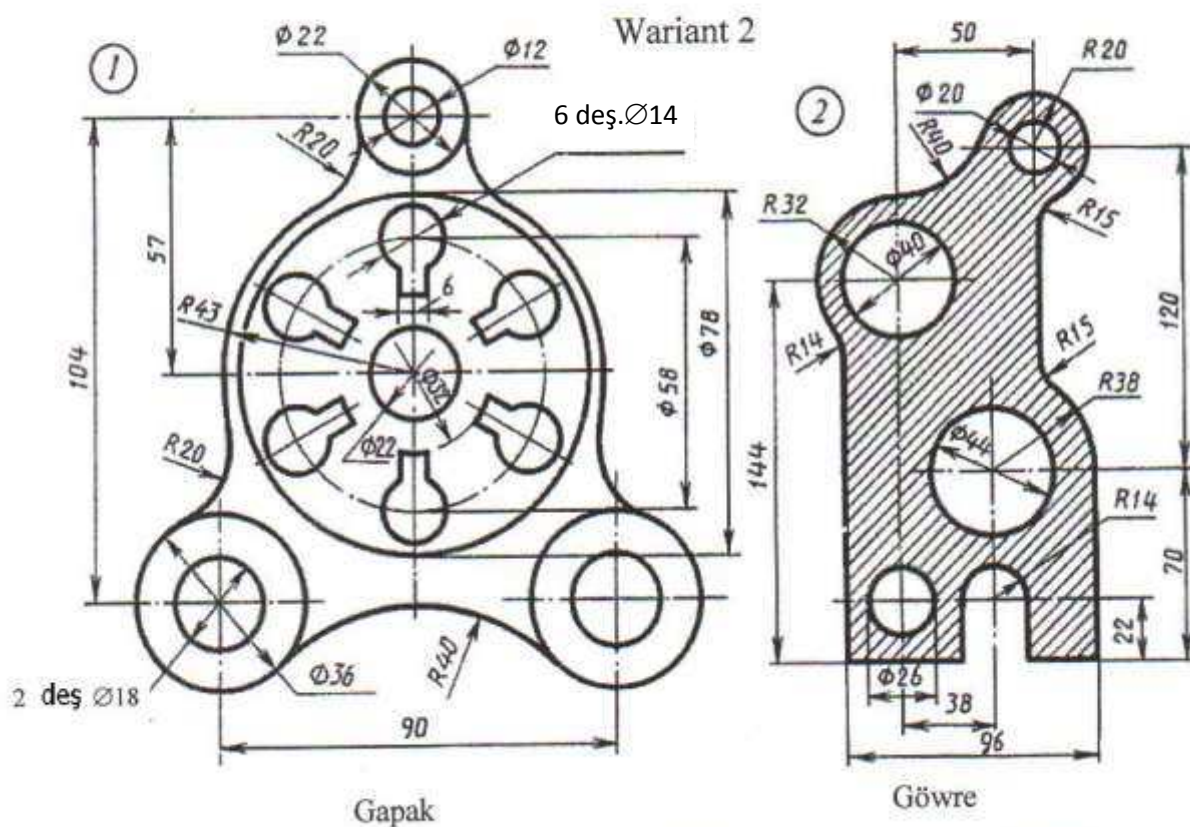
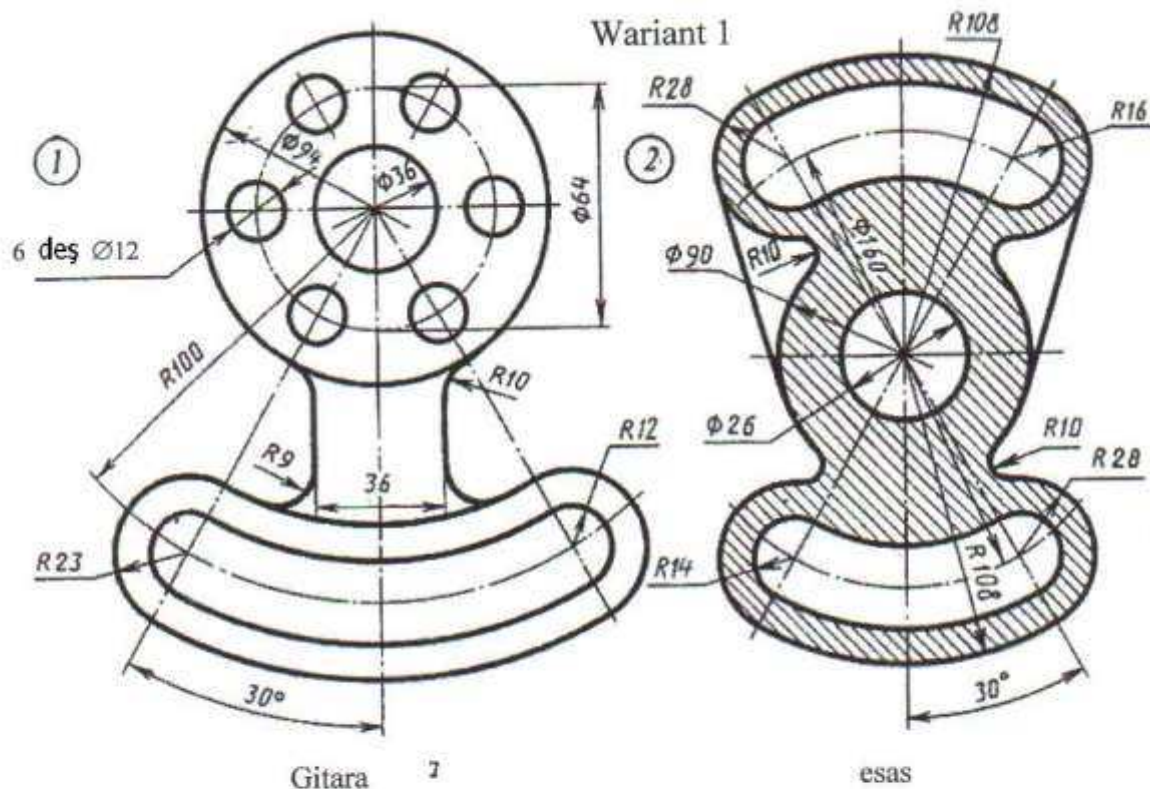


burum

Başlangyç berlenler esasynda sirkul egrilerini gurmaly. Radiuslaryň berilmedik ululyklaryny gurmak arkaly kesgitlemeli.

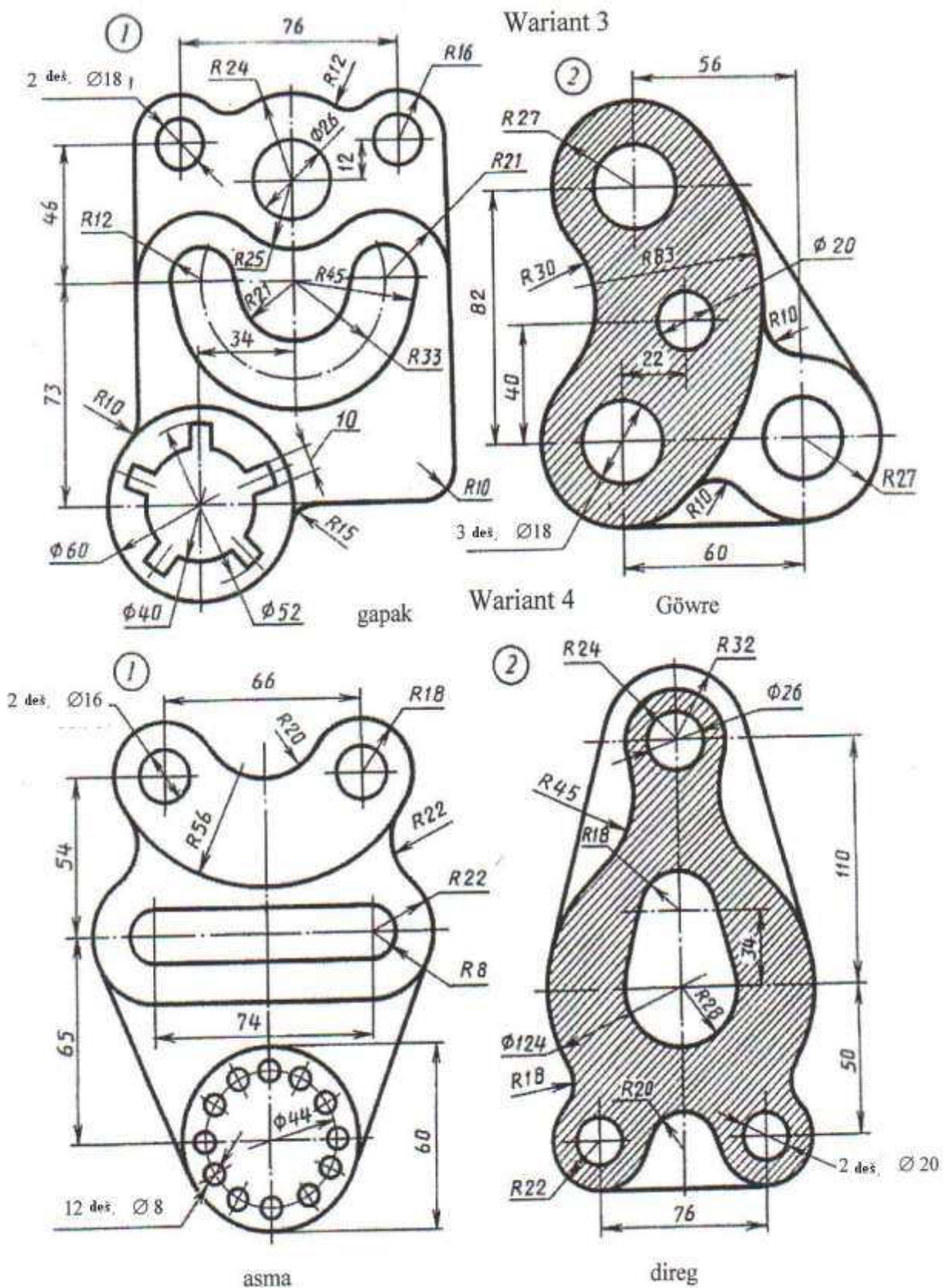


## YUMUŞ 6



Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

## YUMUŞ 6

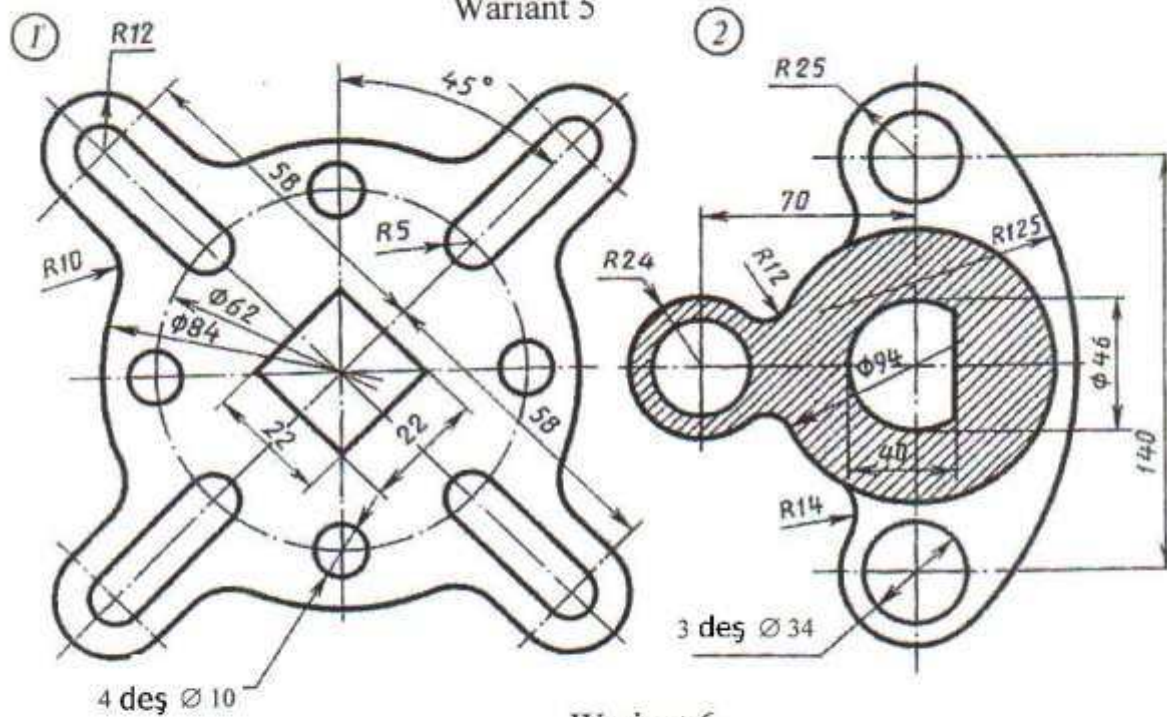


Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

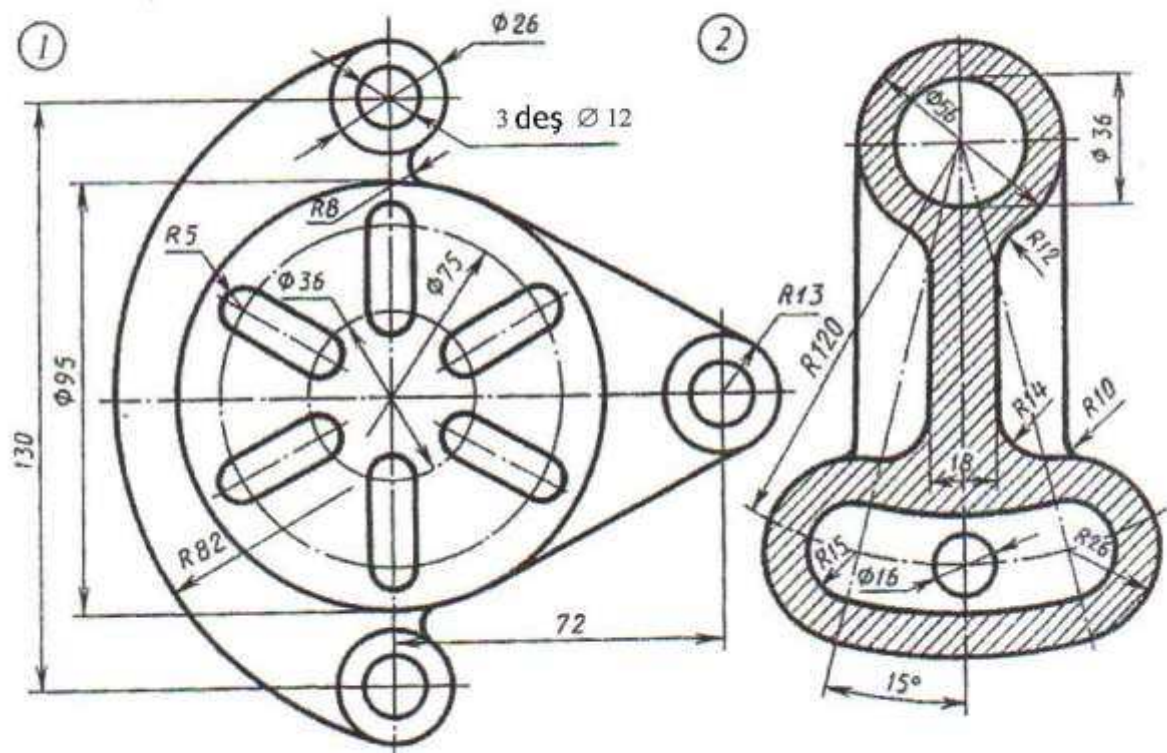


## YUMUŞ 6

Wariant 5



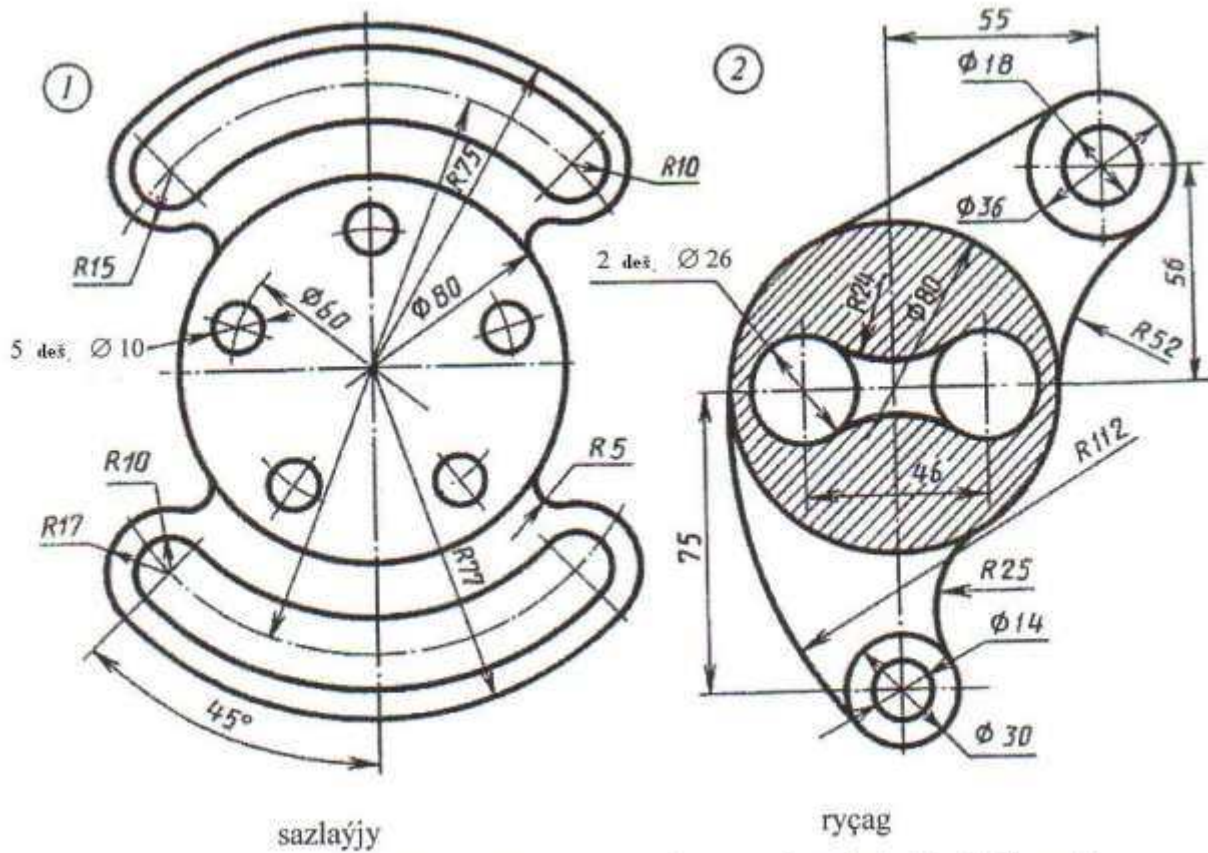
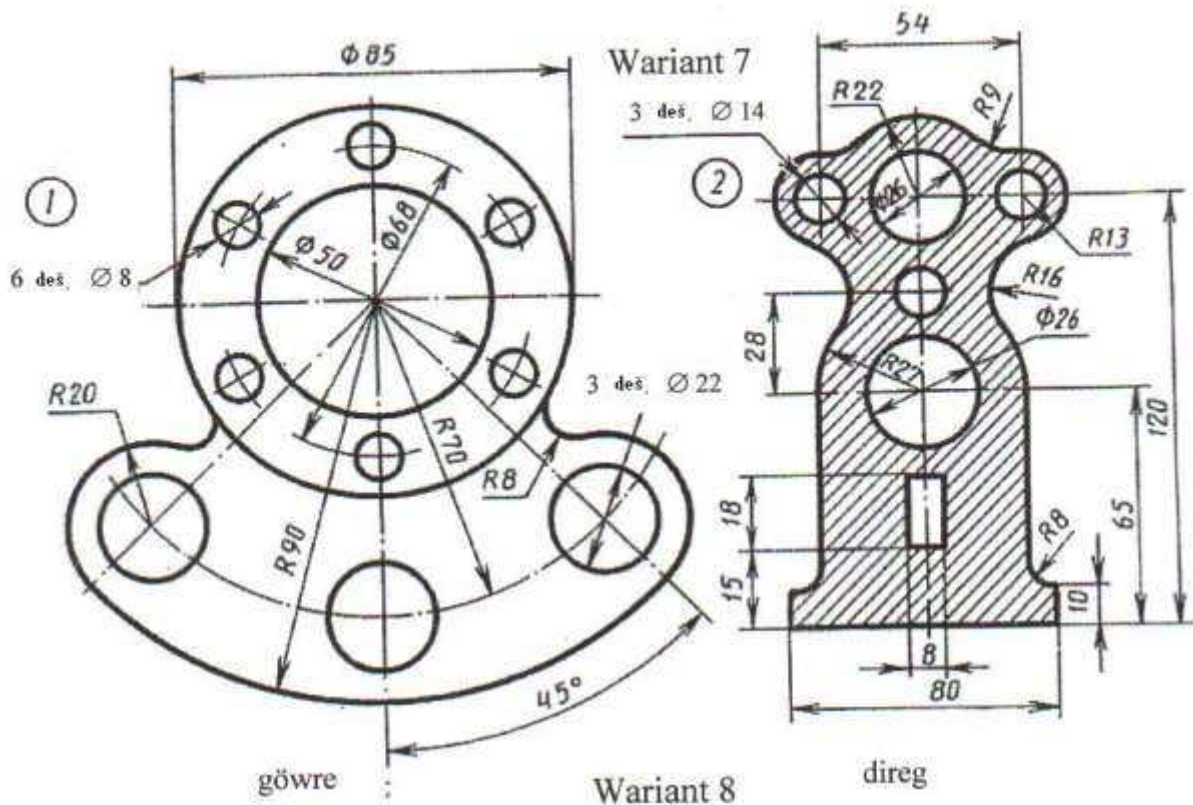
Wariant 6



Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

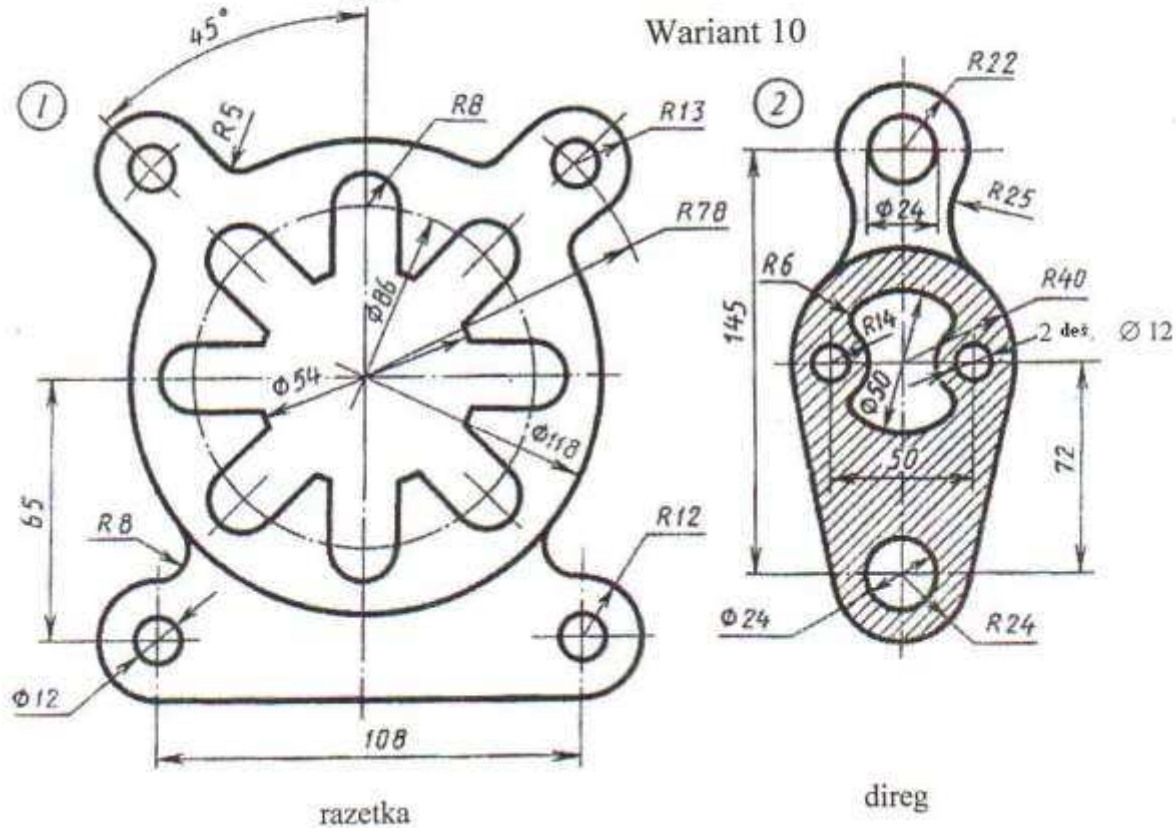
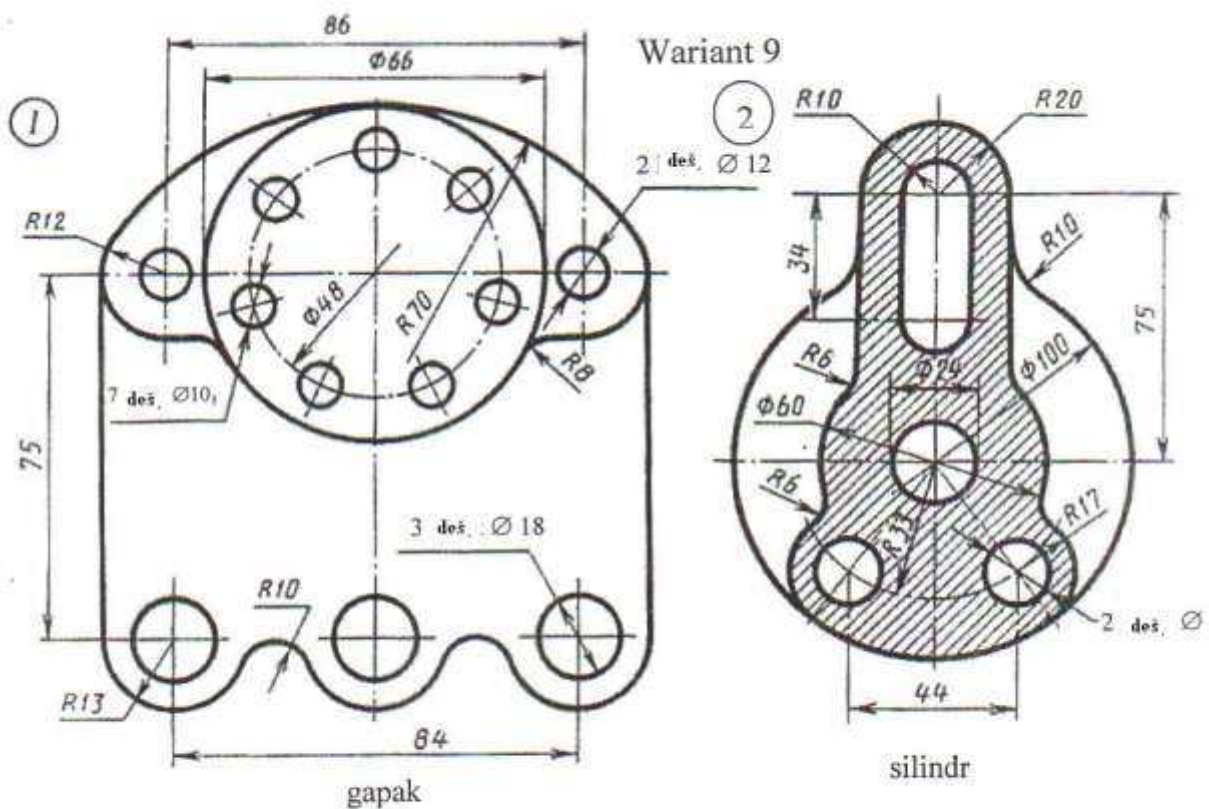


## YUMUŞ 6



Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

## YUMUŞ 6

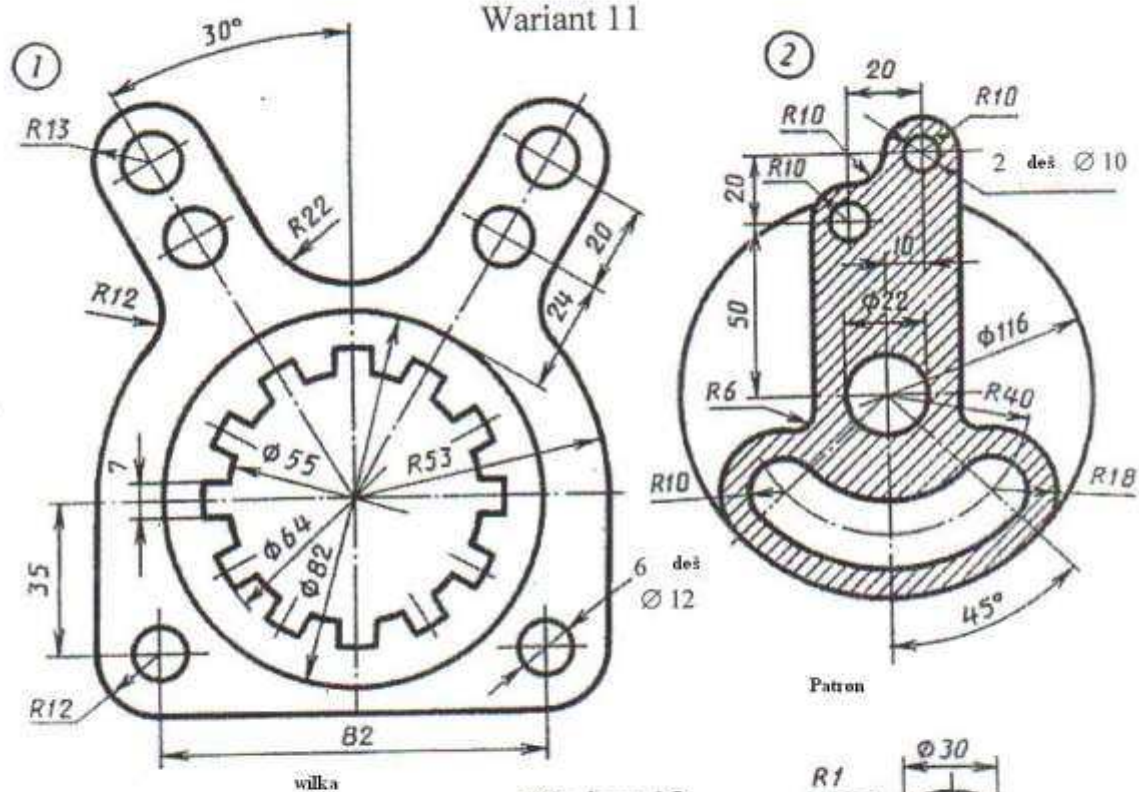


Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

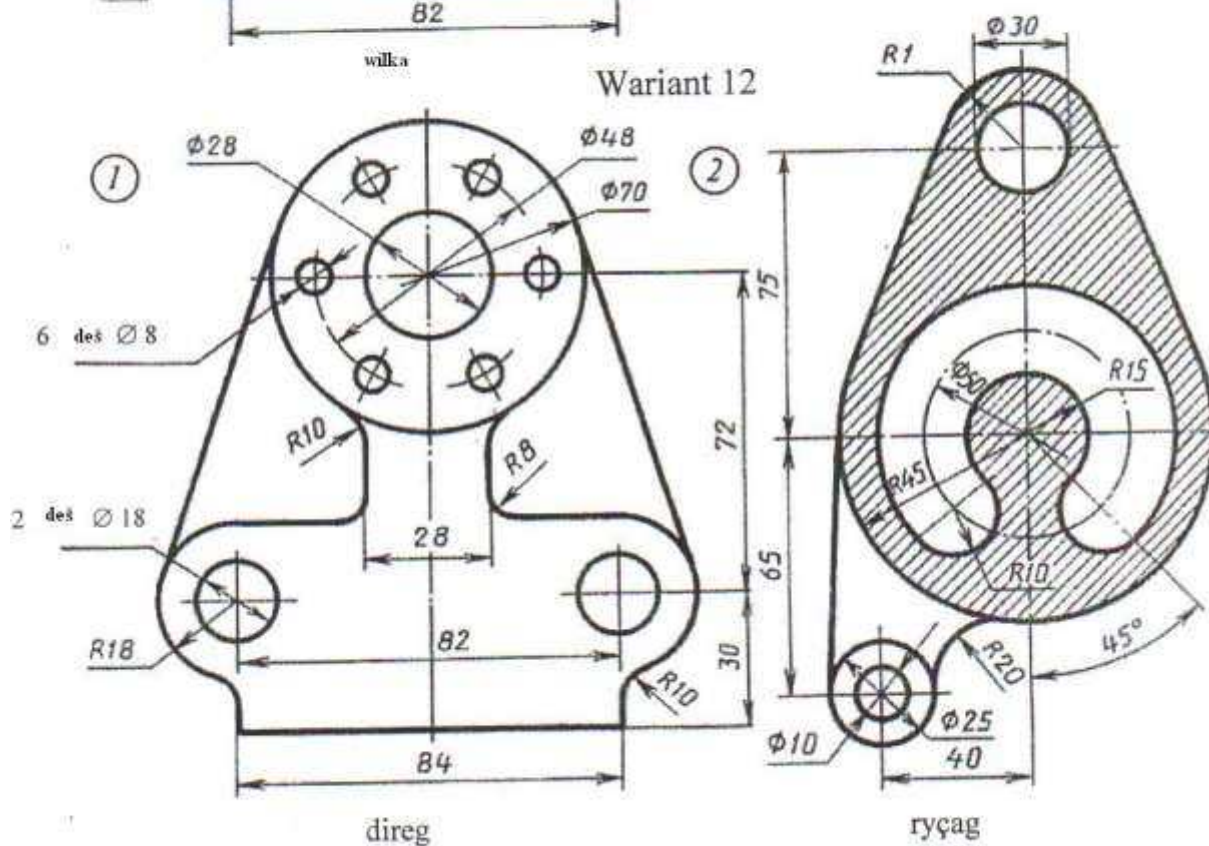


# YUMUŞ 6

Wariant 11



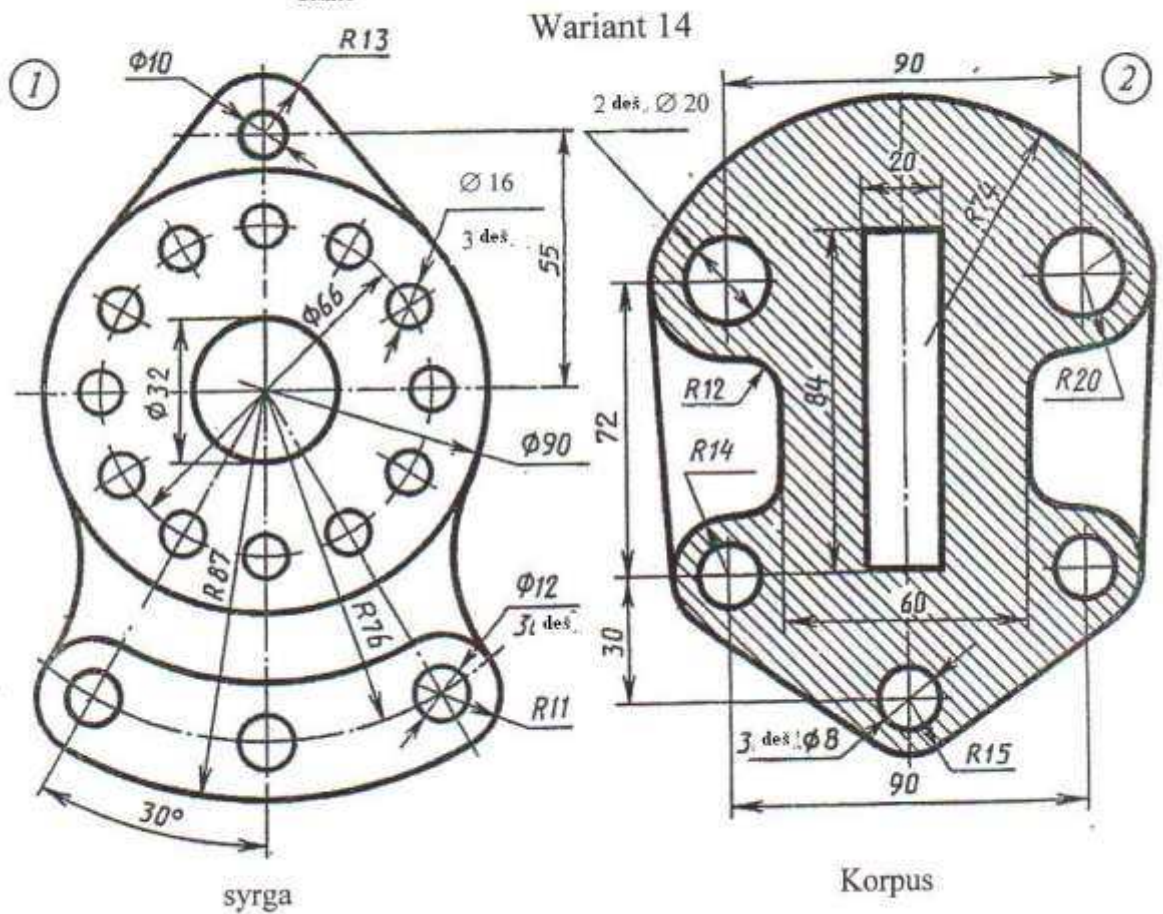
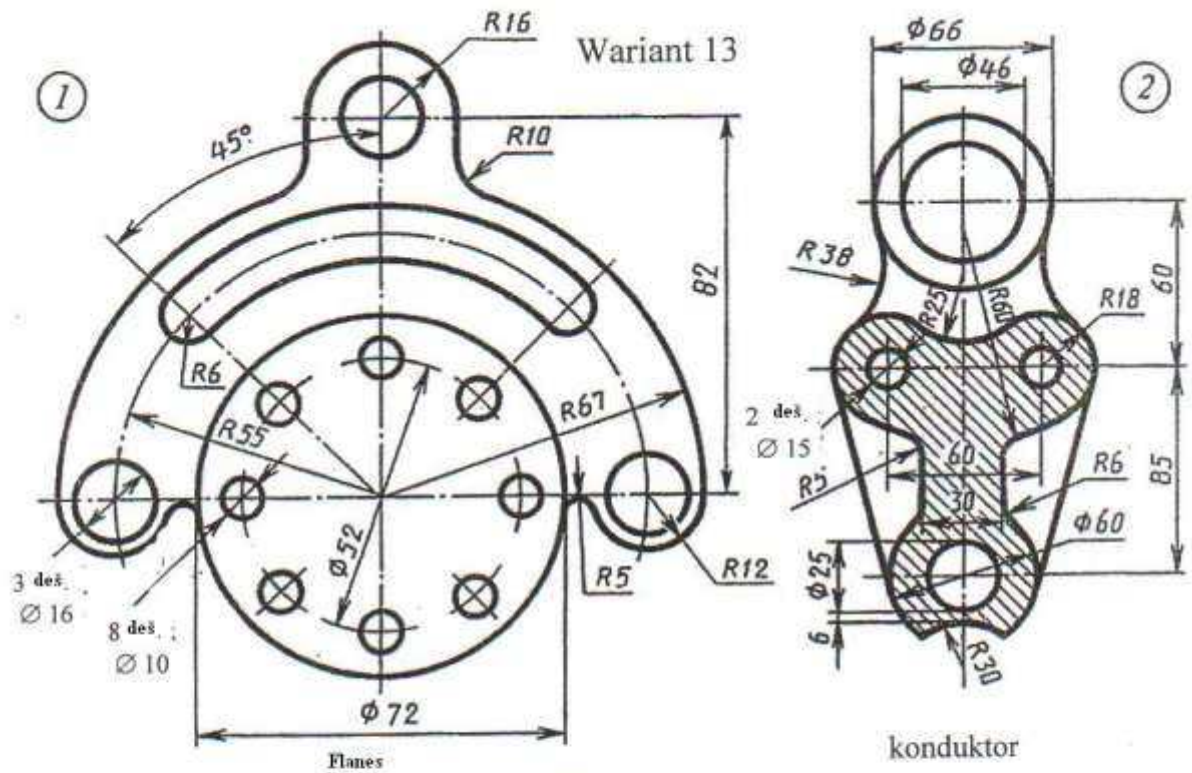
Wariant 12



Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

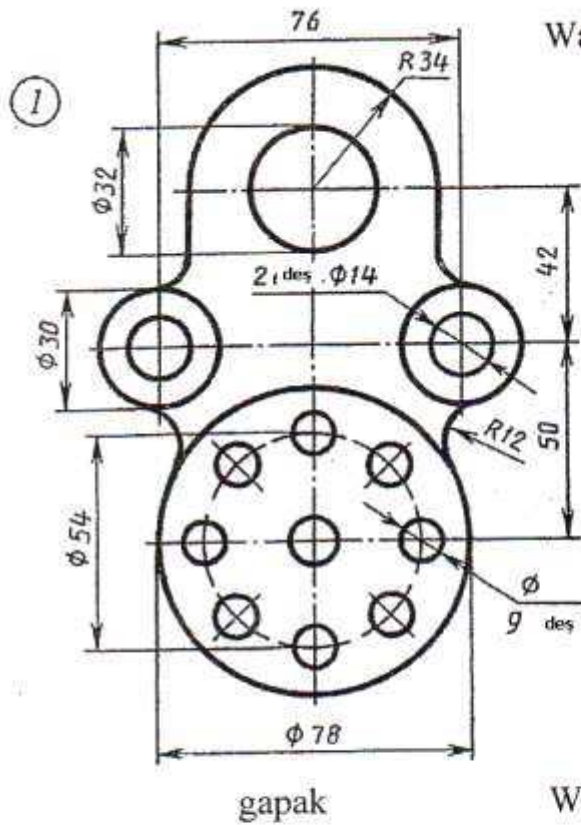


## YUMUŞ 6

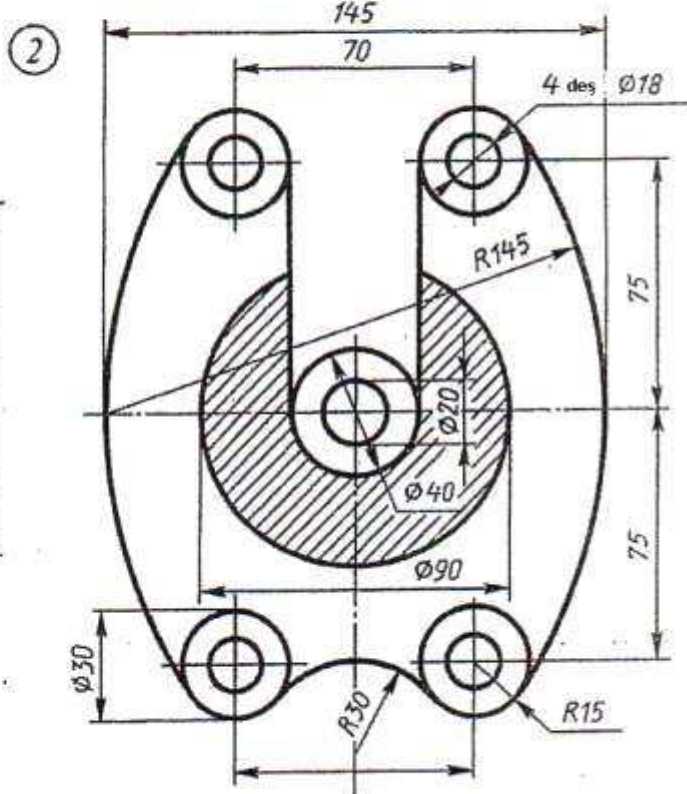
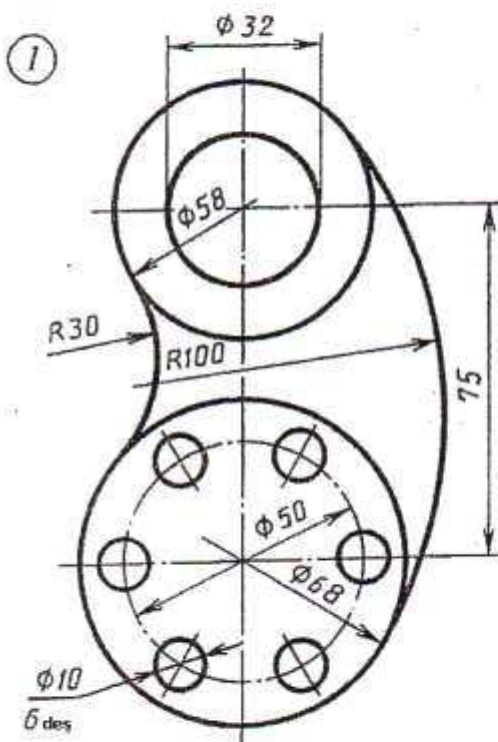
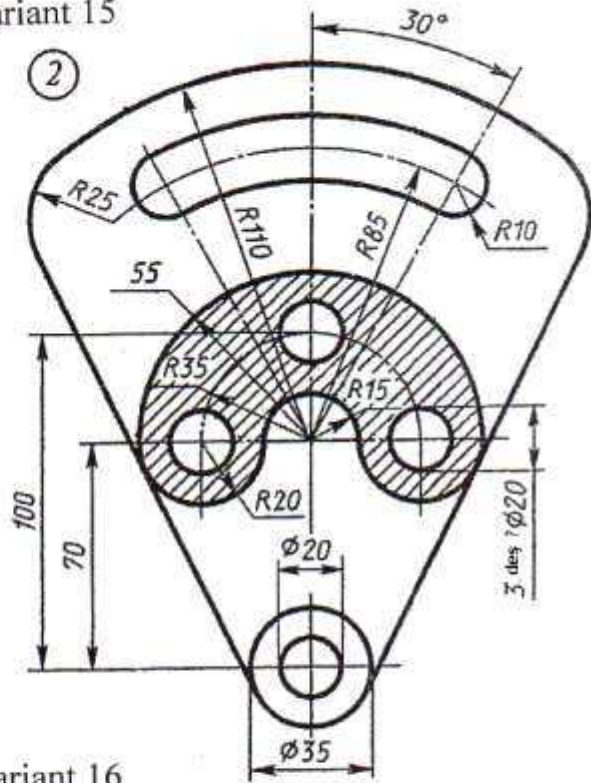


Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

## YUMUŞ 6



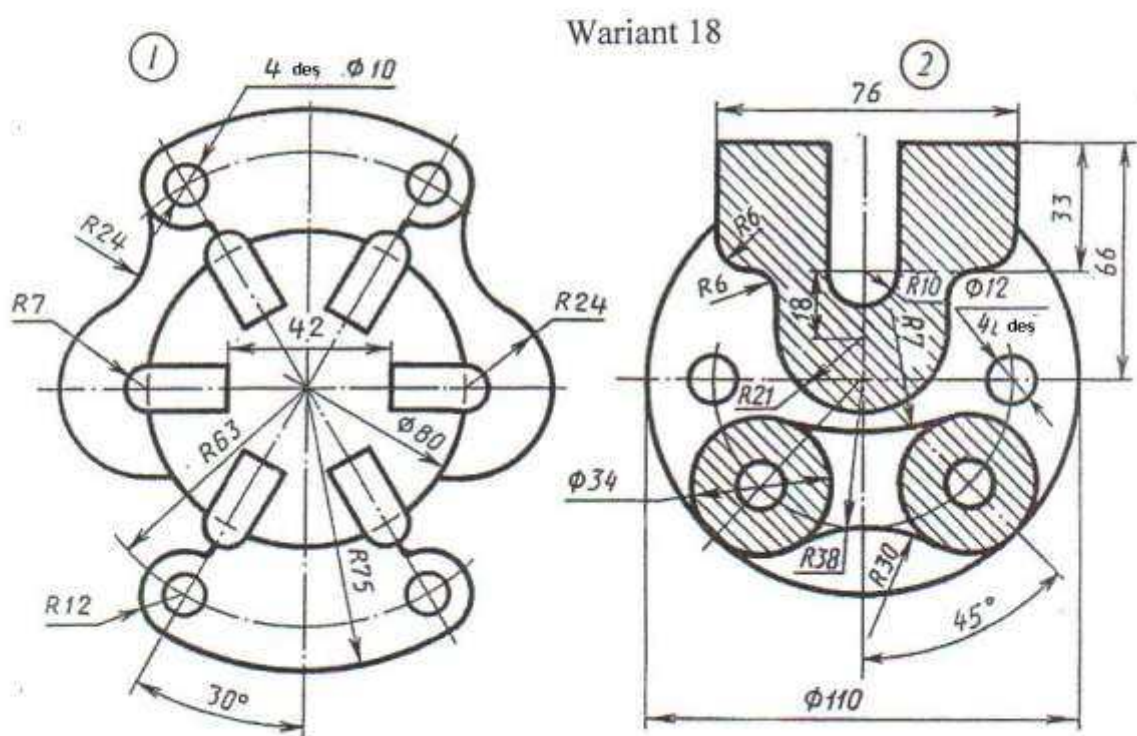
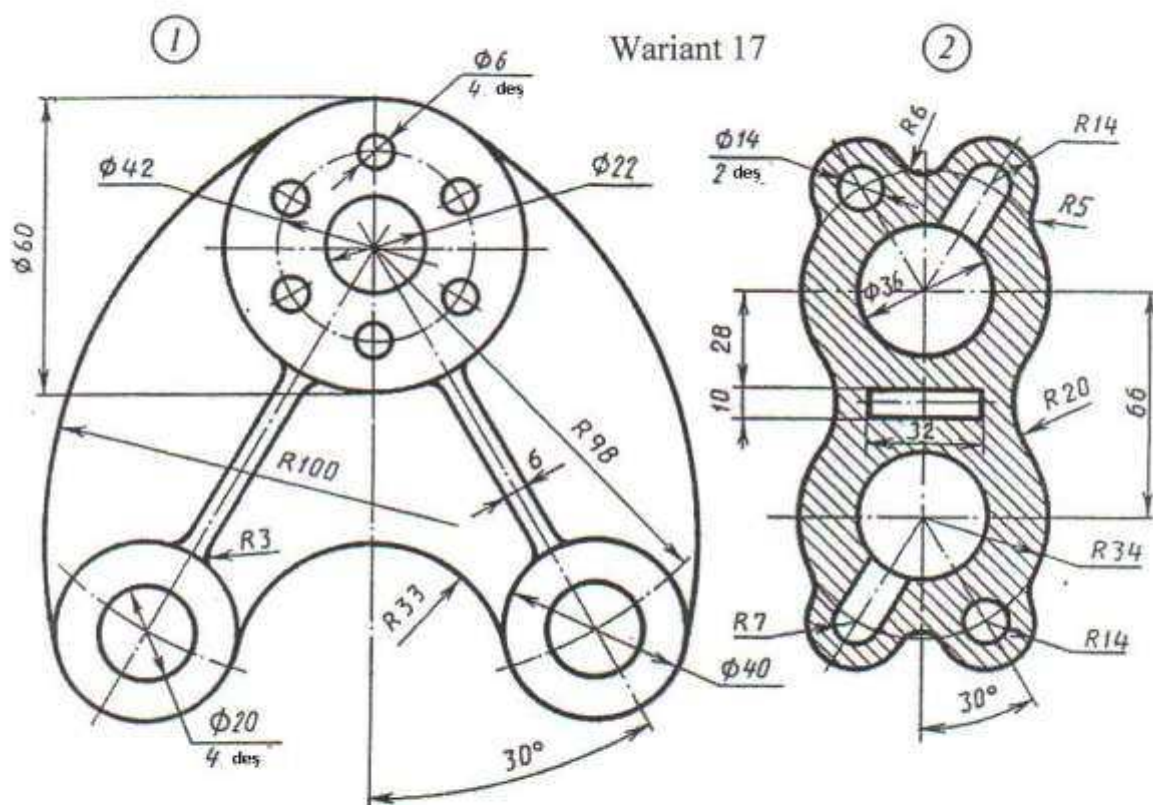
Wariant 15



şaylaryň suduryňnyň şekilini çyzmaly we ölçeglerini belgilemeli



# YUMUŞ 6

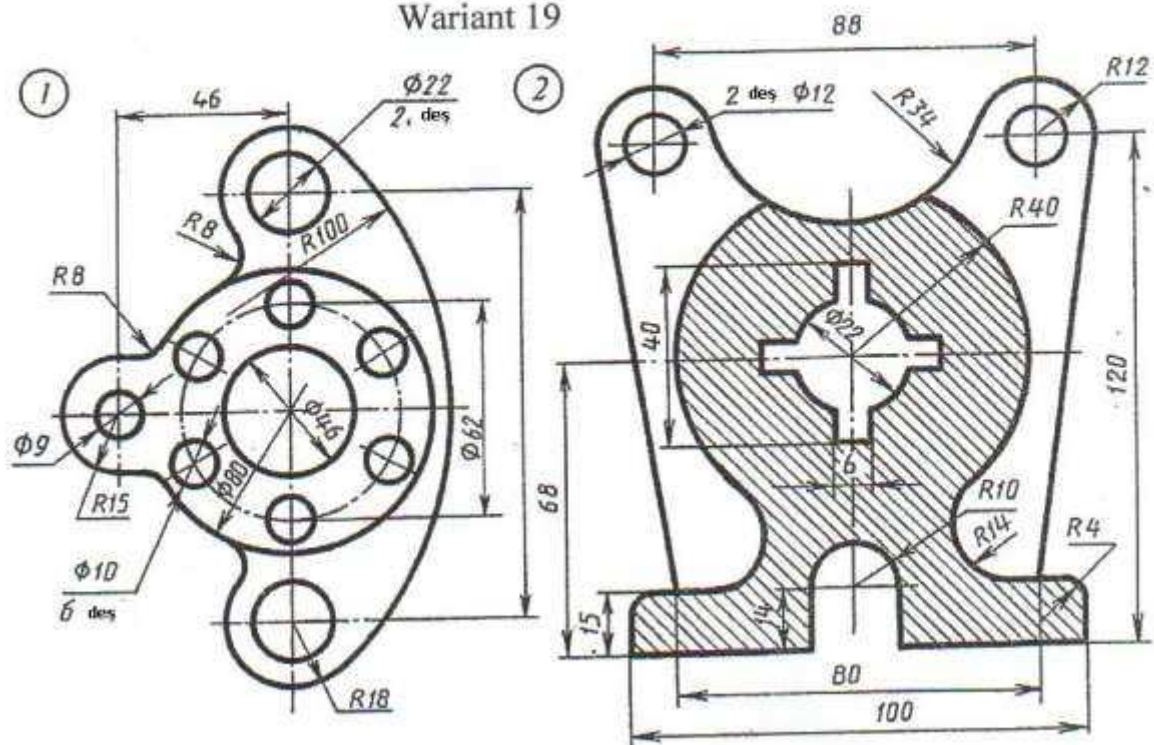


Şaýlaryň suduryňyň şekilini çyzmaly we ölçeglerini belgilemeli.

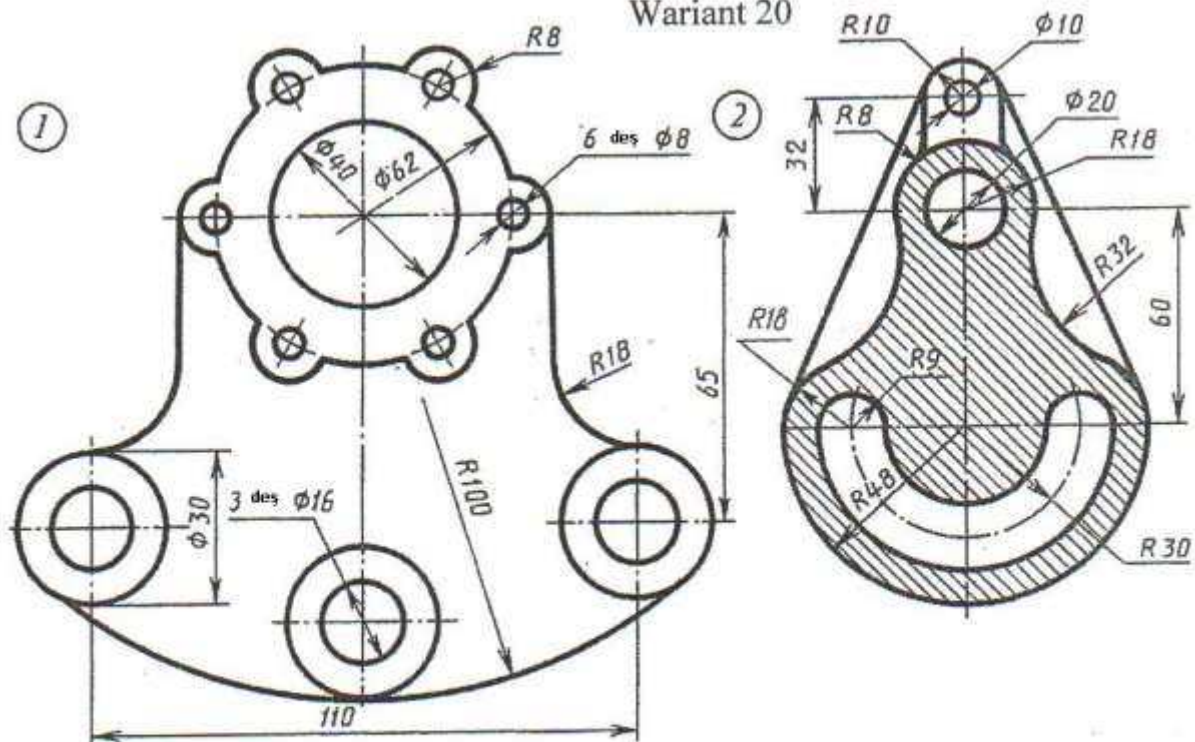


# ÝUMUŞ 6

Wariant 19



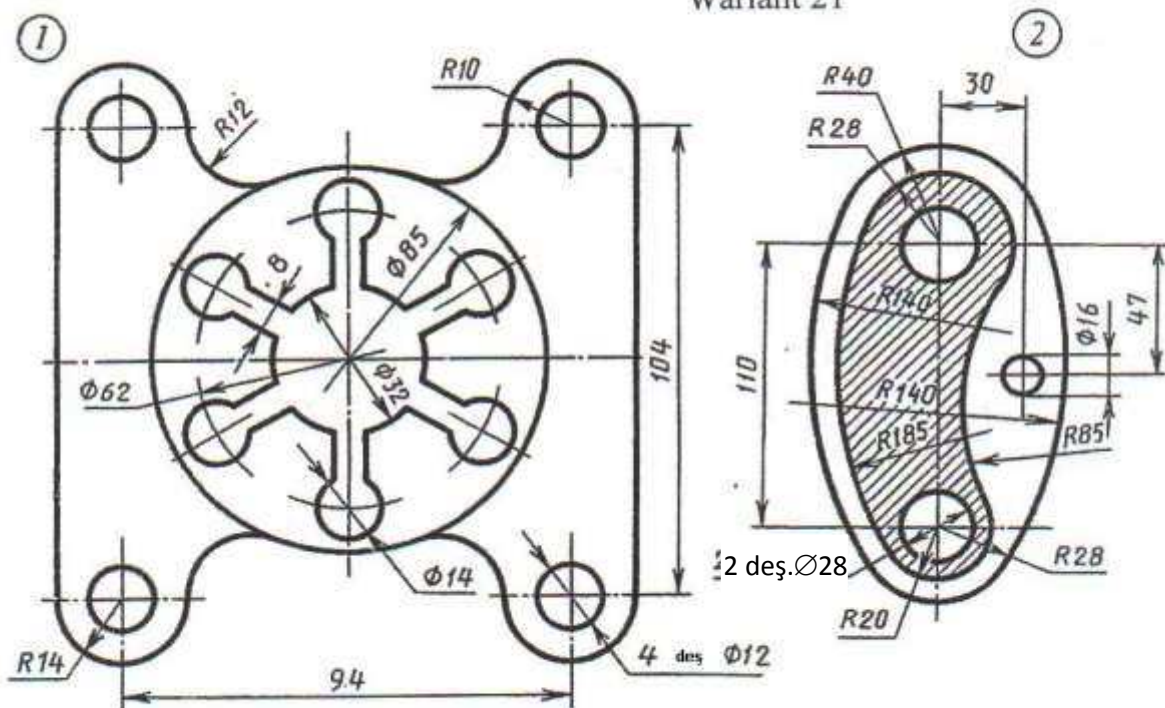
Wariant 20



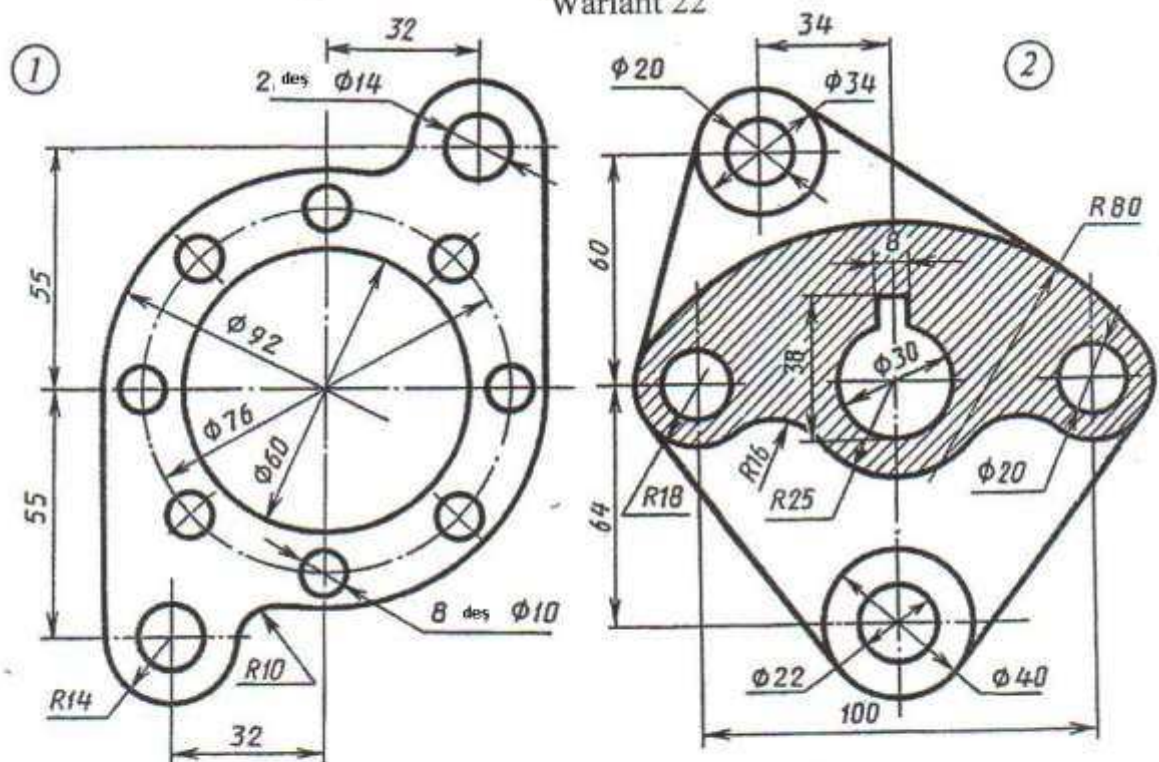
Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

# YUMUŞ 6

Wariant 21



Wariant 22

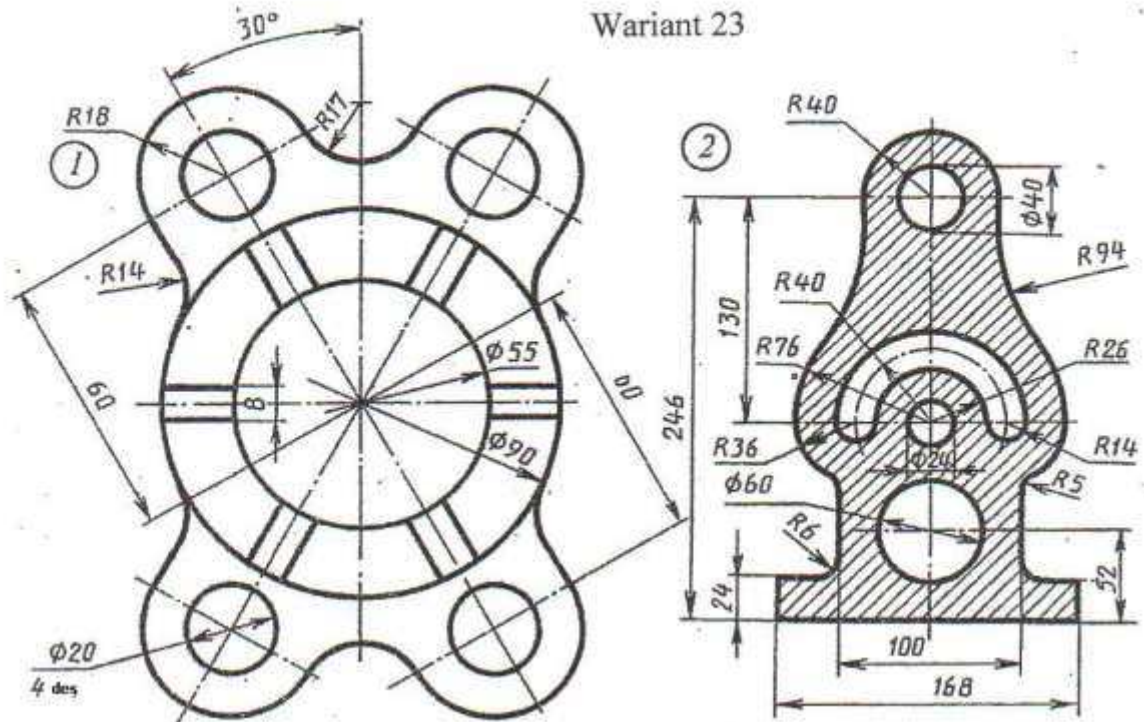


Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

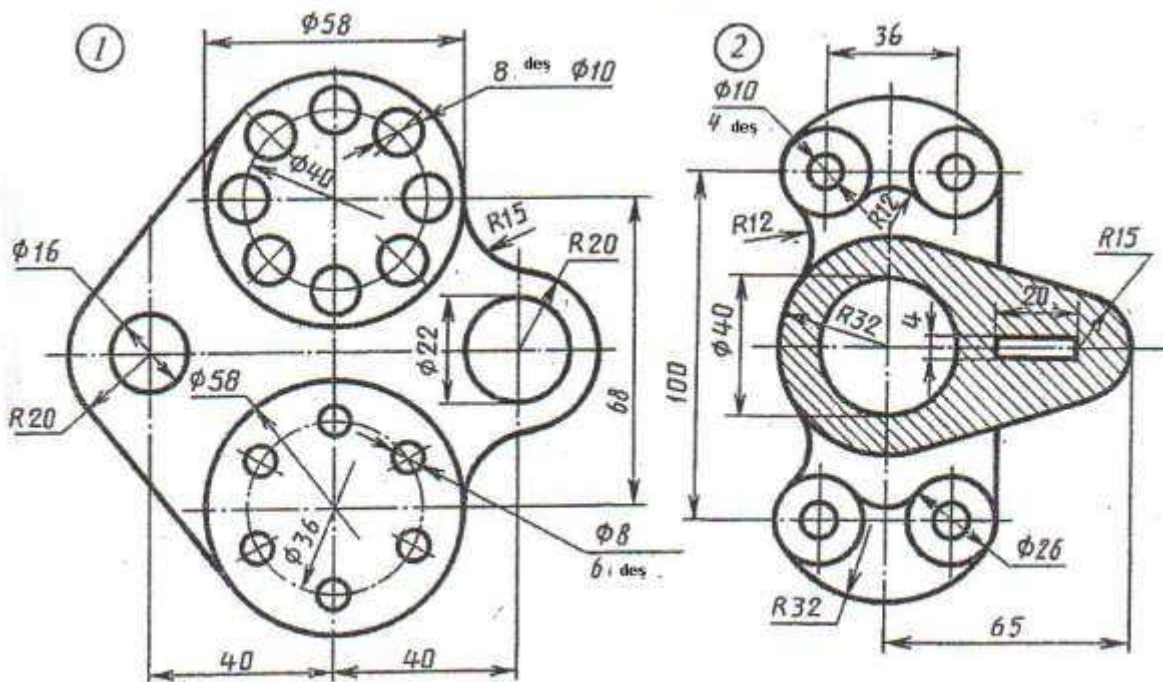


# YUMUŞ 6

Wariant 23



Wariant 24

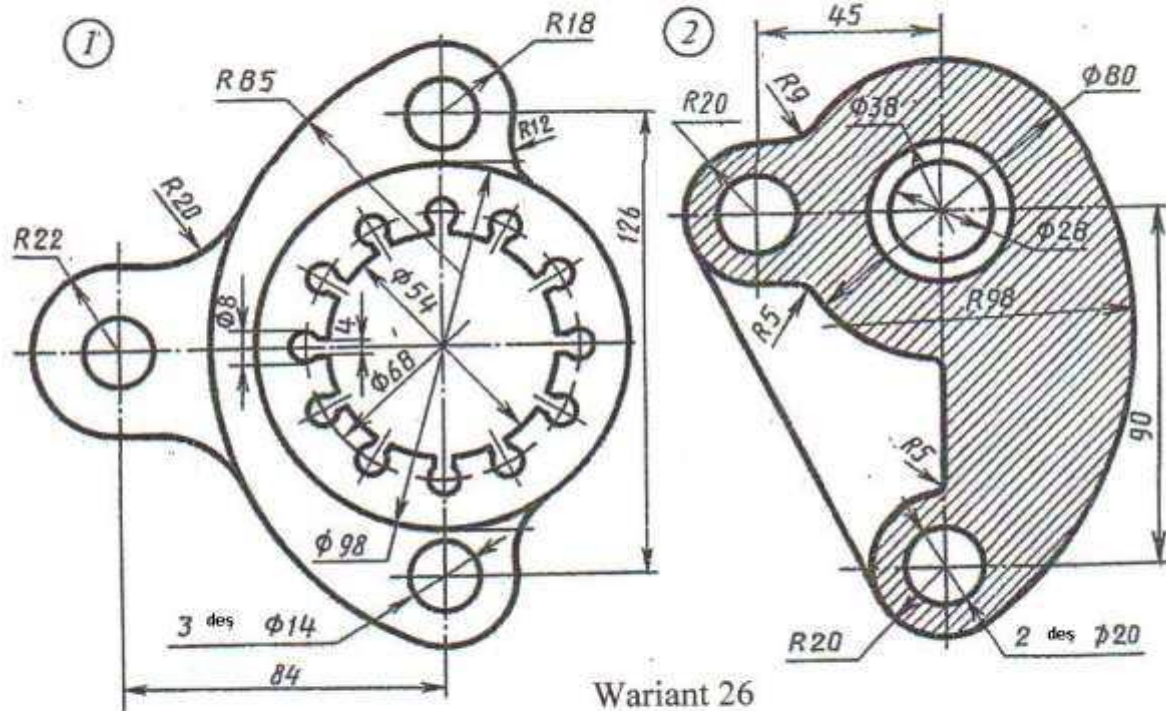


Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

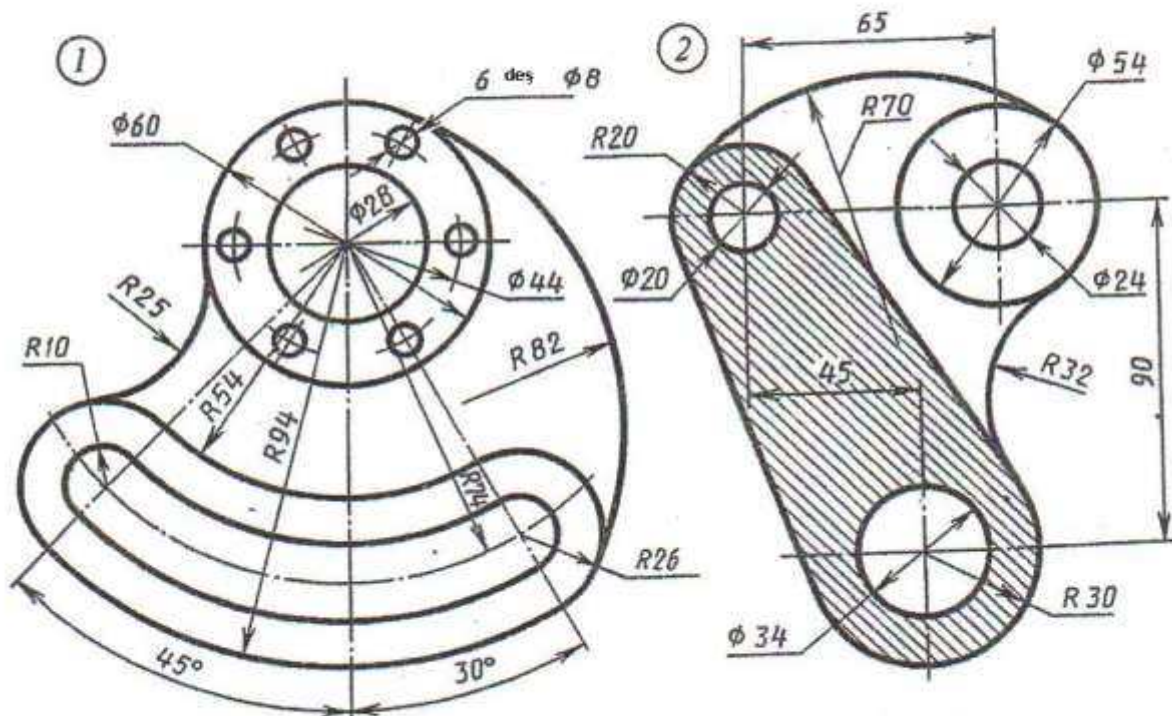


# YUMUŞ 6

Wariant 25

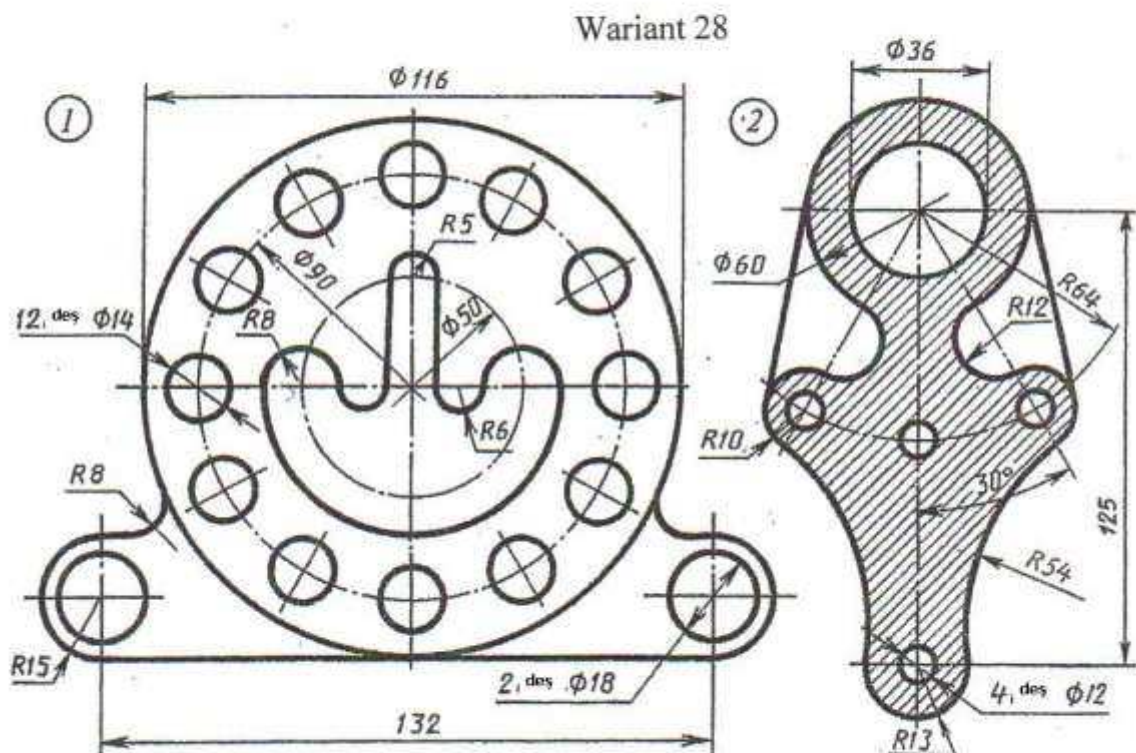
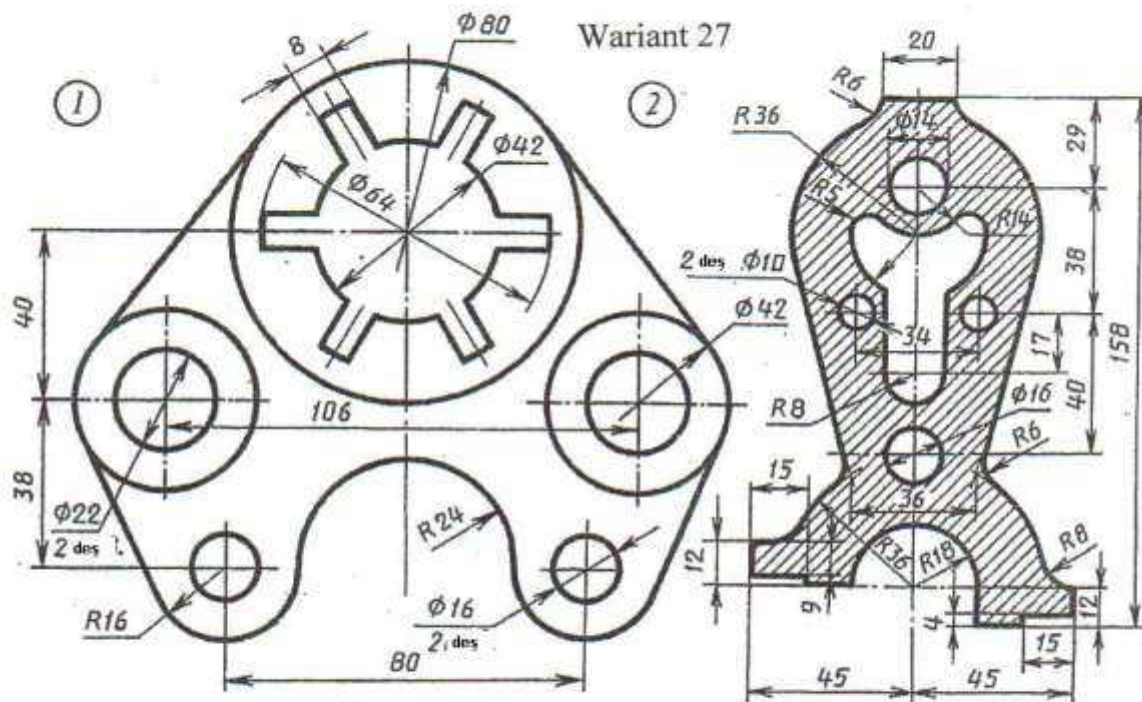


Wariant 26



Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

# YUMUŞ 6

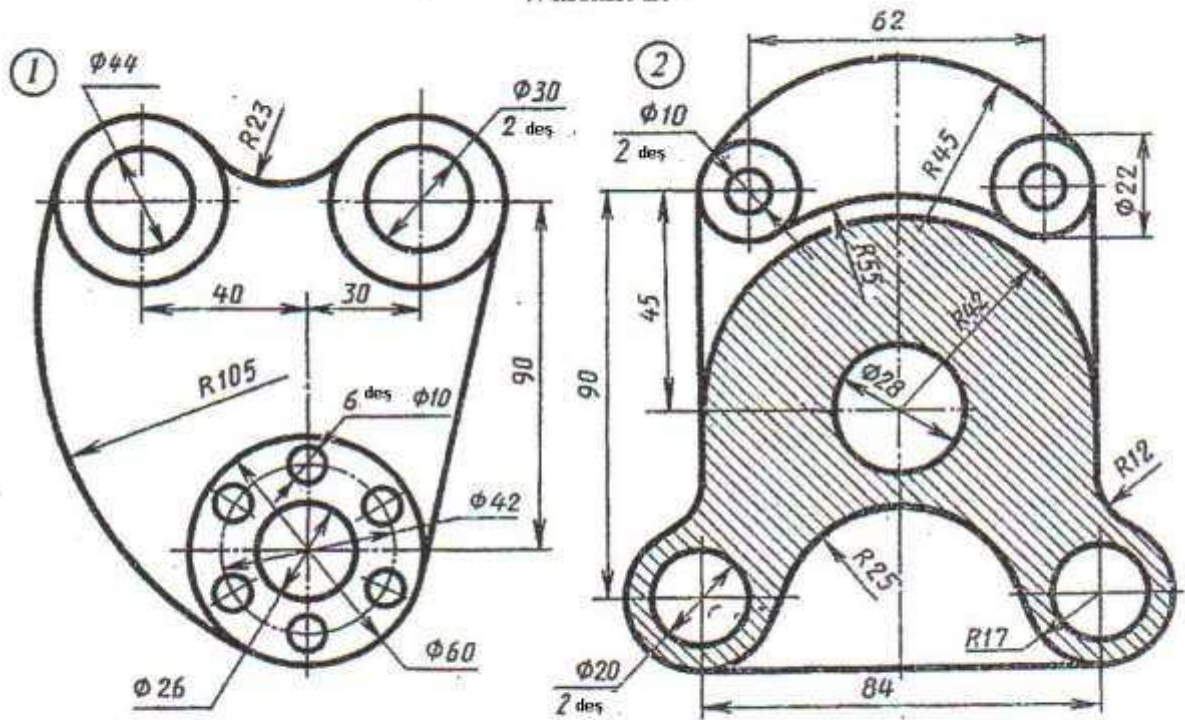


Şaýlaryň sudurynyň şekilini çyzmaly we ölçeglerini belgilemeli.

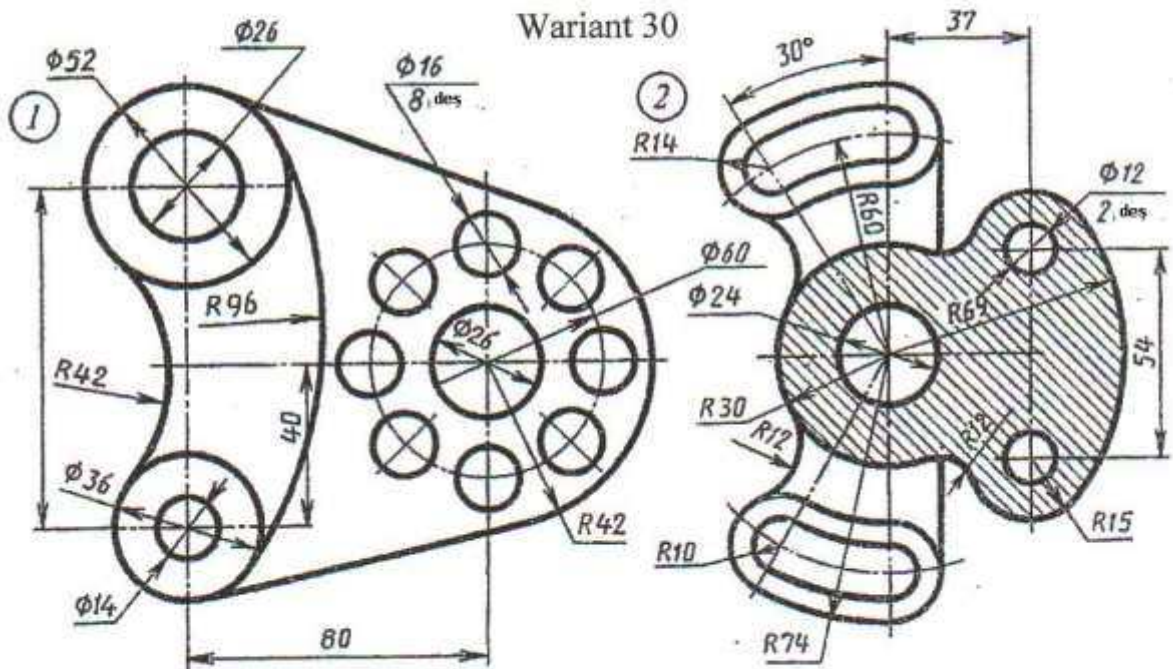


# YUMUŞ 6

Wariant 29



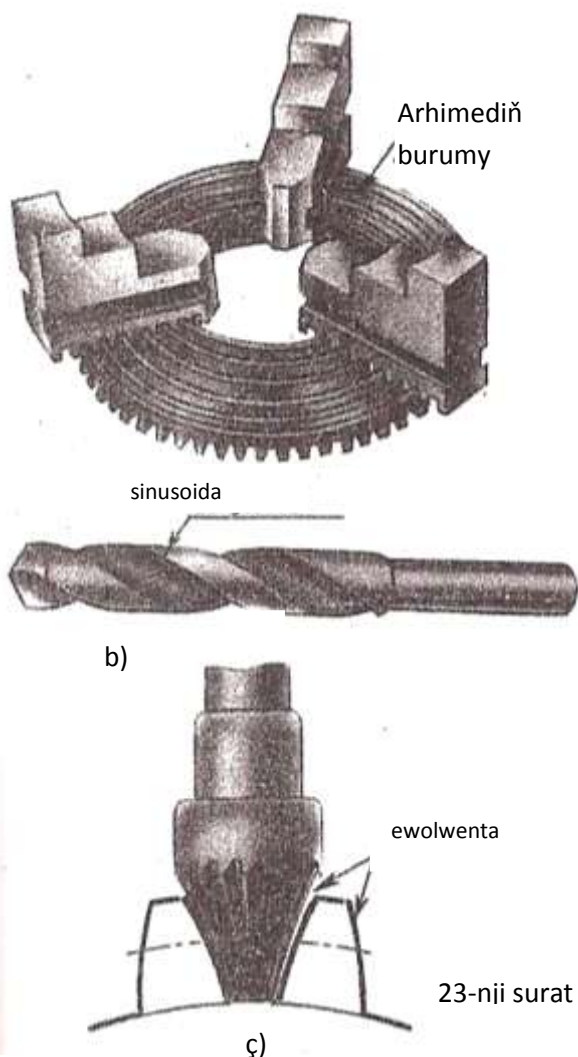
Wariant 30



Şaylaryn suduryňnyň şekilini çyzmaly we ölçeglerini belgilemeli.



## 7. Lekal egrilerini gurmak



23-nji surat

gabatlamaly we has köp nokat galtaşan lekaly kabul edip şol egriniň üstünden galam ýöretmeli. 24-nji suratda 1...6 nokatlar arasyndaky egriniň üstünden galam ýörediler. Indiki bölegine galam ýöretmek üçin 5...10 nokatlara lekaly gabatlaýarlar. Galam ýöretmäni dowam edilende birinji bölek egriniň çyzylan 5, 6 nokatlaryna lekaly hökmany gabatlamak bilen 5...10 nokatlar arasyndaky egrä galam ýöredilýär, şol bir wagtyň özünde 9, 10 aralyga galam goýy ýöredilmeýär, sebäbi bu aralyk 9...12 aralyk üçin lekal saýlamaga gerek bolýar.

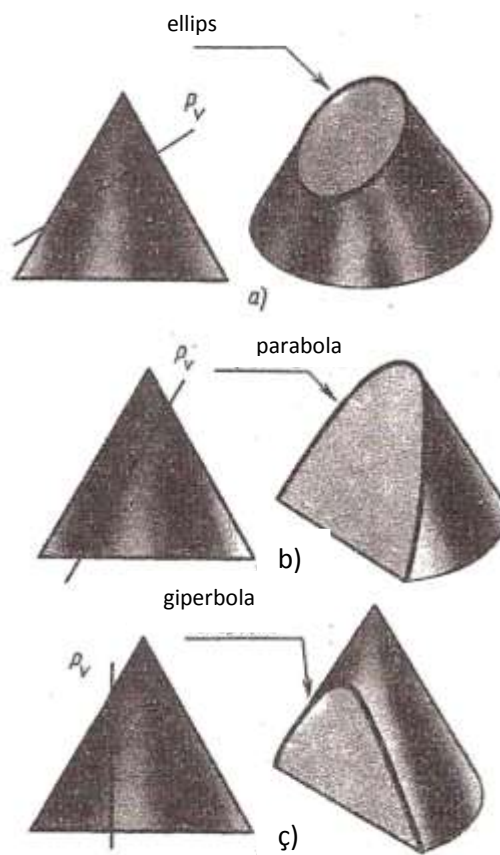
konusy, konusyň okuna görä dürli

Maşyngurluşyk çyzgylarynda sirkul bilen çyzyp bolmaýan, birnäçe çatrymlardan ybarat bolan egrileri çyzmaklyk, tiz-tizden gabat gelýär.

Olartyň käbirleri 23-nji a,b,ç suratlarda görkezilen.

**Lekal egrileri** elmydama oňa degişli nokatlaryň hatarlary gurulup, soňra galam bilen önünçä elde endigan çyzyk arkaly birikdirilýär, ondan soňra lekalyň kömegi bilen 24-nji suratda görkezilişi ýaly üstünden geçilýär.

Lekal egrilerini endigan çyzmak üçin, birnäçe görnüşli lekallaryň ýygındysyny edinmeli. Amatly lekaly saýlap almak üçin egriniň köp sanly nokatlaryna lekalyň egri böleklerini



25-nji surat

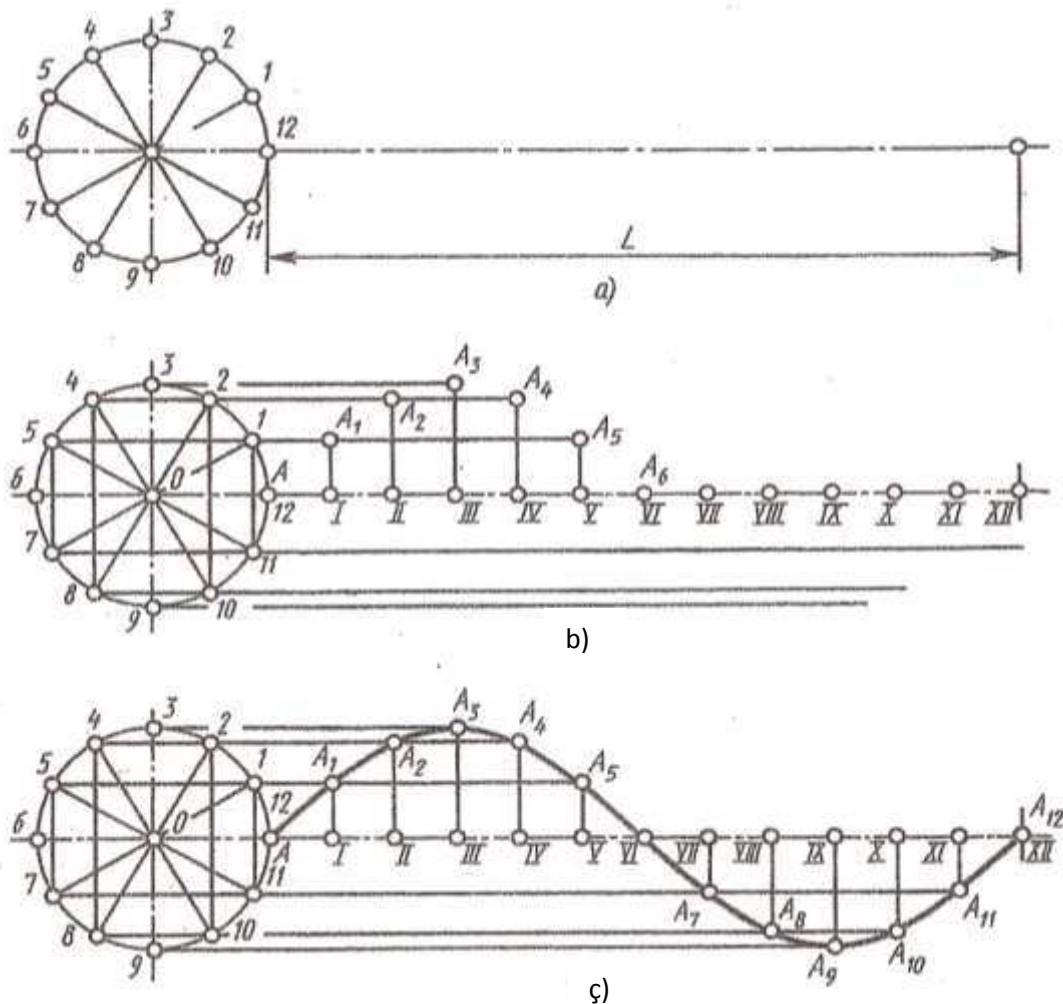
hallardaky tekizlikler bilen kesip, kesigiň sudurynda emele gelýän ellipsi, parabolany we giperbolany almak mümkin. 25-nji a, suratda.

P – tekizlik bilen konusunň ähli emele getirijileri kesilende **ellips** emele gelýär, konusunň emele getirijileriniň birine P – tekizligi parallel edip konus kesilse, 25-nji a, surat- **parabola**, eger-de P – tekizligi konusunň okuna parallel edilip konus kesilse, onda 25-nji b, surat – **giperbola** emele geler.

**7 – ýumuşda** durmuşda giňden ýaýraýan lekal egrilerini gurnaklyga deňişli on bir mesele berlen. Talybyň haýsy ýumuşy ýerine ýetirilmelidigini mugallym tarapyndan kesgitleýär.

Ýumuş ýerine ýetirilende peýdalanylan kömekçi gurnamalar çyzgy tamamlanandan soň hem galdyrmak maslahat berilýär.

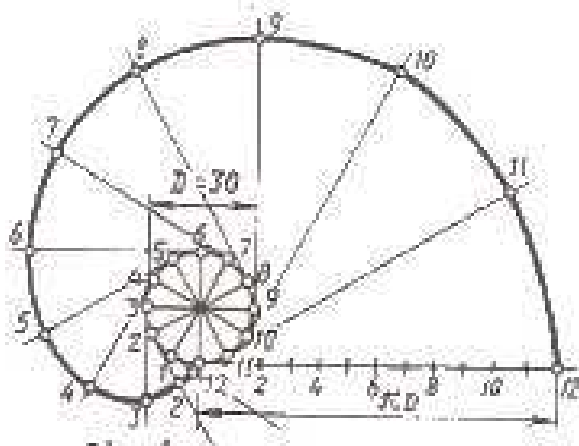
26-njy a, b, ç suratlarda sinusoidiň ýerine ýetiriliş yzygiderligi görkezilen.



26-njy surat

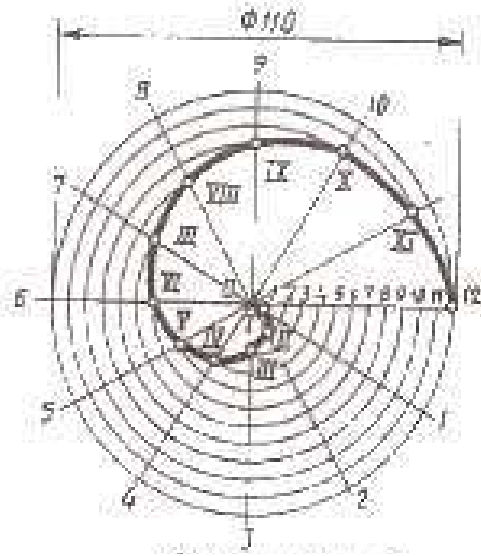
## ÝÜMUŞ 7

1



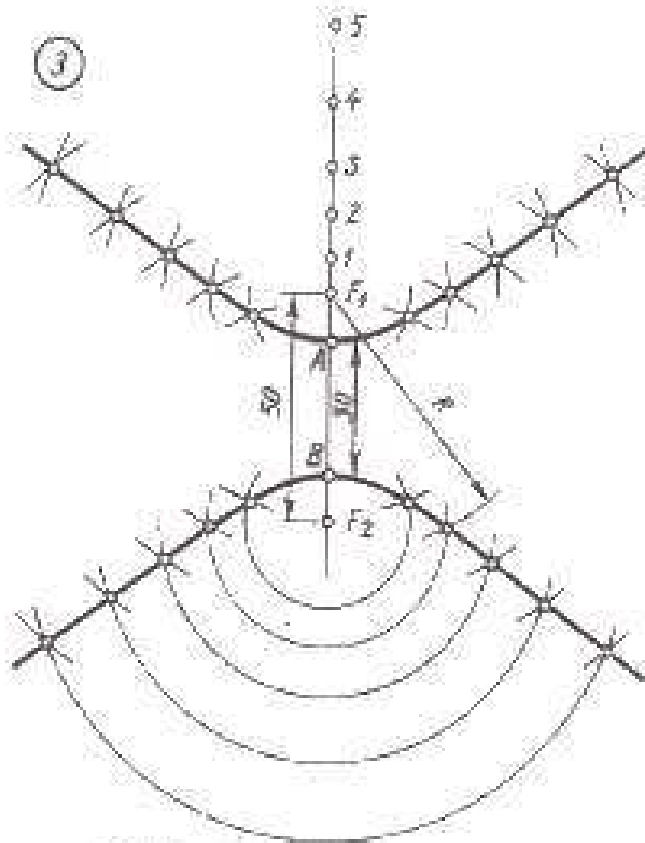
töwregiň ewolwenti

2



Arhimediň burumy

3



giperbola

4



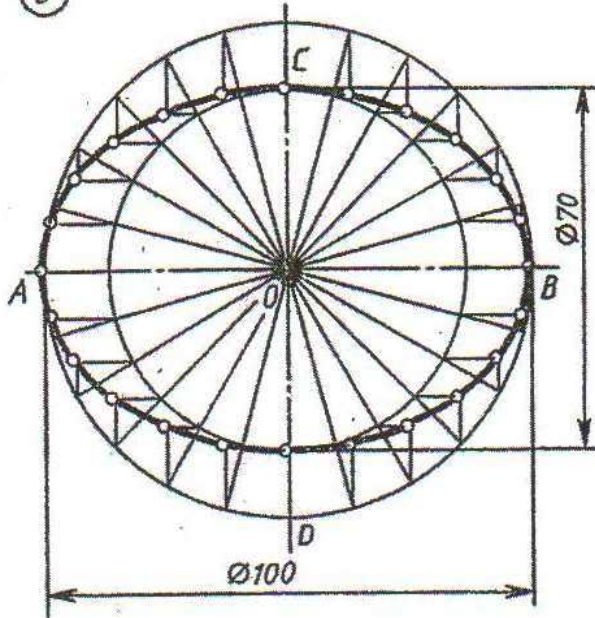
sinusoid

Başlangyç berlenler esasynda görkezilen lekal egrilerini gurmak



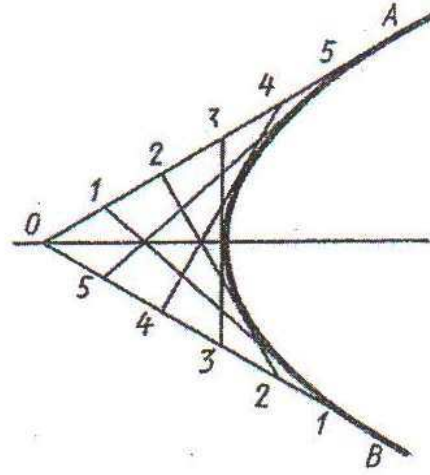
## YUMUŞ 7

5



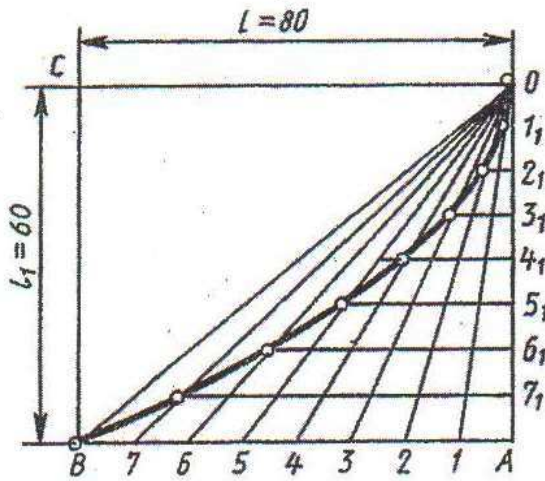
Ellips

6



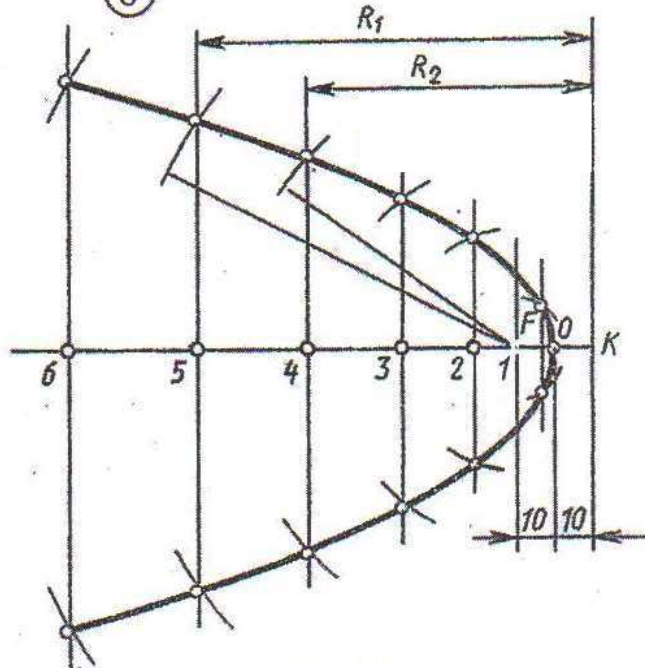
Parabola

7



Parabola

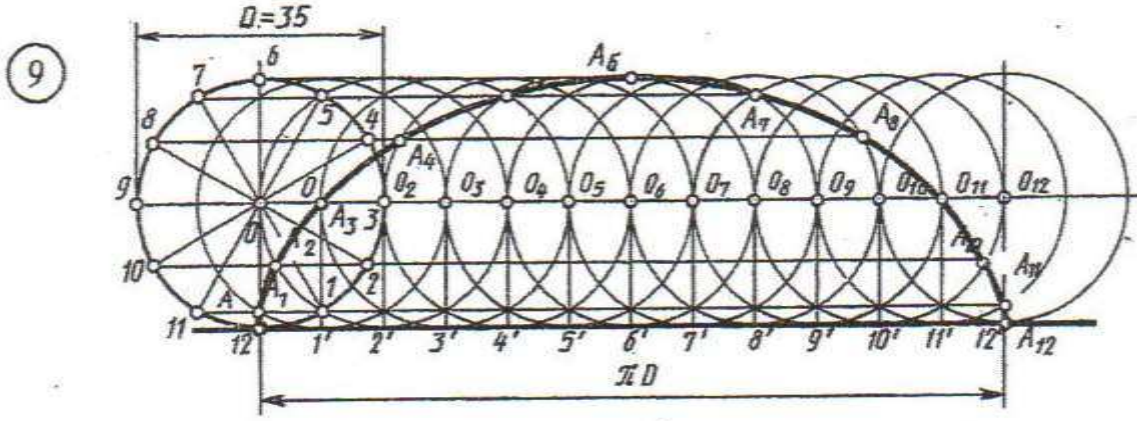
8



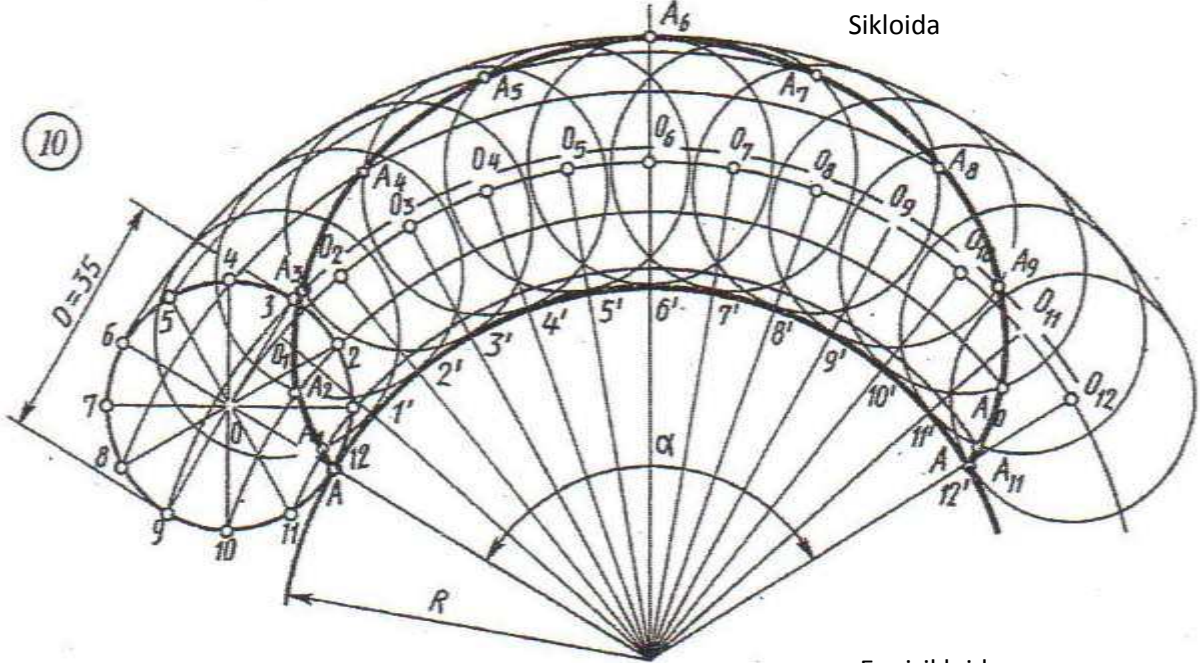
Parabola

Başlangıç berlenler esasynda görkezilen lekal egrilerini gurmak.

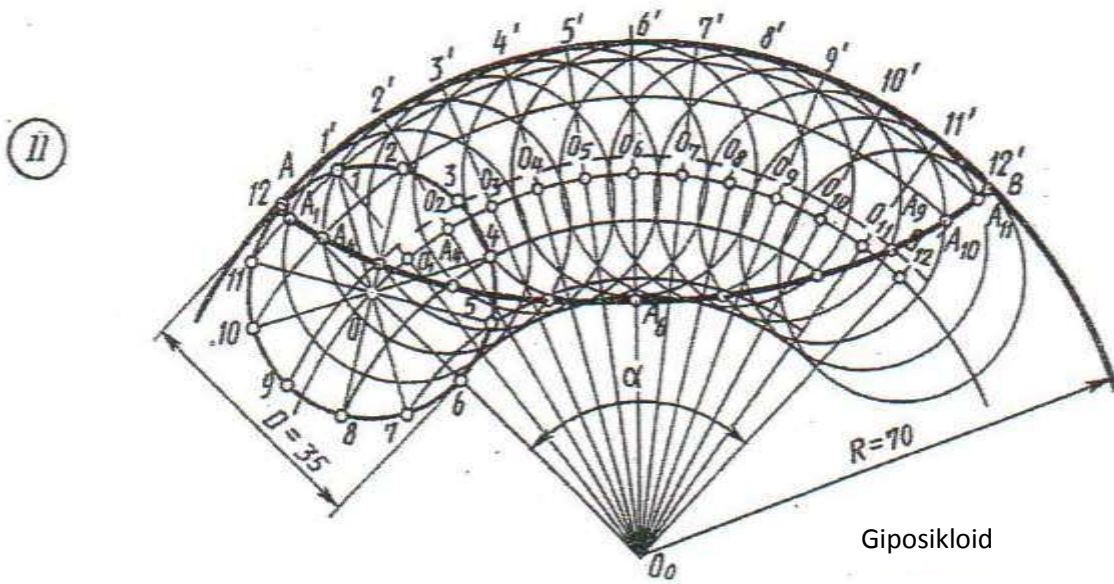
## YUMUŞ 7



Sikloida



Eppisikloid



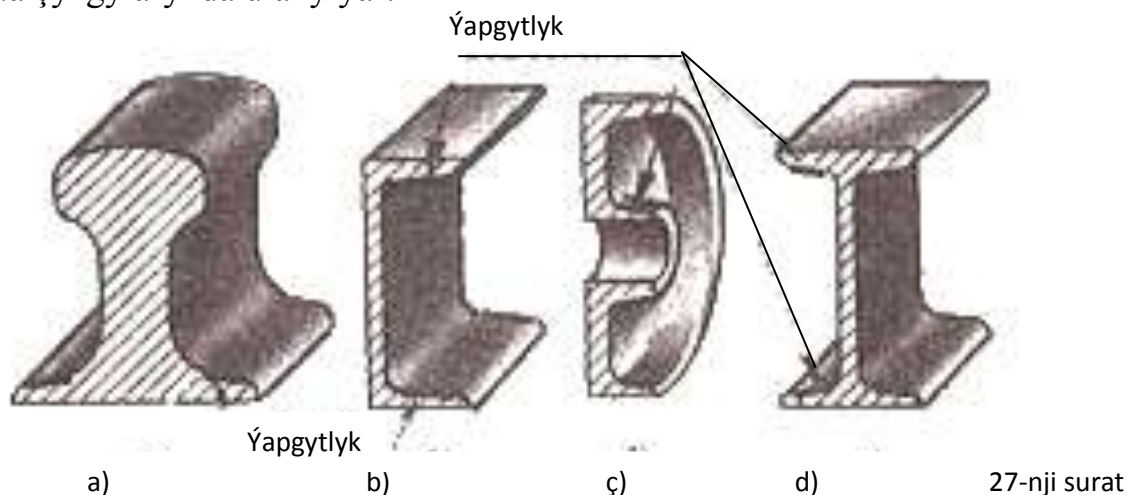
Giposikloid

Başlangıç berlenler esasynda görkezilen lekal egrilerini gurmak.



## 8. Ýapgytlyklary we konuslyklary gurmak hem-de belgilemek

Köp sanly detallar çyzylanda ýapgytlyklar peýdalanylýar. Meselem, prokat stanoklarda ýasalýan polat balkalaryň (pürüstleriň) we relsleriň çyzgylary ýerine ýetirilende 27-nji a, b, ç suratlarda we käbir eredilip, guýulýan detallaryň 27-nji d suratda çyzgylarynda ulanylýar.



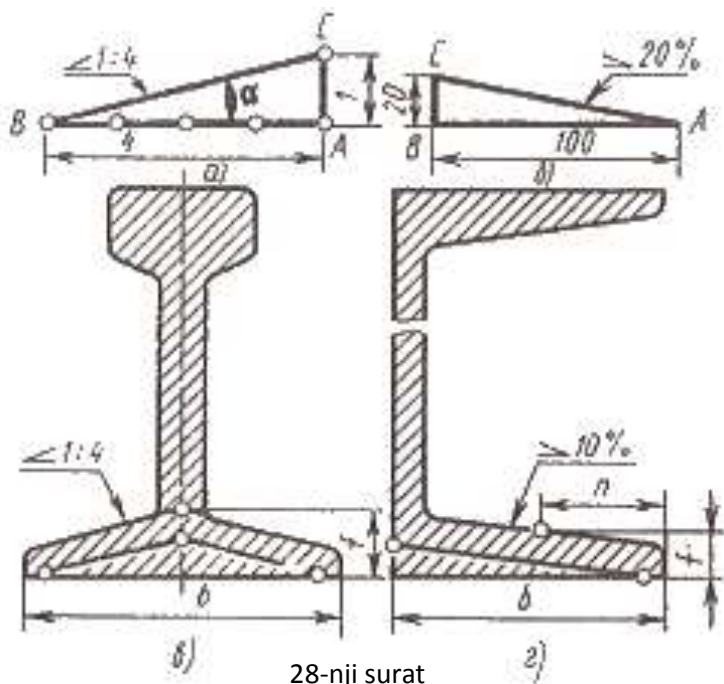
**Ýapgytlyk diýilip, bir göni çyzygyň, ikinji bir göni çyzygyna ýapgytlygyny häsiýetlendirýän ululyga aýdylýar.**

BC kesimiň BA kesime görä  $i$  ýapgytlygy göniburçly ABC üçburçlygyň katetleriniň gatnaşygy bilen (28-nji a, suratda) kesgitlenýär, ýagny

$$i = \frac{AC}{AB} = \operatorname{tg} \alpha$$

Ýapgytlyk drob ýa-da prosent görnüşinde aňladylyp bilner.

28-nji suratda görkezilişi ýaly BC gönini berlen (meselem 1:4) ýapgytlykda gurmak üçin gorizonta gonüde A nokatdan AB kesimi dört ölçeg birligine deň

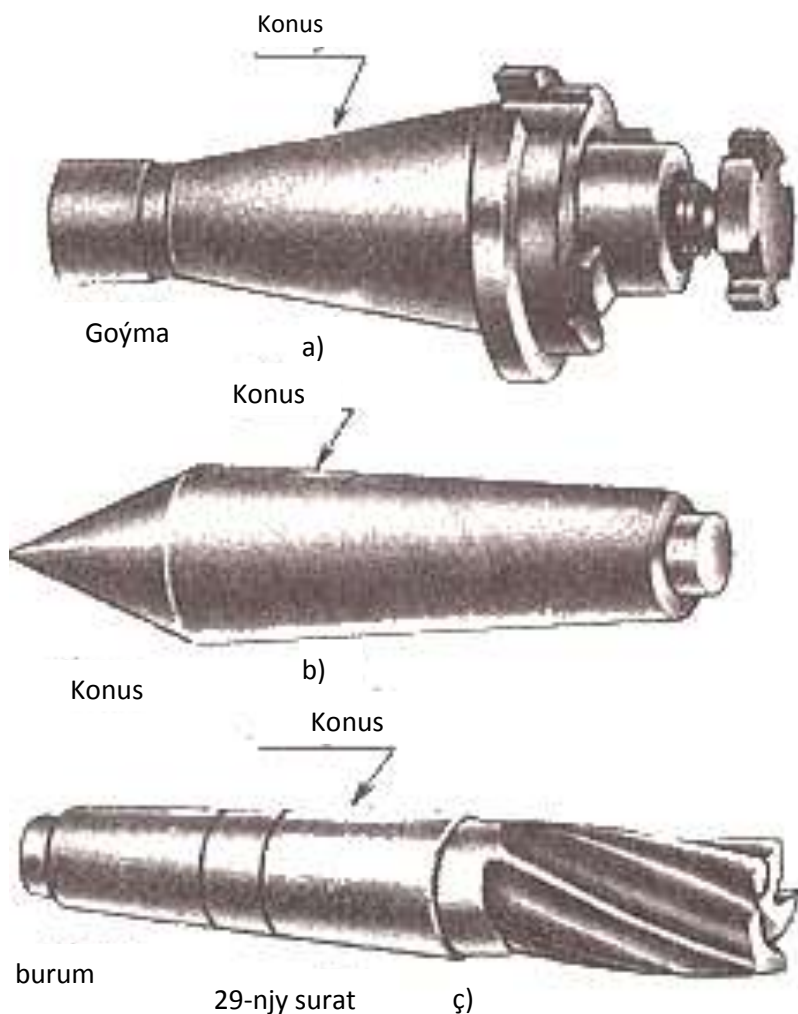


bolar ýaly ölçäp goýmaly, A nokatdan ýokarlygyna bir ölçeg birligine deň bolar ýaly edip AC kesimi gurmaly.

C we B nokatlary birikdirýän C B göni çyzygy, gözlenilýän ýapgytlygyň ugryny berer.

1:4 ýapgytlykdaky detalyň sudury çyzylanda 28-nji ç, surtda görkezilişi ýaly öňi bilen ýapgytlyk çyzygyny gurmaklyk ýerine ýetirilýär, soňra şoňa parallel edilip şaýyň sudur çyzyklary geçirilýär. Eger





ýapgytlyk prosentde berilse, meselem 20% 28-nji b, d, onda-da ýapgytlyk çyzygy göniburçly üçburçlugyň gipetenuzasyny 100%-de, başgasyny 20%-de alýarlar. Görnüşi : ýaly 20%- ýapgyt diýmek 1:5 diýmeklikdir. TDS 2.307-68 ýapgytlygy görkezýän sanyň önünde ýapgytlygy kesgitleýän şertli belgini goýmaklygy ykrar edýär. 28-nji ç, d suratlardan görnüşi ýaly ýiti burçuň ugry ýapgytlyga tarap gönükdirilen bolmaly. 29-nji a, b, ç suratlarda dakma, konus we swerlo şaýlary görkezilen, olaryň ählisinde konuslyk bar.

**Konuslyk diýilip,**

**konusyň esasynyň diametriniň onuň beýikligine bolan gatnaşygyna aýdylýar.** 30-njy a, suratda konuslyk ç harp bilen belgilenýär. Eger-de kesilen konus bolsa 30-njy b, surat, onda esaslarynyň diametrleri D we d hem-de  $\alpha$  beýikligi, onda konuslyk aşakdaky formulada kesgitlenir.

$$C = \frac{D - d}{\alpha}$$

Meselem, eger-de  $D=30$  mm,  $d=20$  mm we  $L=70$  mm berilse 29 b ,surat, onda

$$C = \frac{30-20}{70} = 1:7$$

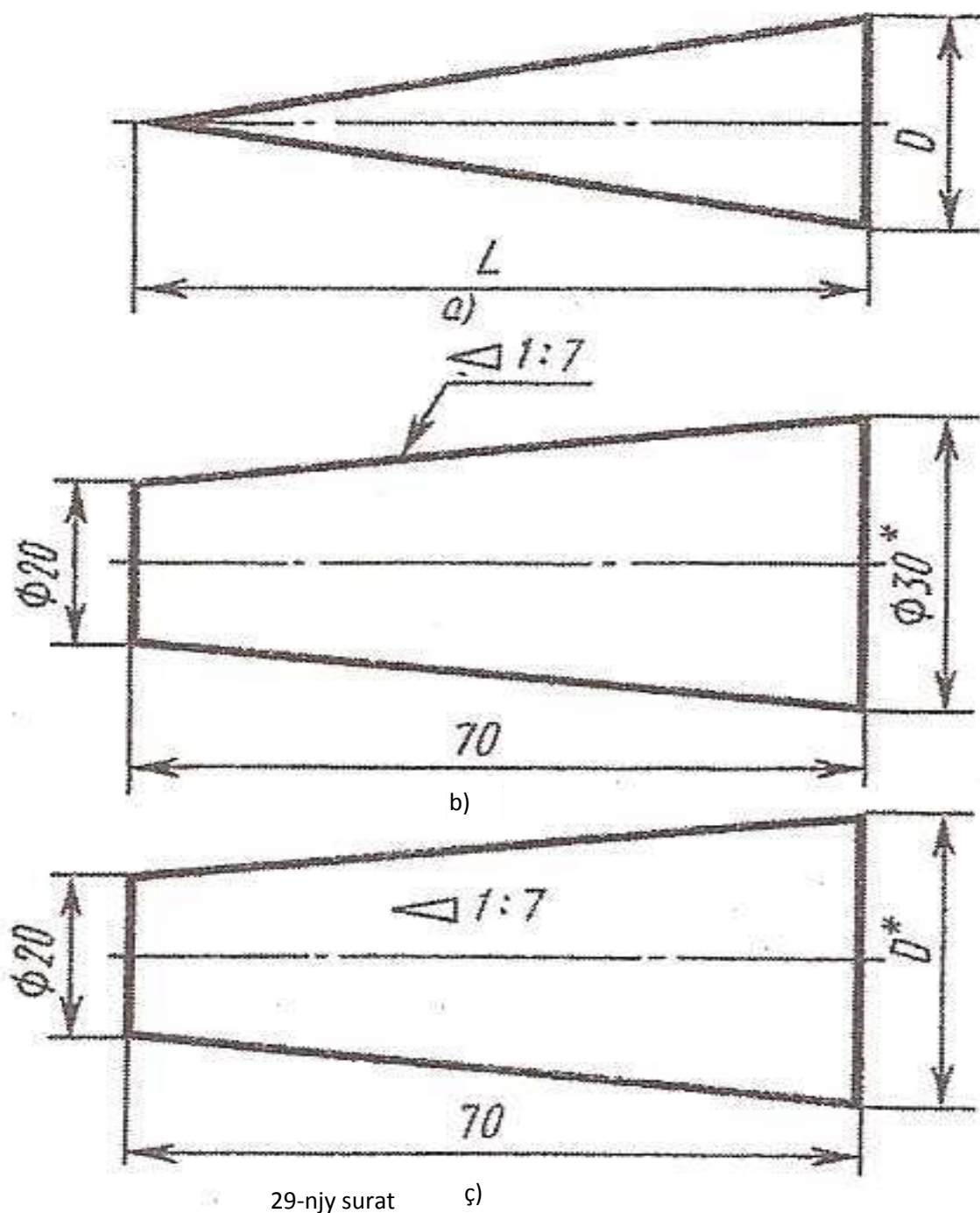
Eger-de konuslyk c, esasynyň bir diametric d we konusyň beýikligi  $\alpha$  belli bolsa, onda konusyň ikinji D diametrini tapyp bolar. Meselem,  $c=1:7$ ,  $d=20$  mm we  $L=70$  mm, onda D ölçegini şu formulada kesgitläp bolar

$$D = c \alpha + d = \frac{1}{7} * 70 + 20 = 30 \text{ mm} \quad 30\text{-njy } \text{ç, surat}$$

Kada boýunça çyzgyda konusyň esasynyň uly diametri berilýär, sebäbi konus şaýlar ýasalanda bu diametri ölçemek amatly.

Konuslygy we konuslygyň burçlaryny TDS 8593-81 berkarar edýär.

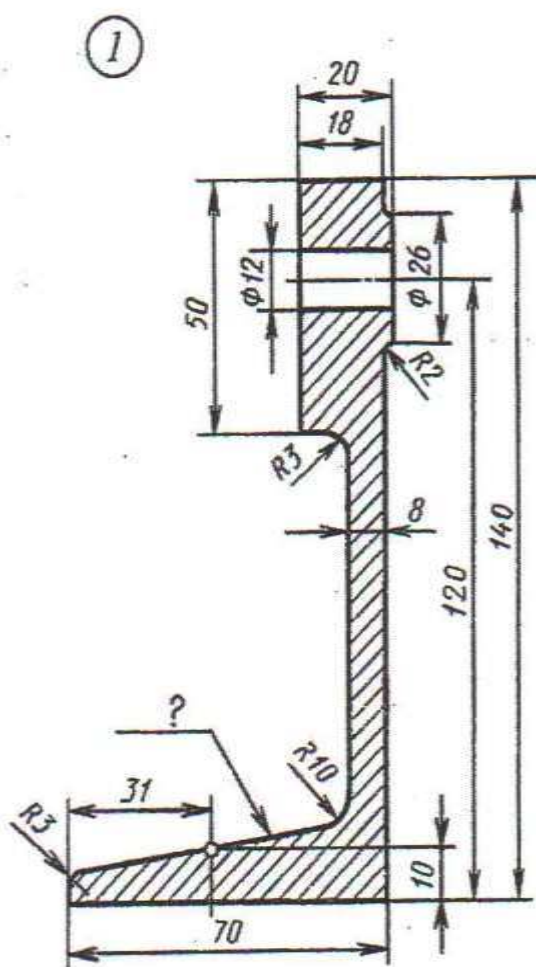
TDS 25548-82 laýyklykda terminler we kesgitlemeler berilýär.



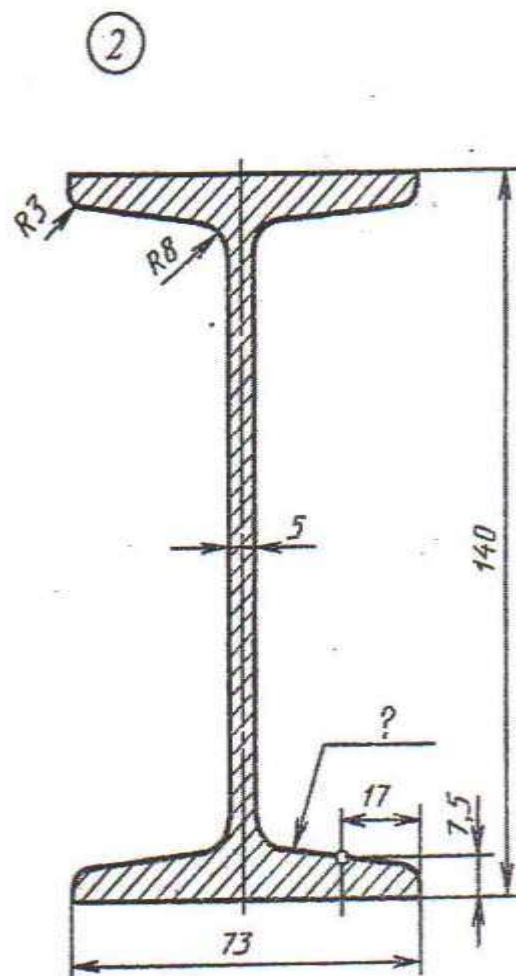
**Ýumuş 8.** Çyzgyda ýapgytlygy gurmaklyga we belgilemäge degişli iki meseleden durýar. 28-nji a, b suratlarda gorizontala görä 1:4 ýapgytlygy gurmaklyk görkezilen. Şoňa meňzeş edilip prosentde berlen ýapgytlyklar gurmak ýerine ýetirilýär. 28-nji ç,d suratlarda görkezilen.

**Ýumuş 9.** Berlen konuslyk we ony kesgitleýän iki görkezijisi esasynda talyplar grafiki işi ýerine ýetirenlerinde şaýyň keşbini şekillendirmeli we konuslygy kesgitleýän üçünji görkezijisini hasaplamaly. 30-njy surata seret.

## ÝUMUŞ 8



Direg

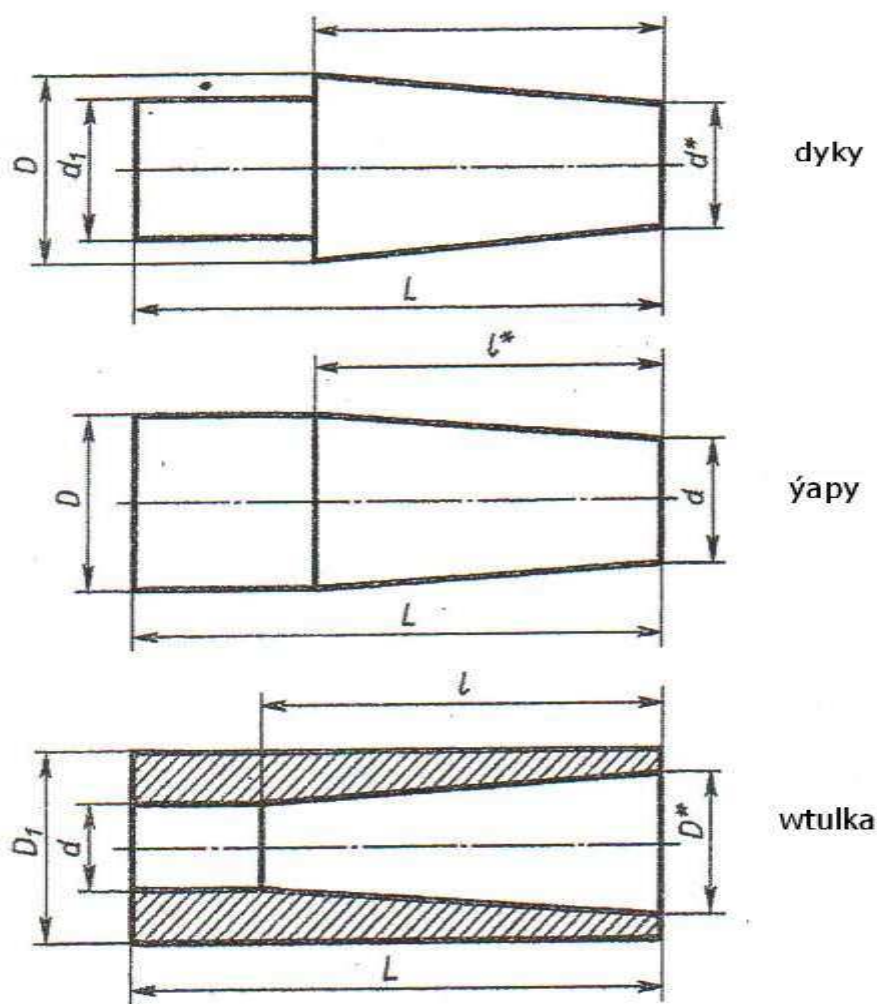


Iki tawr

Şaýlaryň sudur şekillerini ýapgytlyklary gurmak bilen çyzmaly. Ýapgytlygy direg üçin 1:6, yöne dwutawr üçin 12% kabul etmeli. Ölçegele goýmaly, ýapgytlygy belliklemeli



## ÝUMUŞ 9



variantlar	dyky					variantlar	ýapy				variantlar	wtulka				
	L	l	D	d <sub>1</sub>	konus lyk		L	D	d	konus lyk		L	l	d	D <sub>1</sub>	konus lyk
1	90	60	40	15	1:3	11	110	60	30	1:3	21	100	70	25	50	1:7
2	105	70	30	16	1:7	12	100	40	25	1:7	22	110	90	20	60	1:3
3	125	100	40	14	1:5	13	105	40	20	1:5	23	115	100	35	70	1:5
4	110	75	50	20	1:3	14	120	50	40	1:10	24	100	75	25	55	1:5
5	125	90	60	20	1:3	15	105	35	25	1:7	25	110	100	30	50	1:10
6	110	75	50	28	1:5	16	110	40	25	1:5	26	115	75	20	45	1:5
7	125	100	50	30	1:10	17	90	30	20	1:7	27	100	60	20	60	1:3
8	125	100	60	25	1:5	18	115	35	25	1:10	28	110	70	35	55	1:7
9	120	100	55	35	1:10	19	110	45	30	1:7	29	105	100	25	50	1:10
10	115	70	35	20	1:7	20	105	50	20	1:3	30	100	90	30	70	1:3

Berlen ölçegler we ýapgyrlyk ululygy esasynda şaýlaryň şekillerini çyzmaly. Ýapgytlygy belgilemeli. Ýyldyzjyk bilen belliklenen ölçegleri hasaplamaly: dyky üçin  $d^*$ , gapak üçin  $l^*$  we wtulka üçin  $D^*$

## 9.Çyzuwly geometriýanyň esaslary

### Nokat, göni çyzyk, tekizlik we proyeksiýalary özgertmegiň usullary

Proyeksion çyzgy çyzuwly geometriýa esaslanmak bilen giňişlikdäki jisimleriň şekillerini, tekizlige şekillendirmek usuly bilen öwrenýär.

Proyeksion çyzgy – maşyngurluşyk çyzgysynyň esasy bolmak bilen, onda geometriki jisimleriň şekillerini we olaryň baglanyşyklary öwrenilýär.

Maşynyň şaýlary ýa-da islendik jisim nähili çylşyrymly gurluşdan bolmagyna garamazdan, olary nokatlaryň, çyzyklaryň, geometriki jisimleriň üstleriniň ýa-da olaryň bölekleriniň ýönekeý keşpleriniň jemi hökmünde göz önüne getirmek bolar.

Maşyn şaýlarynyň üstleri, aýlama üstleri (silindrik, koniki, sfera, tor, hyrly) we tekizligi göz önüne getirýär. 31-nji suratda ýönekeý geometriki üstler bilen çäklenen şeýle şaýyň mysaly görkezilen.

Çyzuwly geometriýada giňişlikdäki şekiller, nokatlaryň, çyzyklaryň we üstleriň jemleri görnüşinde aňladylýar we olaryň proyeksiýalaryny şekillendirmek arkaly öwrenilýär.

Çyzuwly geometriýanyň esasy meselelerinden biri, üç ölçegi bolan, şekillendirmegiň usullaryny döretmeklik hasap edilýär.

Çyzuwly geometriýa öz usullary we mazmuny boýunça adamzadyň giňişlige göz ýetirmekliginiň ösmegi üçin iň oňat serişde bolup hyzmat edýär, bu düşüňjesiz inžener döredijiligi akyla sygmajak zatdyr.

Proyeksion çyzgy boýunça birnäçe meseläni ýerine ýetirmek üçin hödürlenilýär.

Ýumuş 10...17 nokady we göni çyzygy proyektirlemegiň aýratynlyklaryny hem-de özara ýerleşişlerini aýdyňlaşdyrýar.

Ýumuş 18...24 tekiz şekilleri proyektirlemek.

Ýumuş 25...30 göni çyzygyň we tekiz şekilleriň hakyky ululygyny tapmagyň usullary barada düşüňje berýär.

Sanalan meseleleri ýerine ýetirmeklik giňişlikde şekillendirmekligi, çyzgyny gurmak we okamak üçin möhüm düşüňjeleri artdyrýar.

Talyplar kompleks çyzgyny ýerine ýetirmekligi, öňi bilen berlen geometriki elementleriň giňişlikde ýerleşişlerini göz önüne getirmeklikden başlamalydyr. Şonuň üçin frontal dimmetriki proyeksiýada aýdyň şekili gurmaklyk hödürlenilýär. 32-nji a, 33-nji a, suratlarda aýdyň şekili ýerine ýetirmek üçin  $y$  oky  $x$  okuna görä  $45^\circ$  burç bilen geçirilýär. Kesimler gurulanda  $x$  we  $z$  oklar boýunça üýtgeşsiz öz ululugynda, ýöne  $y$  ok boýunça iki esse kiçeldilip (gurulýan kesimleriň öz hakyky ululygy bilen deňeşdirilende) gurulýar. 32-nji b, 33-nji b, kompleks çyzgylarda

kesimler öz hakyky ölçeglerinde koordinatalar boýunça ölçenip goýulýar. Her bir nokat aýdyň şekilde-de, kompleks çyzgyda-da şol bir koordinatalar boýunça gurulýar.

34-nji a, b, suratda kompleks çyzgynyň çyzylyşy we onda gurluşlaryň ýerine ýetirilişi görkezilen.

Kompleks çyzgyda proyeksion baglanyşyk, baglanyşyk çyzgylarynyň üsti bilen her bir nokadyň proyeksiýasyna baglylykda birikdirilen.

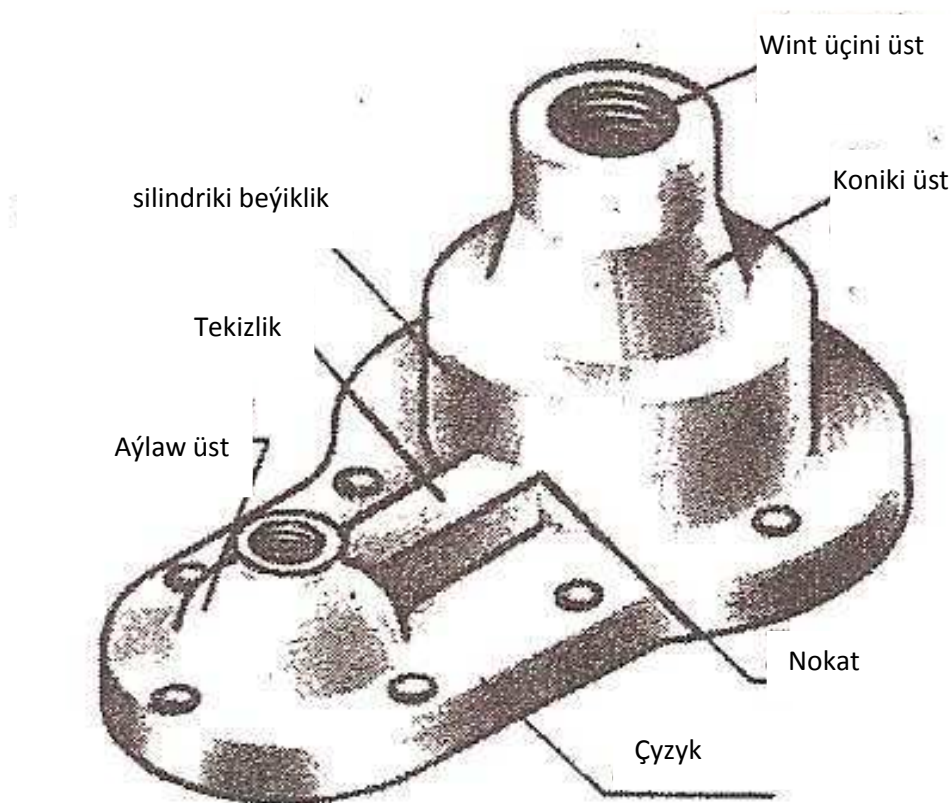
34-nji b, suratda üçburçlugyň tekizligine degişli bolup, frontal proyeksiýada berlen, n' nokadyň proyeksiýasynyň tapylyşy şekillendirilen. Şu meselede göni çyzygyň ,üçburçlugyň tekizligi bilen kömekçi  $P_v$  frontal proyektirleýji tekizlik bilen kesişmesinde emele gelen k kesişme nokadyny tapmaly.

35-nji suratda tekiz figuranyň hakyky ulugyny kesgitlemegiň meseleleri görkezilen.

35-nji a, suratda tekizlikleri çalşyrmak usuly bilen.

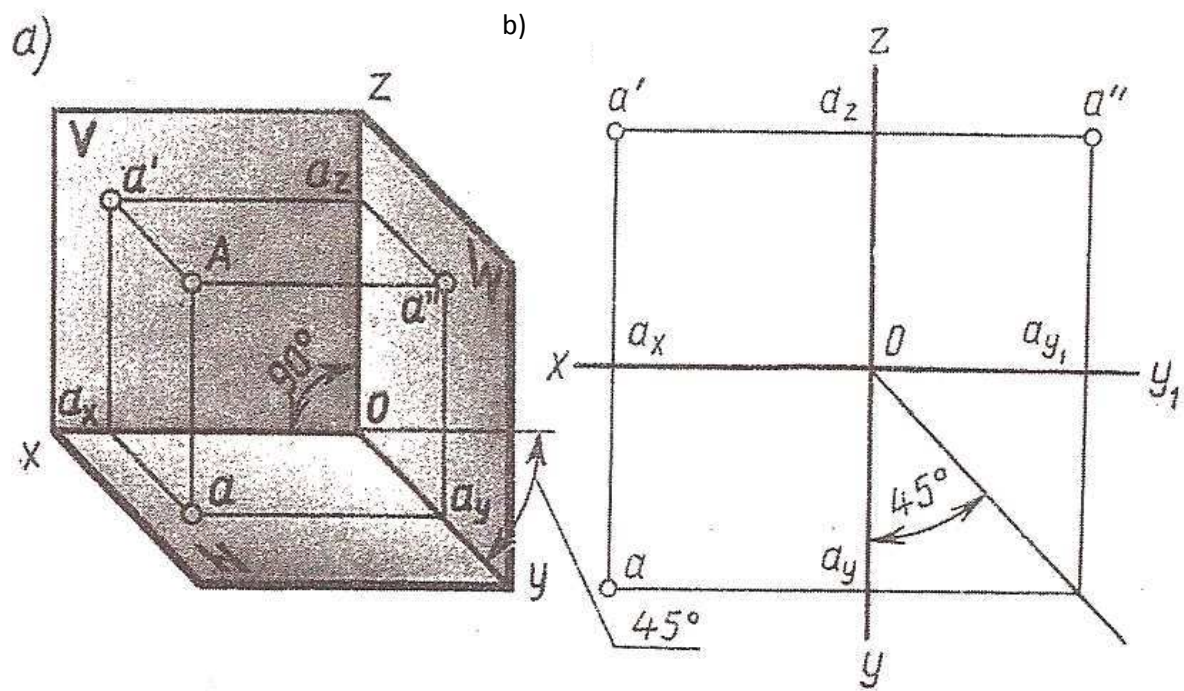
35-nji b, suratda aýlama usuly bilen.

35-nji ç, , suratda utgaşdyrmak usuly bilen.

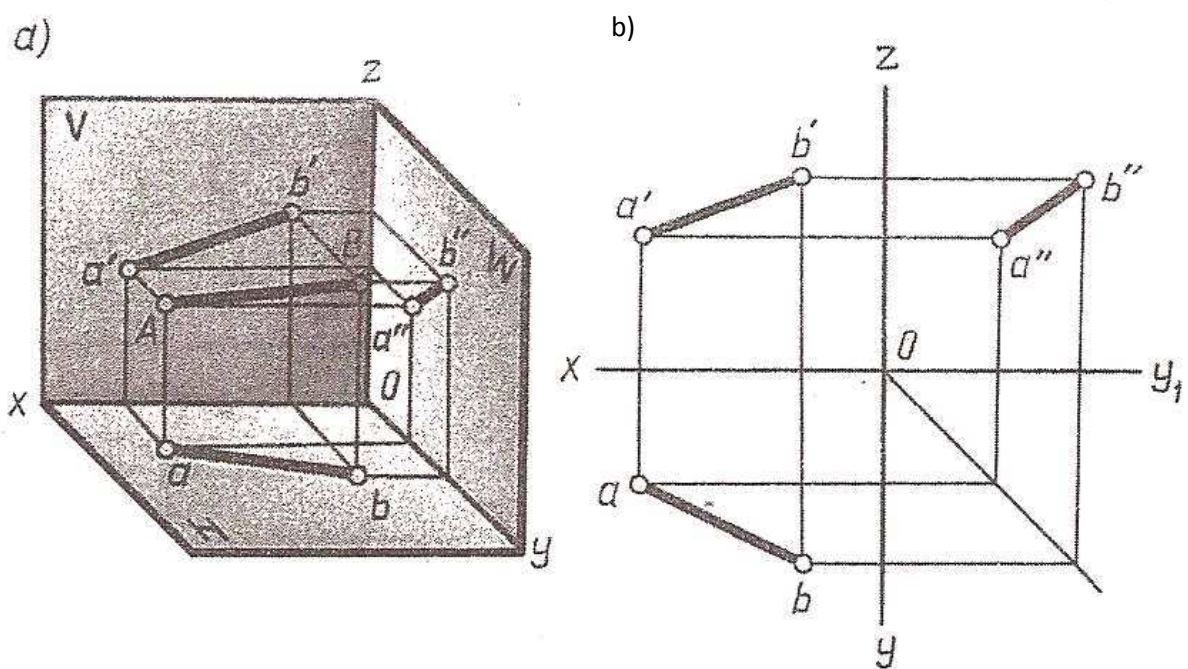


31-nji surat

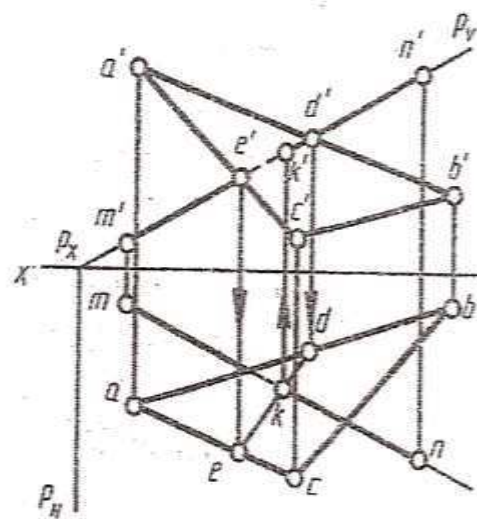




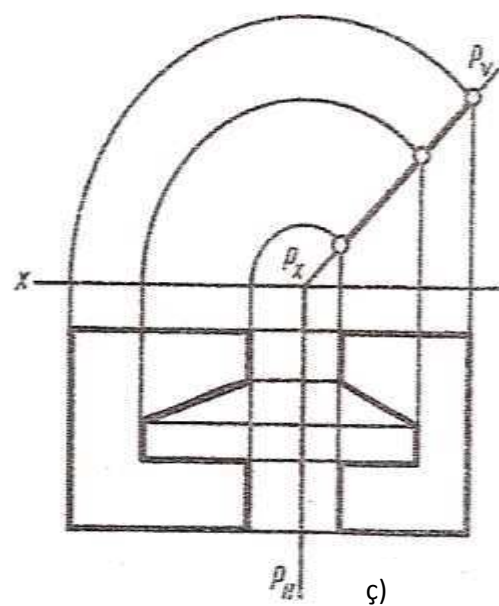
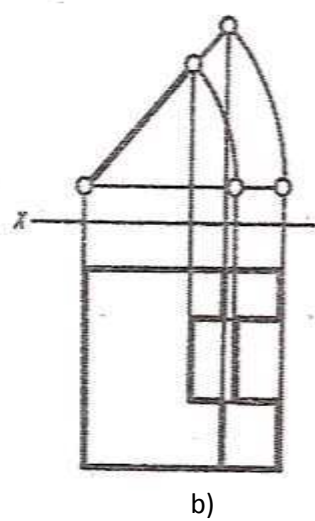
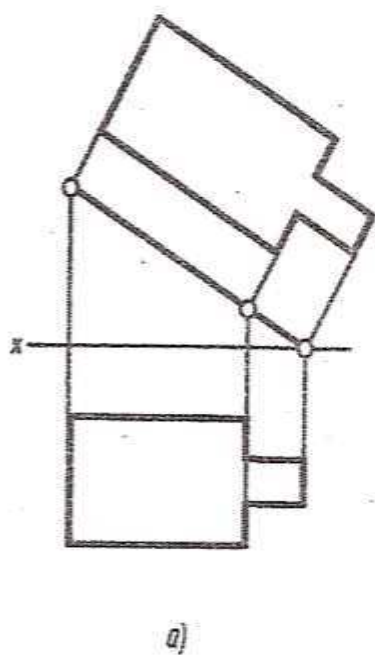
32-nji surat



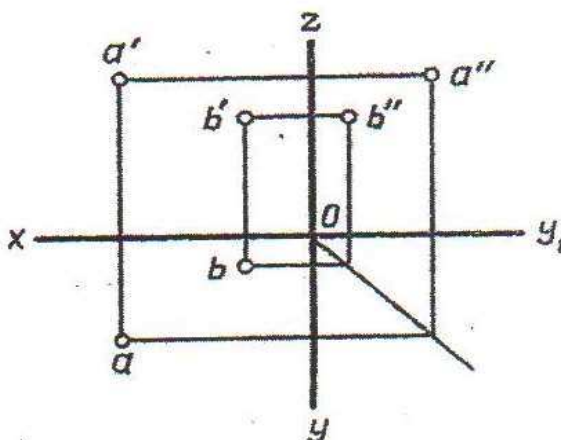
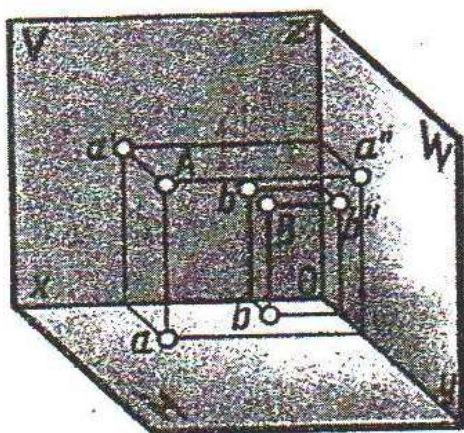
33-nji surat



b)



# ÝUMUŞ 10

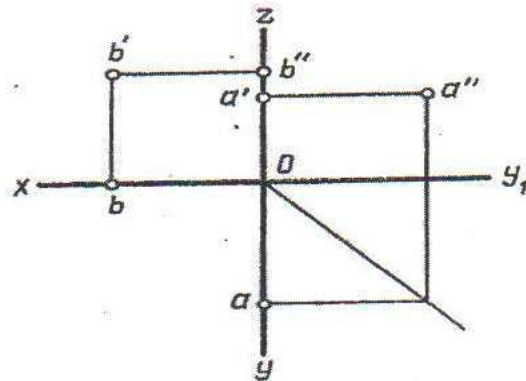
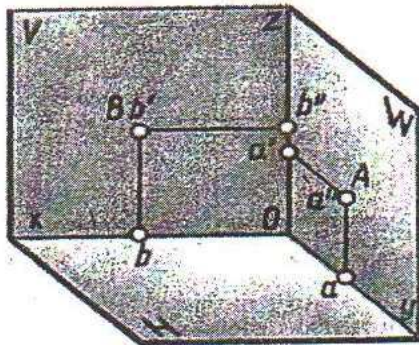


WARIANT	Koordinatalar					
	A			B		
	X	Y	Z	X	Y	Z
1	30	20	10	20	40	28
2	35	24	15	20	14	25
3	28	20	15	20	35	25
4	30	22	16	22	35	38
5	38	28	20	15	15	28
6	15	20	30	35	30	10
7	30	22	13	20	35	25
8	15	30	15	35	16	25
9	30	22	15	22	35	30
10	30	30	5	5	30	25
11	uñ	28	12	40	40	40
12	38	28	36	15	15	15
13	40	25	20	14	14	28
14	15	30	10	35	15	20
15	5	15	30	30	30	15
16	30	20	10	36	36	36
17	25	28	10	40	40	40
18	25	26	15	20	15	26
19	30	30	5	5	30	25
20	30	25	12	25	35	30
21	15	28	10	35	14	30
22	30	20	10	30	30	30
23	30	25	14	20	35	25
24	30	22	12	22	35	30
25	35	24	15	20	14	30
26	30	28	14	32	35	30
27	25	28	12	40	36	28
28	40	28	22	15	15	28
29	25	30	12	36	36	36
30	30	26	16	35	35	35

A we B nokatlaryň aýdyň şekillerini we kompleks çyzgylaryny gurmaly. Nokatlaryň proyeksiýalar tekizliklerine görä ýagdaýlaryny kesgitlemeli



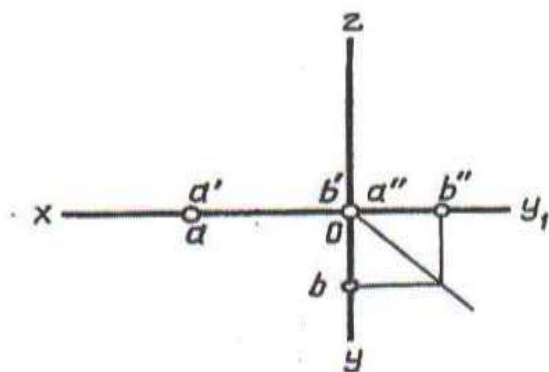
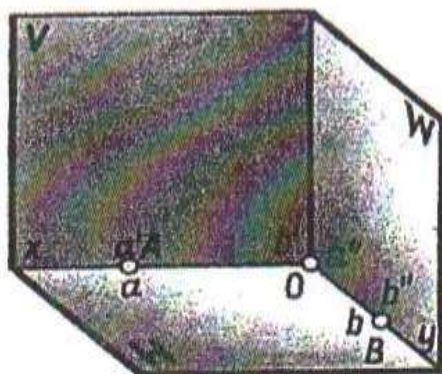
# ÝUMUŞ 11



Wariant-lar	koordinatalar					
	A			B		
	X	Y	Z	X	Y	Z
1	30	20	0	35	0	30
2	0	32	36	40	0	20
3	34	0	22	0	20	38
4	34	0	35	30	20	0
5	35	0	30	0	32	10
6	0	30	30	30	20	0
7	0	30	34	38	0	18
8	0	40	10	35	26	0
9	30	26	0	15	30	0
10	20	20	0	30	0	16
11	5	26	0	35	0	28
12	15	30	0	0	30	30
13	10	0	30	30	30	0
14	25	20	0	0	36	35
15	0	30	35	20	10	0
16	30	28	0	20	0	40
17	34	0	22	0	20	38
18	20	25	0	35	0	30
19	15	30	0	0	30	30
20	35	0	30	0	32	10
21	0	30	35	20	10	0
22	35	0	30	0	32	10
23	35	0	25	16	30	0
24	15	30	0	0	30	30
25	30	20	0	20	0	30
26	10	0	30	30	30	0
27	6	26	0	35	0	28
28	34	0	35	30	20	0
29	20	20	0	35	0	30
30	5	26	0	35	0	28

A we B nokatlaryň aýdyň şekillerini we kompleks çyzgylaryny gurmaly. Nokatlaryň proyeksiýalar tekizliklerine görä ýagdaýlaryny kesgitlemeli

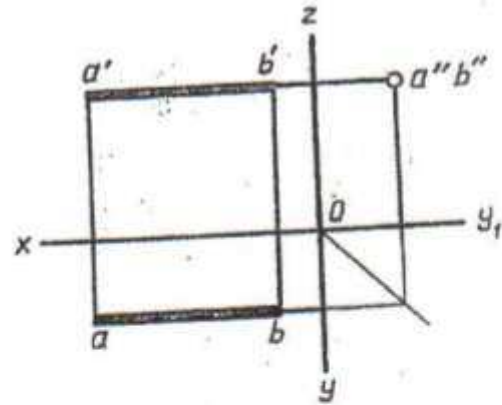
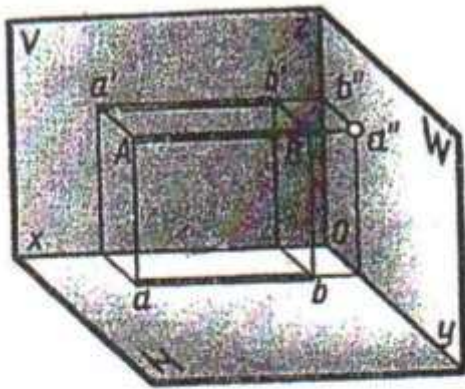
# ÝUMUŞ 12



Wariant-lar	koordinatalar					
	A			B		
	X	Y	Z	X	Y	Z
1	40	0	0	0	0	30
2	0	30	0	0	28	0
3	0	28	0	0	0	35
4	40	0	0	0	28	0
5	40	0	0	0	55	0
6	20	0	0	0	0	30
7	42	0	0	0	35	0
8	0	0	38	0	38	0
9	36	0	0	0	0	0
10	0	44	0	42	0	0
11	20	0	0	0	42	0
12	0	38	0	40	0	0
13	50	0	0	0	32	0
14	0	40	0	20	0	0
15	36	0	0	0	30	0
16	0	30	0	0	0	30
17	38	0	0	0	60	0
18	40	0	0	0	34	0
19	38	0	0	0	0	32
20	0	44	0	40	0	0
21	0	37	0	40	0	0
22	40	0	0	0	0	30
23	0	0	30	25	0	0
24	38	0	0	0	30	0
25	0	45	0	25	0	0
26	38	0	0	0	0	30
27	0	32	0	0	0	32
28	0	40	0	40	0	0
29	30	0	0	0	42	0
30	0	35	0	0	0	35

A we B nokatlaryň aýdyň şekillerini we kompleks çyzgylaryny gurmaly. Nokatlaryň proyeksiýalar tekizliklerine görä ýagdaýlaryny kesgitlemeli

# ÝUMUŞ 13

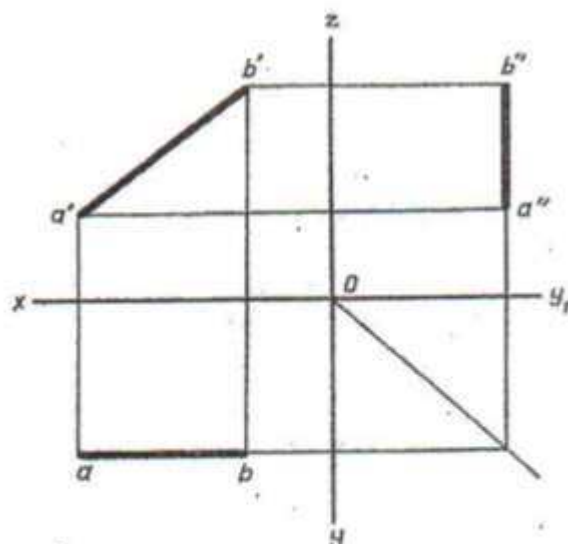
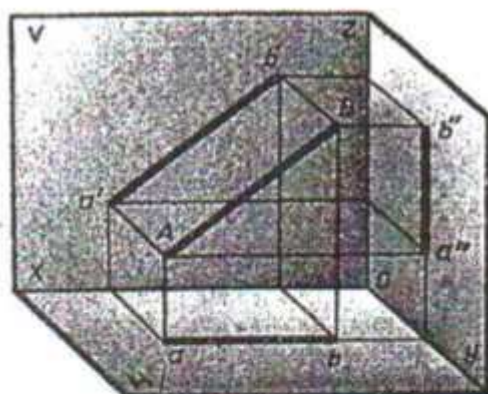


Variant-lar	koordinatalar					
	A			B		
	X	Y	Z	X	Y	Z
1	50	20	15	10	20	15
2	30	10	25	30	40	25
3	35	30	5	35	30	40
4	40	26	35	0	26	35
5	32	6	28	32	46	28
6	40	40	25	4	40	25
7	36	30	40	36	30	0
8	45	24	15	10	24	15
9	30	0	38	30	0	38
10	33	8	30	33	48	30
11	28	30	12	28	30	45
12	50	28	35	15	28	35
13	45	30	28	0	30	28
14	32	30	10	32	30	45
15	32	10	34	32	42	34
16	40	12	25	40	46	25
17	33	8	30	39	48	30
18	50	20	15	10	20	15
19	40	40	25	4	40	25
20	30	0	38	30	44	38
21	33	8	32	33	48	32
22	35	30	5	35	30	40
23	37	30	40	37	30	0
24	45	30	28	0	30	28
25	40	40	25	4	40	25
26	29	32	12	29	32	45
27	42	12	25	42	46	25
28	34	9	30	34	18	30
29	30	7	28	30	46	28
30	32	0	38	32	42	38

AB kesimiň uçlarynyň kordinatalary (san bahalary) boýunça aýdyň şekillerini we kompleks çyzzgysyny gurmaly. Kesimiň proyeksiýalar tekizliklerine görä ýagdaýlaryny kesgitlemeli



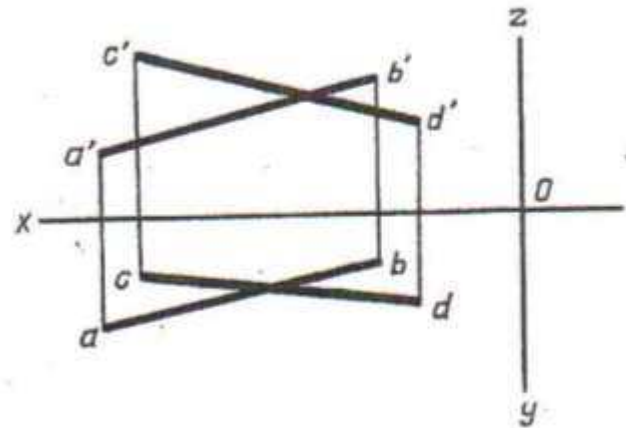
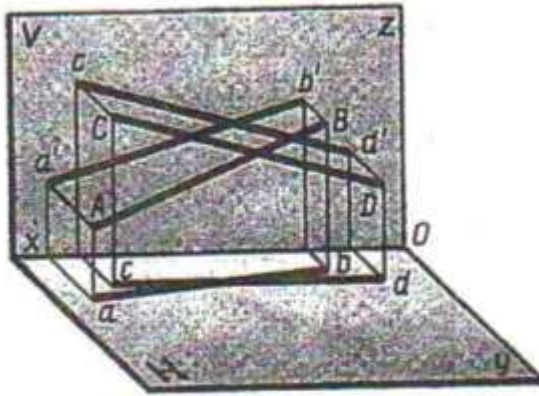
# ÝUMUŞ 14



Variant-lar	koordinatalar					
	A			B		
	x	y	z	x	y	z
1	38	20	20	5	20	40
2	25	40	35	25	10	10
3	40	10	20	10	30	20
4	39	21	22	6	21	38
5	37	24	5	10	24	39
6	40	6	30	9	30	30
7	38	20	19	10	20	39
8	41	5	15	13	30	15
9	34	40	35	34	6	10
10	22	10	35	22	35	4
11	38	20	20	5	20	40
12	38	38	30	12	0	30
13	30	38	10	30	8	38
14	40	12	22	12	30	22
15	28	40	10	28	8	30
16	37	24	5	10	24	30
17	37	19	19	5	19	39
18	30	38	10	30	9	38
19	40	12	23	12	30	23
20	36	25	6	12	25	30
21	40	22	23	6	22	43
22	32	38	10	32	8	38
23	40	10	25	10	30	25
24	28	8	38	28	12	21
25	36	24	6	9	24	39
26	28	25	5	9	25	25
27	35	40	10	35	8	38
28	37	24	5	5	24	39
29	45	0	30	9	30	30
30	22	5	40	22	35	5

AB kesimiň uçlarynyň kordinatalary boýunça aýdyň şekillerini we kompleks çyzgysyny gurmaly. Kesimiň proyeksiýalar tekizliklerine görä ýagdaýlaryny kesgitlemeli

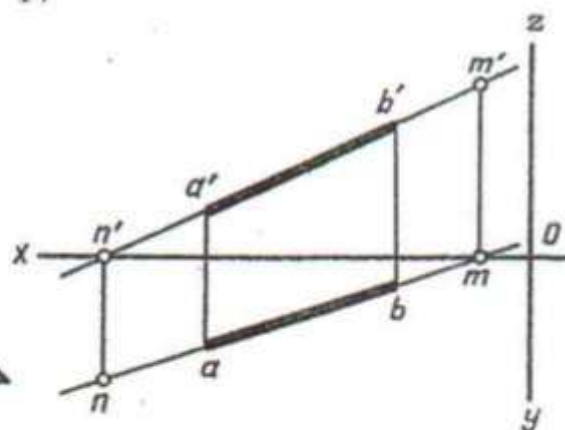
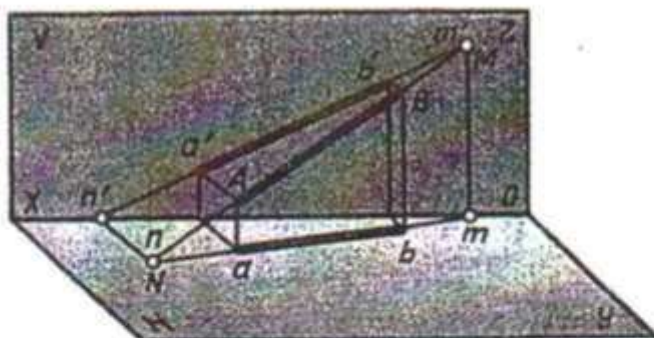
# ÝUMUŞ 16



Wariant- lar	koordinatalar											
	A			B			C			D		
	x	y	z	x	y	z	x	y	z	x	y	z
1	55	5	20	15	20	5	45	20	10	10	7	20
2	45	20	25	10	4	5	50	7	8	7	8	25
3	50	17	12	12	22	23	55	6	4	15	11	14
4	55	4	22	15	21	6	45	20	9	10	8	20
5	56	5	20	15	20	5	46	20	10	10	8	20
6	46	20	26	10	5	5	50	8	8	8	7	25
7	50	17	13	12	22	23	55	6	4	15	11	14
8	54	6	20	16	20	5	46	20	10	10	8	20
9	58	6	20	16	20	5	44	19	10	10	10	20
10	45	20	25	10	4	5	50	7	8	8	8	25
11	52	17	13	12	14	23	55	60	4	15	11	14
12	54	6	20	16	20	6	45	20	10	10	8	20
13	60	10	20	18	20	5	45	19	10	12	12	20
14	46	19	25	10	5	5	10	7	8	8	7	24
15	50	17	13	12	22	23	55	6	4	15	11	14
16	52	17	13	12	22	23	56	6	4	16	11	14
17	55	5	20	20	20	6	48	20	10	15	10	20
18	45	20	25	10	6	6	10	7	7	8	7	24
19	52	17	13	12	22	23	55	6	4	15	11	14
20	46	20	24	10	5	5	52	7	8	3	8	25
21	56	6	20	22	20	7	45	20	10	16	7	18
22	45	20	26	10	7	7	10	7	7	8	8	24
23	50	17	13	12	22	23	55	6	4	15	11	14
24	45	20	25	10	4	5	52	7	8	7	7	25
25	55	7	18	20	18	8	44	18	10	17	7	18
26	46	18	25	10	7	6	45	8	6	7	7	25
27	50	17	13	12	22	23	55	6	4	15	11	14
28	45	20	25	10	4	5	50	7	8	7	8	25
29	56	8	19	20	18	8	45	18	8	16	8	20
30	45	19	25	10	7	7	45	8	8	7	7	25

AB we CD kesimleriniň uçlarynyň kordinatalary boýunça kompleks çyzgylaryny gurmaly. Kesimleriniň özara ýerleşiş ýagdaýlaryny kesgitlemeli

# ÝUMUŞ 17

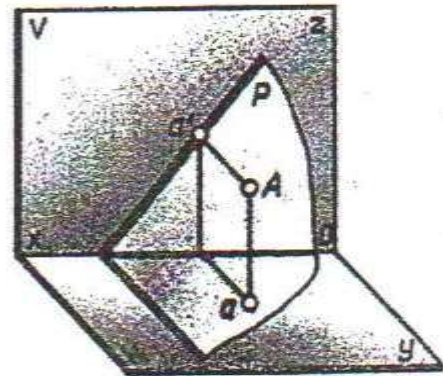
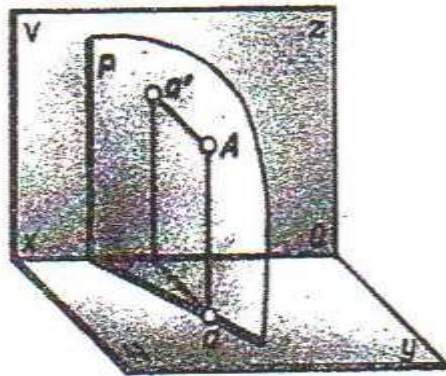


Wariant-lar	koordinatalar					
	A			B		
	X	Y	Z	X	Y	Z
1	45	13	6	17	3	24
2	40	20	10	15	5	30
3	48	20	8	20	4	28
4	40	18	9	12	4	29
5	51	24	12	21	6	32
6	40	20	8	15	6	22
7	42	22	10	15	6	30
8	44	26	8	15	6	28
9	46	22	12	14	4	28
10	48	20	10	17	4	28
11	45	14	8	18	4	30
12	48	18	10	16	4	40
13	56	26	8	20	6	28
14	48	16	9	15	4	32
15	50	20	7	20	4	20
16	48	22	10	22	6	30
17	29	23	11	23	7	31
18	51	25	11	22	7	31
19	41	21	9	16	7	29
20	47	21	13	17	5	27
21	46	14	8	17	4	30
22	41	17	9	17	4	39
23	57	27	8	21	7	27
24	50	16	10	16	5	30
25	26	21	9	22	7	29
26	50	22	9	22	7	28
27	42	18	10	16	4	40
28	47	17	9	15	4	30
29	47	22	10	22	6	30
30	50	20	6	19	4	9

Berlen AB kesimiň uçlarynyň koordinatalary boýunça aýdyň şekilini we kompleks çyzgysyny gurmaly. M we N göni çyzyklaryň yzlaryny tapmaly

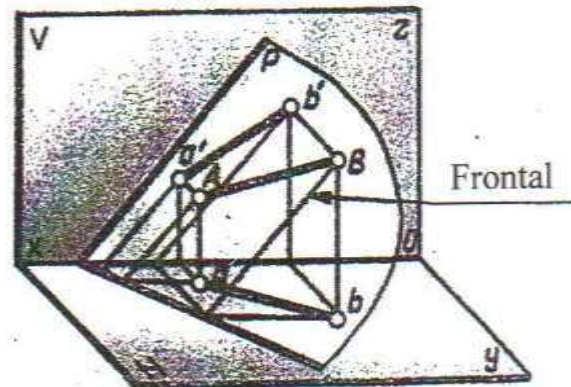
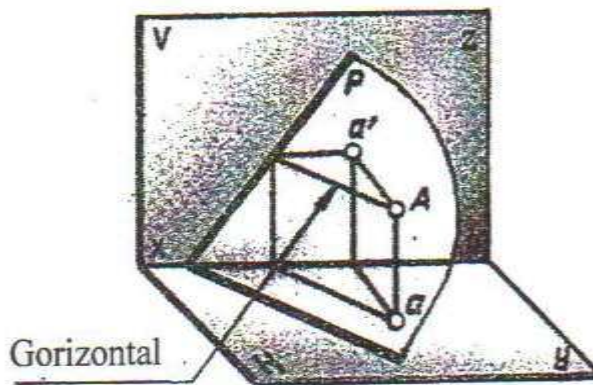


## ÝUMUŞ 18



x —————

x —————

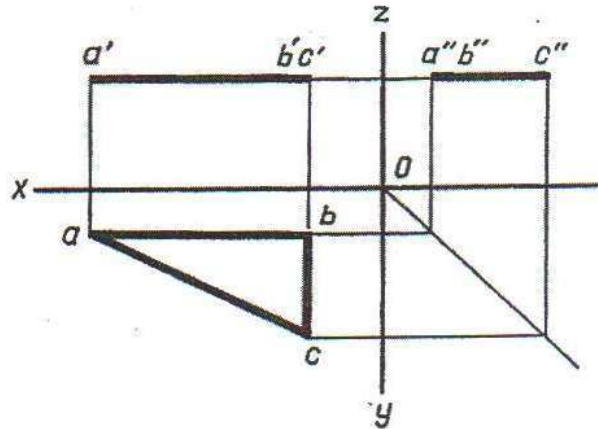
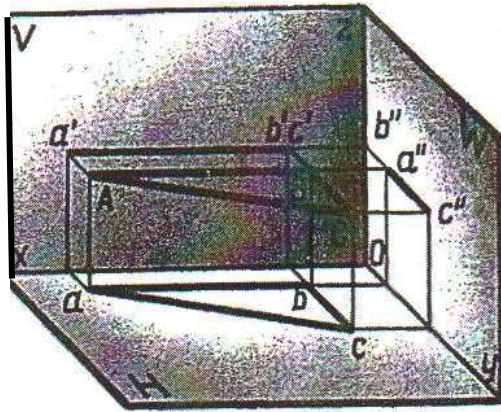


x —————

x —————

Berlen aýdyň şekilleri göçürmeli we olara degişli kompleks çyzgylaryny gurmaly

# YUMUŞ 19

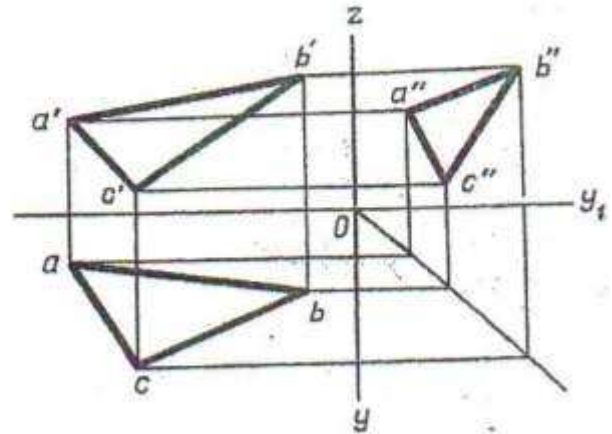
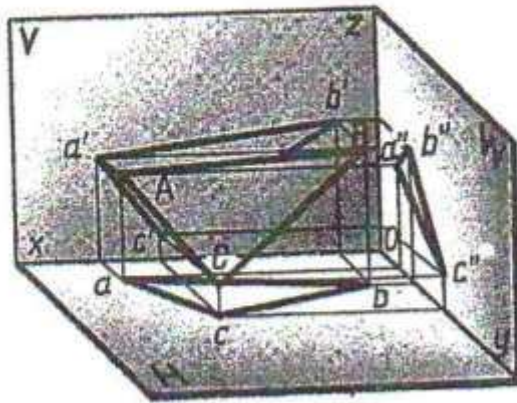


variantlar	koordinatalar								
	A			B			C		
	X	Y	Z	X	Y	Z	X	Y	Z
1	40	10	20	10	10	20	10	25	20
2	25	10	45	25	10	15	25	40	20
3	40	20	45	40	20	10	10	20	10
4	40	10	20	10	10	20	10	25	15
5	25	10	45	25	10	15	25	40	15
6	40	20	45	40	20	10	10	20	10
7	40	10	20	10	10	20	10	25	20
8	25	10	45	25	10	15	25	40	15
9	40	20	45	40	20	10	10	20	10
10	40	10	20	10	10	20	10	25	20
11	25	10	45	25	10	15	25	40	15
12	40	20	45	40	20	10	10	20	10
13	40	10	20	10	10	20	10	25	20
14	25	10	45	25	10	15	25	40	15
15	40	20	45	40	20	10	10	20	10
16	40	10	20	10	10	20	10	25	20
17	25	10	45	25	10	15	25	40	15
18	40	20	45	40	20	10	10	20	10
19	40	10	20	10	10	20	10	25	20
20	25	10	45	25	10	15	25	40	15
21	40	20	45	40	20	10	10	20	10
22	40	10	20	10	10	20	10	25	20
23	25	10	45	25	10	15	25	40	15
24	40	20	45	40	20	10	10	20	10
25	20	15	48	20	15	13	20	40	13
26	40	10	20	10	10	20	10	25	20
27	25	10	45	25	10	15	25	40	15
28	40	20	45	40	20	10	10	20	10
29	46	15	16	16	15	44	16	15	16
30	40	10	20	10	10	20	10	25	20

Berlen depeleriniň A,B we C koordinatalary esasynda üçburçlygyň kompleks çyzygysyny gurmaly we onuň proyeksiýalar tekizliklerine görä ýagdaýyny kesgitlemeli



# YUMUŞ 20

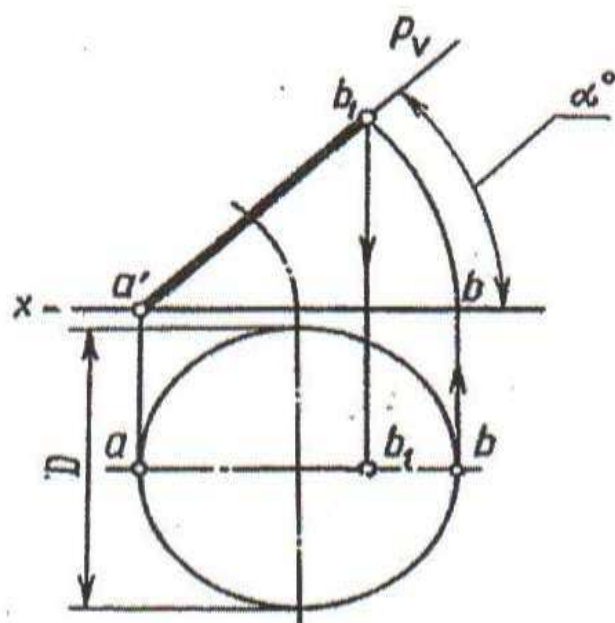


Variant-lar	koordinatalar								
	A			B			C		
	x	y	z	x	y	z	x	y	z
1	47	35	15	15	8	35	5	18	6
2	35	20	6	55	8	35	5	26	18
3	53	16	17	10	8	40	28	50	10
4	45	20	40	32	35	11	5	5	7
5	47	35	15	15	9	36	6	18	6
6	35	21	7	55	9	36	6	26	17
7	52	15	16	10	8	40	27	48	9
8	46	20	42	30	33	10	6	6	8
9	46	35	16	15	8	36	7	19	5
10	36	22	8	56	7	37	6	27	16
11	52	15	18	10	9	42	25	46	9
12	44	19	39	30	34	10	7	7	7
13	45	36	16	16	8	36	7	19	5
14	36	20	8	56	7	37	6	26	15
15	54	16	16	10	9	40	26	48	9
16	45	16	40	30	40	12	6	25	15
17	47	36	15	16	9	34	6	17	6
18	35	19	6	54	8	34	7	25	18
19	53	15	16	10	9	40	27	48	10
20	43	20	40	30	33	10	6	5	5
21	46	36	16	17	7	35	5	20	5
22	36	20	8	53	7	36	6	26	15
23	52	15	15	10	9	40	25	48	12
24	42	18	38	30	30	10	6	6	6
25	45	35	15	15	10	35	4	20	5
26	35	20	8	55	6	36	6	25	16
27	52	14	16	8	10	40	25	45	10
28	46	20	40	33	35	15	15	5	5
29	47	35	15	15	9	35	4	18	6
30	35	21	7	55	8	35	8	26	17

Berlen depeleriniň A,B we C koordinatalary esasynda üçburçlygyň kompleks çyzgysyny gurmaly we onuň proyeksiýalar tekizliklerine görä ýagdaýyny kesgitlemeli



# ÝUMUŞ 21

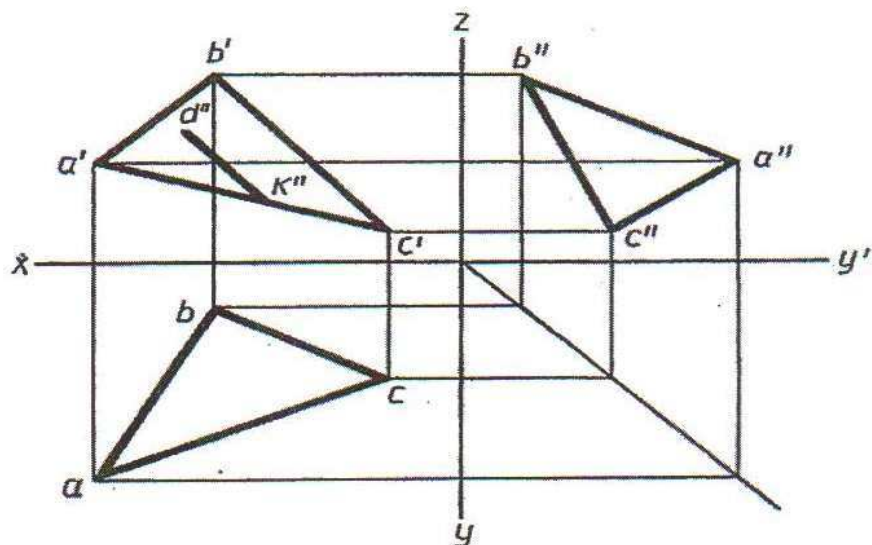


Variant-lar	ölçegler		Variant-lar	ölçegler	
	$d$	$\alpha^\circ$		$d$	$\alpha^\circ$
1	40	30	16	45	60
2	45	45	17	52	45
3	42	60	18	60	45
4	46	45	19	48	45
5	48	60	20	58	60
6	50	60	21	56	60
7	38	45	22	54	45
8	45	60	23	52	60
9	48	45	24	50	30
10	50	60	25	48	45
11	46	45	26	45	60
12	52	60	27	44	60
13	50	30	28	42	45
14	48	60	29	45	60
15	46	45	30	48	60

Frontal proyektirleýji  $P_v$  tekizliginde ýerleşen, töweregiň gorizonttal proyeksiýasyny berlen ölçegler esasynda gurmaly



# ÝUMUŞ 23

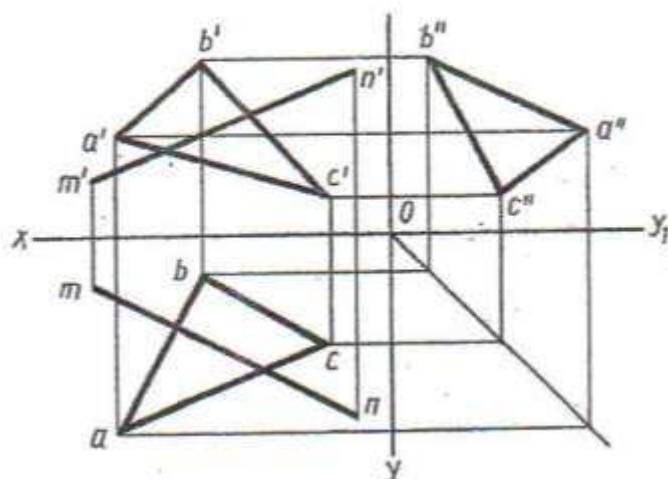


wariantlar	koordinatalar								
	A			B			C		
	X	Y	Z	X	Y	Z	X	Y	Z
1	42	26	59	36	8	8	10	30	25
2	50	25	10	30	5	45	12	40	15
3	47	10	9	30	48	44	10	18	5
4	41	26	49	36	11	10	9	30	20
5	46	9	9	32	50	46	10	18	5
6	50	24	10	32	5	45	10	40	16
7	42	27	48	36	10	11	12	29	25
8	47	10	8	30	48	45	10	20	4
9	50	24	9	28	5	44	12	40	14
10	43	25	49	35	9	9	9	30	25
11	46	10	11	32	48	46	10	20	5
12	52	25	8	30	5	45	13	40	14
13	42	26	50	35	10	10	10	32	24
14	47	10	9	32	48	45	10	20	4
15	50	24	10	30	5	48	12	42	15
16	40	26	50	34	10	10	9	30	25
17	45	10	10	30	50	45	10	20	5
18	48	26	12	32	6	44	11	40	16
19	42	25	50	35	10	11	9	30	26
20	50	24	10	30	8	43	10	40	15
21	42	26	48	35	9	9	9	30	24
22	40	25	48	36	8	9	10	29	25
23	52	26	9	32	6	45	12	40	16
24	49	14	10	32	50	44	9	20	6
25	50	24	8	30	6	45	12	40	14
26	42	27	47	35	10	9	8	30	25
27	45	9	9	30	50	45	10	18	5
28	42	27	50	36	10	10	10	30	25
29	47	10	10	32	50	45	10	20	5
30	50	25	10	30	5	45	12	40	15

Berlen A, B we C depeleriniň koordinatalary esasynda üçburçlygyň we onuň tekizliginde erkin ýerleşen DK kesimiň kompleks çyzgysyny gurmaly



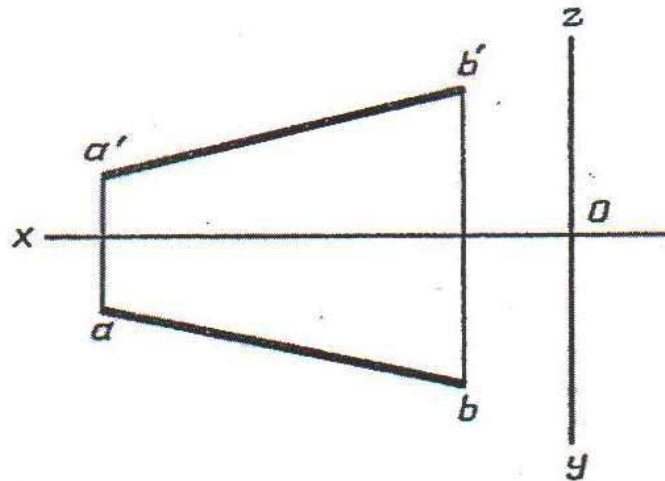
# ÝUMUŞ 24



Wariant-lar	koordinatalar														
	A			B			C			N			M		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1	42	27	50	36	10	10	10	30	25	50	25	15	12	13	35
2	47	10	10	32	50	45	10	20	5	57	17	45	10	40	10
3	50	25	10	30	5	45	12	40	15	48	40	27	10	8	6
4	41	26	49	36	11	10	9	30	26	50	25	16	11	13	35
5	46	9	9	32	50	46	10	18	5	56	16	44	10	40	9
6	48	24	8	30	6	44	12	38	14	46	40	26	10	8	8
7	40	25	50	35	10	11	10	30	25	48	24	16	10	12	34
8	47	10	9	30	48	44	10	20	5	55	15	45	11	42	10
9	50	24	10	32	5	45	10	40	16	48	40	26	10	9	9
10	42	27	48	36	10	11	12	29	25	50	26	15	11	14	35
11	47	10	8	30	48	45	10	20	4	57	16	44	10	39	9
12	50	24	9	28	5	44	12	40	14	50	40	25	9	9	9
13	43	25	49	35	9	9	9	30	25	48	25	16	12	12	35
14	46	10	11	32	48	46	10	20	5	56	16	45	9	39	9
15	52	25	8	30	5	45	13	40	14	47	40	26	10	10	10
16	42	26	50	35	10	10	10	32	24	50	25	13	13	13	34
17	47	10	9	32	48	45	10	20	4	57	15	45	10	40	9
18	50	24	10	30	5	48	12	42	15	48	39	26	8	8	8
19	40	26	50	34	10	10	9	30	25	47	26	17	11	12	35
20	45	10	10	30	50	45	10	20	5	55	15	45	10	40	10
21	48	26	12	32	6	44	11	40	16	46	38	27	10	9	8
22	42	25	50	35	10	11	9	30	26	50	24	16	13	12	36
23	50	24	10	30	8	43	10	40	15	54	15	44	9	40	10
24	42	26	48	35	9	9	9	30	24	50	24	14	13	13	35
25	40	25	48	36	8	9	10	29	25	52	26	15	12	12	35
26	52	26	9	32	6	45	12	40	16	48	40	25	10	10	6
27	49	14	10	32	50	44	9	20	6	56	16	44	10	40	10
28	50	24	8	30	6	45	12	40	14	47	40	26	10	9	8
29	42	27	47	35	10	9	8	30	25	48	24	14	11	11	34
30	45	9	9	30	50	45	10	18	5	55	15	45	10	40	10

Berlen koordinatalar esasynda ABC üçburçlygyň we MN göni çyzygyň kompleks çyzgysyny gurmaly. MN göni çyzygyň ABC tekizlik bilen galtaşma nokadyny tapmaly. Göni çyzygyň görünyän bölegini kesgitlemeli

# ÝUMUŞ 25

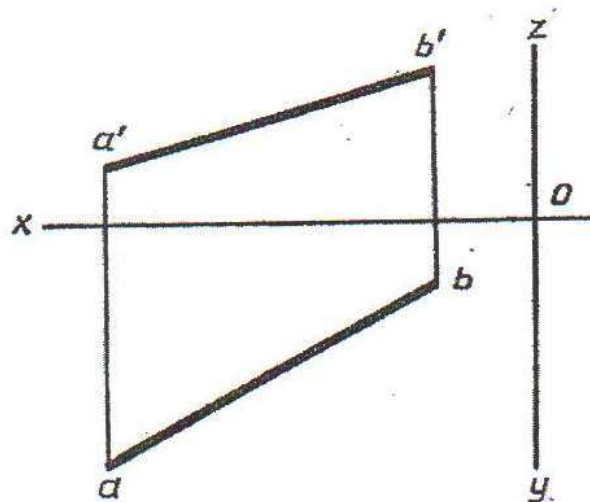


wariantlar	koordinatalar					
	A			B		
	X	Y	Z	X	Y	Z
1	60	5	5	15	40	40
2	45	45	10	10	10	45
3	40	10	40	15	40	10
4	57	28	28	10	5	5
5	60	8	15	15	30	30
6	50	30	35	15	10	5
7	55	15	40	15	35	10
8	45	10	35	10	40	12
9	62	10	10	16	32	30
10	52	38	30	14	12	8
11	60	12	8	16	32	28
12	50	35	35	10	15	5
13	45	35	20	10	5	45
14	55	10	35	15	45	10
15	50	5	10	5	40	40
16	60	9	16	16	28	28
17	48	38	33	15	10	8
18	50	28	28	14	5	5
19	62	10	10	18	32	30
20	46	33	5	10	5	46
21	55	6	10	10	32	32
22	52	15	44	18	42	10
23	60	10	5	18	32	32
24	52	8	36	15	29	7
25	40	10	50	15	40	10
26	60	5	5	14	40	40
27	58	40	5	13	10	38
28	55	10	40	10	40	5
29	54	12	5	12	40	40
30	52	40	40	10	10	10

Uçlarynyň koordinatalary bilen berlen AB kesimiň kompleks çyzygysyny gurmaly. Aýlanma usulyndan peýdalanyň, kesimiň hakyky ululygyny tapmaly



# ÝUMUŞ 26

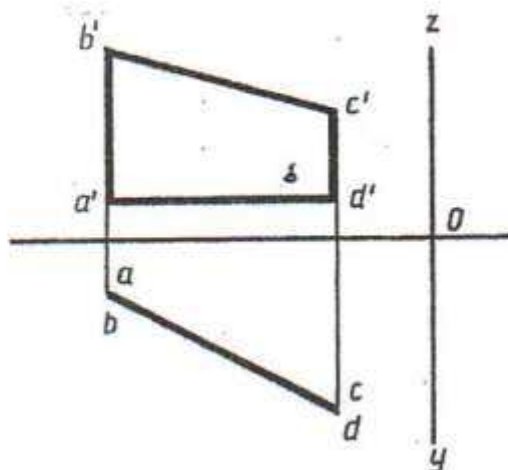


wariantlar	koordinatalar					
	A			B		
	X	Y	Z	X	Y	Z
1	60	8	15	15	30	30
2	50	30	35	15	10	5
3	55	15	40	15	35	10
4	45	10	35	10	40	12
5	62	10	10	16	32	30
6	52	38	30	14	12	8
7	60	12	8	16	32	28
8	50	35	35	15	10	5
9	45	35	20	10	5	45
10	55	10	35	15	45	10
11	50	5	10	5	40	40
12	60	9	16	16	28	28
13	48	38	33	15	10	8
14	58	8	4	20	25	35
15	45	45	45	8	8	10
16	50	28	28	14	8	5
17	48	25	25	10	5	5
18	62	10	10	18	32	30
19	46	33	18	10	5	46
20	47	5	5	10	38	40
21	55	8	10	15	32	32
22	50	28	33	16	12	8
23	52	15	44	18	42	10
24	48	8	10	8	40	50
25	56	10	10	10	35	45
26	60	10	5	18	32	32
27	52	8	36	15	29	7
28	40	10	40	15	40	10
29	45	45	10	10	10	45
30	60	5	5	15	40	40

Uçlarynyň koordinatalary bilen, berlen AB kesimiň kompleks çyzgysyny gurmaly. Aýlanma usulyndan peýdalanyp, kesimiň hakyky ululygyny tapmaly



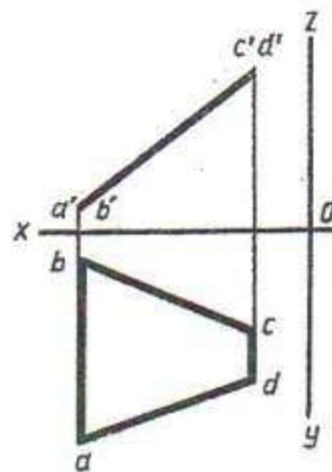
# ÝUMUŞ 27



Wariant-lar	koordinatalar											
	A			B			C			D		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1	58	15	10	58	15	55	25	48	40	25	48	10
2	45	60	12	45	60	30	15	15	60	15	15	20
3	55	65	25	55	65	70	20	20	40	20	20	0
4	70	20	0	70	20	20	30	65	70	30	65	15
5	58	15	10	58	15	55	25	48	40	25	48	10
6	45	60	12	45	60	30	15	15	60	15	15	20
7	65	70	15	65	70	70	20	20	40	20	20	15
8	70	20	0	70	20	20	30	65	70	30	65	15
9	58	15	10	58	15	55	25	48	40	25	40	10
10	66	15	10	66	15	55	25	28	40	25	48	10
11	45	60	12	45	60	30	15	15	60	15	15	20
12	55	65	25	55	65	70	20	20	40	20	20	0
13	70	20	0	70	20	20	30	65	70	30	65	15
14	65	70	5	65	70	70	18	12	40	18	12	15
15	58	15	10	58	15	55	25	48	40	25	48	10
16	45	60	12	45	60	30	15	15	60	15	15	20
17	55	65	25	55	65	70	20	20	40	20	20	0
18	70	20	0	70	20	20	30	65	70	30	65	15
19	65	70	15	65	70	70	18	12	40	18	12	15
20	58	15	10	58	15	55	25	48	40	25	48	10
21	45	60	12	45	60	30	15	15	60	15	15	20
22	55	65	25	55	65	70	20	20	40	20	20	0
23	70	20	0	70	20	20	30	65	70	30	65	15
24	65	70	15	65	70	70	18	12	40	18	12	15
25	58	15	10	58	15	55	25	48	40	25	48	10
26	45	60	12	45	60	30	15	15	60	15	15	20
27	55	65	25	55	65	70	20	20	40	20	20	0
28	70	20	0	70	20	20	30	65	70	30	65	15
29	65	70	15	65	70	70	18	12	40	18	12	15
30	58	15	10	58	15	55	25	48	40	25	48	10

Dörtburçlygyň depeleriniň berlen koordinatalary esasynda kompleks çyzgysyny gurmaly. Aýlanma usulyndan peýdalanyp, dörtburçlygyň hakyky ululygyny tapmaly

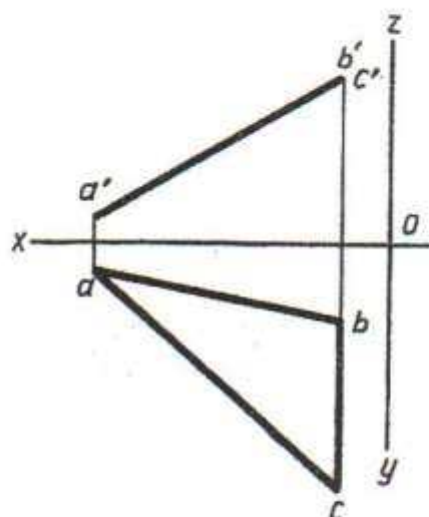
# YUMUŞ 28



wari antlar	koordinatalar											
	A			B			C			D		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1	58	50	5	58	8	5	12	18	60	12	60	60
2	60	60	10	60	25	10	30	5	65	30	55	65
3	65	68	6	65	38	6	20	5	72	20	45	72
4	70	10	5	70	10	45	15	60	65	15	60	15
5	58	50	5	58	8	5	12	18	60	12	60	60
6	60	60	10	60	25	10	30	5	65	30	55	65
7	65	68	6	65	38	6	20	5	72	20	45	72
8	80	48	70	80	5	70	35	15	10	35	30	10
9	70	10	5	70	10	45	15	60	65	15	70	15
10	58	50	5	58	8	5	12	18	60	12	60	60
11	60	60	10	60	25	10	30	5	65	30	55	65
12	65	68	6	65	38	6	20	5	72	20	45	72
13	80	48	7	80	5	70	35	15	10	35	30	10
14	70	10	5	70	10	45	15	70	65	15	70	15
15	58	50	5	58	8	5	12	18	60	12	60	60
16	60	60	10	60	25	10	30	5	65	30	55	65
17	65	68	6	65	38	6	20	5	72	20	45	72
18	80	50	7	80	5	70	35	15	10	35	30	10
19	70	10	5	70	10	45	15	60	65	15	60	15
20	58	50	5	58	8	5	12	18	60	12	60	60
21	60	60	10	60	25	10	30	5	65	30	55	65
22	65	68	6	65	38	6	20	5	72	20	45	72
23	80	50	7	80	5	70	35	15	10	35	30	10
24	70	10	5	70	10	45	15	70	65	15	70	15
25	58	50	5	58	8	5	12	18	60	12	60	60
26	60	60	10	60	25	10	30	5	65	30	55	65
27	65	68	6	65	38	6	20	5	72	20	45	72
28	80	50	7	80	5	70	35	15	10	35	30	100
29	70	10	5	70	10	45	15	60	65	15	60	15
30	58	50	5	58	8	5	12	18	60	12	60	60

Dörtburçlygyň depeleriniň berlen koordinatalary esasynda onuň kompleks çyzgysyny gurmaly. Projeksiýalar tekizlikleri çalşyrmak usulyndan peýdalanyp, dörtburçlygyň hakyky ululygyny tapmaly

# YUMUŞ 29

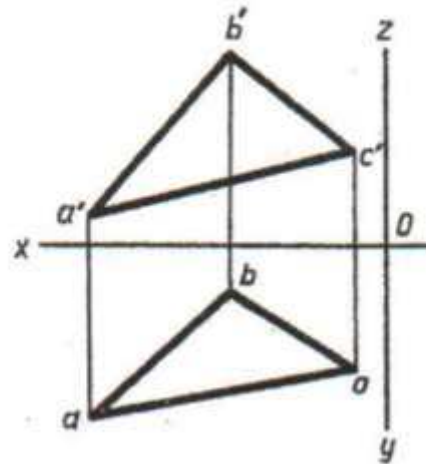


wari antlar	koordinatalar								
	A			B			C		
	X	Y	Z	X	Y	Z	X	Y	Z
1	50	10	10	15	15	55	15	45	55
2	55	50	15	10	8	40	10	35	40
3	60	20	17	16	20	50	10	56	50
4	58	60	18	20	5	65	20	35	65
5	50	10	10	15	15	35	15	45	35
6	56	50	15	10	8	40	10	35	40
7	60	20	17	16	20	50	16	56	50
8	58	60	18	20	5	65	20	35	65
9	62	10	48	62	55	48	18	25	26
10	50	10	12	15	15	35	15	46	47
11	56	50	15	10	8	40	10	35	40
12	60	20	17	16	20	50	16	56	50
13	58	60	18	20	5	65	20	35	65
14	53	10	12	15	15	35	15	46	47
15	56	50	15	10	8	40	10	35	40
16	58	60	18	20	5	65	20	35	65
17	60	20	17	16	20	50	16	56	50
18	52	10	12	16	16	35	16	46	47
19	56	50	15	10	8	40	10	35	40
20	58	60	18	20	5	65	20	35	65
21	62	10	48	62	55	48	18	25	26
22	50	10	12	17	17	35	17	46	47
23	56	50	15	10	8	40	10	35	40
24	58	60	18	20	5	65	20	35	65
25	62	10	48	62	55	48	18	25	26
26	50	10	12	16	16	35	16	46	35
27	56	50	15	10	8	40	10	35	40
28	58	60	18	20	5	65	20	35	65
29	62	10	48	62	55	48	18	25	26
30	50	10	12	15	15	35	15	46	47

Berlen A, B we C depeleriniň koordinatalary esasynda üçburçlygyň kompleks çyzgysyny gurmaly. Utgaşdyrma usulyndan peýdalanyň, üçburçlygyň hakyky ululygyny tapmaly



# YUMUŞ 30



Wariant -lar	koordinatalar								
	A			B			C		
	X	Y	Z	X	Y	Z	X	Y	Z
1	55	40	8	30	10	40	10	30	20
2	56	20	35	10	5	50	30	50	15
3	45	35	20	60	10	60	5	25	5
4	55	38	20	10	45	55	20	10	5
5	55	40	8	30	10	40	10	30	20
6	56	20	35	10	5	50	30	50	15
7	45	35	20	60	10	60	5	25	5
8	55	38	20	10	45	55	20	10	5
9	55	40	8	30	10	40	10	30	20
10	56	20	35	10	5	50	30	50	15
11	45	35	20	60	10	60	5	25	5
12	55	38	20	10	45	55	20	10	5
13	55	40	8	30	10	40	10	30	20
14	56	20	35	10	5	50	30	50	15
15	45	35	20	60	10	60	5	25	5
16	55	38	20	10	45	55	20	10	5
17	55	40	8	30	10	40	10	30	20
18	56	20	35	10	5	50	30	50	15
19	45	35	20	60	10	60	5	25	5
20	55	38	20	10	45	55	20	10	5
21	55	40	8	30	10	40	10	30	20
22	56	20	35	10	5	50	30	50	15
23	45	35	20	60	10	60	5	25	5
24	55	38	20	10	45	55	20	10	5
25	55	40	8	30	10	40	10	30	20
26	56	20	35	10	5	50	30	50	15
27	45	35	20	60	10	60	5	25	5
28	55	40	8	30	10	40	10	30	20
29	56	20	35	10	5	50	30	50	15
30	55	38	20	10	45	55	20	10	5

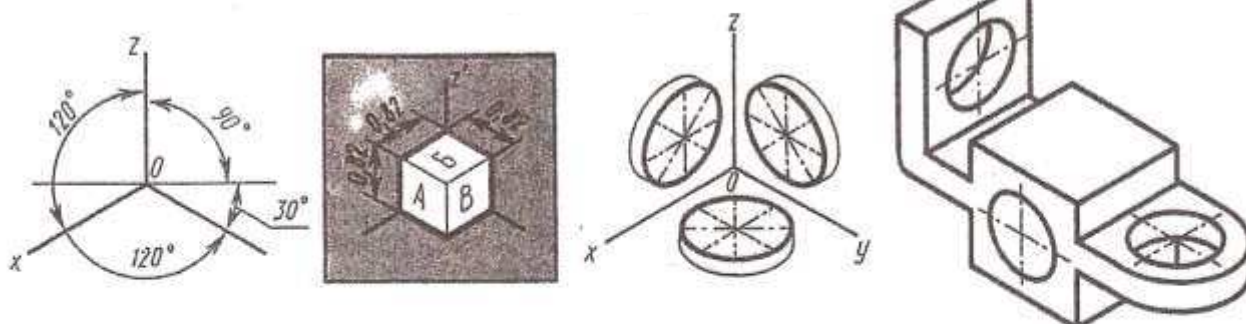
Berlen A, B we C depeleriniň koordinatalary esasynda üçburçlygyň kompleks çyzgysyny gurmaly. Iki sapar utgaşdyrma usulyny peýdalanmak bilen üçburçlygyň hakyky ululygyny tapmaly

## 10. Aksonometriki proyeksiyalary gurmak

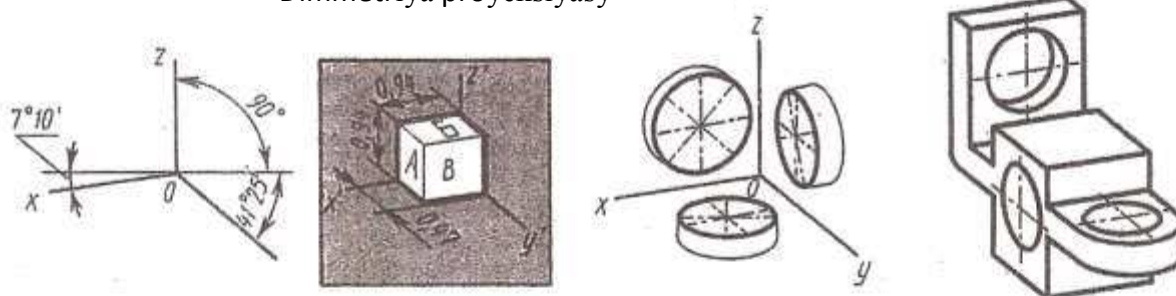
Önümi ýa-da ony düzüji böleklerini aýdyň şekillendirmek üçin şol predmetleriň aksonometriki proyeksiýalar gurulýar.

Aksonometriki proyeksiýalary gurmaklyga degişli meseleleri çözmeklik, talyplara çyzgyny okamaklygy öwredýär we maşynyň hem-de enjamlarynyň şaýlarynyň giňişlikdäki ýagdaýlaryny göz önüne getirmeklik ukybyny ösdürýär.

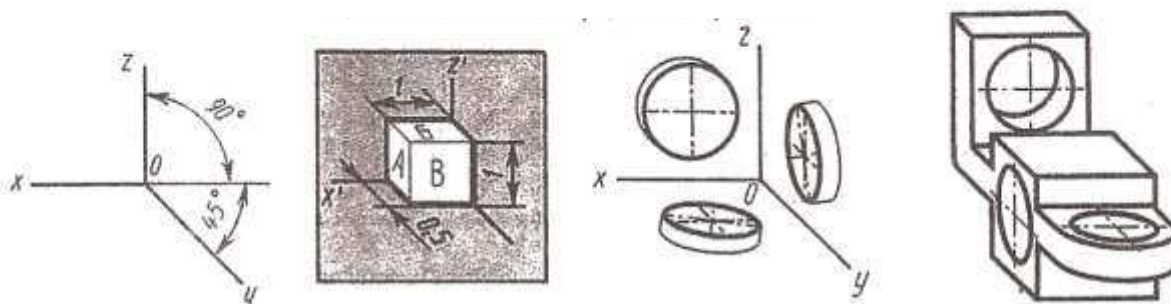
Izometriýa proyeksiýasy



Dimmetriýa proyeksiýasy



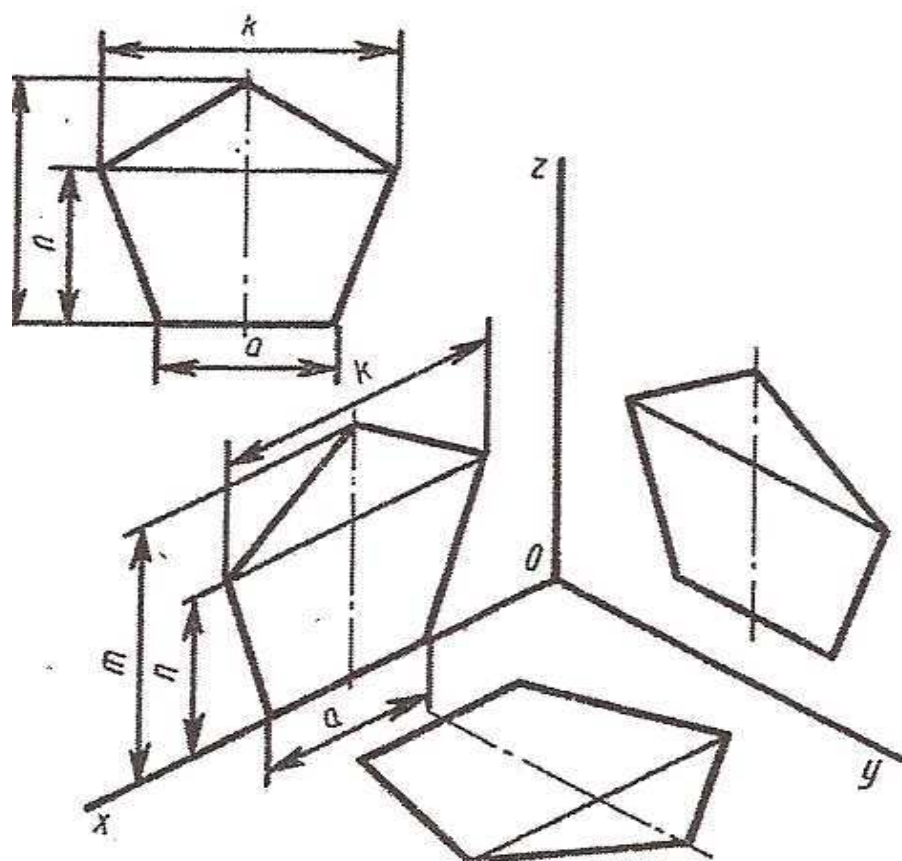
Frontal dimmetriýa proyeksiýasy



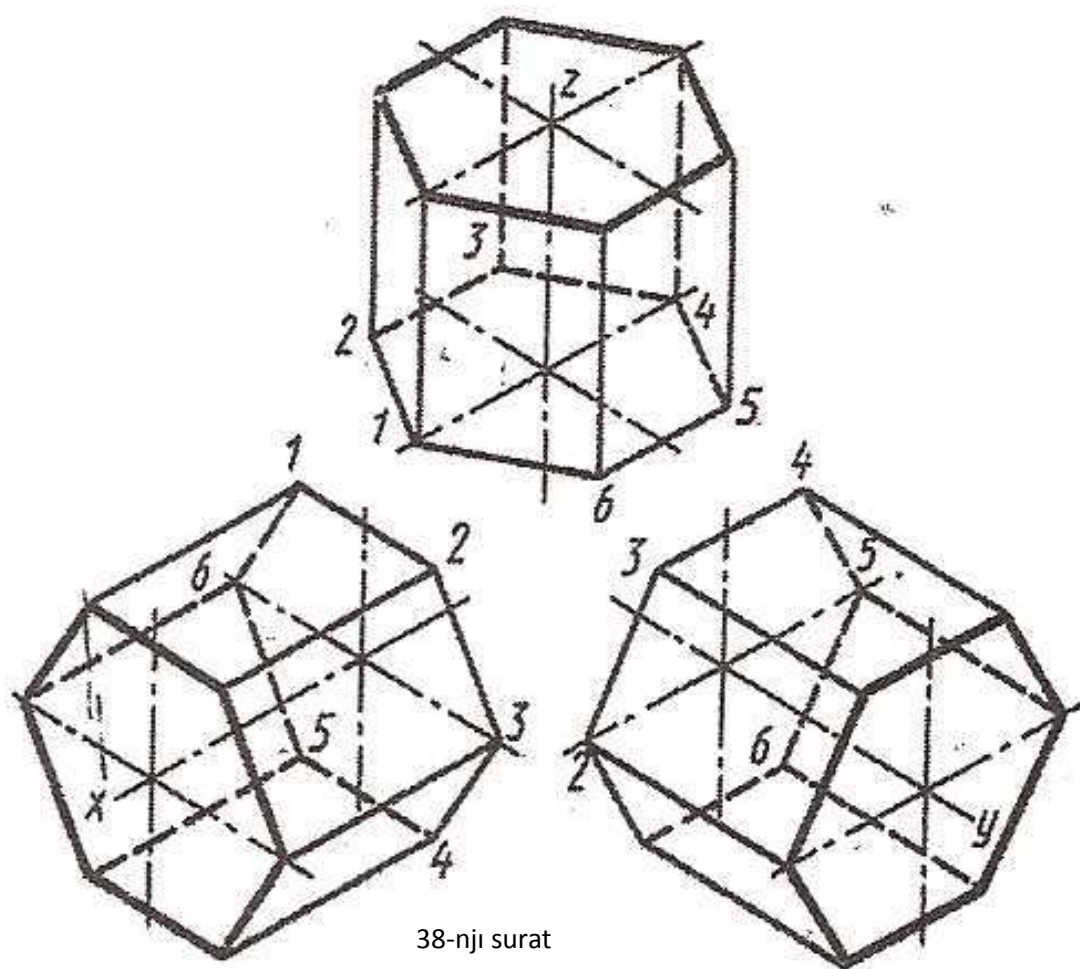
36-njy surat

Haçanda şaýyň keşbini düşündirmeklikde aýdyň şekillendirmek gerek bolanda, şolar ýaly ýagdaýlarda şaýyň kompleks çyzgysynyň ýany bilen kömekçi, aksonometriki proyeksiýasy ulanylýar. 36-njy suratda askonometriki proyeksiýalaryň birnäçe görnüşiniň atlary, olaryň oklarynyň ýerleşişini we oklar boýunça çyzykly ölçegleriniň ýoýulma koeffisienti berlen.

37-nji, 38-nji, 39-njy suratlarda tekiz figuralaryň gorizont, frontal, profil şekiller tekizligine parallel ýerleşen hallaryndaky aksonometriki proyeksiýalarynyň gurluşynyň mysallary görkezilen.



37-nji surat



38-nji surat



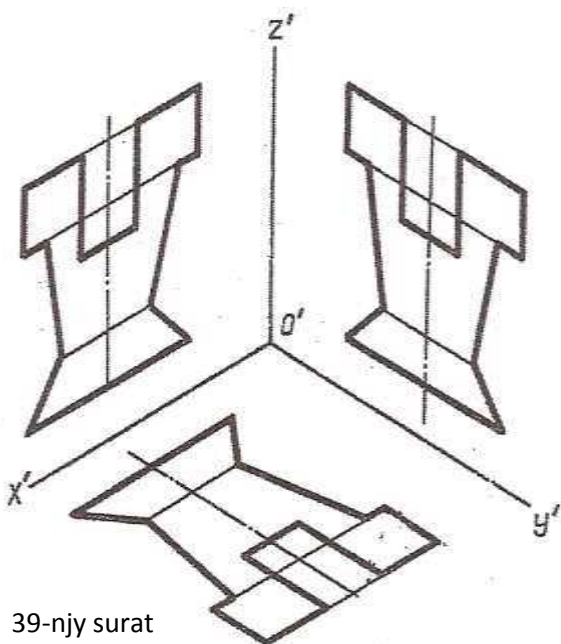
Figuranyň göni çyzykly kesiminiň aksonometriki proyeksiýasy gurlanda, özem kompleks çyzgyda proyeksiýalar okuna parallel ýerleşen bolsa, onda ol kesime laýyklykda aksonometriki oklara-da parallel ýerleşmelidir.

Tekiz egri çyzyklar we uly radiusly töweregiň dugalarynyň aksonometriýalary belli-belli bir näçe esasy nokatlaryň koordinatalary boýunça yzygiderli gurulýar.

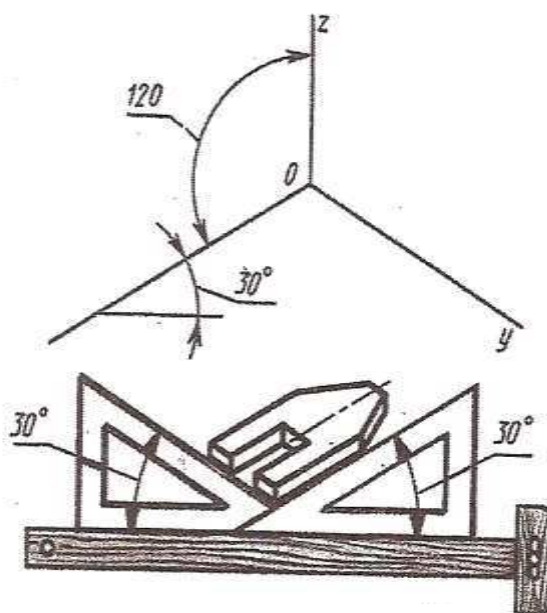
41-nji suratda görkezilişi ýaly, izometriki proyeksiýa gurlanda  $30^\circ$  burçy bolan üçburç çyzgydan peýdalanmak amatlydyr. Frontal dimetriki proyeksiýa gurlanda  $45^\circ$  burçly üçburç çyzgydan peýdalanmak gerek.

Aksonometriki çyzgylarda ölçegler goýlanda, aksonometriki oklara parallel edilip, ölçeg çyzyklary ölçenýän kesimlere parallel edilip çykarylýar.

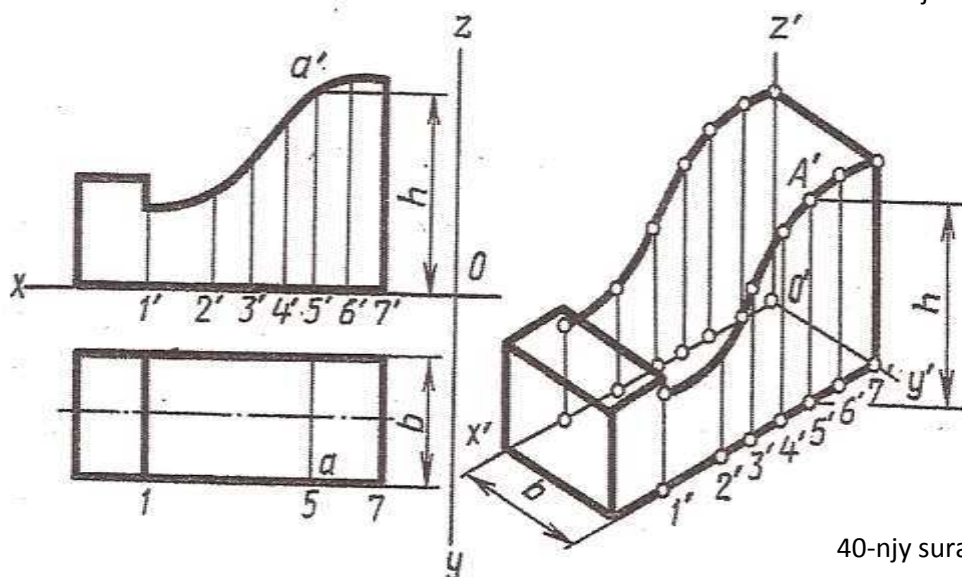
Aksonometriki proyeksiýalar barada giňişleýin maglumatlar TDS – 2.317-69 berilýär.



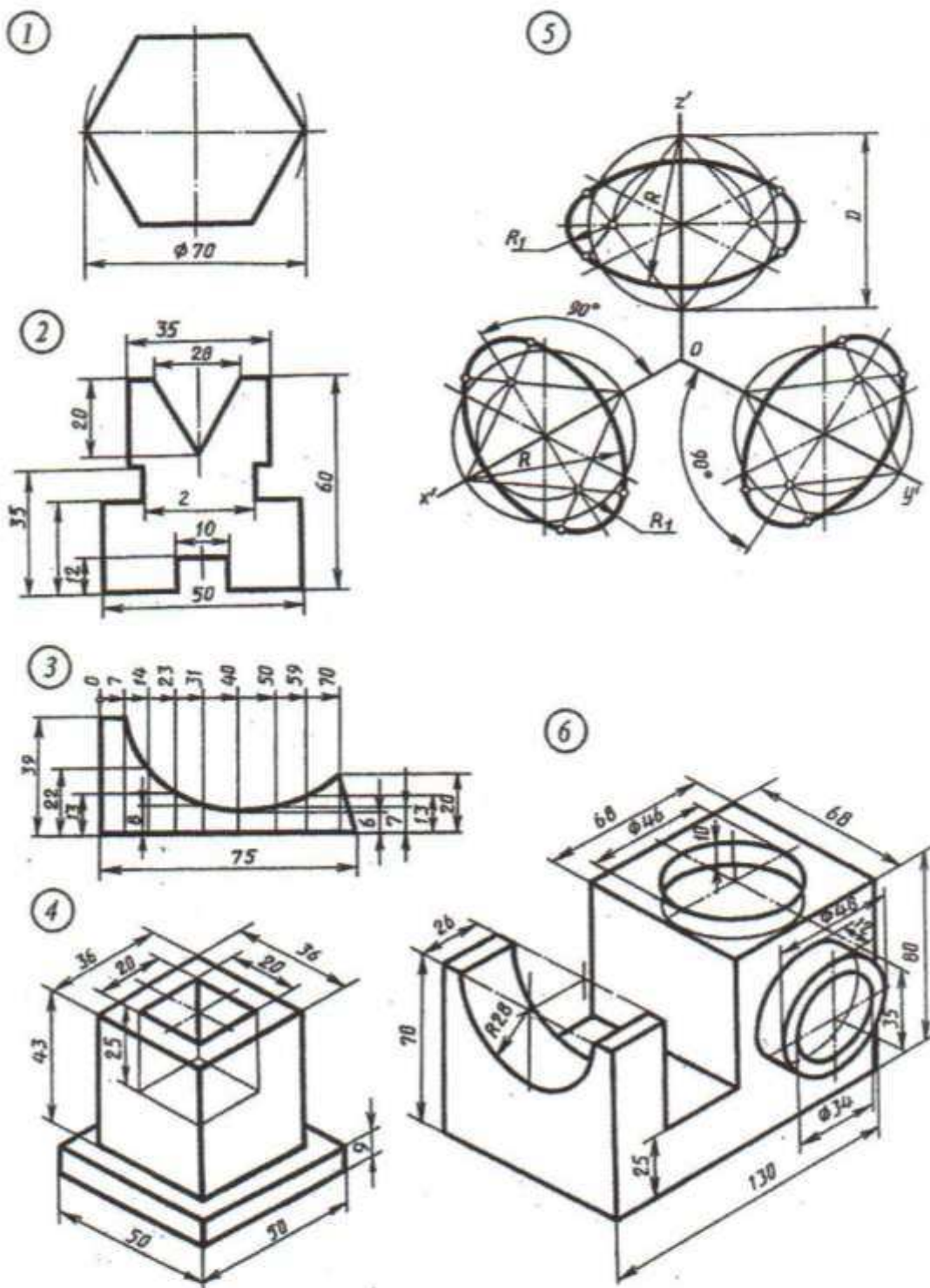
39-njy surat



41-nji surat

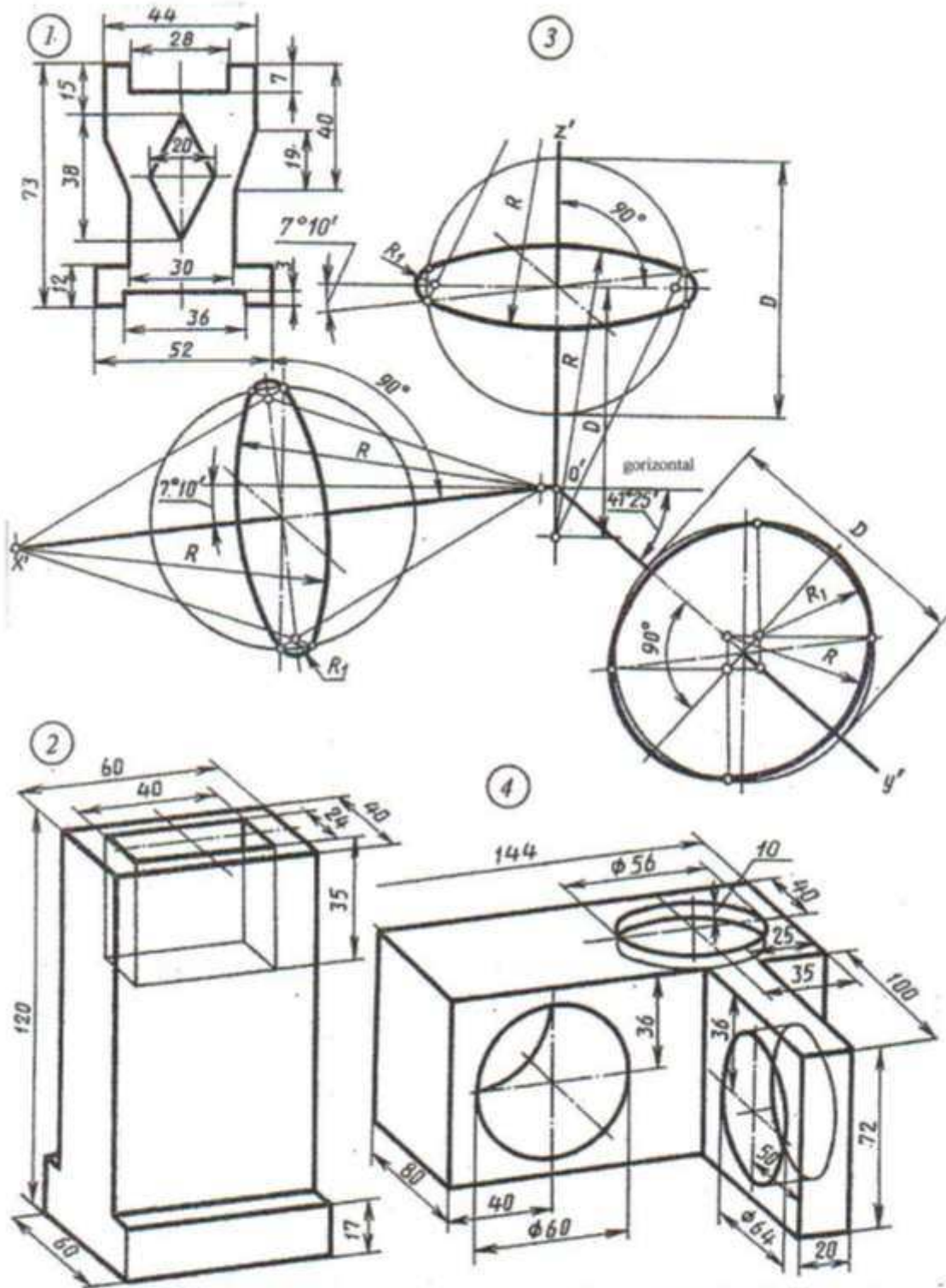


40-njy surat



1.2.3. Her bir şekiliň, gorizonta, fronta we profil şekiller tekizliklerine parallel bolan ýagdaýlaryndaky, tekiz şekilleriniň izometriýadaky proyeksiýalaryny gurmaly

1. Nusgadaky şekiliň izometriýa proyeksiýasyny, önünden görüňän çäryegin kesigi bilen gurmaly
2. Diametri  $\varnothing 70$  mm bolan we gorizonta, fronta, profil şekiller tekizliklerine parallel ýerleşen töweregiň izometriýada proyeksiýasyny, süýnmekligini gurmaly
- 6.Şaýyň izometriýada proyeksiýasyny gurmaly



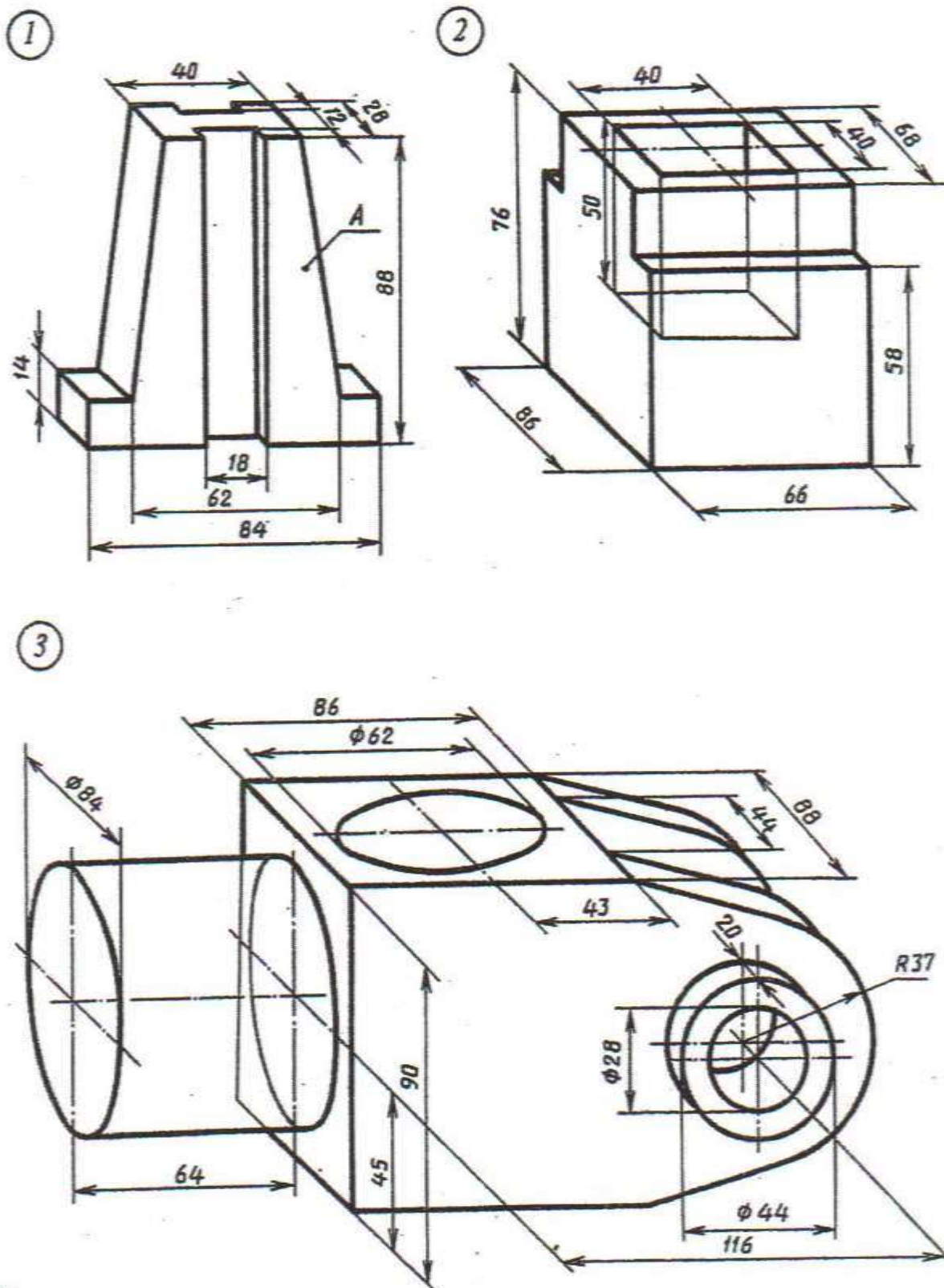
1. Tekiz şekiliň gorizonta, frontal we profil şekiller tekizliklerine parallel ýerleşen hallaryndaky dimetriýada proyeksiýasyny gurmaly

2. Nusgadaky şekiliň dimetriýada proyeksiýasyny, önünden görüňän çäryegin kesigi bilen gurmaly

3. Diametri  $\phi 70$  mm bolan we gorizonta, frontal, profil şekiller tekizliklerine parallel ýerleşen töweregiň dimetriýada proyeksiýasyny, süýnmekligini gurmaly

4. Şaýyň dimetriýada proyeksiýasyny gurmaly

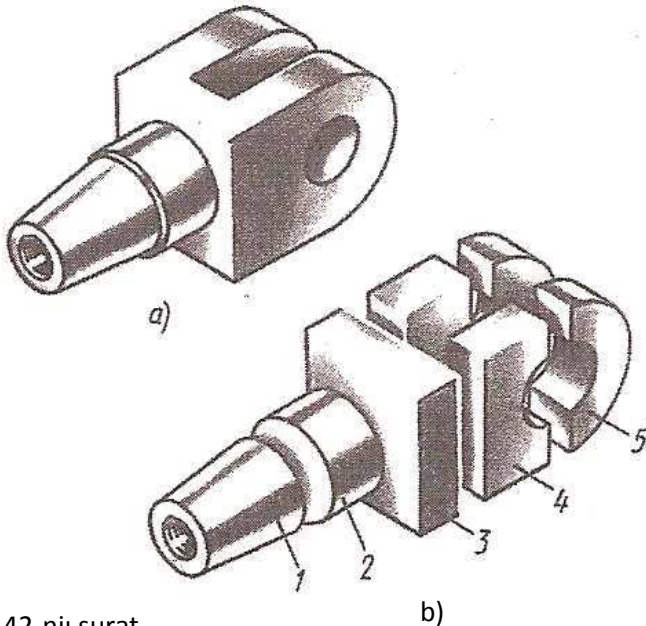




1. Şaýyň A granyny profil şekiller tekizligine parallel ýerleşdirip frontal dimetriýa proyeksiýasyny gurmaly
2. Şaýyň frontal dimetriýa proyeksiýasyny önünden görünyän çäryegin kesigi bilen gurmaly
3. Şaýyň frontal dimetriýa proyeksiýasyny gurmaly

## 11. Geometriki figuralaryň we nusgalaryň proyeksiýalary

Islendik görnüşdäki şaýy, aýry-aýry geometriki figuralaryň birikmesinden emele gelen diýip hasap etse bolar.



42-nji surat

42-nji a suratdaky şaýy mysal edip onuň şekilini derňäliň, ony pikirimizde aýry-aýry elementlere bölüp, 42-nji b suratdaky 1-kesilen işi deşik silindre meňzeş konus, 2-göni töwerek silindr, 3-parallelepiped, 4-iki gönüburçly parallelepiped silindr görnüşli deşikli, 5-iki ýarty ýarymsilindri alarys.

Şeýle kompleks çyzgylary ýerine ýetirmek üçin geometriki figuralary aýratynlykda proyektirlemegiň usullaryny, şonuň ýaly-da şol geometriki figuralaryň üstünde ýerleşen nokatlary we çyzyklary öwrenmek hökmandyr.

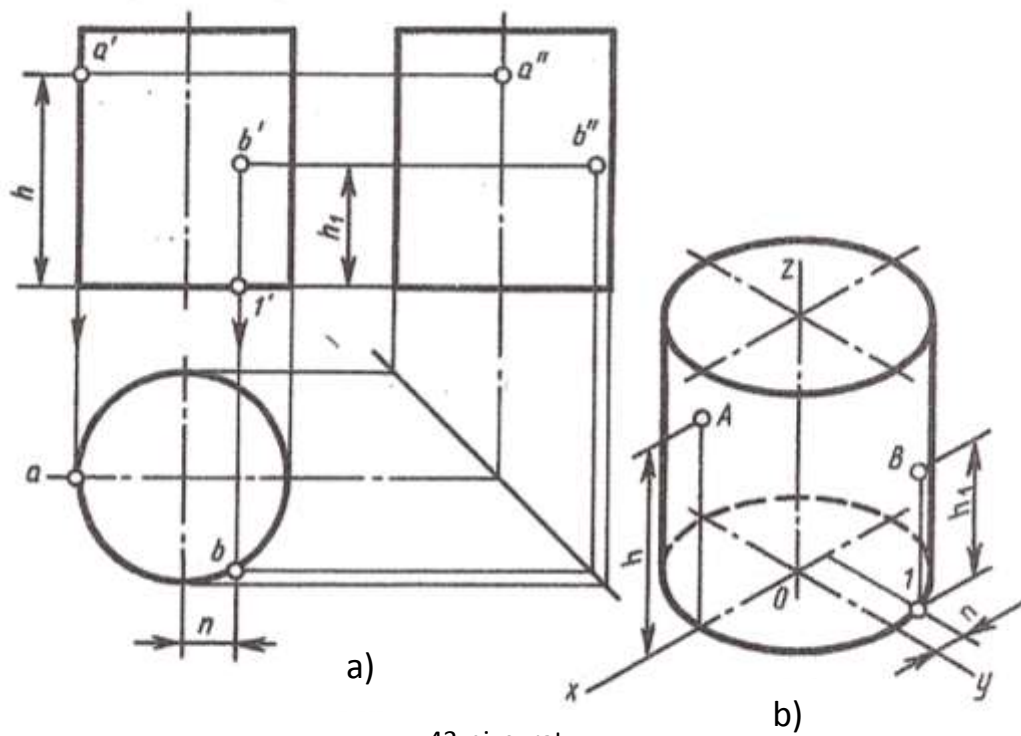
**Ýumuş 34:** ýönekeý geometriki figuralaryň (prizmalaryň, piramidalaryň, silindriň, konusyň, toruň), şeýle hem geometriki figuralaryň toparynyň proyeksiýalaryny gurmaklyga seredilendir.

Şu ýumuşda nokady, çyzygy we tekizlikleri proyektirlemegiň düzgünlerinden we usullaryndan peýdalanylandyr.

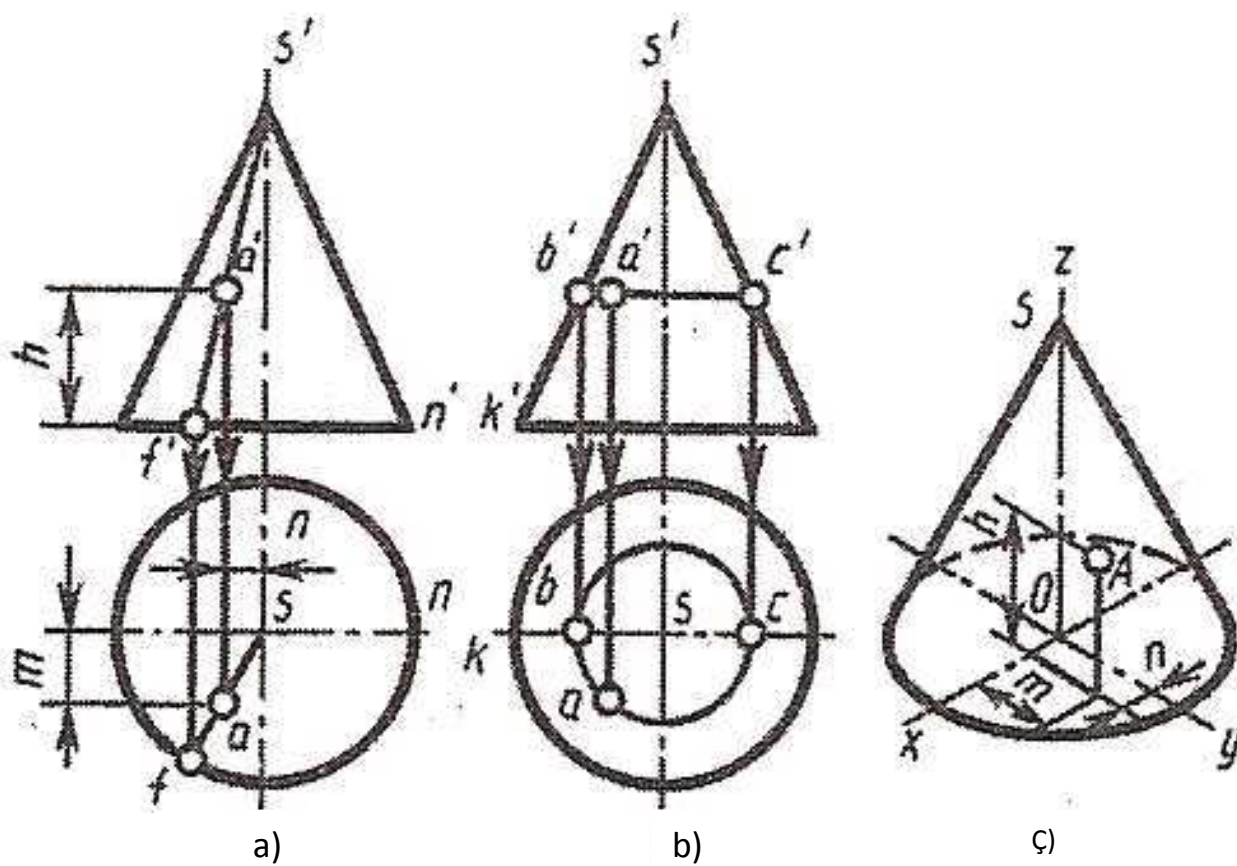
Geometriki figuranyň üstündäki nokadyň ýetmeýän proyeksiýalaryny gurmak üçin, berlen bir proyeksiýasy boýunça, öňi bilen üstleriň ähli proyeksiýalaryny gurmaklyk hödürlenýär, soňra üstäki ýerleşýän nokadyň galan tekizliklerdäki proyeksiýalary tapylýar.

43-nji a, b suratlarda mysal edilip silindr bilen onuň üstünde berlen nokadyň proyeksiýasyny gurmak görkezilen hem-de şolar esasynda aksonometriki proyeksiýalaryň gurluşy şekillendirilen.

44-nji a, b suratlarda konusyň üstünde berlen nokadyň ýetmeýän proyeksiýalarynyň tapylyşynyň mysaly görkezilen.

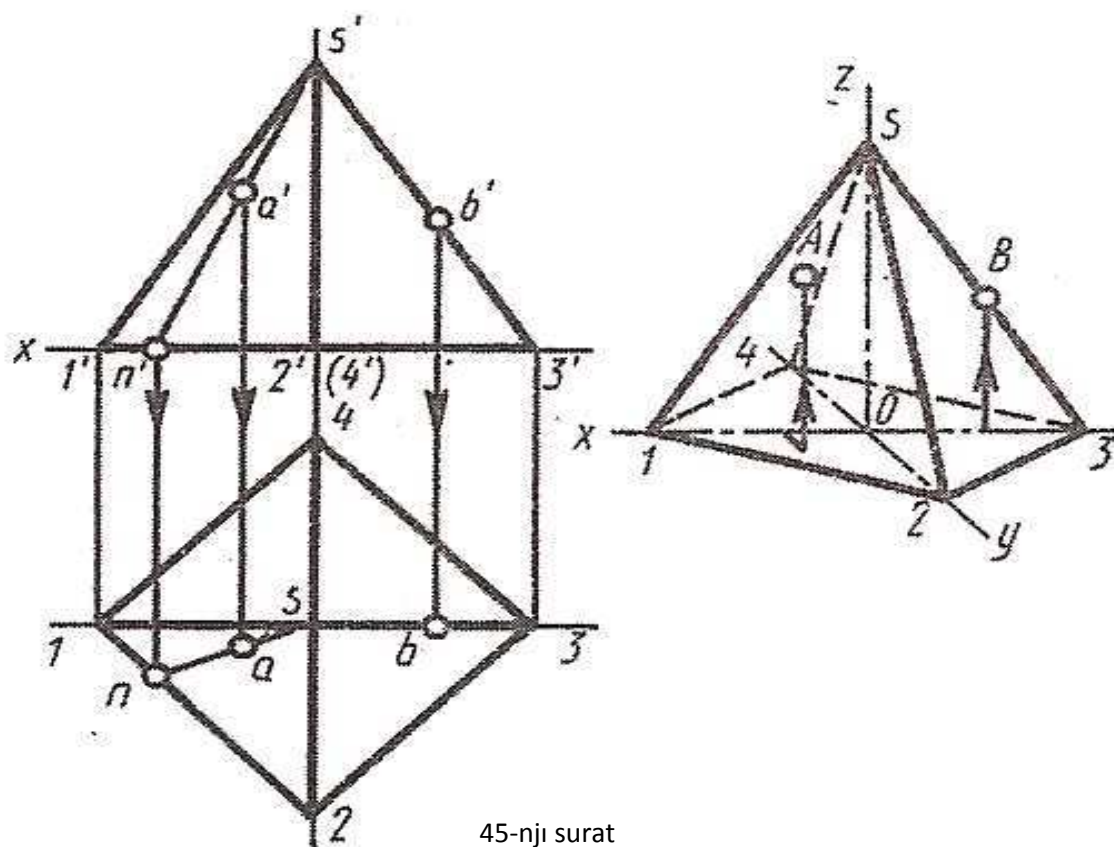


43-nji surat



44-nji surat





45-nji suratda dogry dörtburçly piramidanyň we onuň üstünde ýerleşýän nokadyň proyeksiýasy berlen. (Görkezilen ýerleşişdäki kwadrat esasly piramidanyň hem-de kwadrat esasly prizmanyň izometriki proyeksiýasyny gurmak maslahat berilmeýär).

46-njy suratda geometrik figuralaryň toparynyň iki proyeksiýasy boýunça ýetmedik bir proyeksiýasyny gurmagyň usuly görkezilen, olaryň ölçegleri we özara ýerleşişleri berlişinden alynýar.

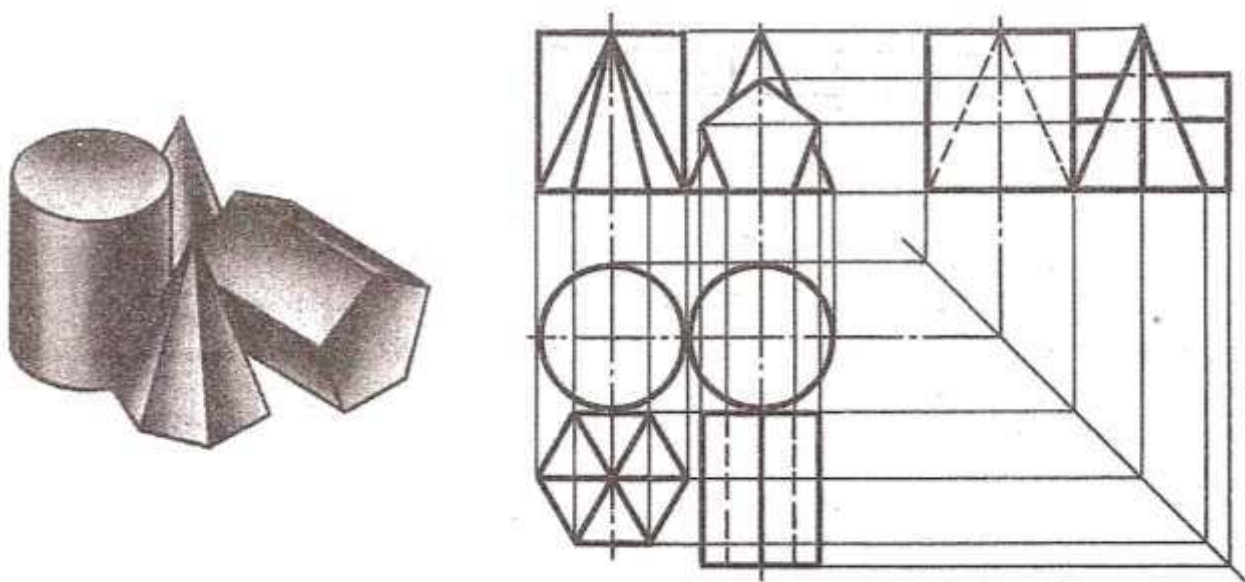
**Ýumuş 35:** nusganyň berlen aksonometriki proyeksiýasy boýunça kompleks çyzgysyny gurmaklyk göz önünde tutulýar.

Ýumuş ýerine ýetirilende şekili çyzgyda dogry ýerleşdirmekligi başarmaly. Frontal şekiller tekizliginde nusganyň şekili we ölçegleri has köpräk görner ýaly edip ýerleşdirilýär.

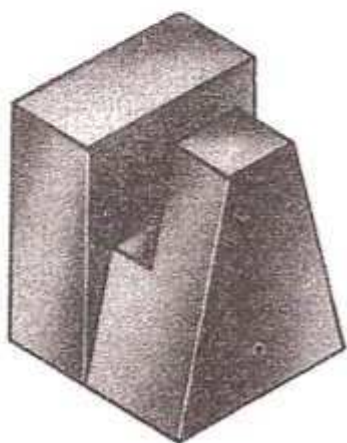
Eger şekillendirilýän nusga simmetrik tekizlikden ybarat bolsa, onda çyzgy simmetriýa oklaryny geçirmeklikden başlanýar. Eger-de tekizlikde simmetriklik bolmasa, onda nusganyň wertikal ýa-da gorizontaý ýagdaýlaryny kesgitleýän daýanç üstleriniň çyzgylaryny şekillendirmeklikden başlanýar.

Proýeksion baglanyşygy we nusganyň aýry-aýry elementleriniň özara ýerleşişlerine dogry düşünmek üçin ähli üç şekili parallel gurmak talabalaýyk hasaplanylýar.

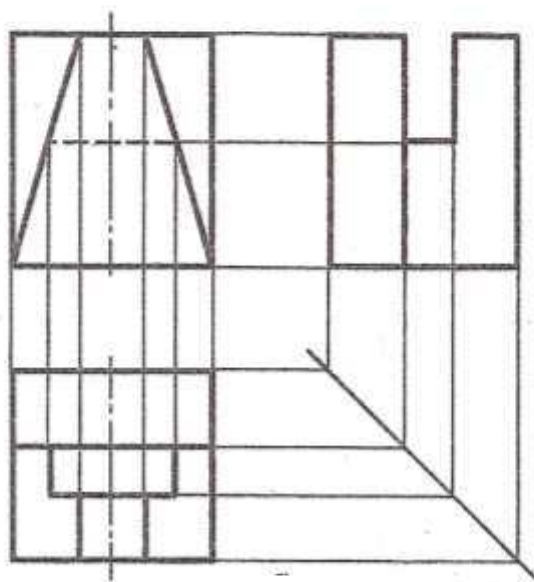
Nusganyň kompleks çyzgysy oksuz ulgamda ýerine ýetirilýär (çyzgyda proýeksiýalar oklary çyzylmaýar). 47-nji a suratda nusganyň aksonometriki çyzgysy görkezilen, 47-nji b suratda bolsa şol esasyda kompleks çyzgysynyň ýerine ýetirilişine mysal getirilen.



46-njy surat



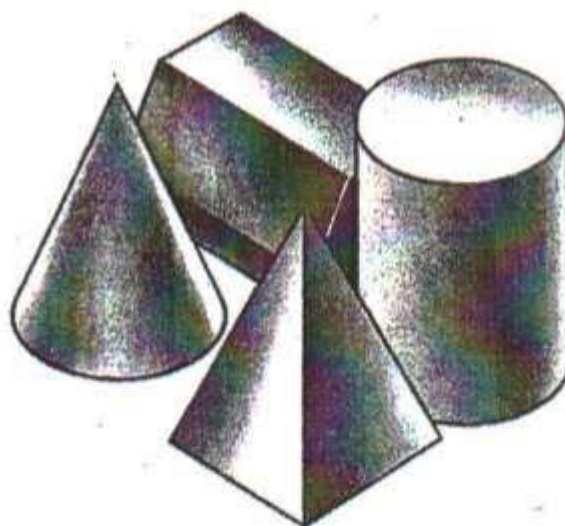
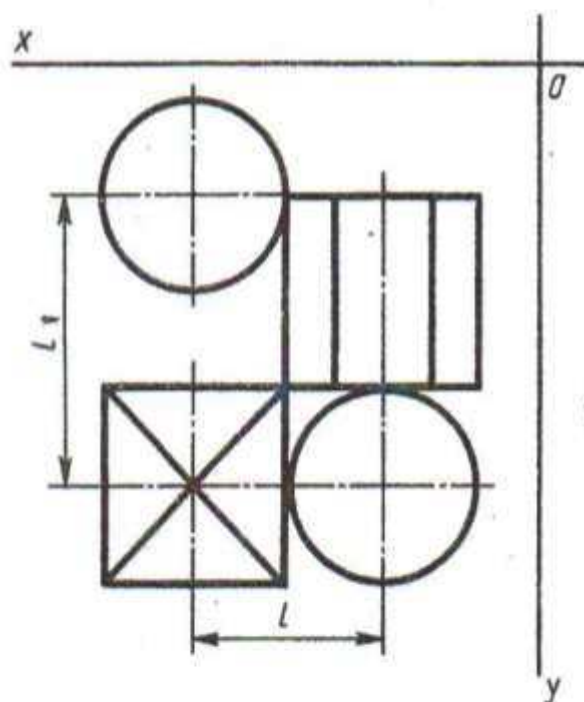
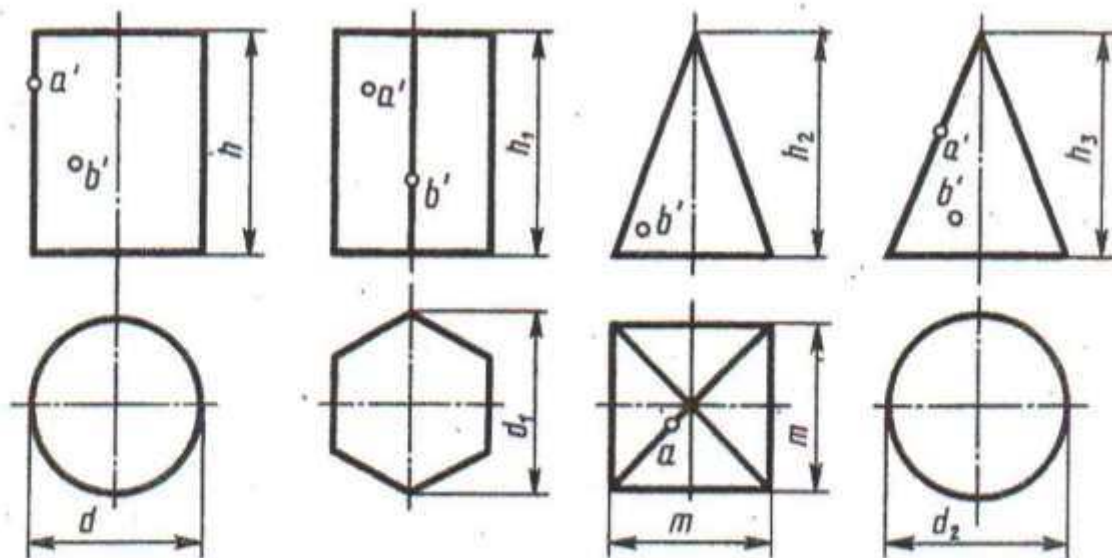
a)



b)

47-nji surat

# ÝUMUŞ 34

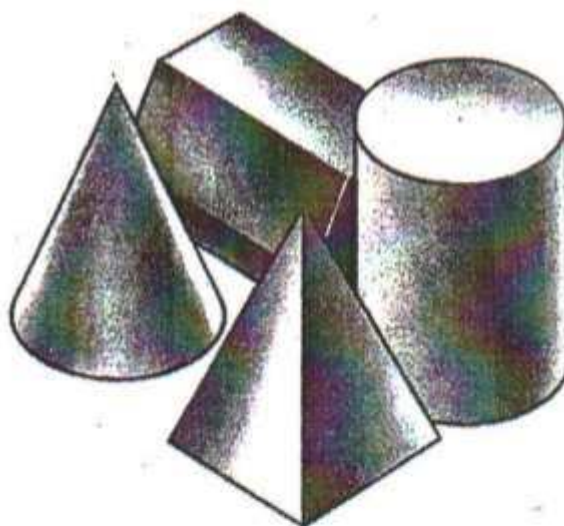
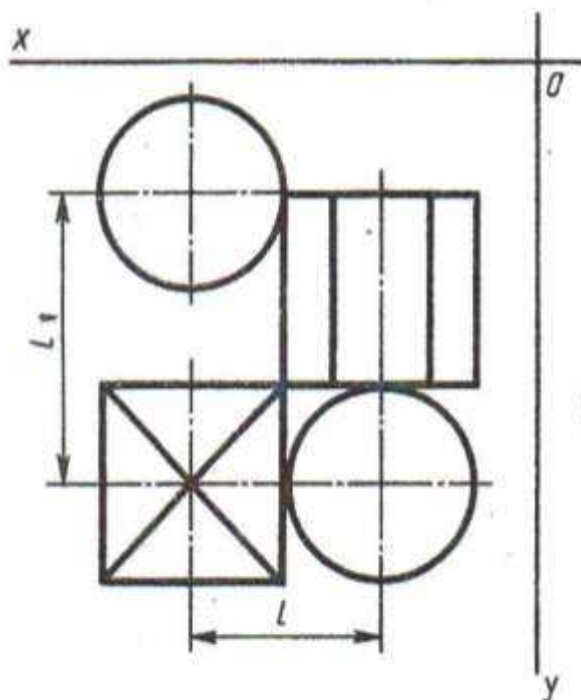
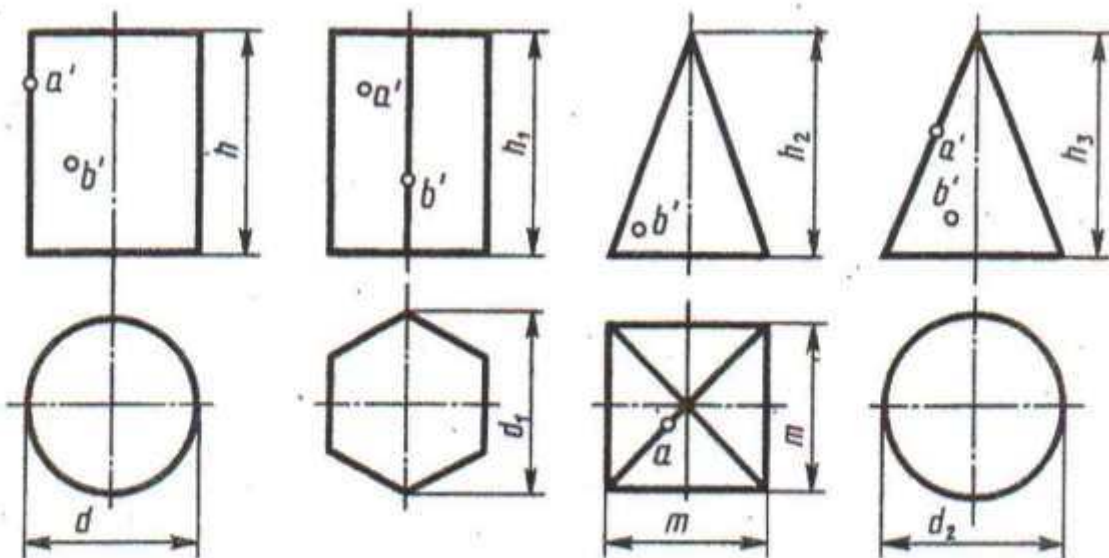


Variant	Ölçegleri, mm									
	d	d <sub>1</sub>	d <sub>2</sub>	m	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
1	2	3	4	5	6	7	8	9	10	11
1	40	50	40	40	50	60	60	60	80	40
2	40	40	40	50	70	60	60	70	80	45
3	50	40	50	40	70	60	70	60	85	45

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizontál proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly.

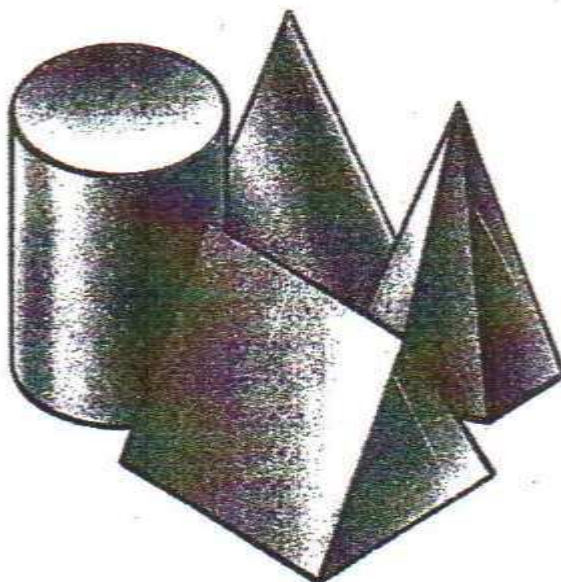
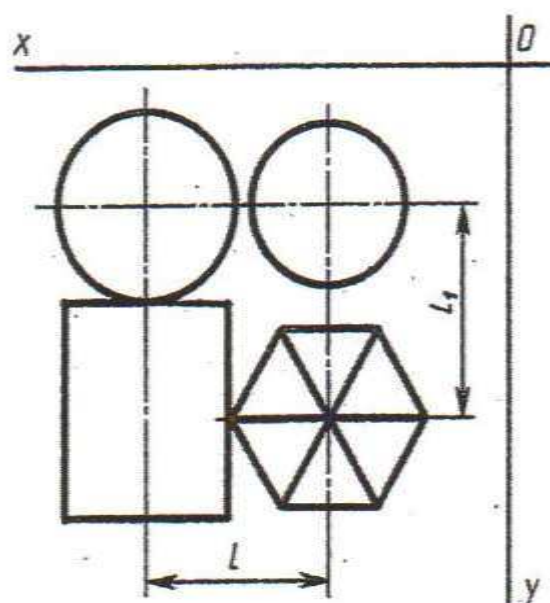
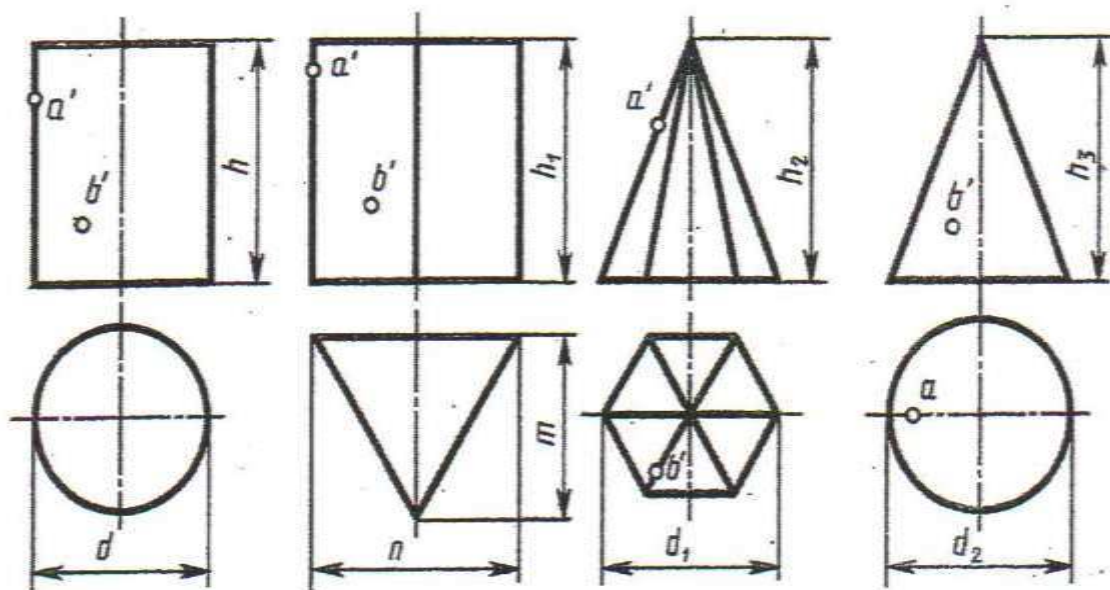




Wariant	Ölçegleri, mm									
	d	d <sub>1</sub>	d <sub>2</sub>	m	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
1	2	3	4	5	6	7	8	9	10	11
1	40	50	40	40	50	60	60	60	80	40
2	40	40	40	50	70	60	60	70	80	45
3	50	40	50	40	70	60	70	60	85	45

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizonta proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly.

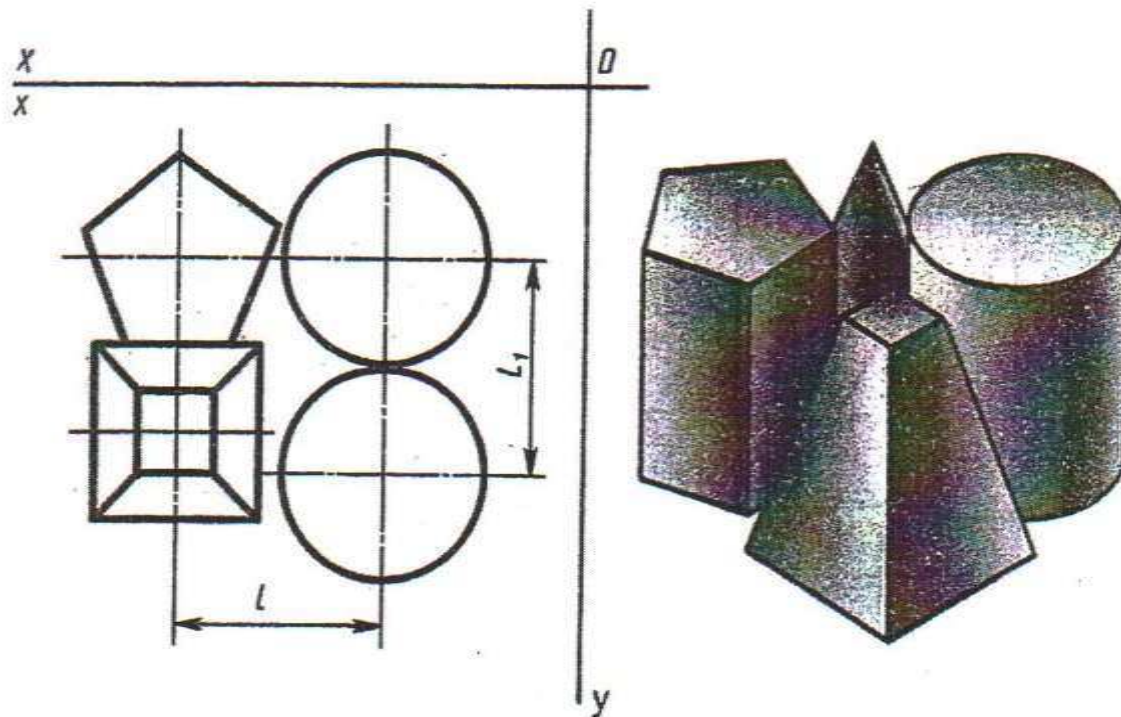
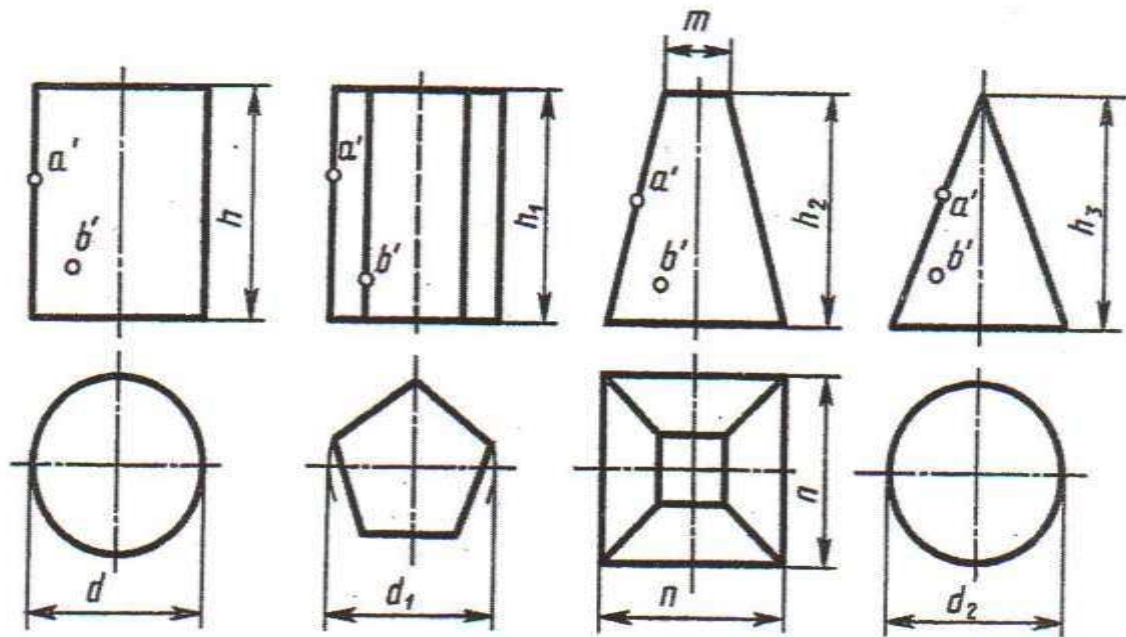


Wariant-lar	Ölçegler, mm.										
	d	d <sub>1</sub>	d <sub>2</sub>	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	n	m	l	l <sub>1</sub>
4	50	40	60	50	60	55	75	60	60	60	55
5	60	60	60	70	70	70	70	50	50	60	95
6	60	60	50	60	50	70	60	60	60	60	65

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşileri gorizontál proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly.



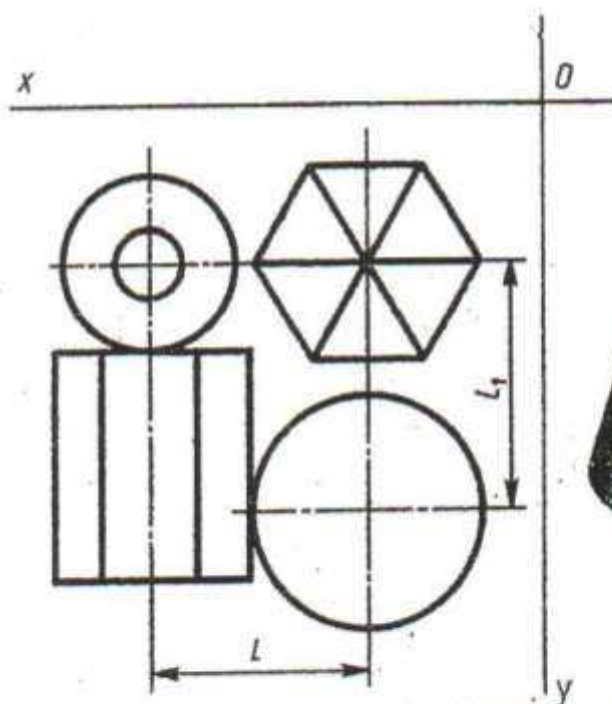
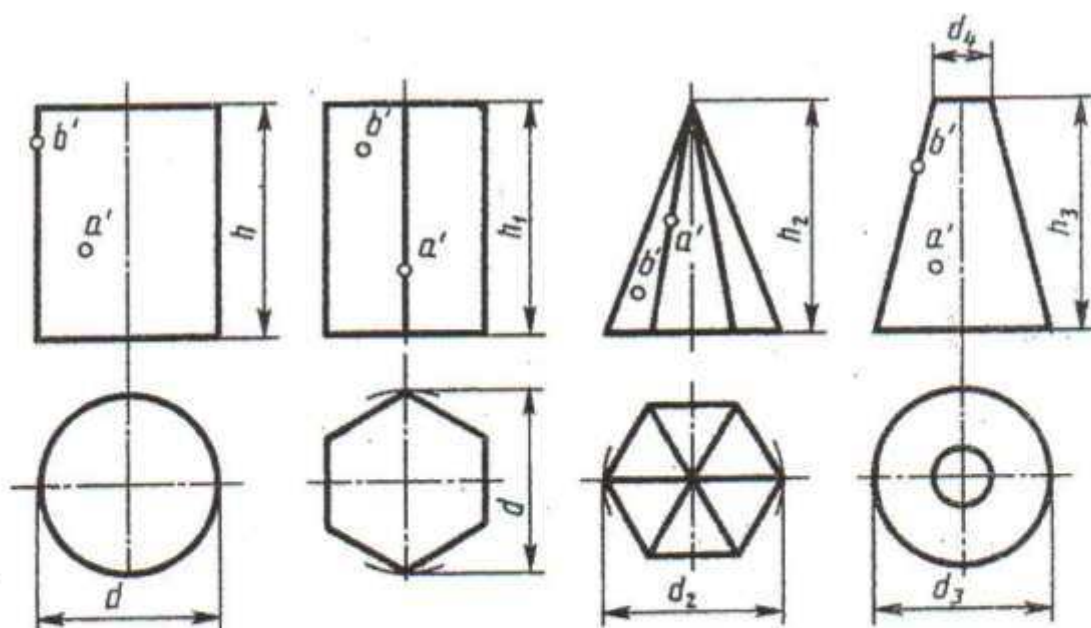


Wariant	Ölçegleri, mm										
	d	d <sub>1</sub>	d <sub>2</sub>	n	m	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
7	45	45	45	38	14	60	60	50	60	50	45
8	50	45	46	38	14	60	60	70	50	50	48
9	46	50	52	38	14	60	50	50	70	50	49

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizonta proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly.

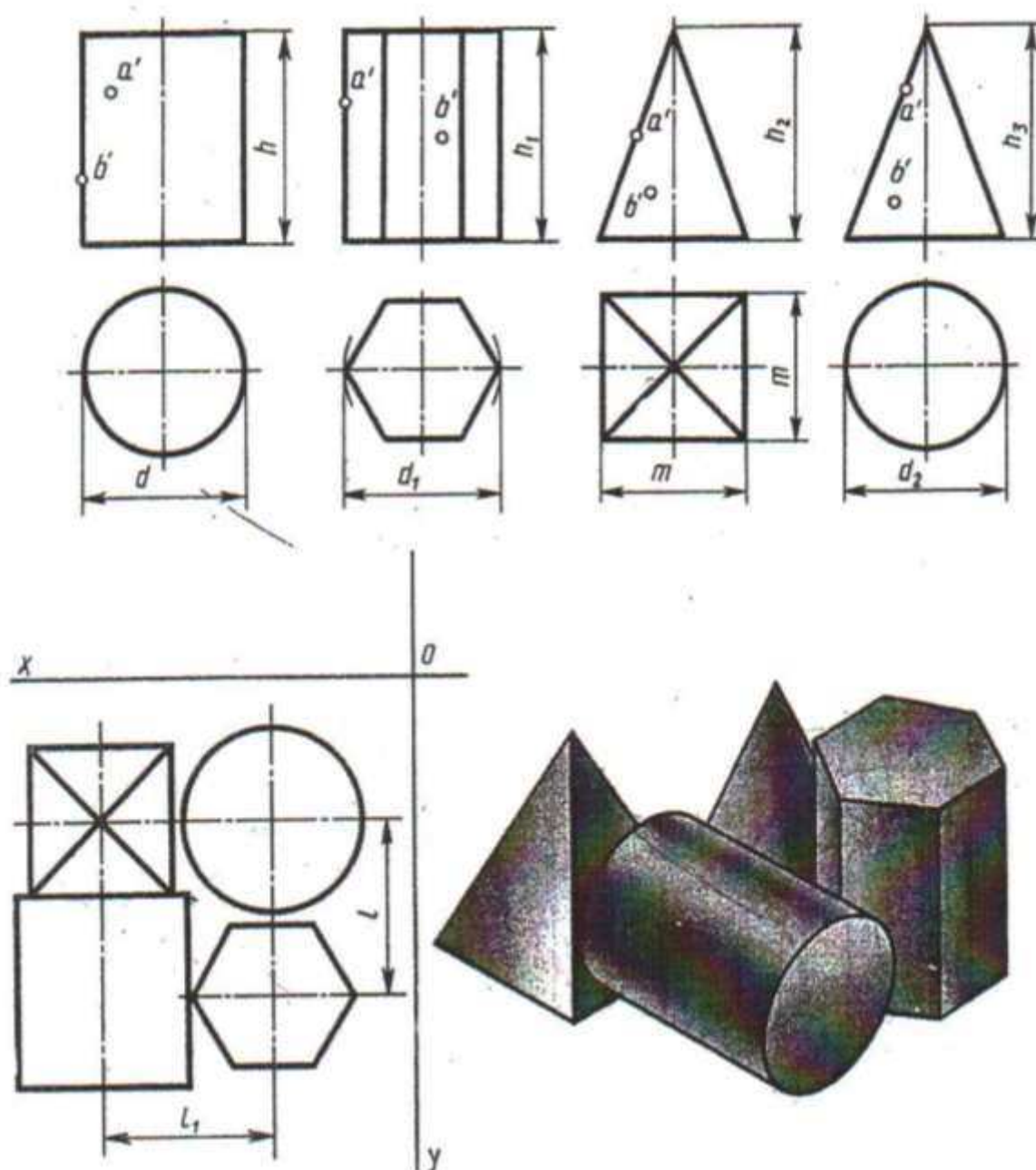




Wariantlar	Ölçegler, mm.										
	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
10	50	48	50	40	14	55	65	60	60	48	50
11	40	40	52	38	14	55	60	50	60	40	50
12	45	45	50	40	14	60	65	60	50	45	50

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

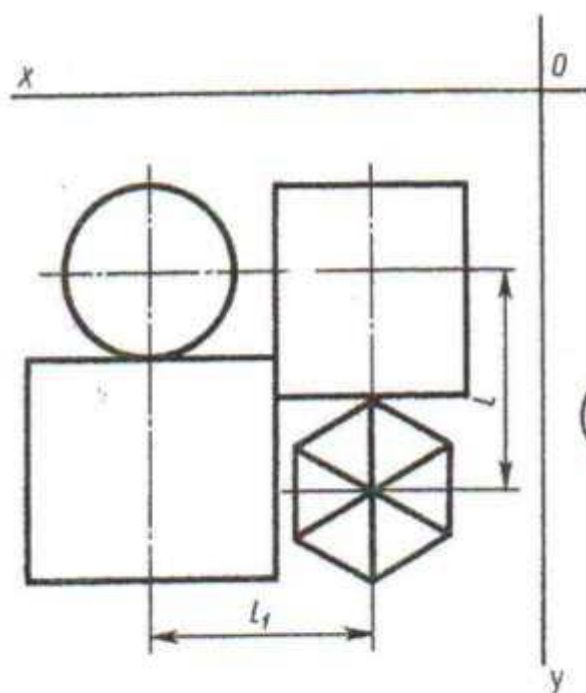
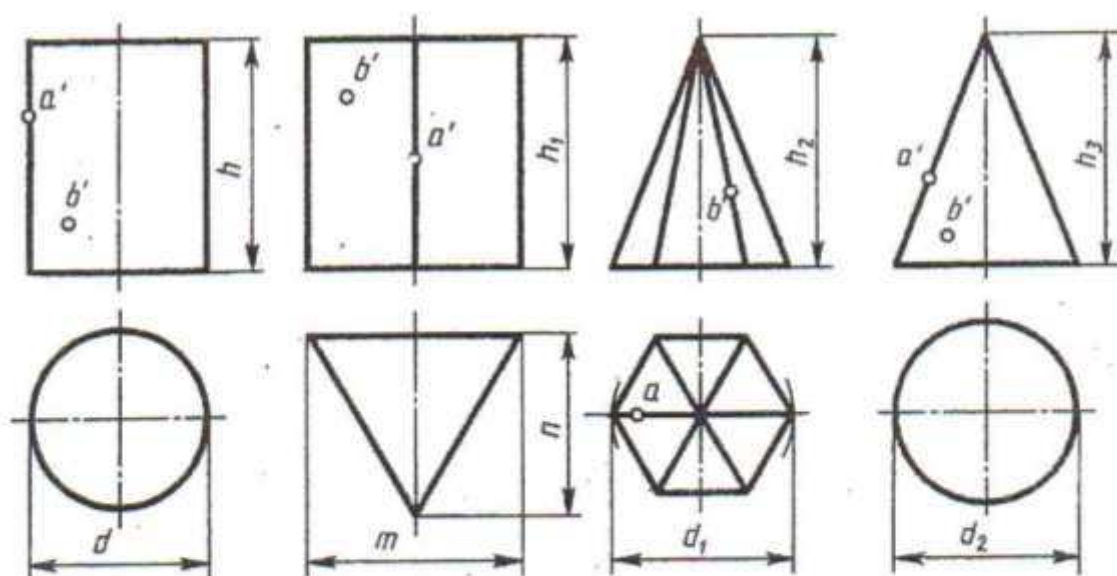
Aşakdaky çyzgyda özara ýerleşişleri gorizontál proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly.



Wariant	Ölçegleri,mm									
	d	d <sub>1</sub>	d <sub>2</sub>	m	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
13	45	45	45	45	50	60	60	70	50	45
14	50	45	45	45	60	70	70	60	55	50
15	50	40	45	36	60	70	50	65	50	50

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizontál proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly

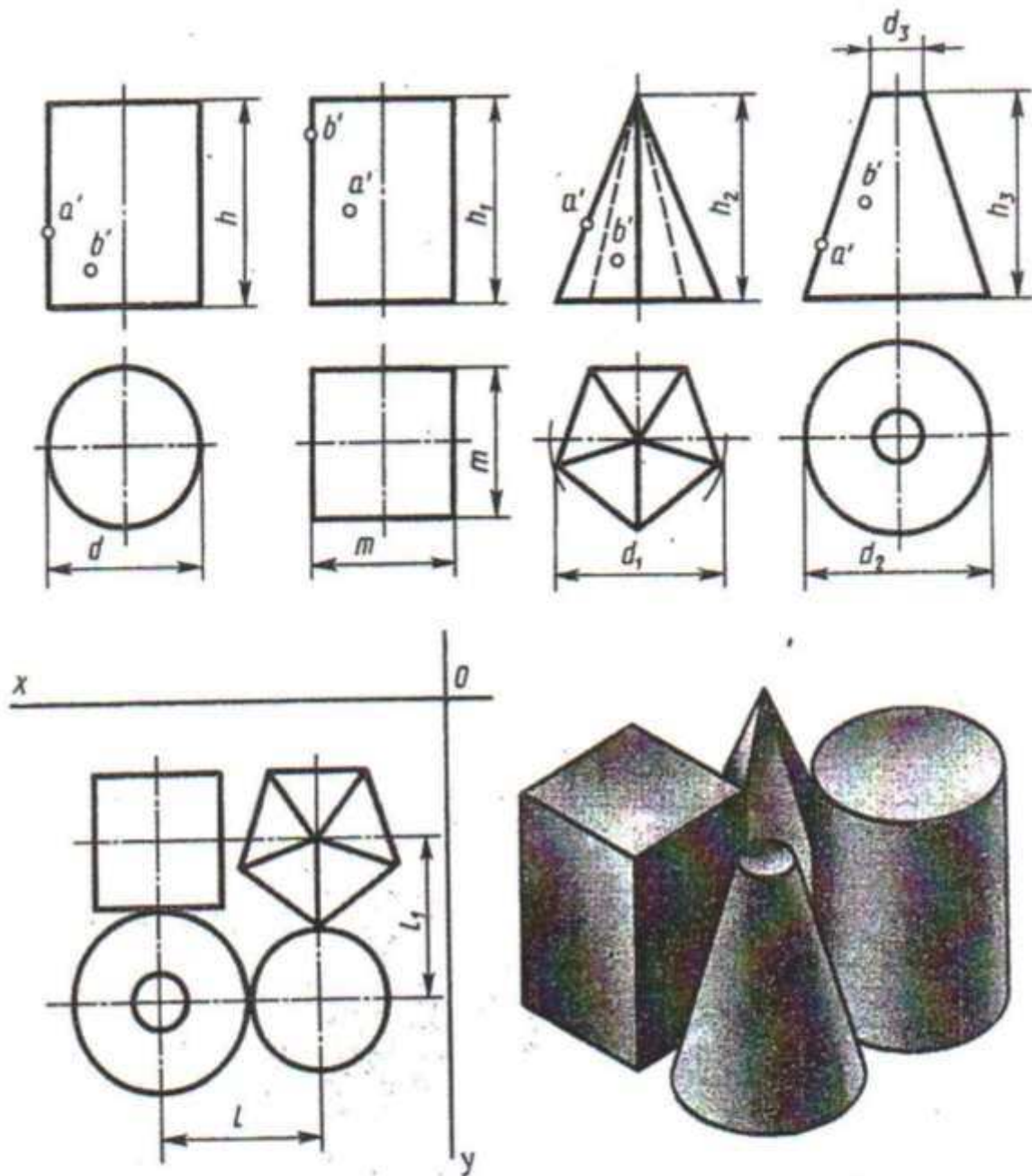


Wariant-lar	Ölçeğerler mm.										
	d	d <sub>1</sub>	d <sub>2</sub>	m	n	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
16	40	55	40	40	50	60	60	70	70	60	40
17	50	40	50	30	40	65	55	60	65	70	50
18	40	50	46	30	45	60	60	65	65	65	43

Geometriki jisimleri üç proyeksiyalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizontaly proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly.

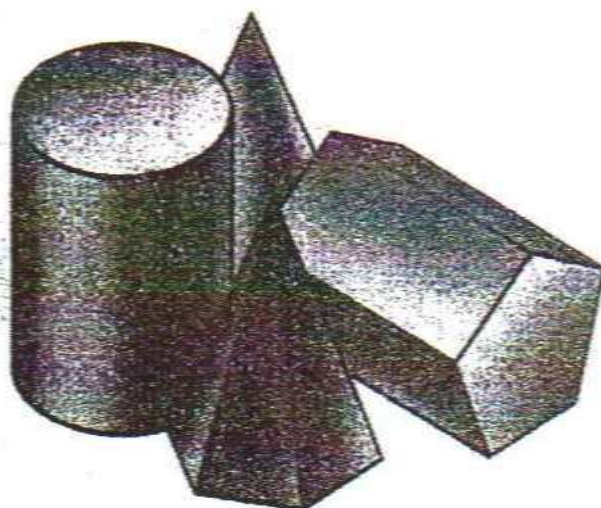
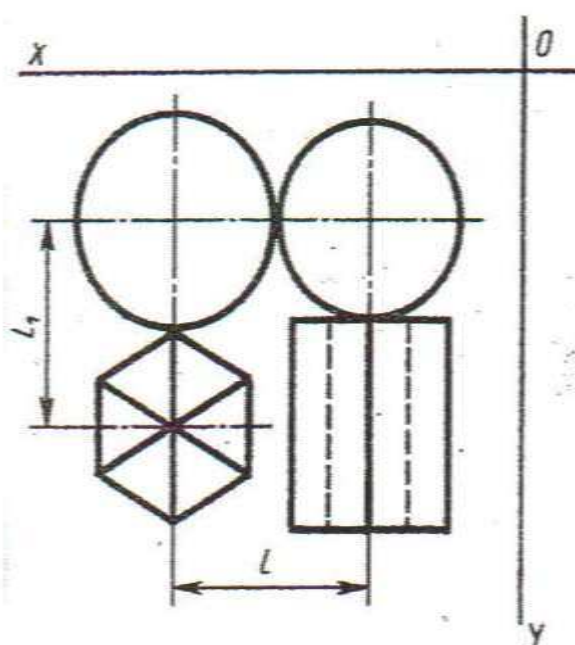
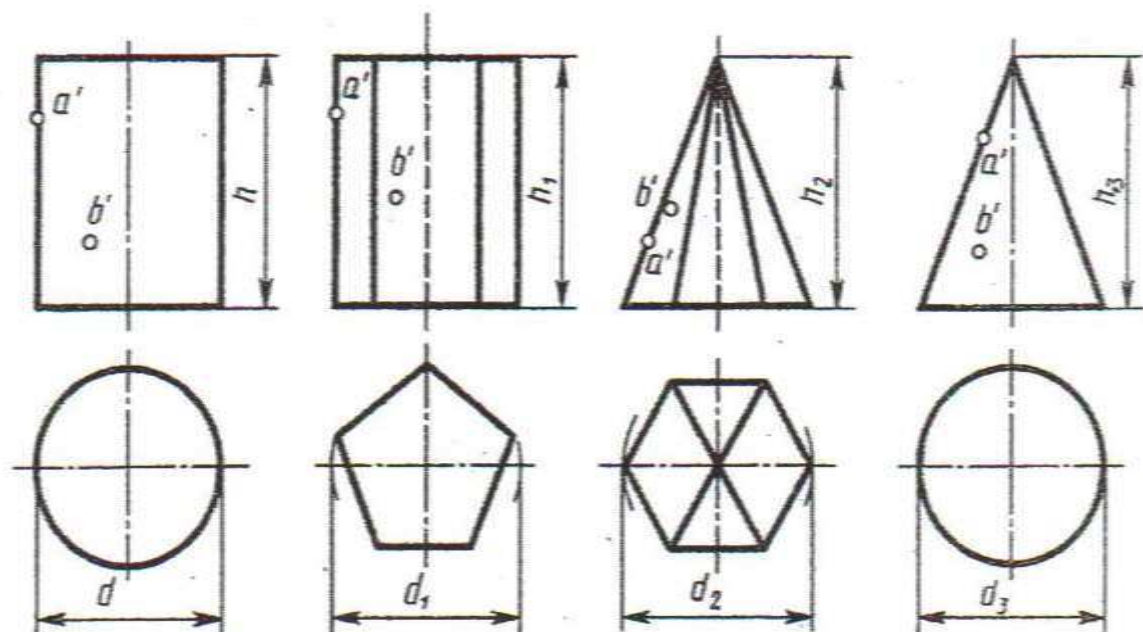




Wariant-lar	Ölçegler mm.										
	$d$	$d_1$	$d_2$	$d_3$	$h$	$h_1$	$h_2$	$h_3$	$m$	$l$	$l_1$
19	50	45	50	14	60	60	60	60	30	50	40
20	50	55	50	14	50	50	50	60	30	50	40
21	40	45	50	14	60	60	50	60	30	70	40

Geometriki jisimleri üç proyeksiyalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizontál proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly

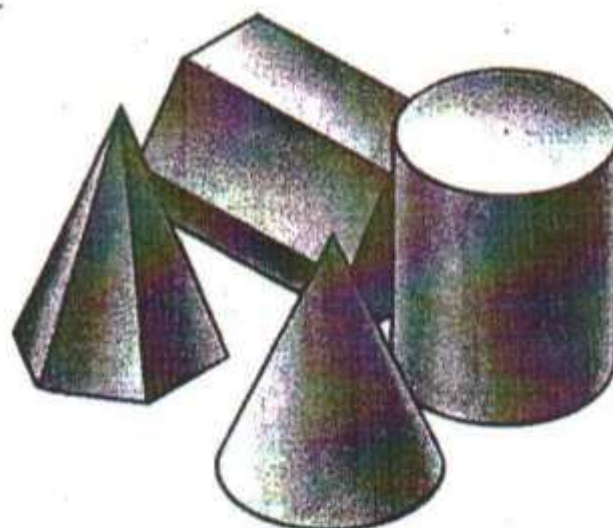
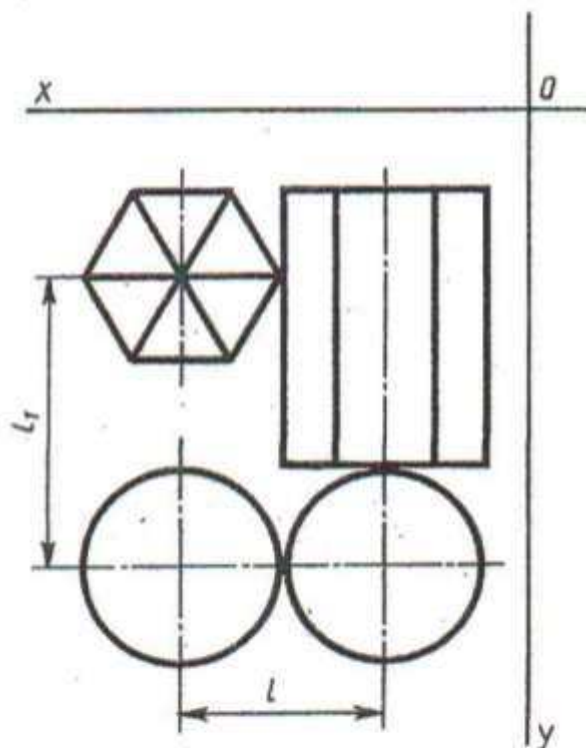
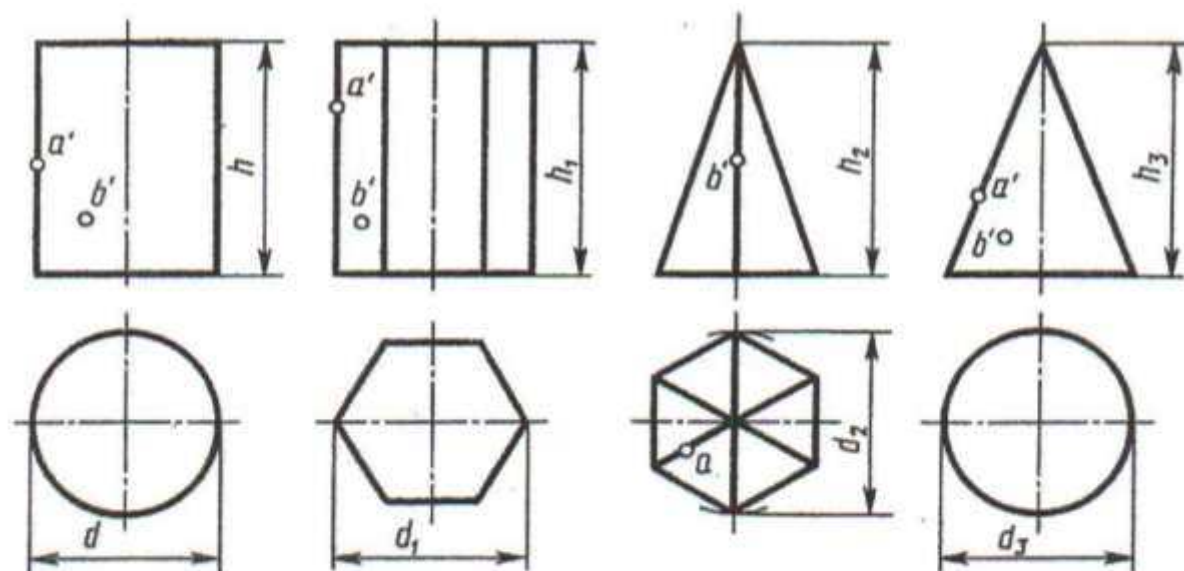


Wariant-lar	Ölçegler mm.									
	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
22	50	50	46	46	70	60	60	70	45	48
23	50	50	46	50	60	70	70	70	50	48
24	50	50	46	46	70	70	70	60	48	48

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizontaly proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly



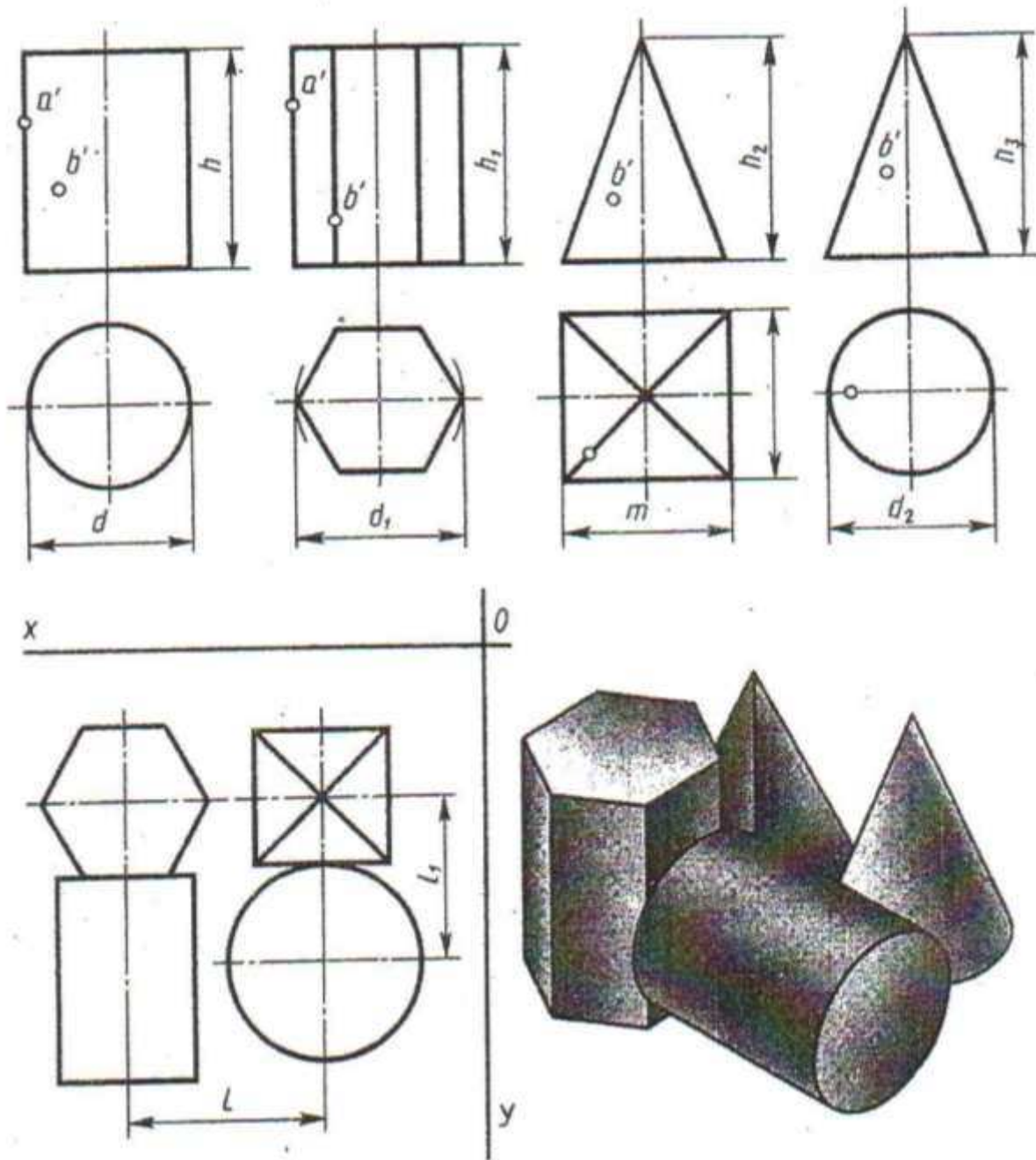


Wariant-lar	Ölçegler mm.									
	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	l <sub>1</sub>
25	45	45	50	45	55	60	45	50	45	60
26	54	45	50	50	70	80	55	50	52	70
27	45	55	45	55	60	70	55	55	50	55

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

Aşakdaky çyzgyda özara ýerleşişleri gorizontál proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly





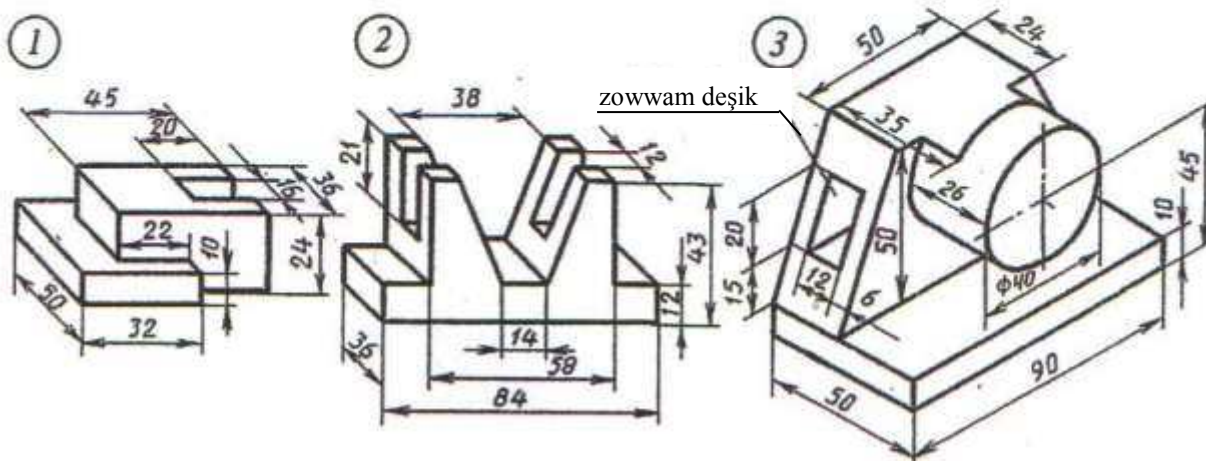
Wariant-lar	Ölçegler mm.									
	d	d <sub>1</sub>	d <sub>2</sub>	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	m	l	l <sub>1</sub>
28	40	50	60	45	45	50	65	40	60	45
29	60	40	40	65	60	50	70	56	55	55
30	50	60	50	40	50	70	70	45	50	60

Geometriki jisimleri üç proyeksiýalarda gurmaly (ýokardaky çyzgyda). Olaryň üstlerindäki nokatlaryň proyeksiýalaryny tapmaly. Ýerine ýetirilen çyzgylaryň esasynda aksonometriýasyny gurmaly.

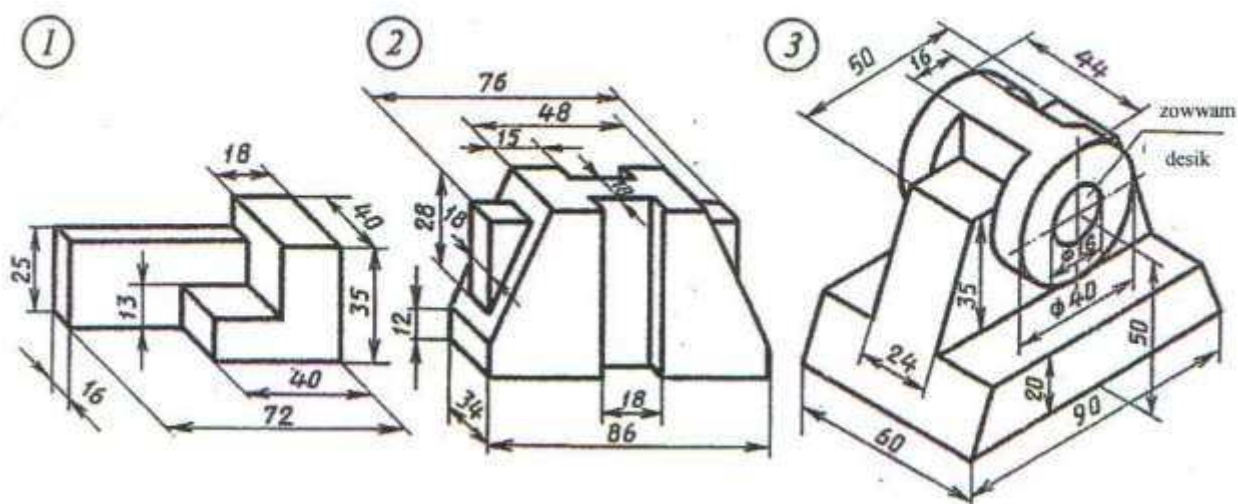
Aşakdaky çyzgyda özara ýerleşişleri gorizontaly proyeksiýada we izometriki proyeksiýada görkezilen geometriki jisimleriň toparyny üç proyeksiýada gurmaly.

# YUMUŞ 35

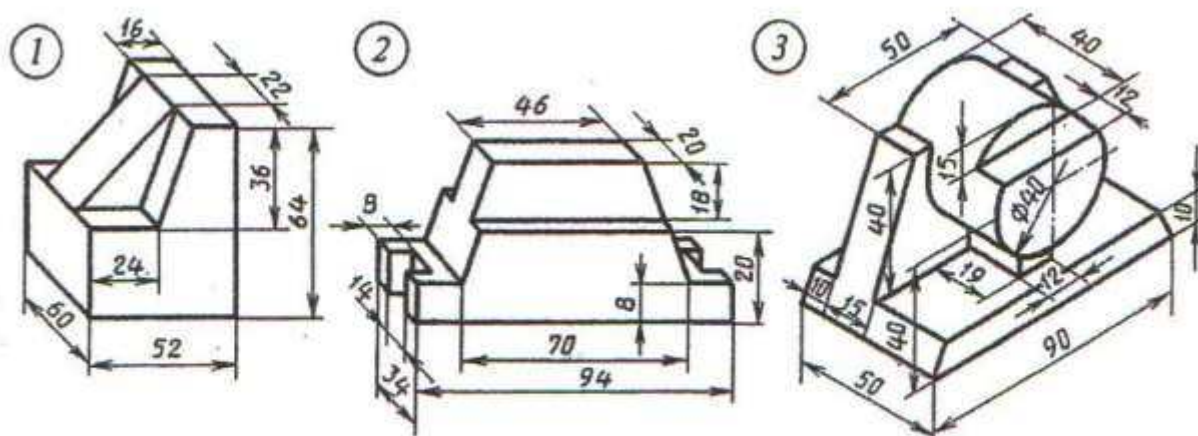
Wariant 1



Wariant 2



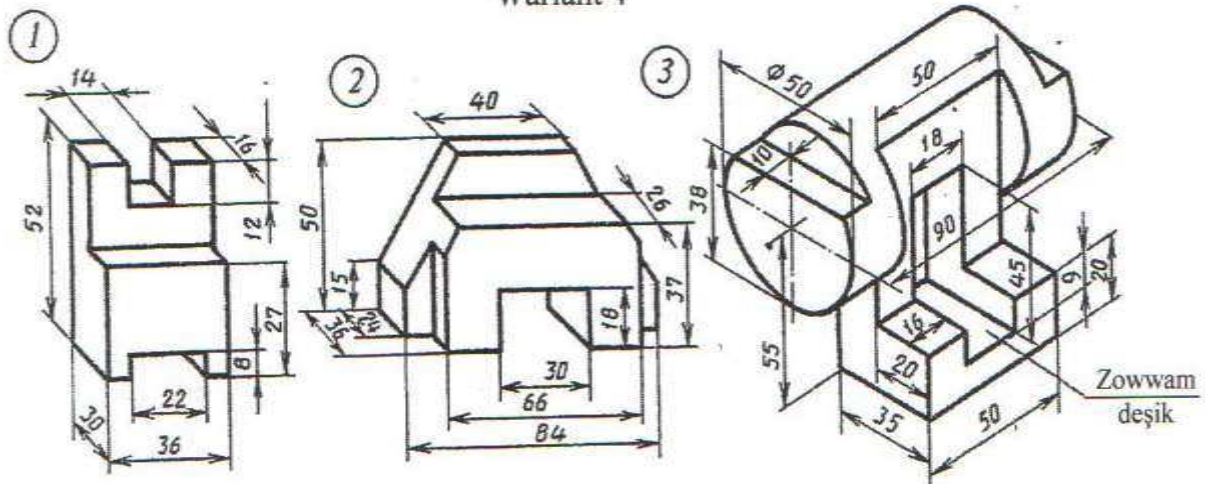
Wariant 3



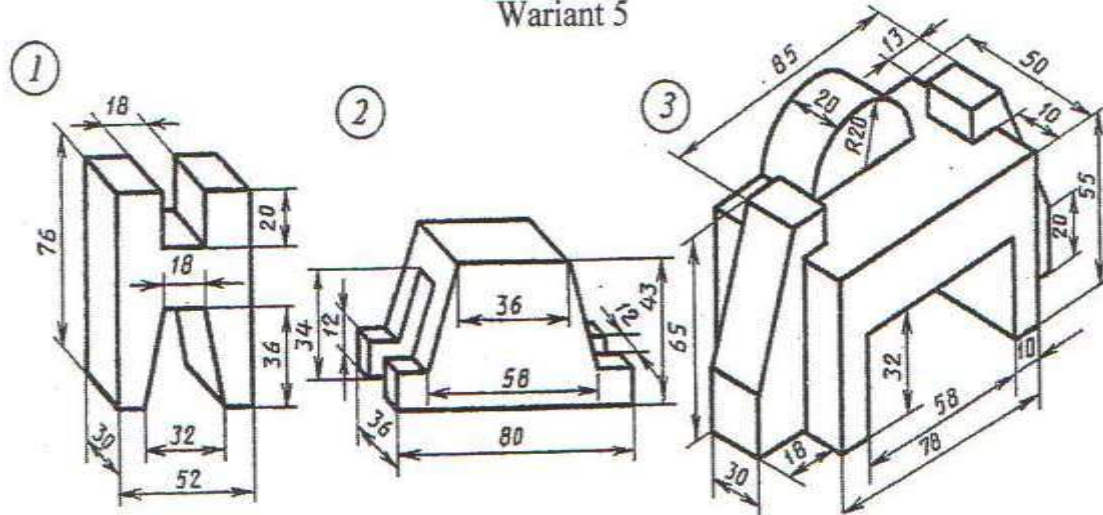
Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).



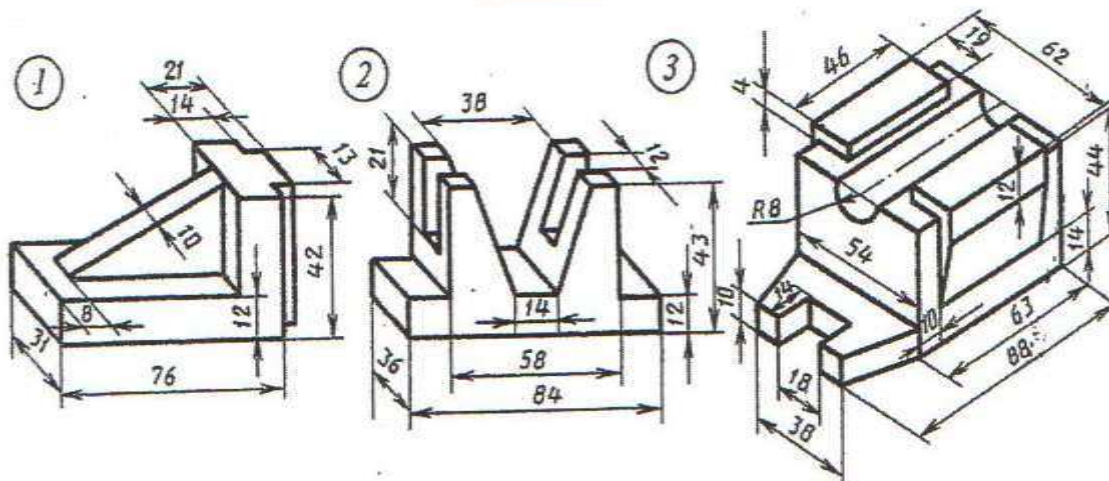
Wariant 4



Wariant 5



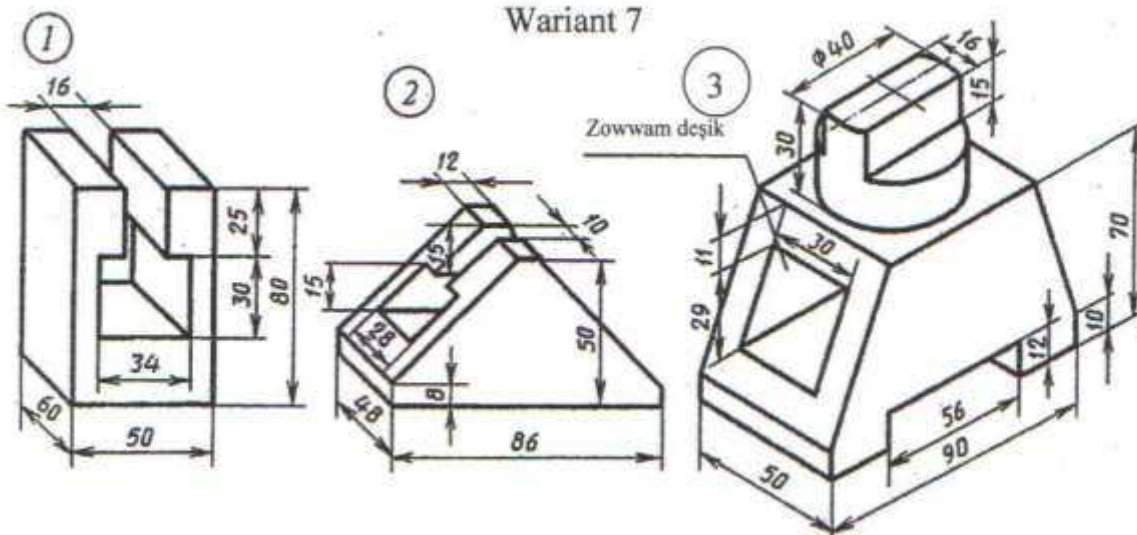
Wariant 6



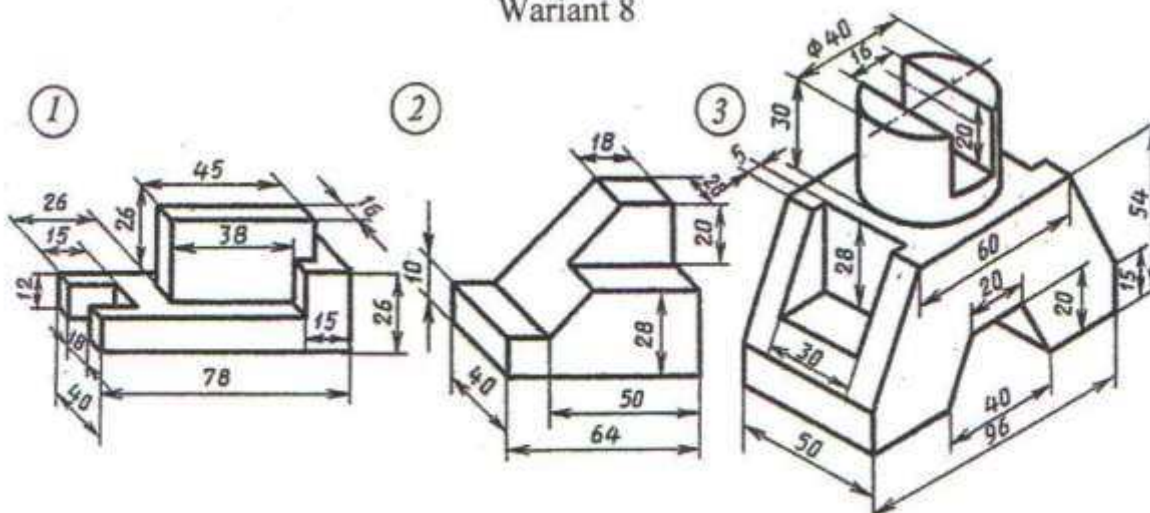
Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).



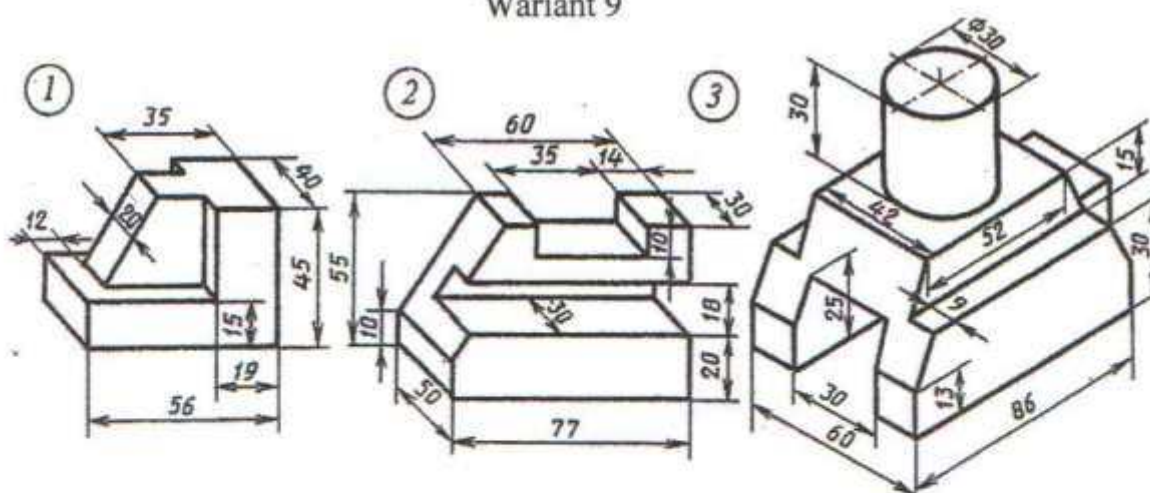
Wariant 7



Wariant 8



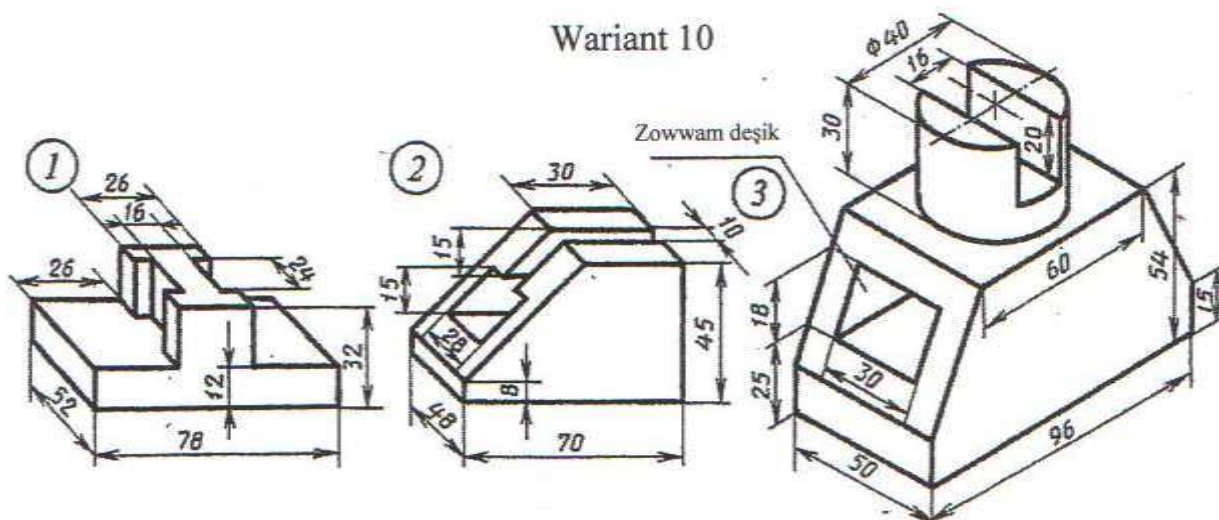
Wariant 9



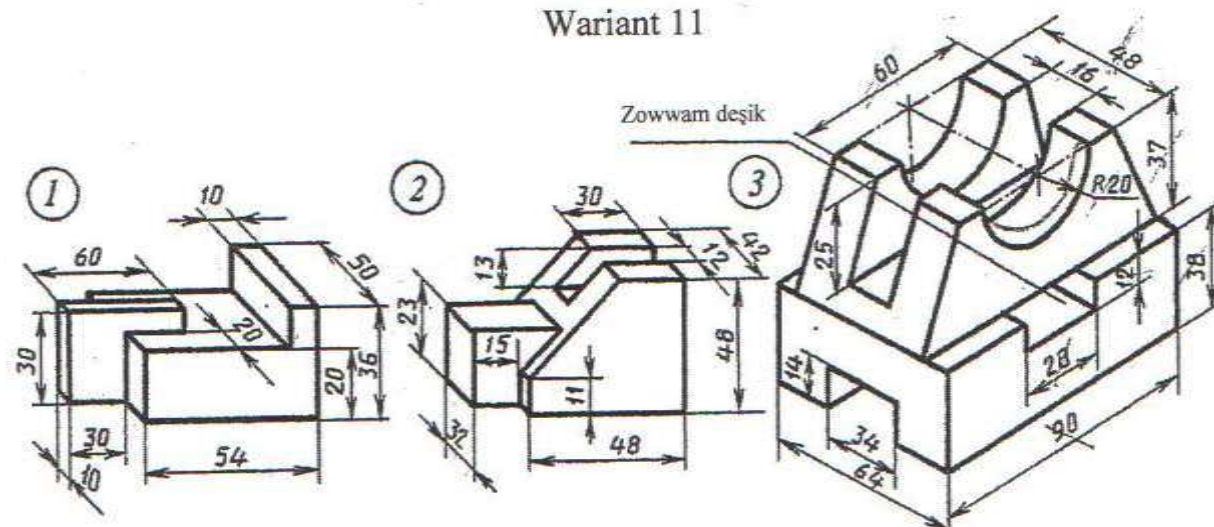
Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).

# Ўмуш 35

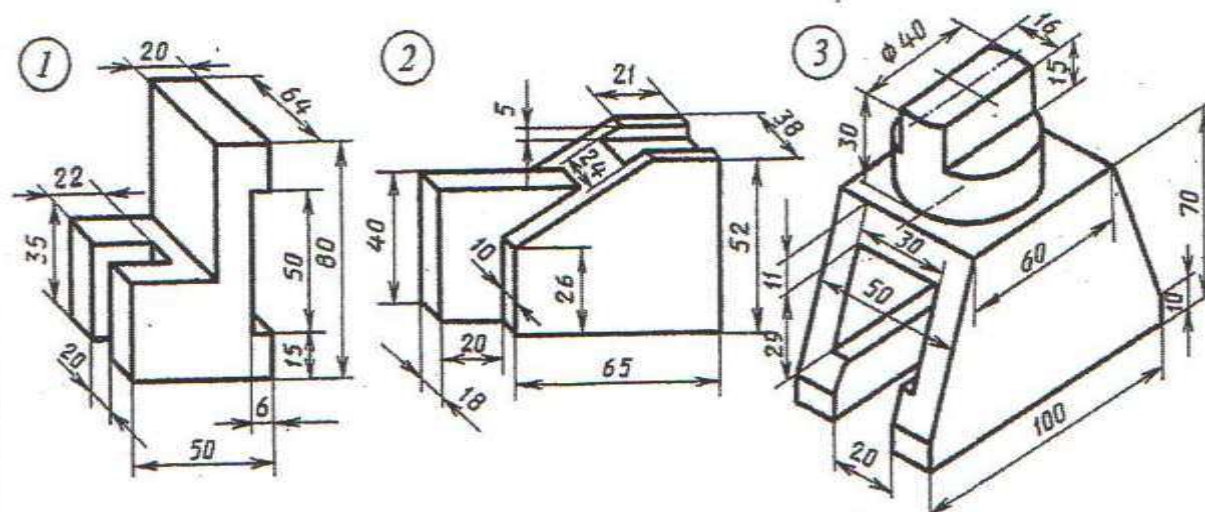
Wariant 10



Wariant 11



Wariant 12

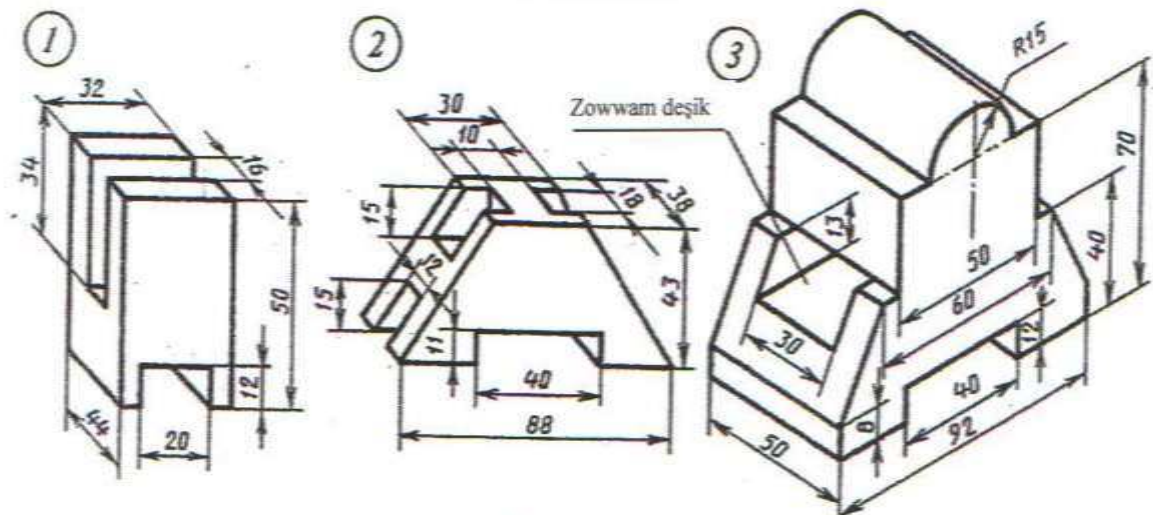


Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).

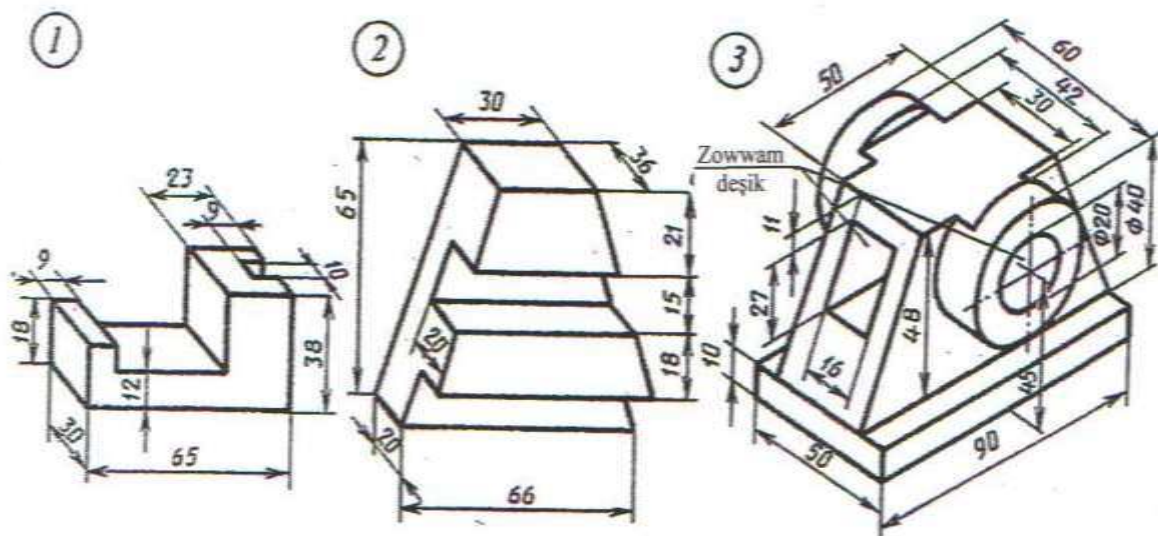


Yumuş 35

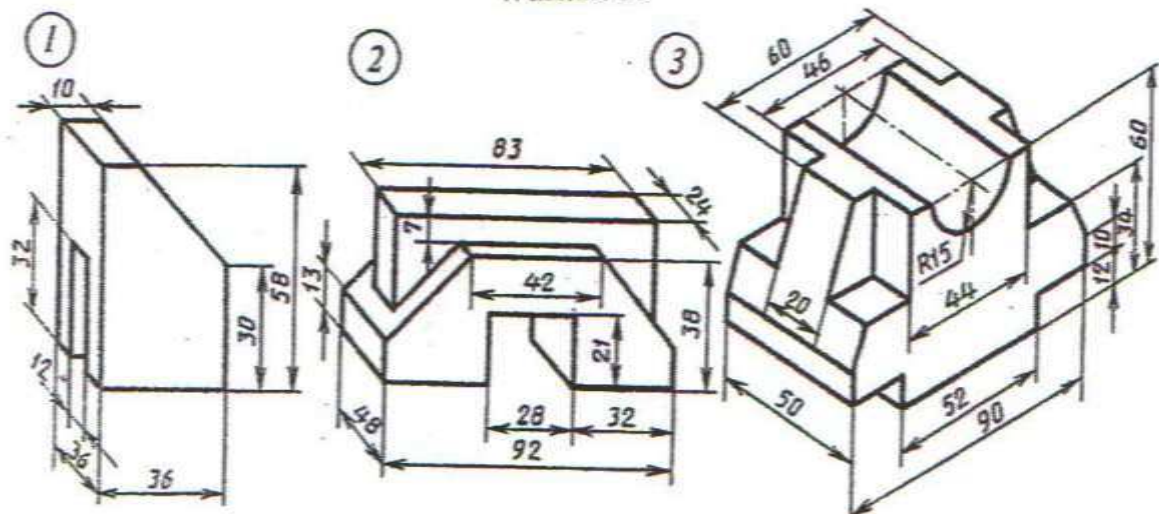
### Warant 13



### Warant 14



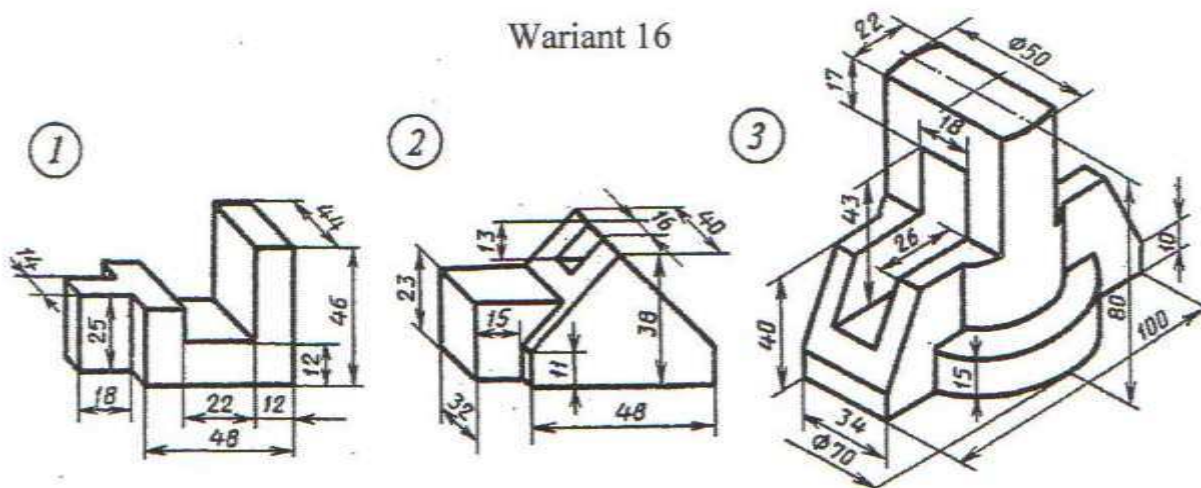
### Warant 15



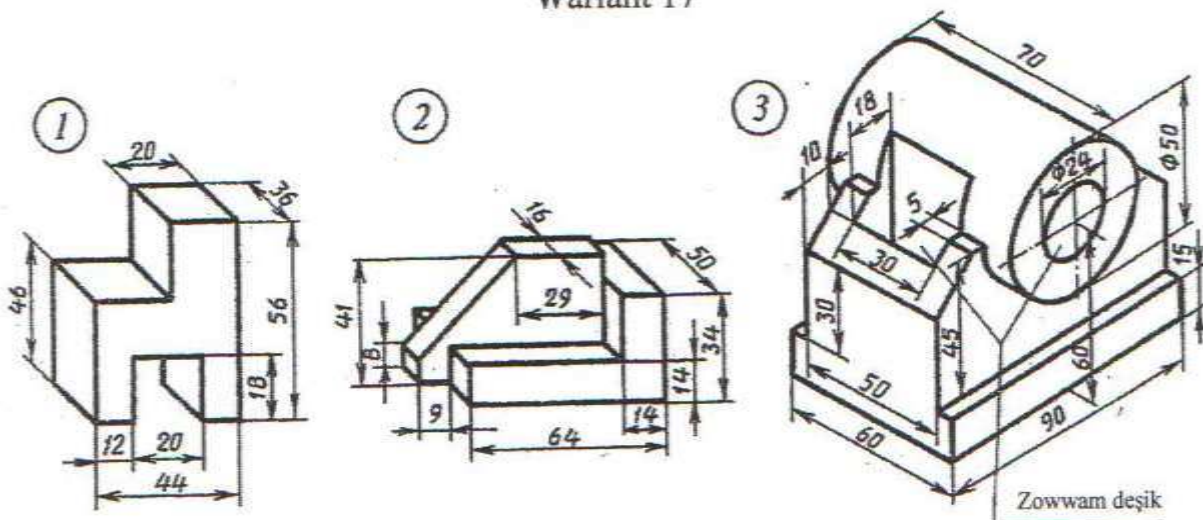
Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).



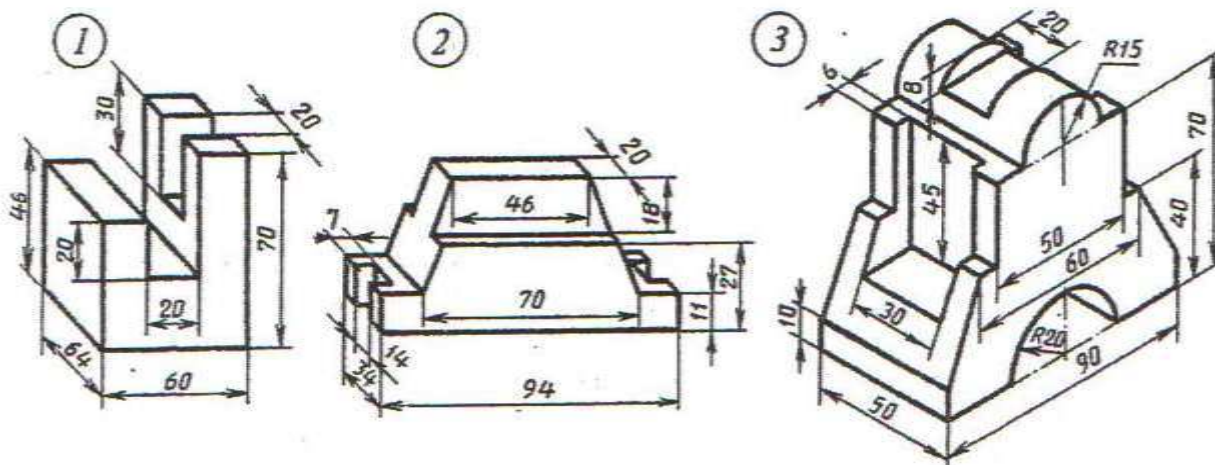
Wariant 16



Wariant 17



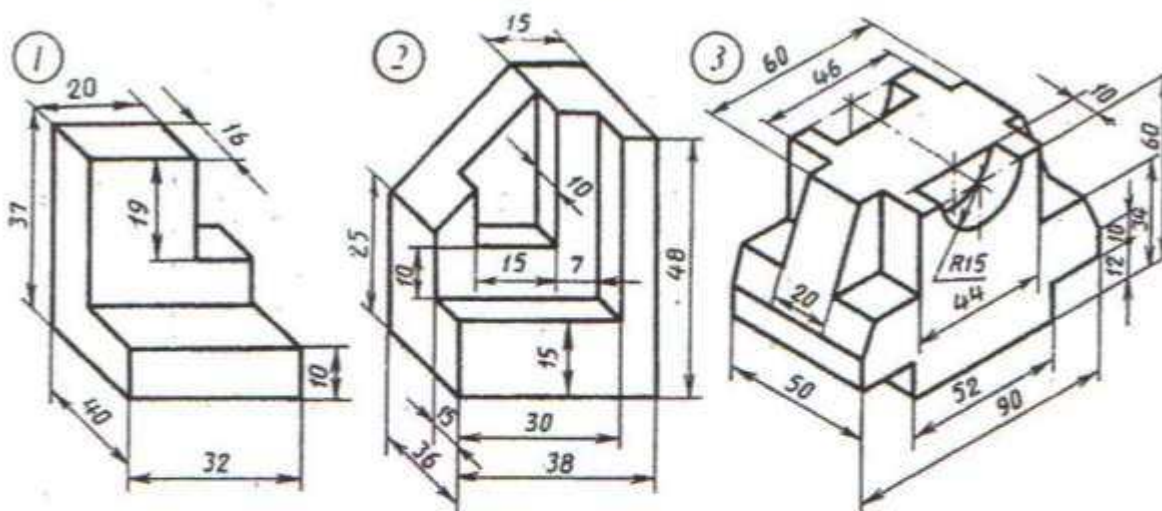
Wariant 18



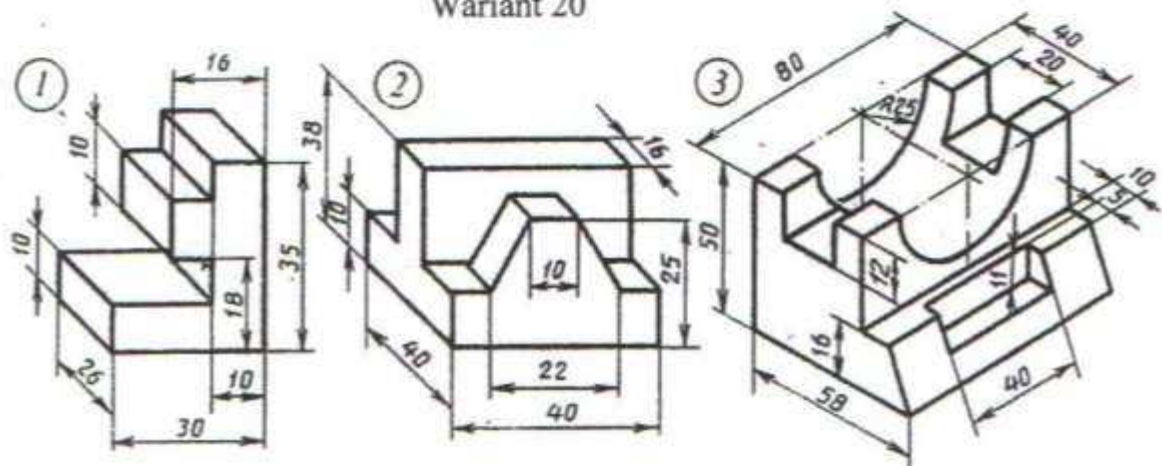
Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).

## Ўмуш 35

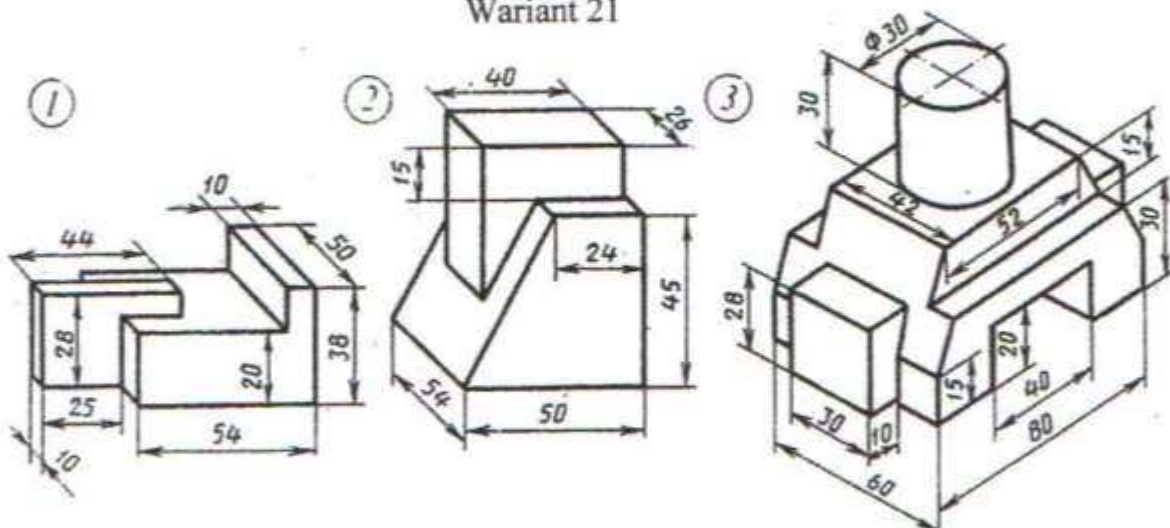
Wariant 19



Wariant 20



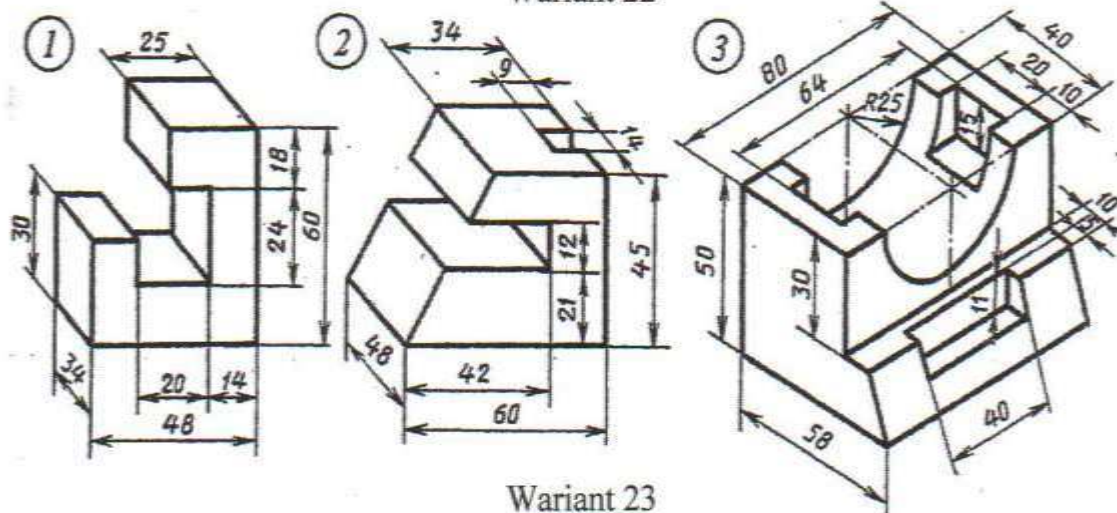
Wariant 21



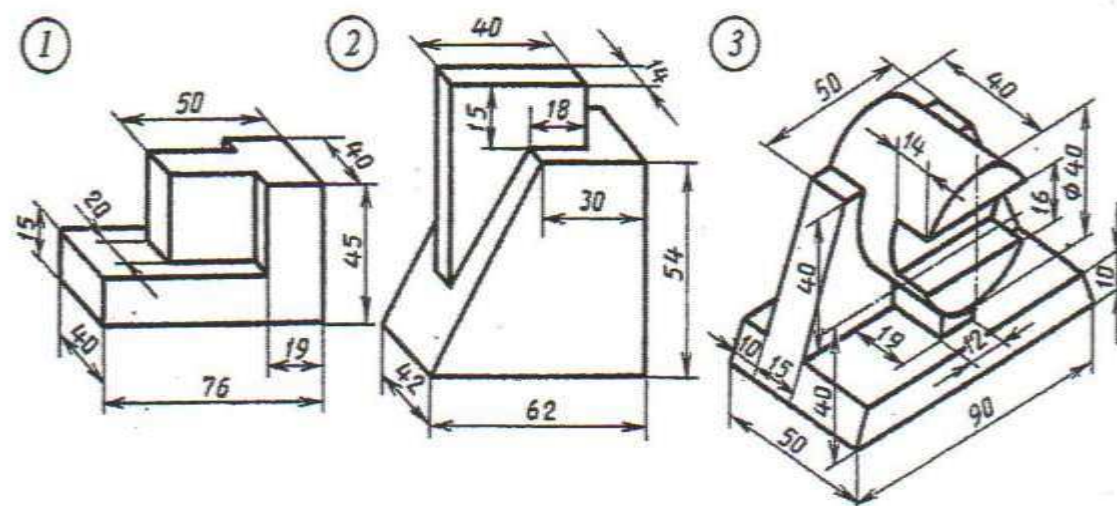
Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).



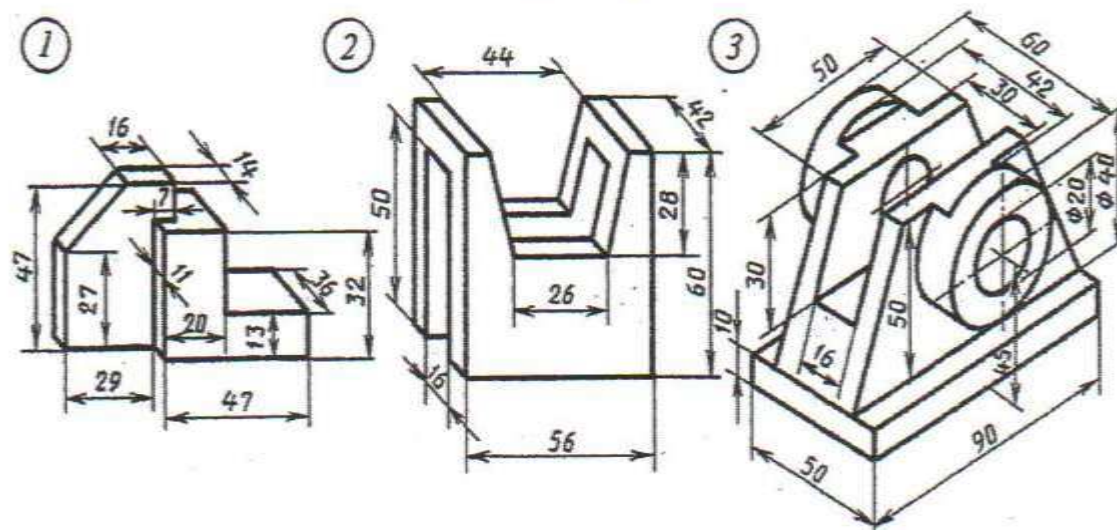
Wariant 22



Wariant 23



Wariant 24

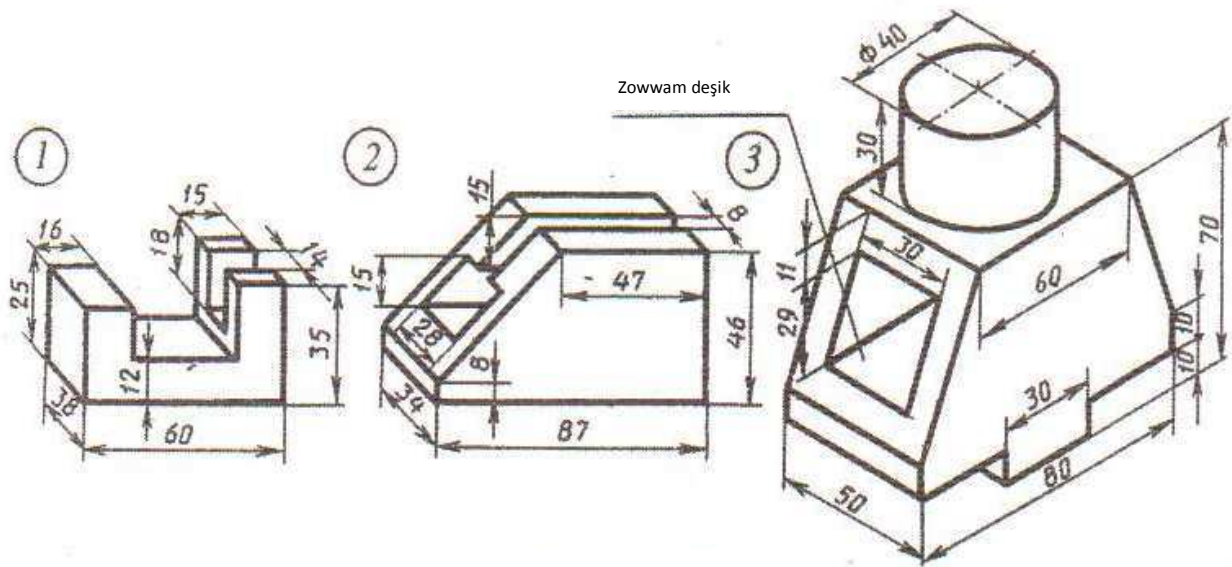


Nusganyň aksonometriki proyeksiýasy esasynda ýerine ýetirmeli (üç proyeksiýasyny gurmaly we ölçeglerini goýmaly).

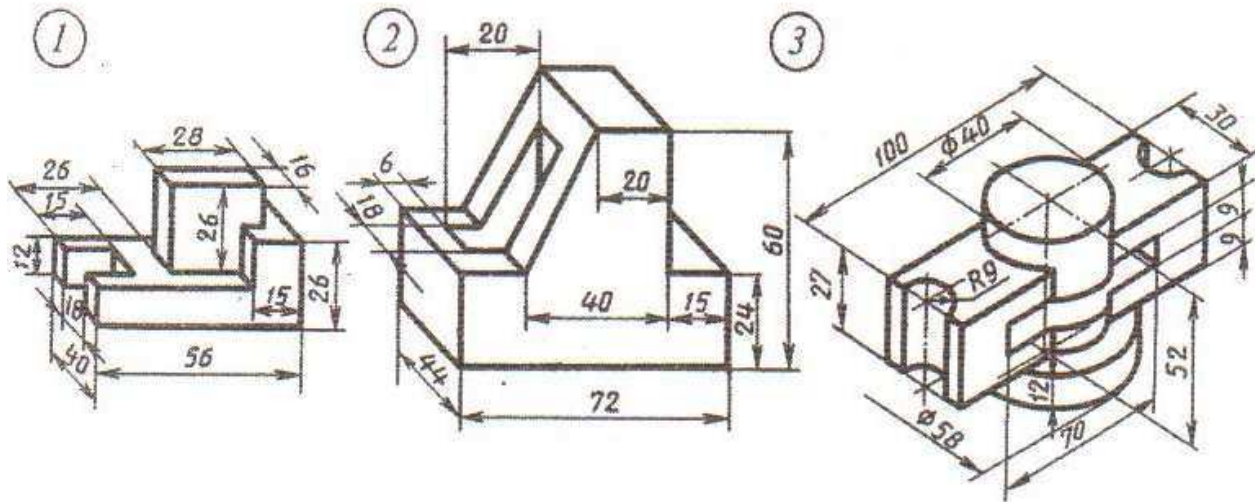


# Ýumuş 35

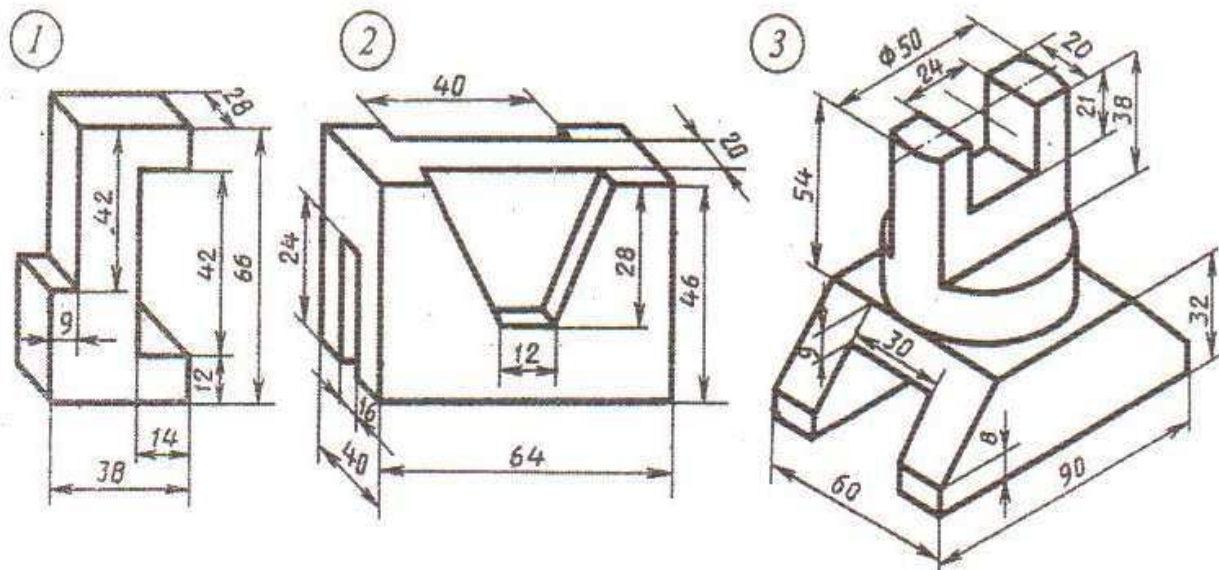
Wariant 25



Wariant 26



Wariant 27







## 12. Figuralaryň tekizlikler bilen kesigi we olaryň üstleriniň ýazgyny

Şaýlar köp halatlarda dürli geometriki figuralaryň tekizlik bilen kesişmesi görnüşine eýe bolýar.



48-nji surat

48-nji suratda göni töwerek konusyň, kesiginiň mysaly berlen. Bu separatoruň gapagy, ol ýuka list metaldan kebşirlenip ýasalan gurnama bolmak bilen iki konusdan durýar.

Iki konus hem konuslaryň okuna ýapgyt ýerleşen frontal proyektirleýji tekizlik bilen kesilen.

Şeýle tekizlikleriň proyeksiýalaryny gurmaklyk, maşyn şaýlarynyň we gurallaryň çyzgysyny ýerine ýetirmekde ýygý-ýygýdan gabat gelýär.

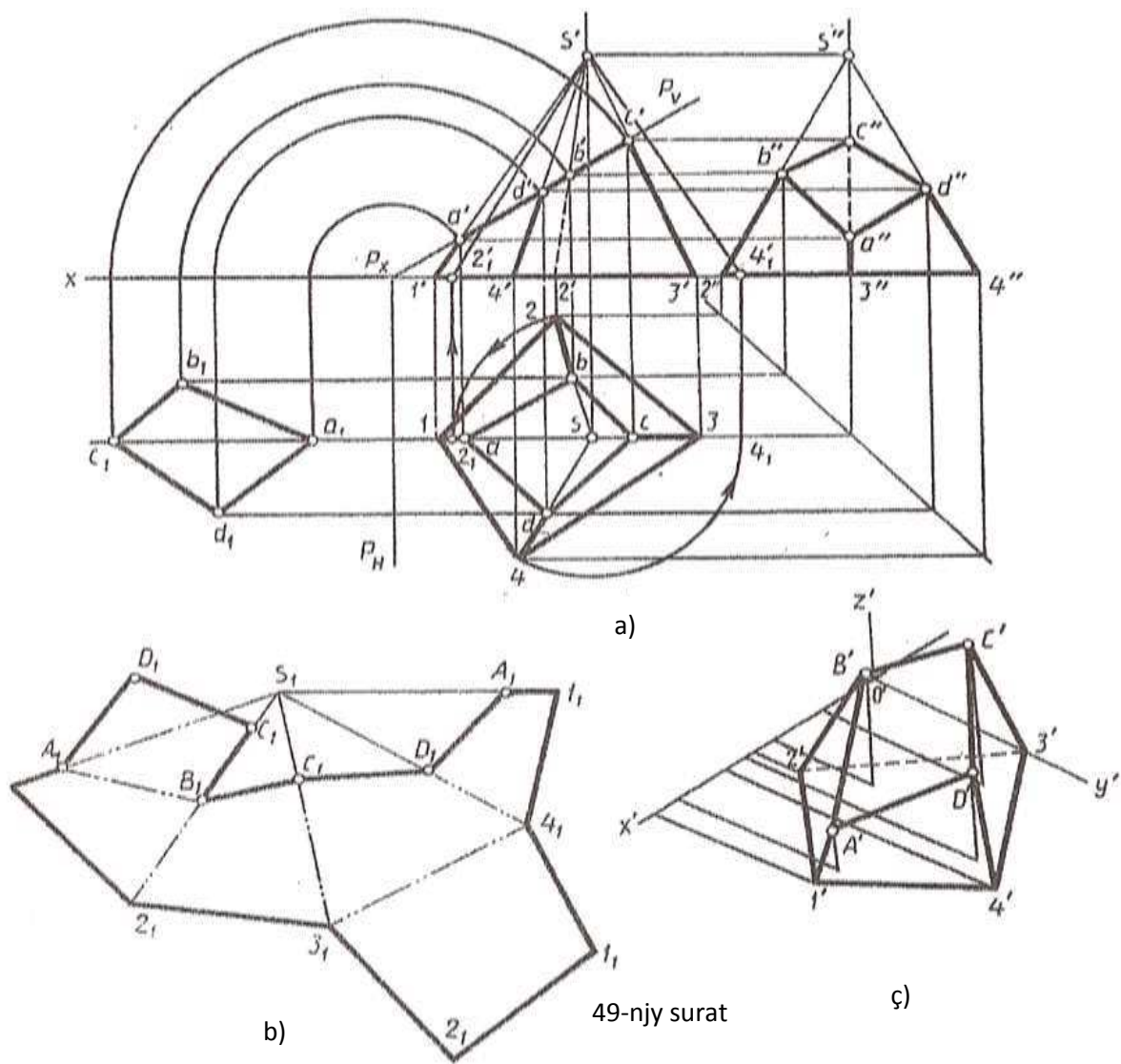
Kähalatlarda içi boşlukly şaýlaryň üstleriniň ýazgynyny gurmak gerek bolýar. Mysal üçin: list materialdan ýasalan içi boşlukly detalyň biçimini almakda şeýle şaýlardan köplenç dürli turbageçirijileri, howany arassalaýjy gurluşy, mehanizmleriň gapaklaryny, stanoklaryň germewlerini we ş.m. görkezmek bolar.

**36...42 ýumuşlarda** geometriki figuralaryň proyektirleýji tekizlik bilen kesiginiň üç proyeksiýada kompleks çyzgysyny gurmaklyk, şeýle hem olaryň aksonometriýa proyeksiýasyny we üstleriniň ýazgynyny gurmaklyk göz önünde tutulýar.

49-njy suratda dörtburçly piramidanyň frontal proyektirleýji tekizlik bilen kesilişi görkezilen. Ýazgyn şekili gurmak üçin piramidanyň gapyrgasynyň hakyky uzynlygyny bilmek gerek.

49-njy e surtdaky piramidanyň kompleks çyzgysyndan onuň S2 we S4 gapyrgasyndan galanlarynyň hakyky uzynlygyny kesgitlep bolýar. Bu ýerde S1 we S3 gapyrgalar frontal tekizlikde öz hakyky uzynlygynda bolmak bilen galan gapyrgalarynyň hakyky ululygyny tapmak üçin piramidanyň depesiniň daşyndan frontal şekiller tekizligine parallel bolýança aýlamaly. Şeýle aýlamanyň nestijesinde S2 we S4 gapyrgalar frontal şekiller tekizligine hakyky ululyklarynda proyektirlenerler.





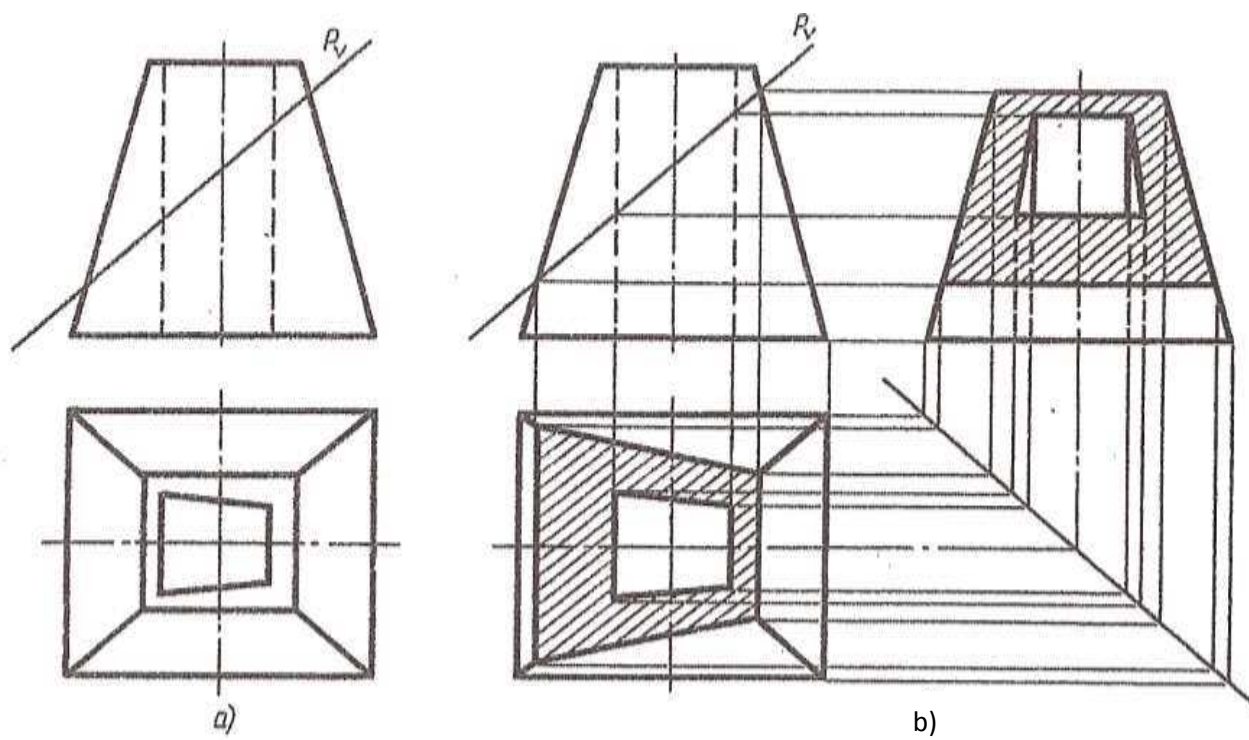
49-njy surat

Kesigiň suduryňň ýazgynynyň hakyky ululygyny gurmak üçin ölçegleri dürli usullardan peýdalanyp tapmak bolar (49-njy a suratda ol şekiller tekizligini çalşyrmak usuly boýunça tapylan).

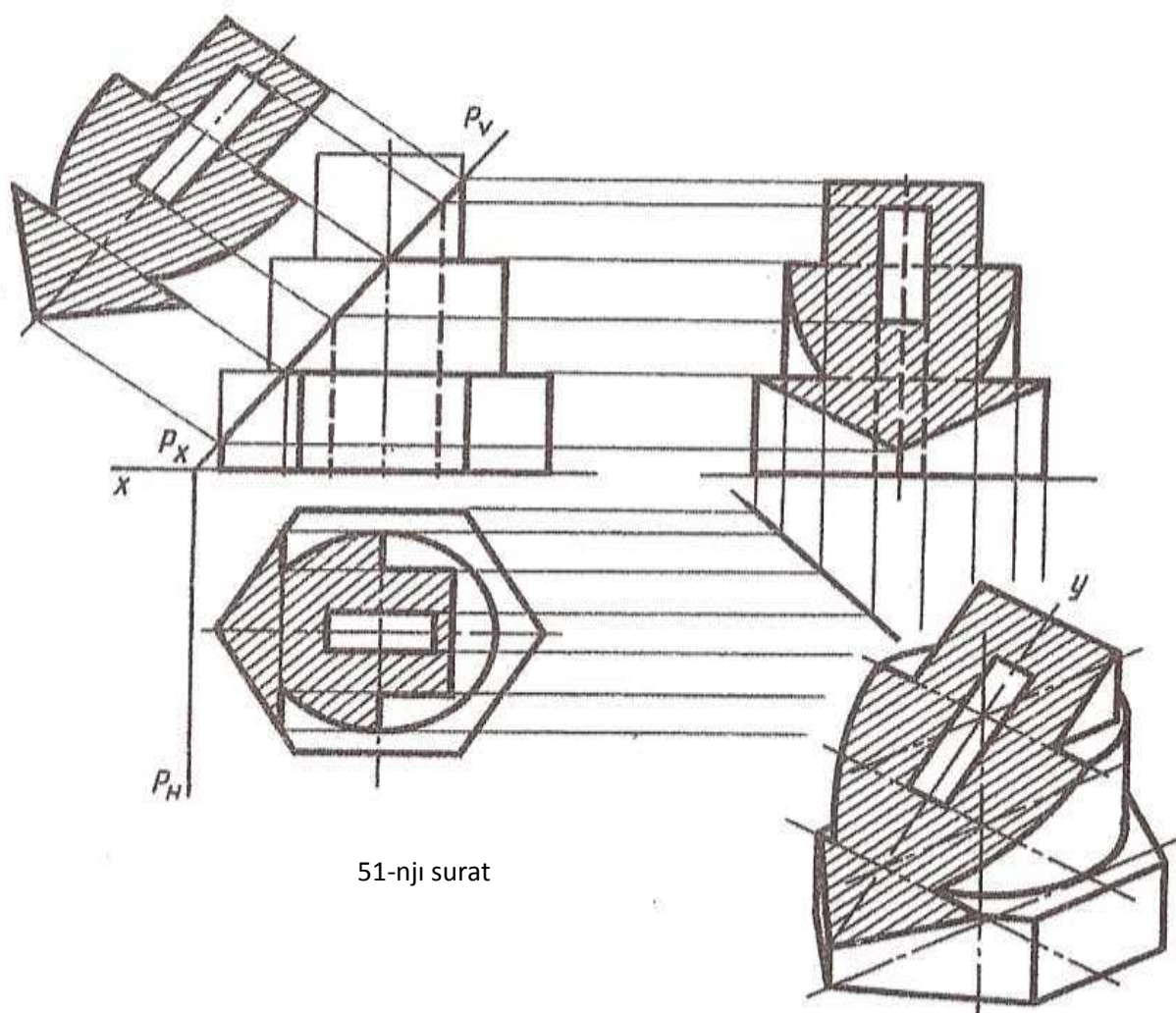
Geometriki figuralar üçin aksonometriki oklaryň ýagdaýlary saýlap alnanda, aksonometriki proyeksiýany gurmaklyk has sada bolar ýaly saýlanyp alynmaly. 49-njy b suratda kesilen piramidanyň her bir depesiniň koordinatalaryna baglylykda aksonometriki proyeksiýasy gurlan. Depeleriniň aksonometriki proyeksiýalaryny birikdirmek bilen kesilen piramidanyň aksonometriki proyeksiýasy alnar.

**43 we 44 ýumuşlarda** kesilen içi boşlukly geometriki figuralaryň üç proyeksiýasyny gurmaklygy tamamlamak teklipe edilýär.

50-nji a, b suratlarda 43 ýumuşy ýerine ýetirmegiň mysaly 51-nji suratda 44 ýumuşyň ýerine ýetirilişiniň mysaly berlen. Aksonometriki proyeksiýa mugallymyň garamagynda ýerine ýetirilýär.

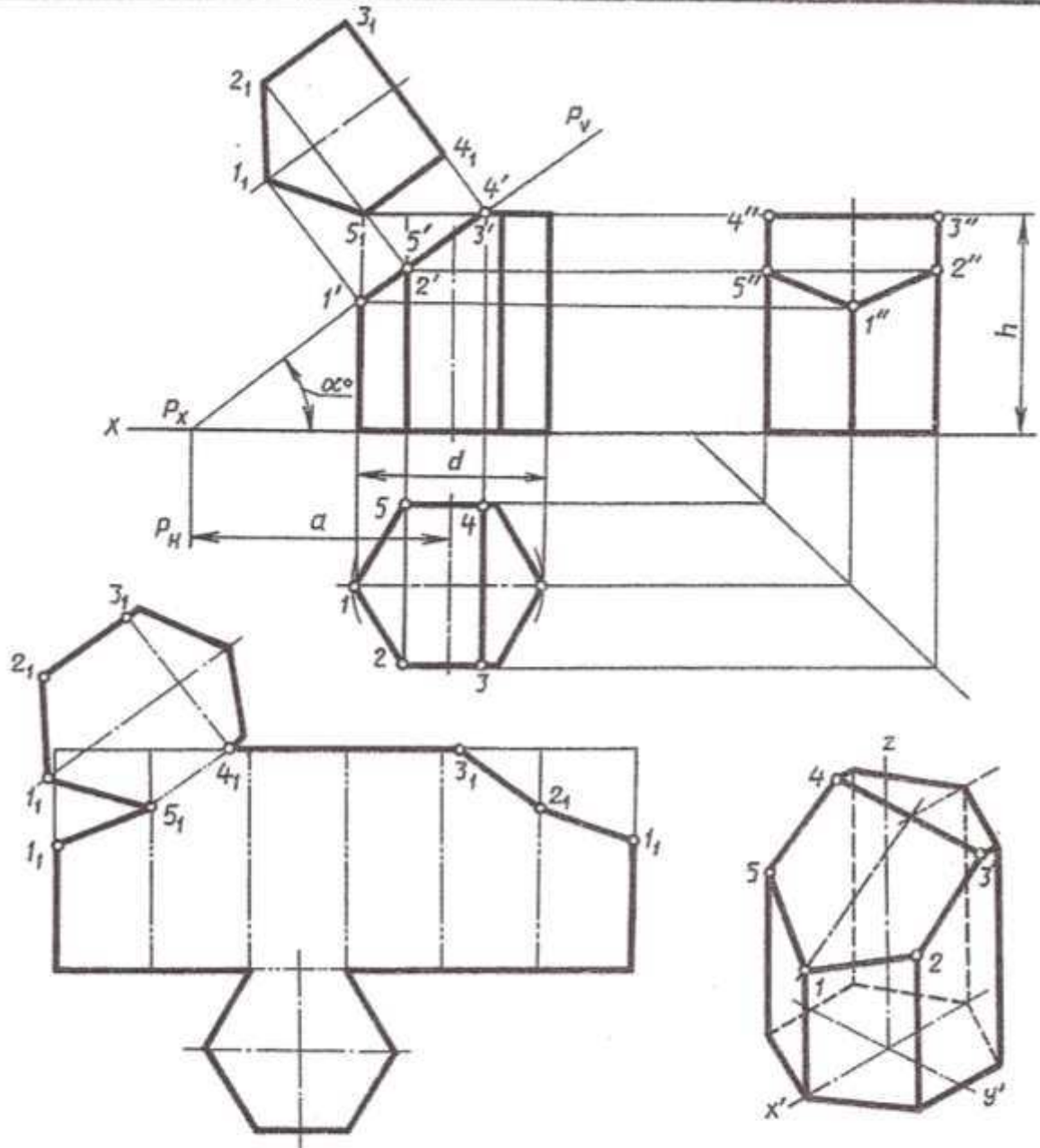


50-nji surat



51-nji surat

# YUMUŞ 36



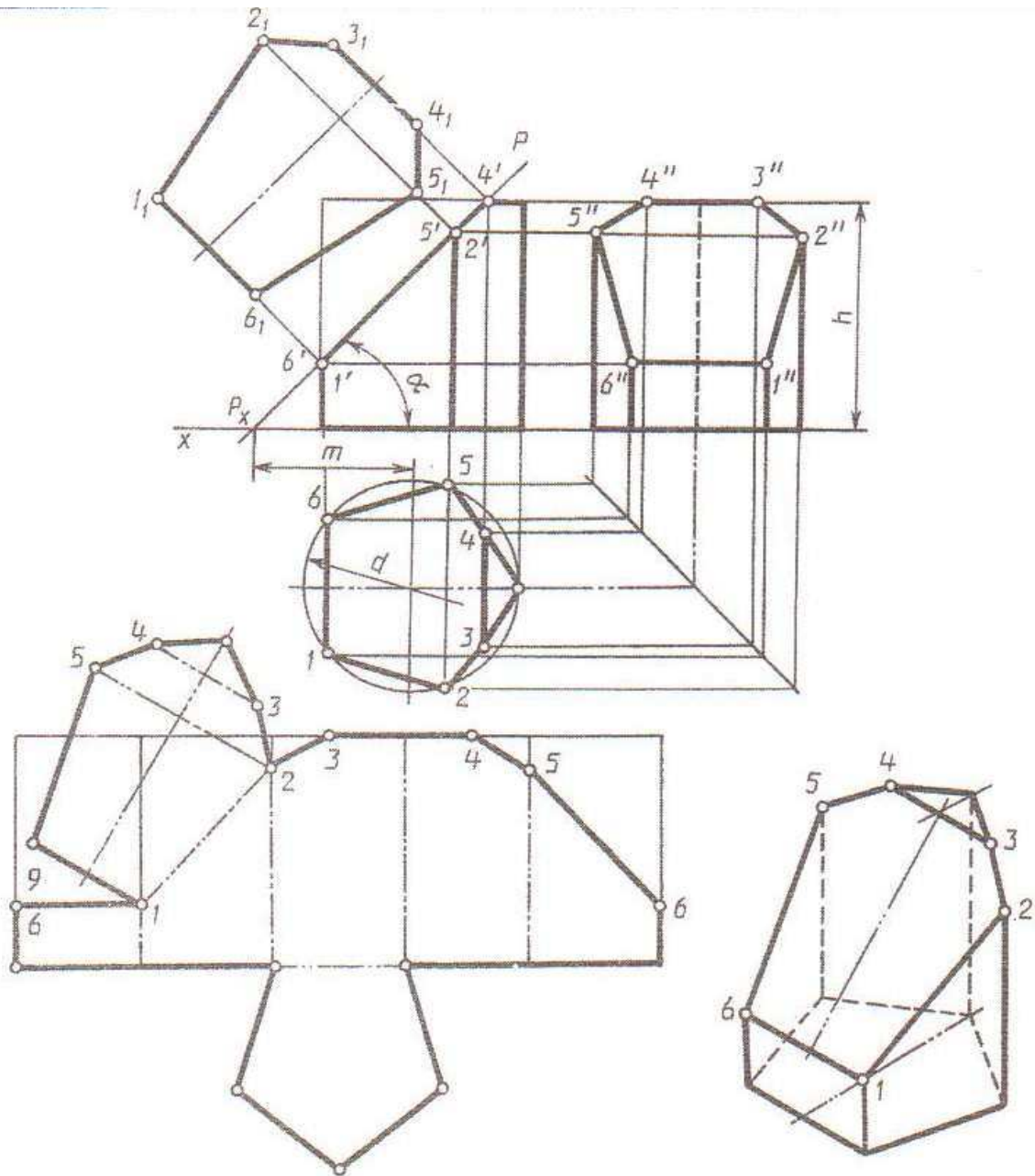
Belgile mek	variantlar														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
d	50	55	60	50	56	60	52	55	60	54	55	62	50	56	60
h	55	60	65	56	62	65	55	60	70	56	62	65	55	60	70
a	37	60	46	38	66	42	36	66	35	38	65	40	37	60	35
$\alpha^\circ$	45	30	45	45	30	45	45	30	45	45	30	45	45	30	45

Belgile mek	variantlar														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	52	55	58	50	56	60	54	55	58	52	56	60	50	55	58
h	56	62	75	55	60	65	56	72	65	54	60	70	55	80	66
a	38	62	40	37	60	44	38	72	46	36	60	35	38	72	40
$\alpha^\circ$	45	30	45	45	30	45	45	30	45	45	30	45	45	30	45



# YUMUŞ 37

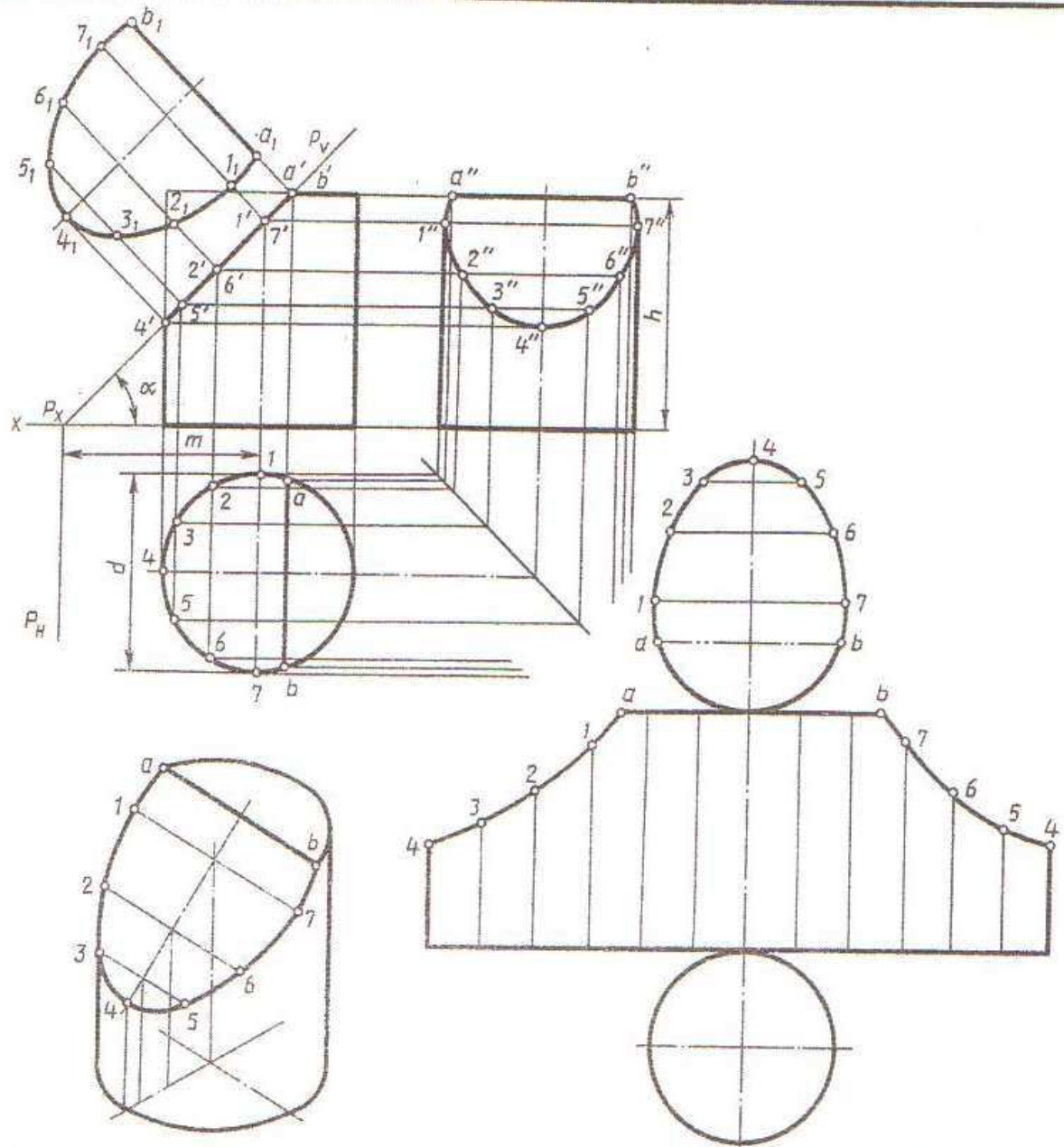


Belgile mek	variantlar														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
d	58	60	58	60	56	60	56	60	58	60	58	60	56	62	56
h	60	58	72	65	58	60	72	65	60	58	72	65	58	60	72
m	43	60	38	45	42	60	37	45	43	62	38	45	42	60	39
$\alpha^\circ$	45	30	45	45	45	30	45	45	45	30	45	45	45	30	45

Belgile mek	variantlar														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	60	58	60	58	60	56	62	56	60	56	60	58	60	58	62
h	65	60	58	72	65	58	60	72	65	58	60	72	65	60	58
m	45	43	62	38	45	42	60	38	45	42	62	37	45	43	60
$\alpha^\circ$	45	45	30	45	45	45	30	45	45	45	30	45	45	45	30

# YUMUŞ 38

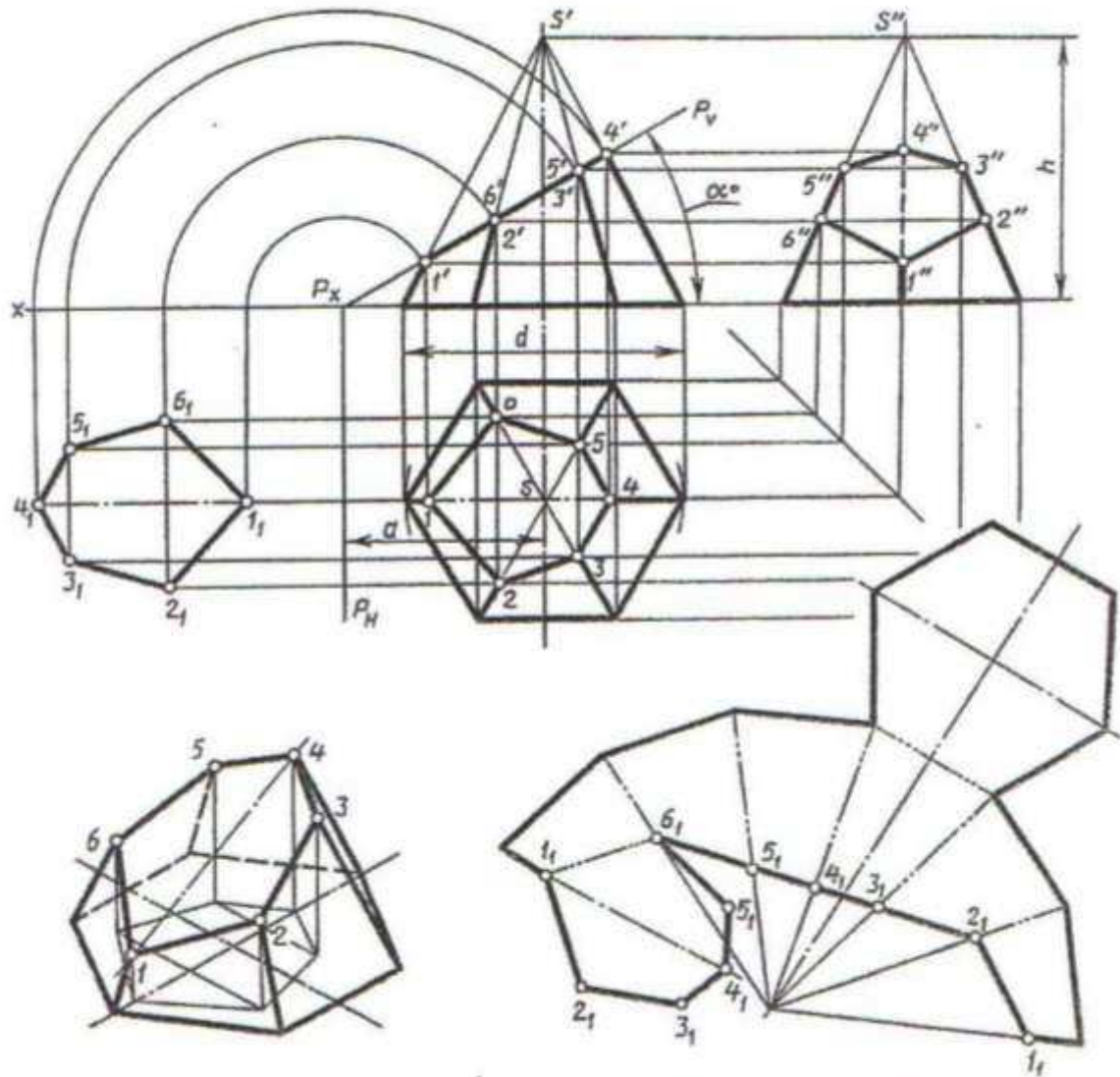


Belgile mek	variantlar														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
d	60	58	54	62	60	58	54	62	60	58	54	62	60	58	54
h	70	65	72	68	70	65	72	68	70	65	72	68	70	65	72
m	32	42	40	33	32	42	40	33	32	42	40	33	32	42	40
$\alpha^\circ$	60	45	45	60	60	45	45	60	60	45	45	60	60	45	45

Belgile mek	variantlar														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	62	60	58	54	62	60	58	54	62	60	58	54	62	60	58
h	68	70	65	72	68	70	65	72	68	70	65	72	68	70	65
m	33	32	42	40	33	32	42	40	33	32	42	40	33	32	42
$\alpha^\circ$	60	60	45	45	60	60	45	45	60	60	45	45	60	60	45





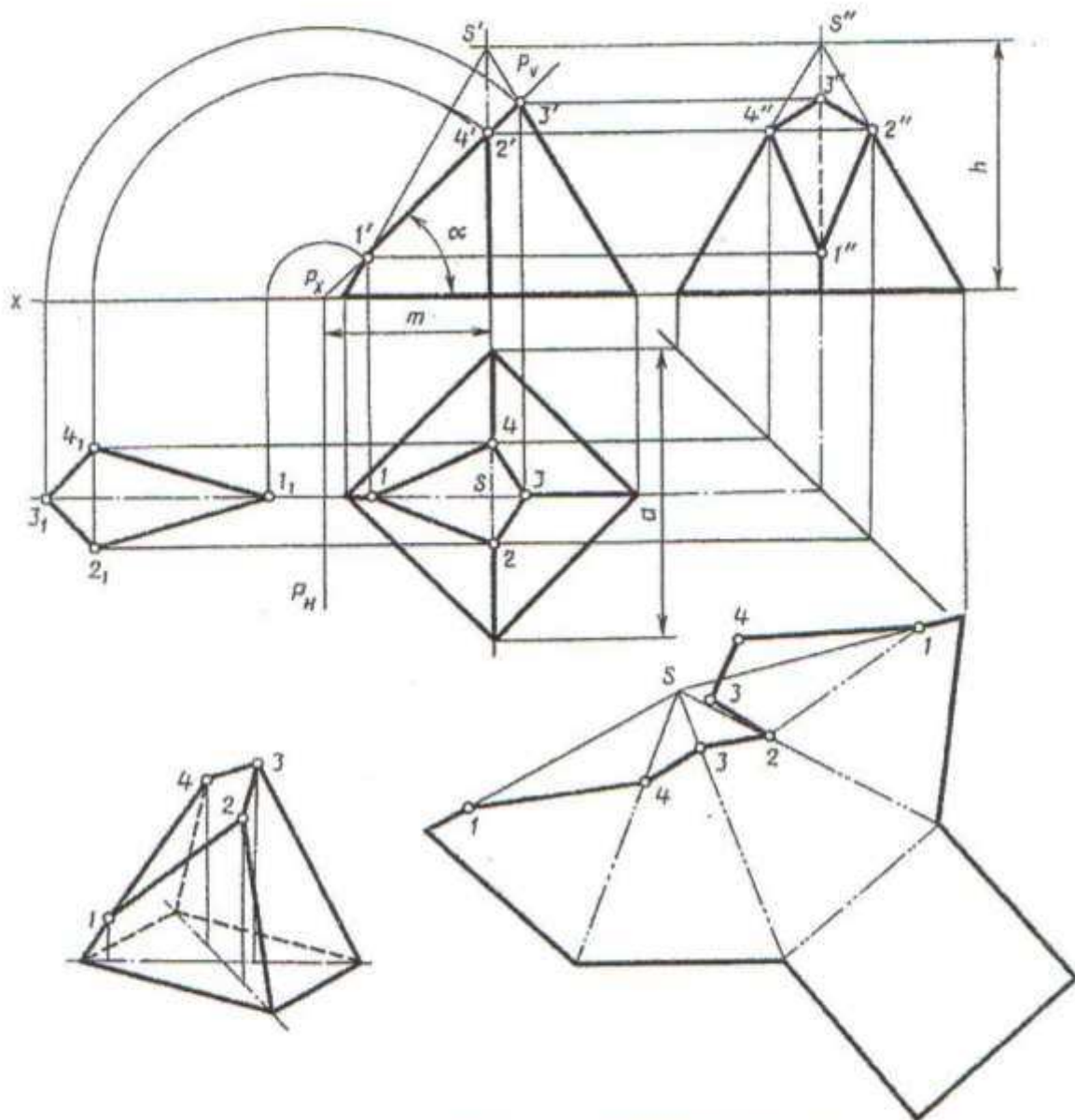
Belgi- lemek	variantlar														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$h$	65	70	60	65	65	70	60	65	65	70	60	65	65	70	60
$d$	70	55	60	65	50	55	60	65	60	55	60	65	50	55	60
$a$	45	30	30	36	45	30	33	35	45	30	30	38	45	30	30
$\alpha^\circ$	30	45	45	45	30	45	45	45	30	45	45	45	30	45	45

Belgi- lemek	variantlar														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
$h$	65	65	70	60	65	65	70	60	65	65	70	60	65	65	70
$d$	65	50	55	60	65	65	55	60	65	50	55	60	65	65	55
$a$	35	45	30	30	38	45	30	30	38	45	30	30	33	45	30
$\alpha^\circ$	45	30	45	45	45	30	45	45	45	30	45	45	45	30	45

Kesilen piramidanyň çyzgysyny ýerine ýetirmeli. Şekiliň suduryň kesiginiň hakyky ululygyny tapmaly. Kesilen piramidanyň aksonometriki proyeksiýasyny we üstüniň ýazgynyny gurmaly



# ÝUMUŞ 40



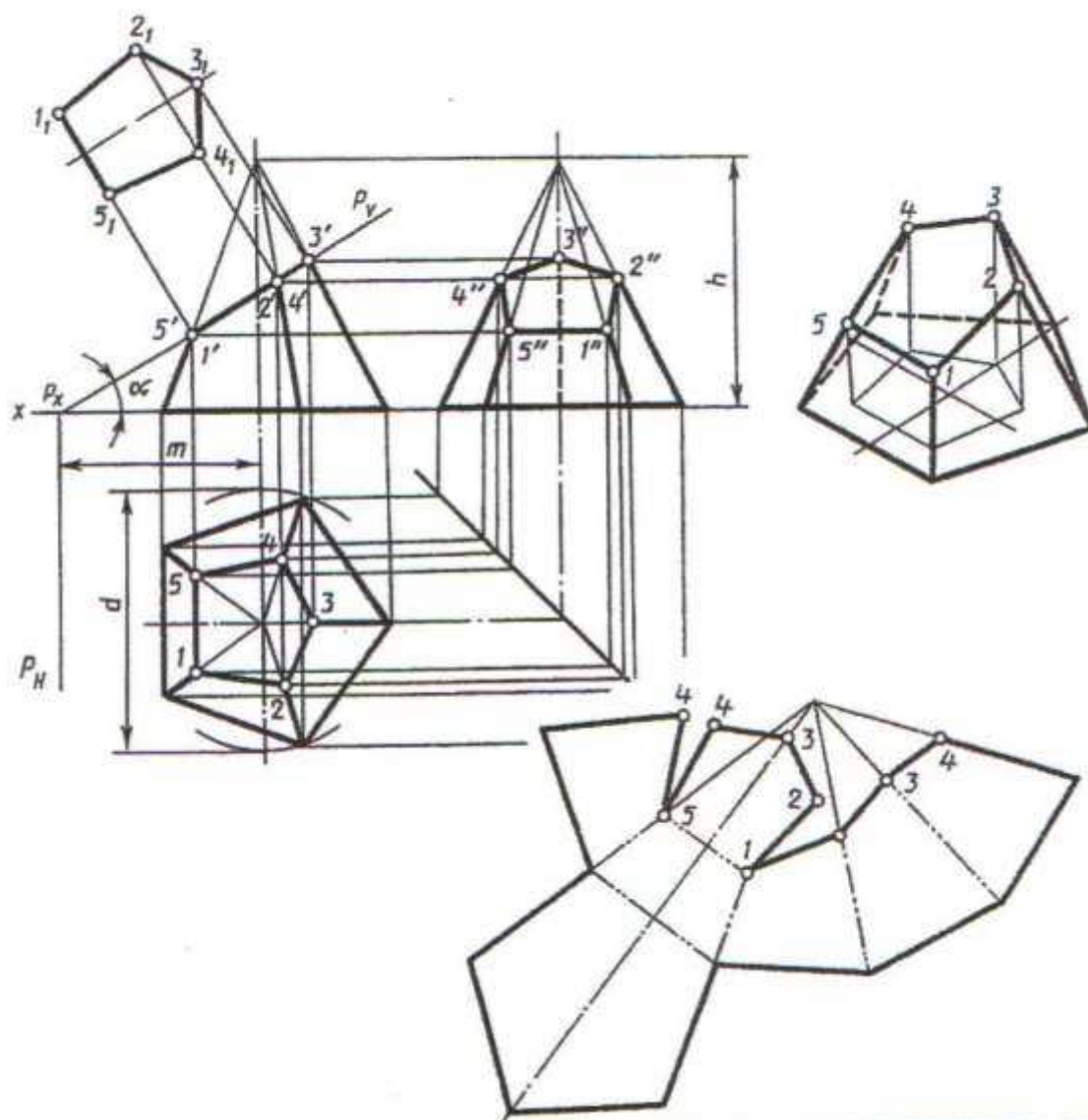
Belgi- lemek	variantlar														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$h$	66	75	80	66	65	75	80	66	65	75	80	66	65	75	80
$d$	70	65	80	76	70	65	80	76	72	65	80	76	70	65	80
$m$	40	35	42	55	40	35	42	55	40	35	43	55	40	35	40
$\alpha^\circ$	45	45	45	30	45	45	45	30	45	45	45	30	45	45	45

Belgi- lemek	variantlar														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
$h$	66	60	75	80	66	60	75	80	66	60	75	80	66	60	75
$d$	76	72	65	80	76	70	65	80	76	72	65	80	76	70	65
$m$	55	42	35	46	55	40	35	46	55	40	35	44	55	40	35
$\alpha^\circ$	45	45	45	45	30	45	45	45	30	45	45	45	30	45	45

Kesilen piramidanyň çyzgysyny ýerine ýetirmeli. Şekiliň suduryň kesiginiň hakyky ululygyny tapmaly. Kesilen piramidanyň aksonometrik projeksiýasyny we üstüniň ýazgynyny gurmaly

# ÝUMUŞ 41



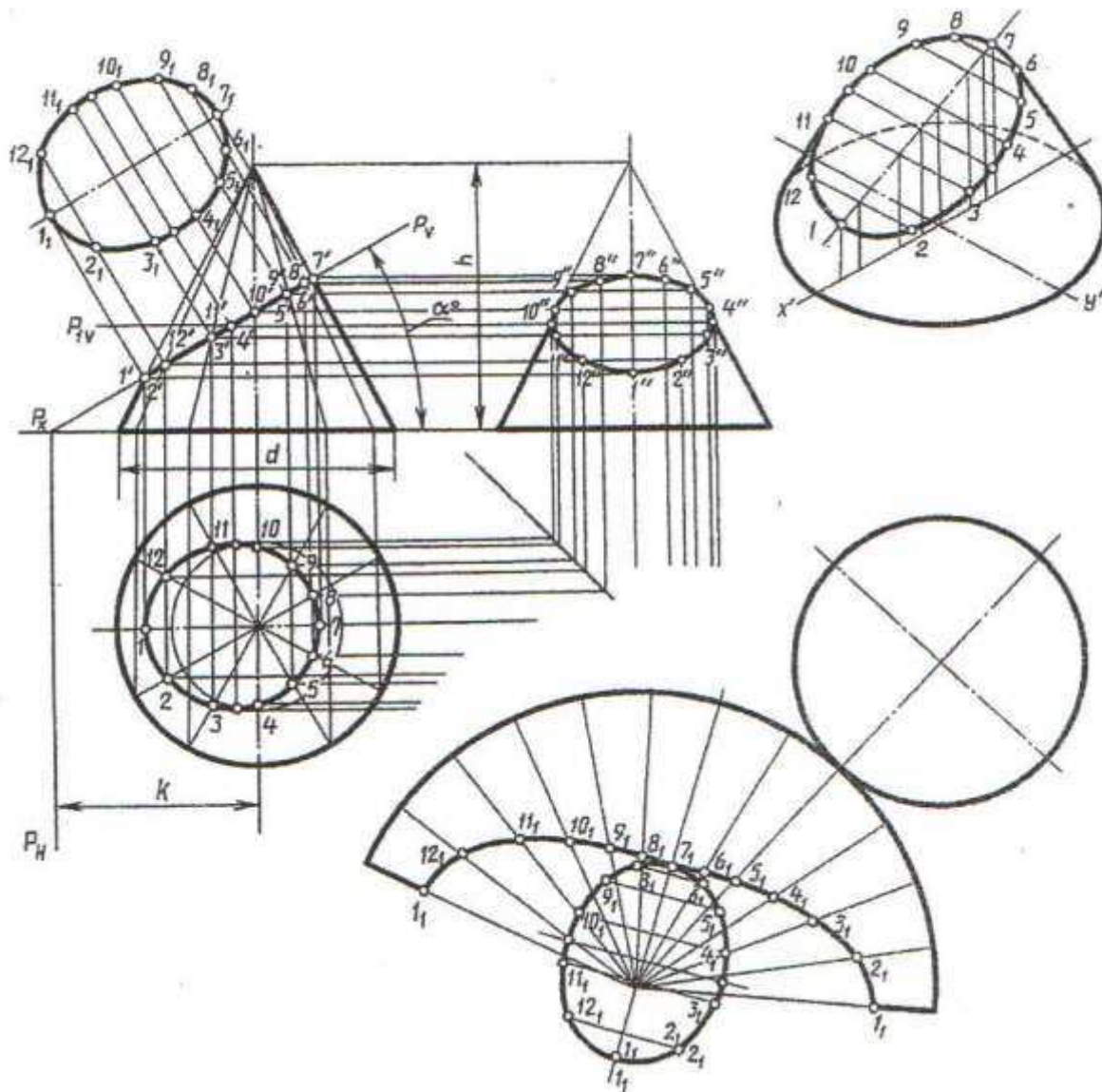
Belgi- lemek	variantlar														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
d	65*	60	62	70	65	60	62	70	65	60	62	70	65	60	63
h	65	64	70	72	64	63	70	72	65	64	70	72	64	65	70
m	50	34	30	33	49	33	46	33	36	35	46	30	49	34	30
$\alpha^\circ$	30	45	45	45	30	45	45	45	45	45	45	45	30	45	45

Belgi- lemek	variantlar														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	70	65	60	62	70	65	60	63	70	65	60	62	70	65	60
h	72	65	63	70	72	65	63	70	72	64	63	70	72	65	63
m	32	50	33	30	30	49	35	30	32	50	34	30	30	49	33
$\alpha^\circ$	45	30	45	45	45	30	45	45	45	30	45	45	45	30	45

Kesilen piramidanyň çyzgysyny ýerine ýetirmeli. Şekiliň suduryň kesiginiň hakyky ululygyny tapmaly. Kesilen piramidanyň aksonometriki proyeksiýasyny we üstüniň ýazgynyny gurmaly





Belgi- lemek	wariantlar														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$d$	60	70	65	62	72	65	60	68	65	62	70	64	62	72	66
$h$	70	65	70	72	66	72	70	64	70	72	65	68	70	66	70
$k$	50	43	45	50	40	40	50	43	40	50	40	40	48	43	40
$\alpha^\circ$	30	45	45	30	45	45	30	45	45	30	45	45	30	45	45

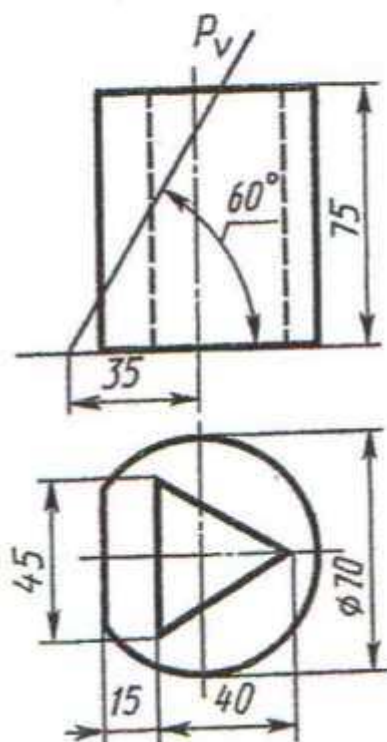
  

Belgi- lemek	wariantlar														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
$d$	60	68	64	62	70	66	60	68	64	62	72	64	60	70	64
$h$	72	65	72	70	66	70	70	65	68	70	64	70	70	65	72
$k$	50	40	40	50	40	40	48	40	45	50	40	40	52	42	45
$\alpha^\circ$	30	45	45	30	45	45	30	45	45	30	45	45	30	45	45

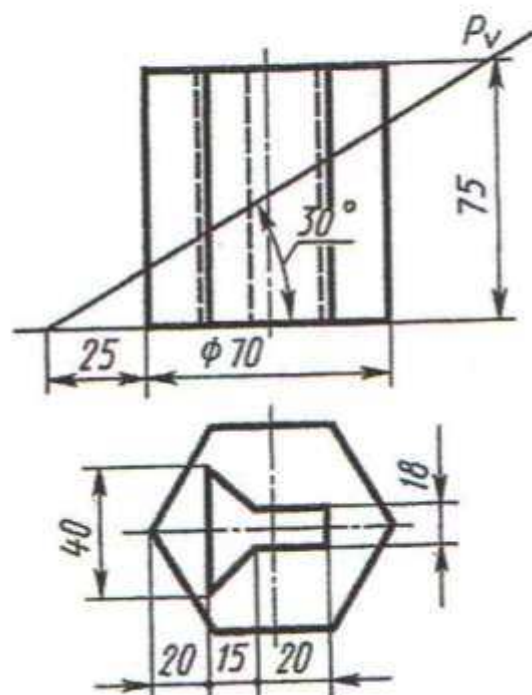
Kesilen konusyň çyzgysyny ýerine ýetirmeli. Şekiliň suduryň kesiginiň hakyky ululygyny tapmaly. Kesilen konusyň aksonometriki proyeksiýasyny we üstüniň ýazgynyny gurmaly



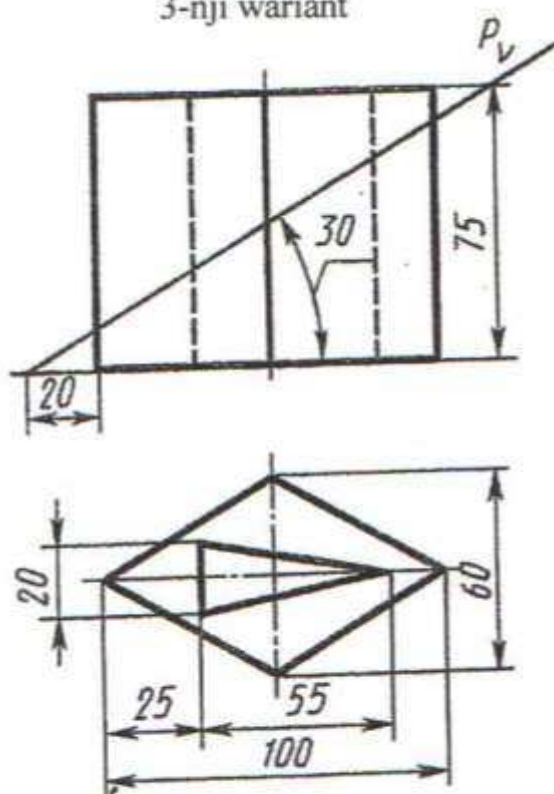
1-nji variant



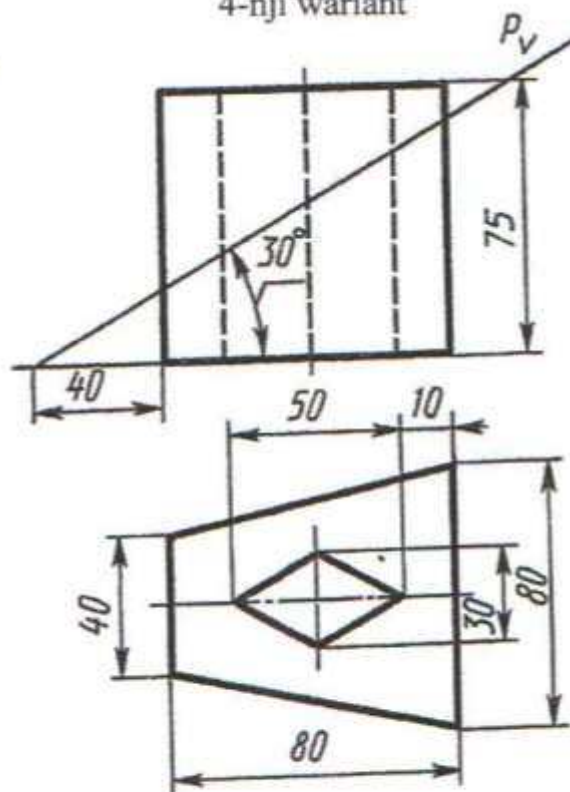
2-nji variant



3-nji variant



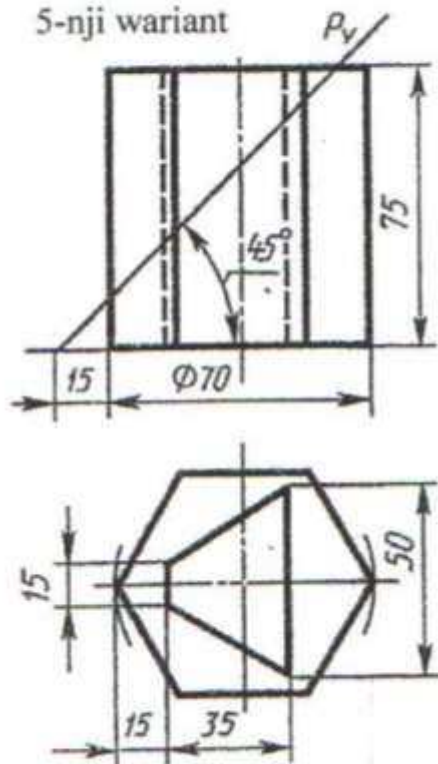
4-nji variant



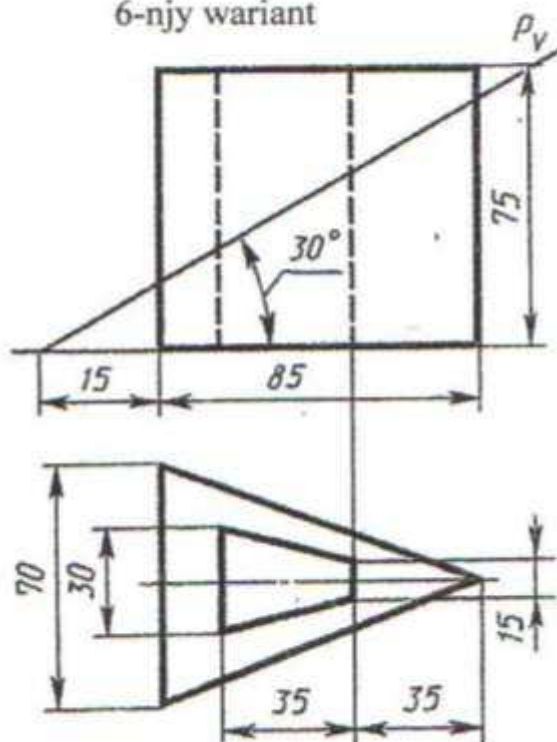
İçi boşlukly kesilen geometriki jisimiň üç proyeksiýada çyzgysyny ýerine ýetirmeli.  
Aksonometriki proyeksiýasyny gurmaly

# ÝUMUŞ 43

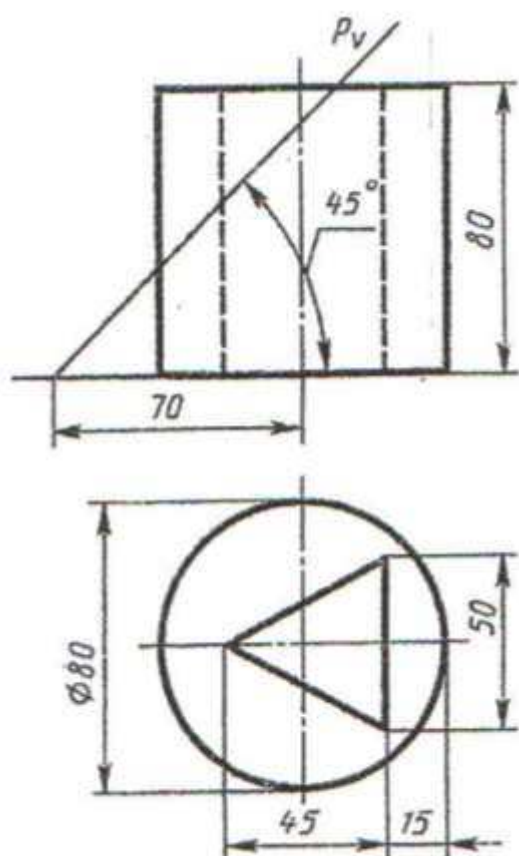
5-nji wariant



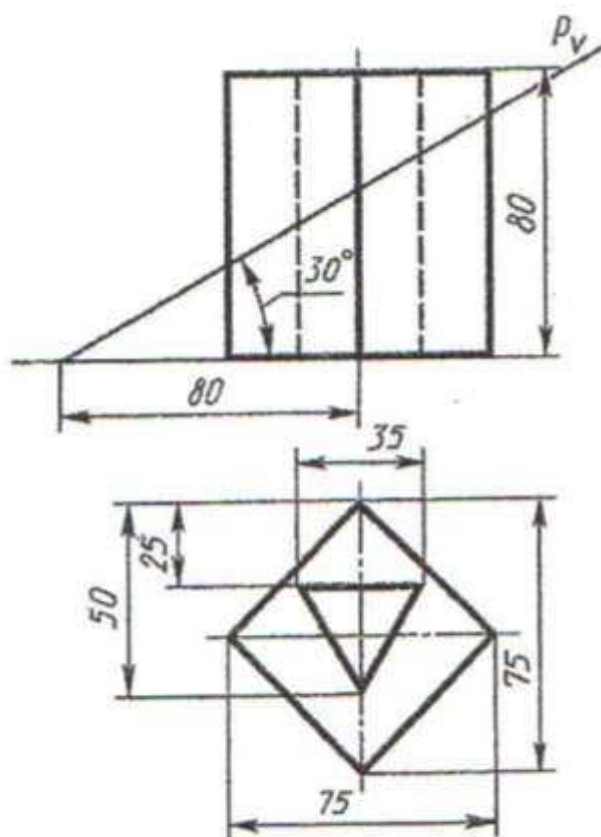
6-njy wariant



7-nji wariant



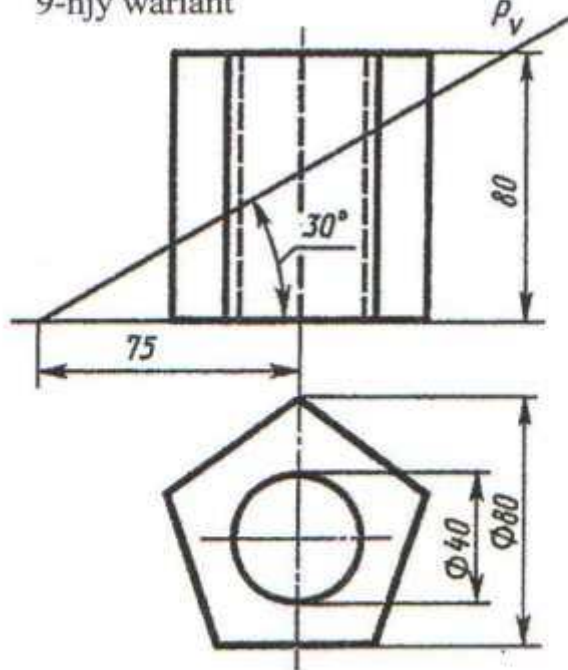
8-nji wariant



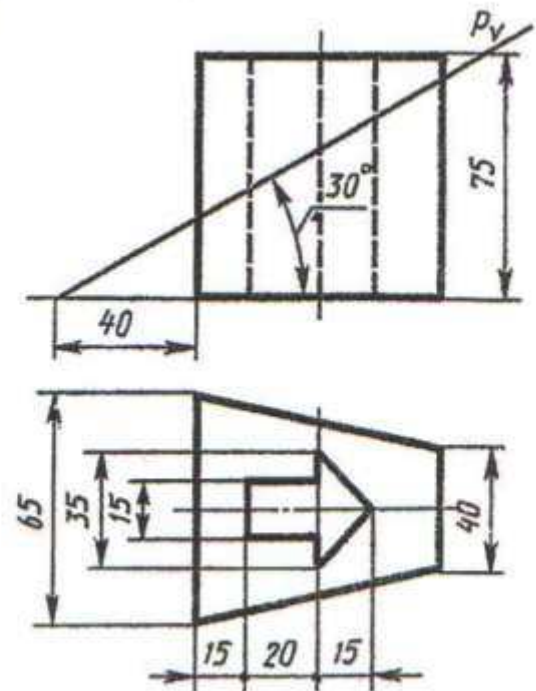
İçi boşlukly kesilen geometriki jisimiň üç proyeksiýada çyzygysyny ýerine ýetirmeli.  
Aksonometriki proyeksiýasyny gurmaly

# ÝUMUŞ 43

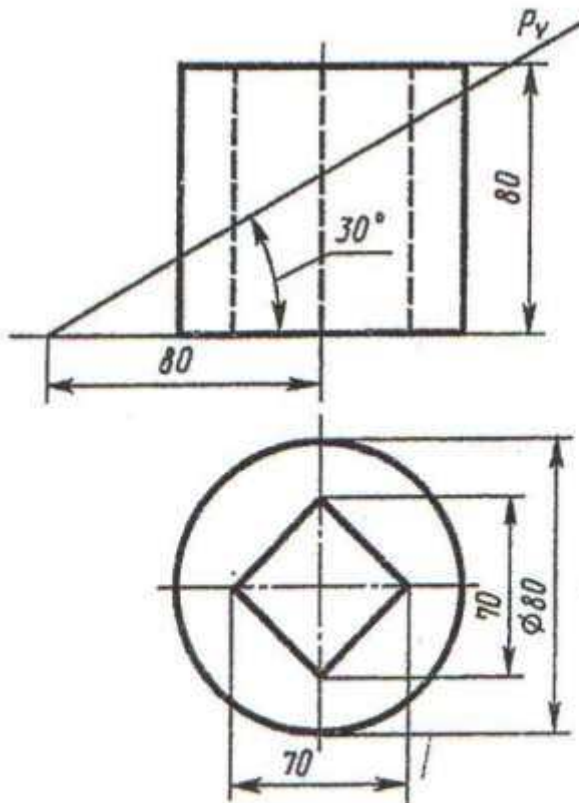
9-njy variant



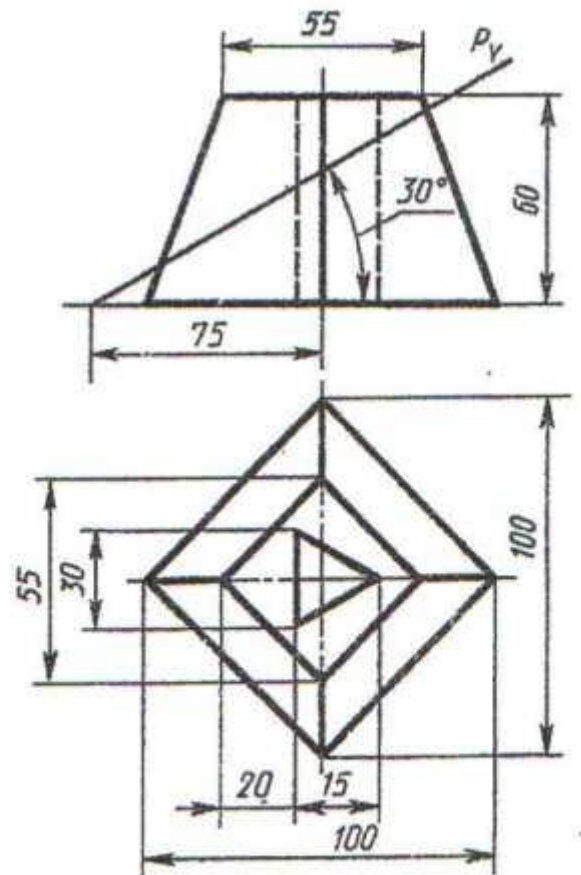
10-njy variant



11-nji variant



12-nji variant

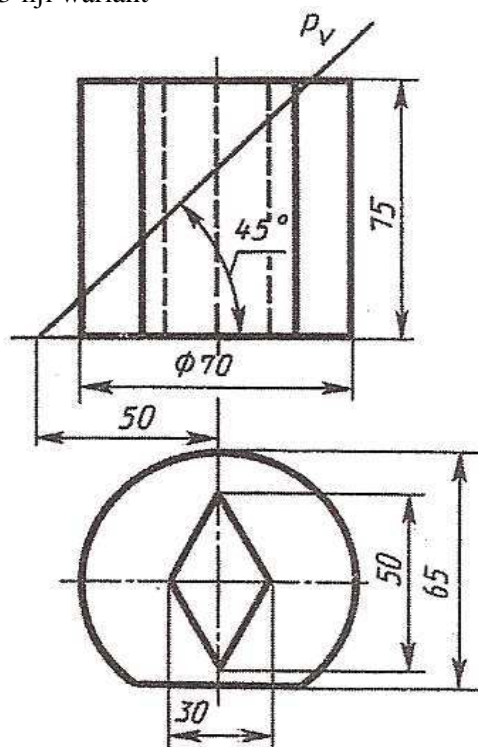


İçi boşlukly kesilen geometriki jisimiň üç proyeksiýada çyzygysyny ýerine ýetirmeli.  
Aksonometriki proyeksiýasyny gurmaly

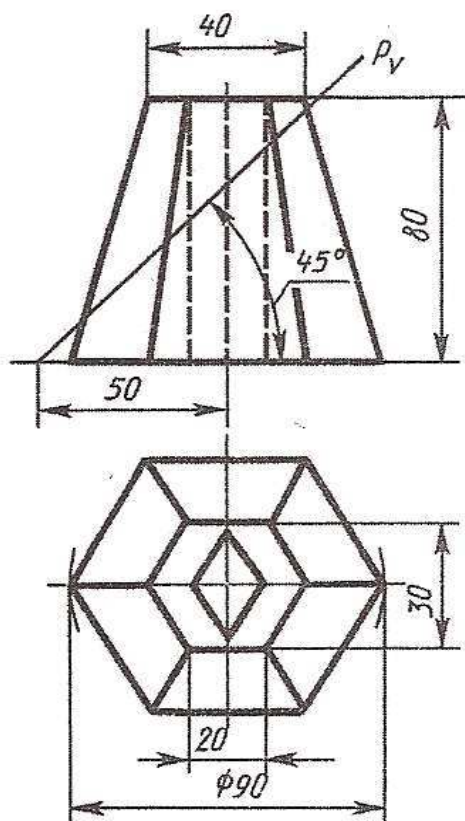


## ÝUMUŞ 36

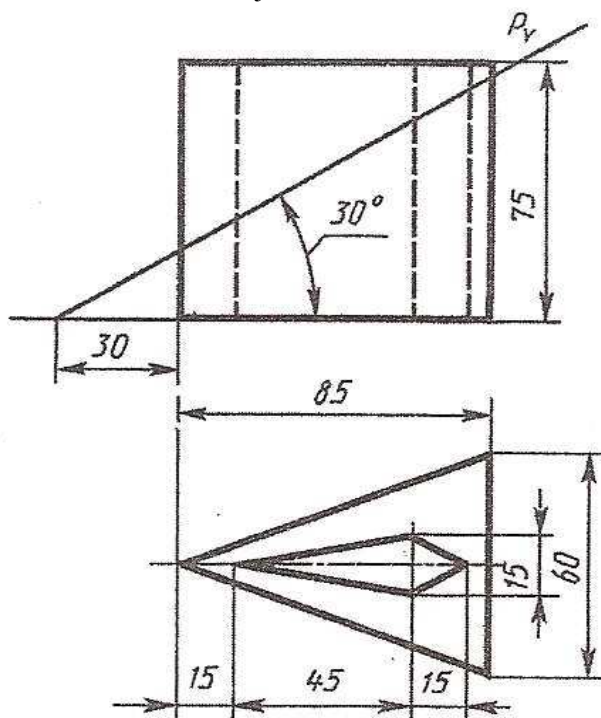
13-njı wariant



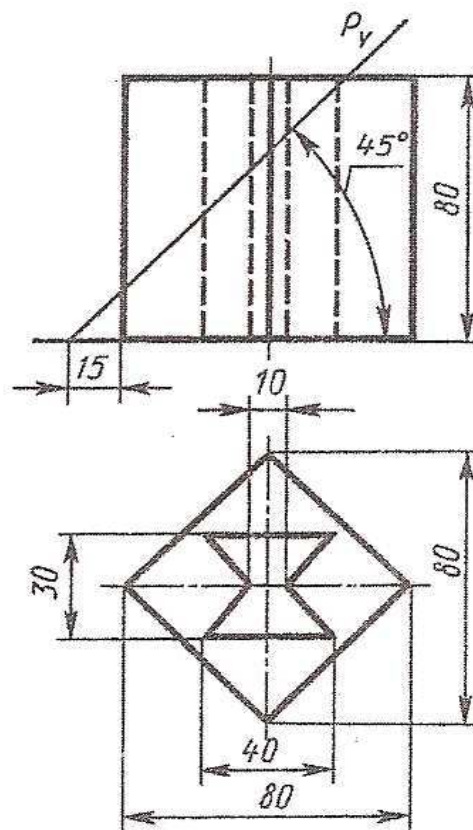
15-njı wariant



13-njı wariant



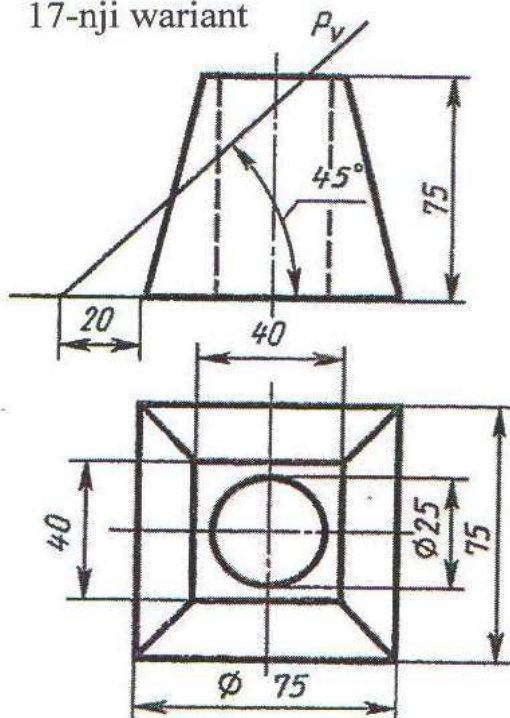
16-njı wariant



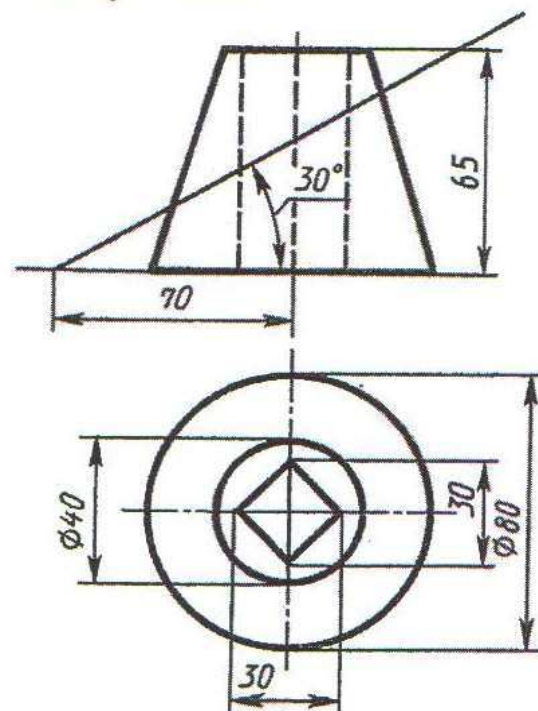
İçi boşlukly kesilen geometriki jisimiň üç proyeksiýada çyzgysyny ýerine ýetirmeli.  
Aksonometriki proyeksiýasyny gurmaly

## ÝUMUŞ 43

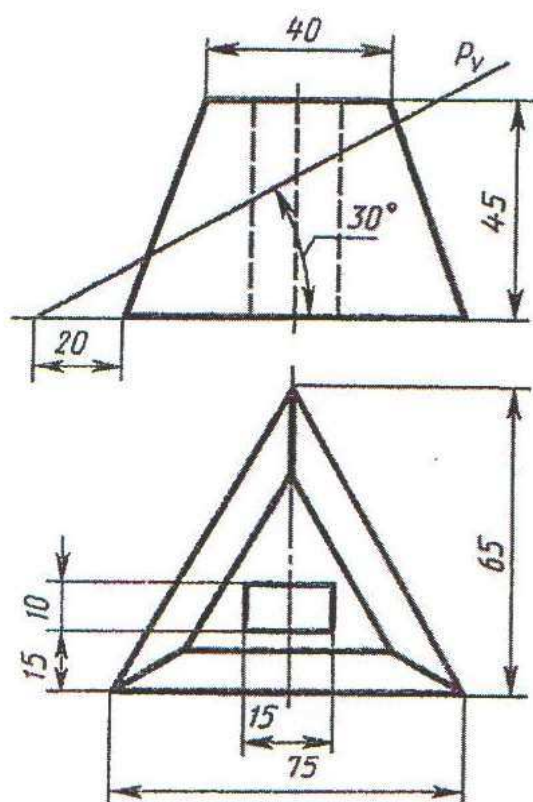
17-nji variant



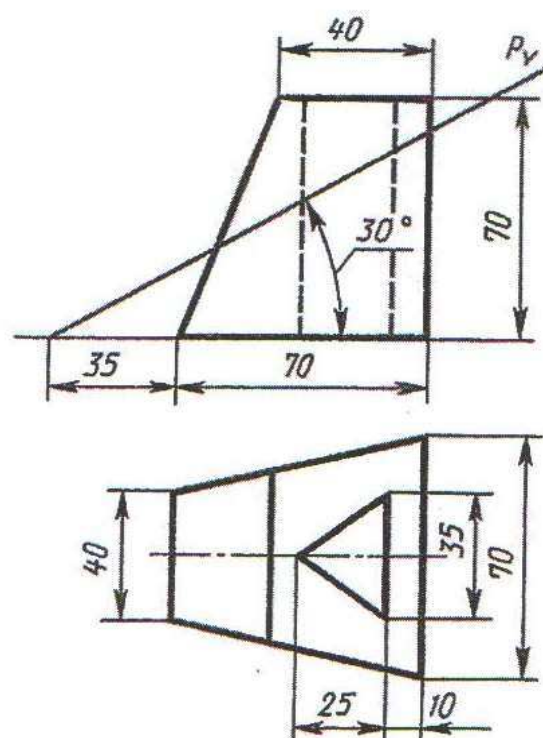
18-nji variant



19-nji variant



20-nji variant

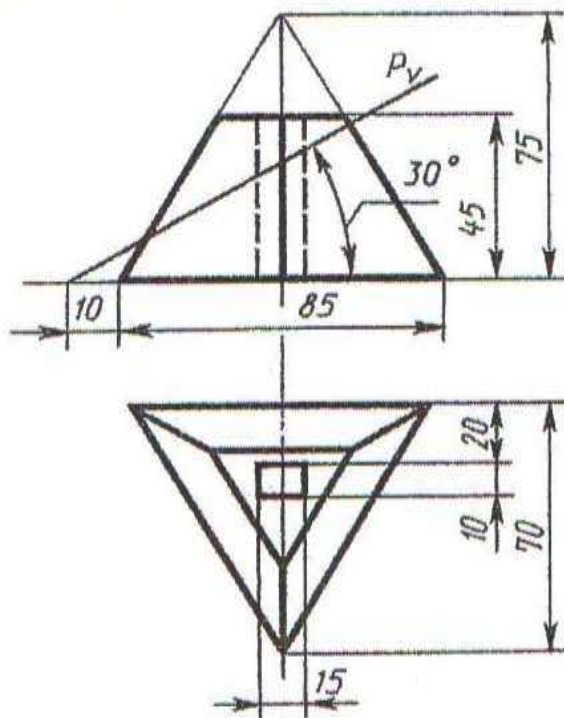


Içi boşlukly kesilen geometriki jisimiň üç proyeksiýada çyzgysyny ýerine ýetirmeli.  
Aksonometriki proyeksiýasyny gurmaly

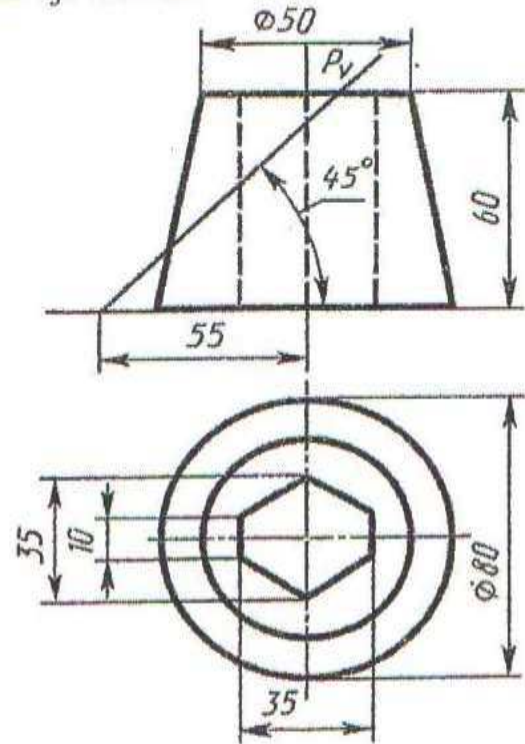


## ÝUMUŞ 43

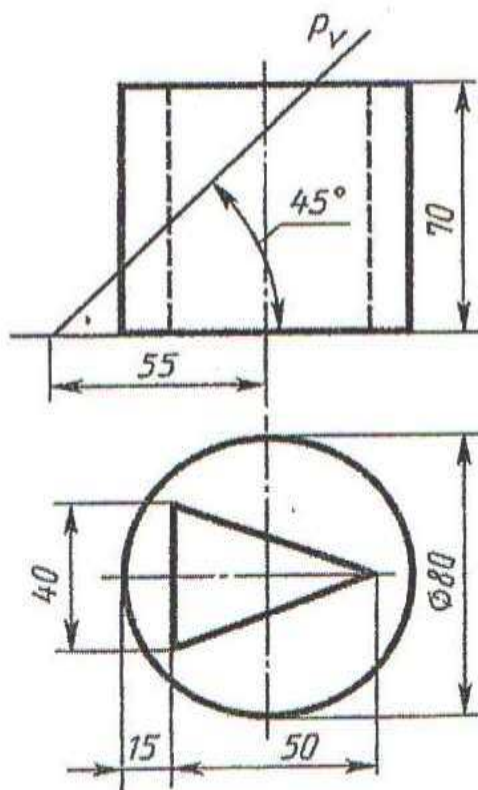
21-nji variant



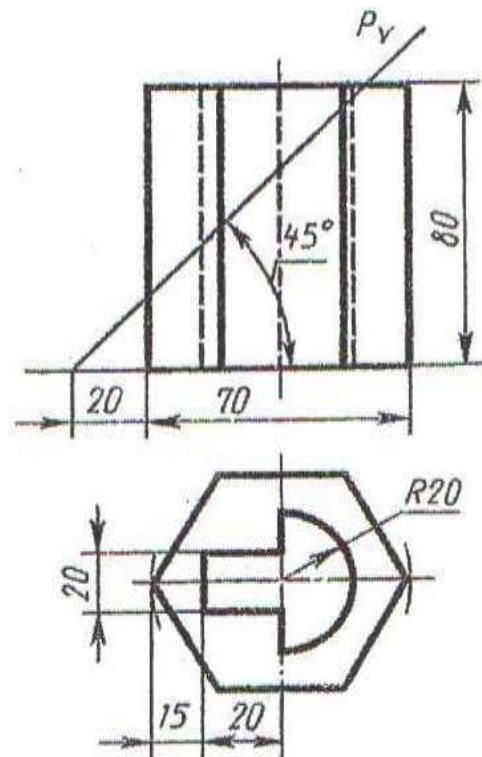
22-nji variant



23-nji variant



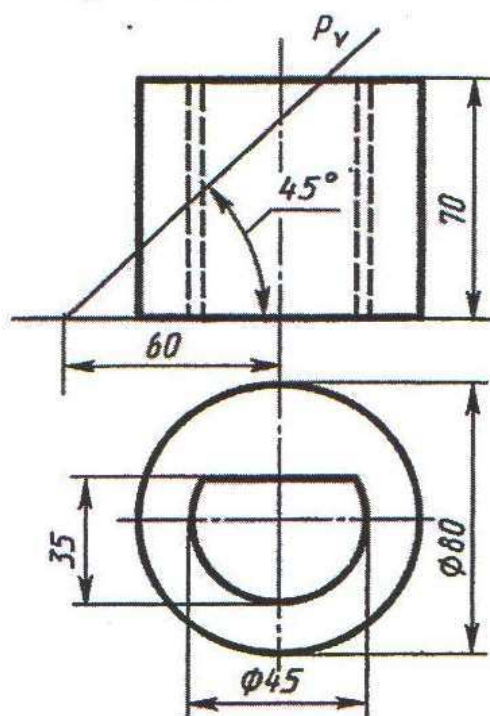
24-nji variant



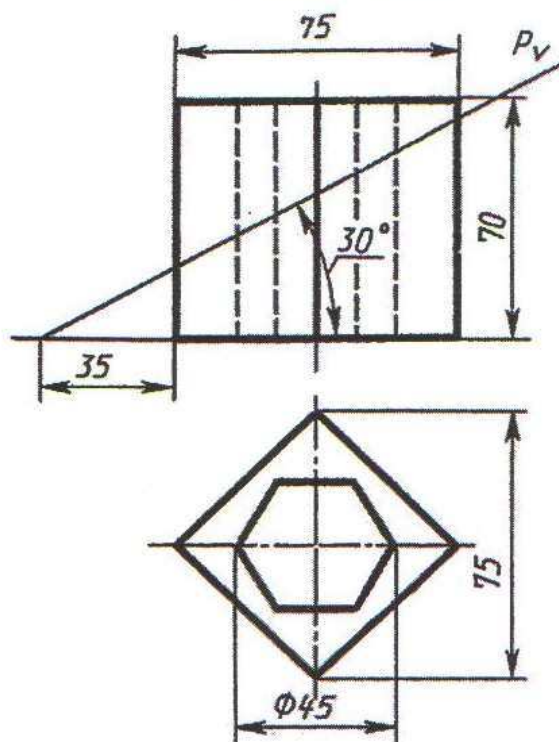
İçi boşlukly kesilen geometriki jisimiň üç proyeksiýada çyzgysyny ýerine ýetirmeli.  
Aksonometriki proyeksiýasyny gurmaly



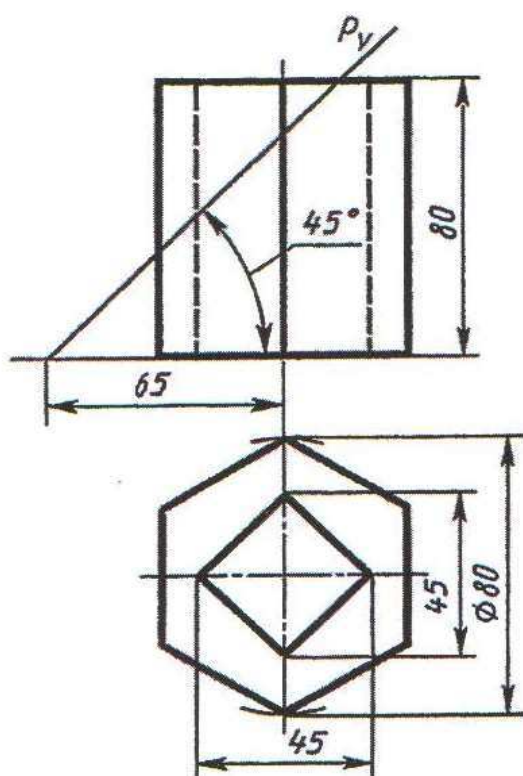
25-nji variant



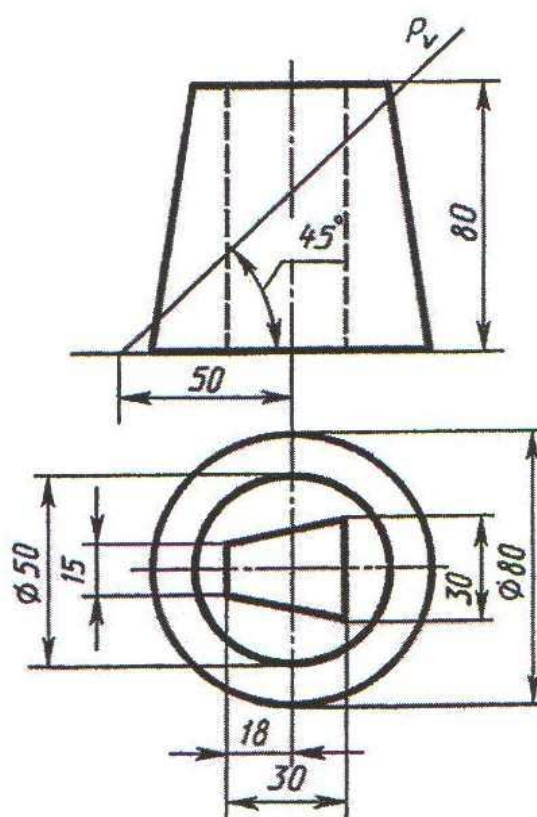
26-njy variant



27-nji variant

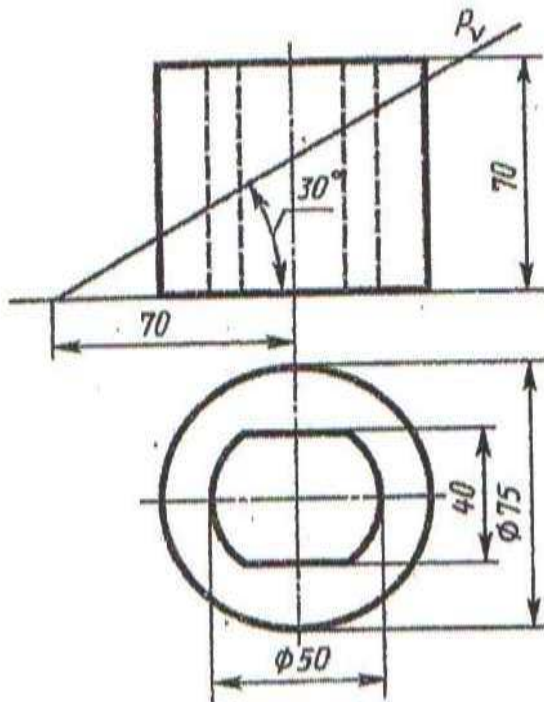


28-nji variant

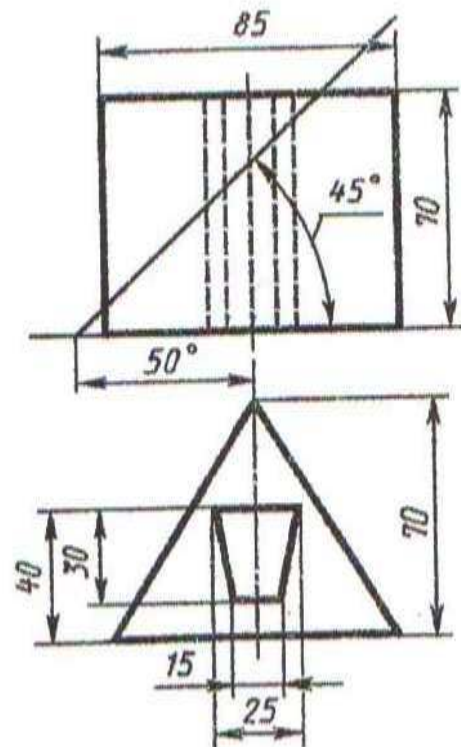


Içi boşlukly kesilen geometriki jisimiň üç proýeksiýada çyzygysyny ýerine ýetirmeli.  
Aksonometriki proýeksiýasyny gurmaly

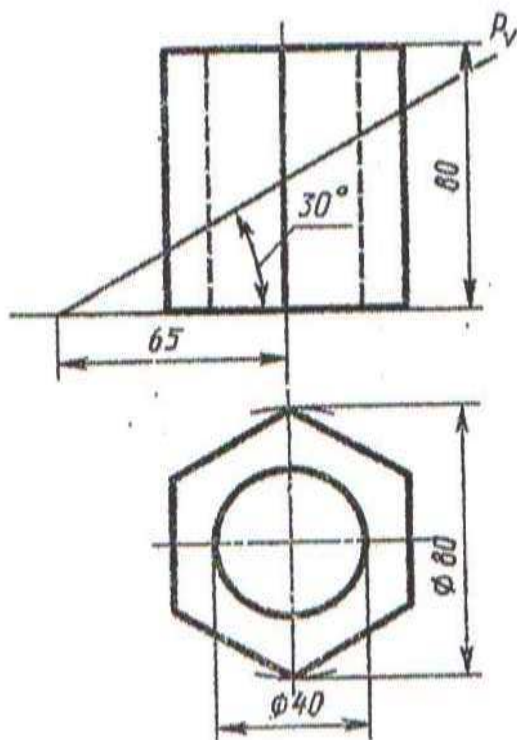
29-njy variant



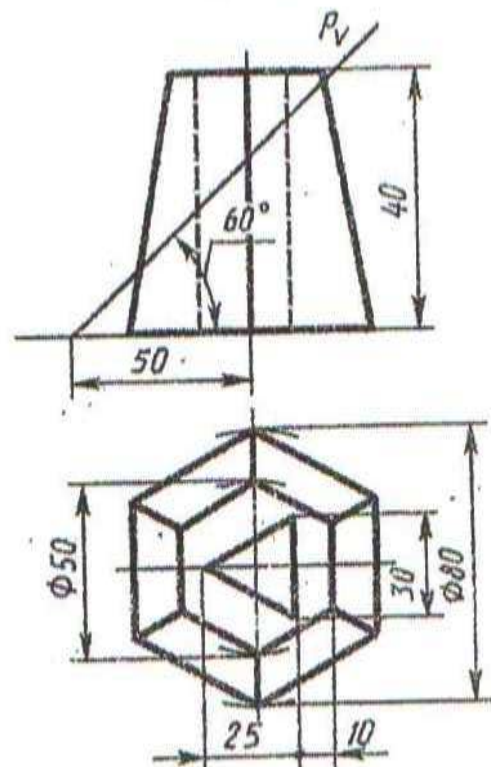
30-njy variant



31-njy variant



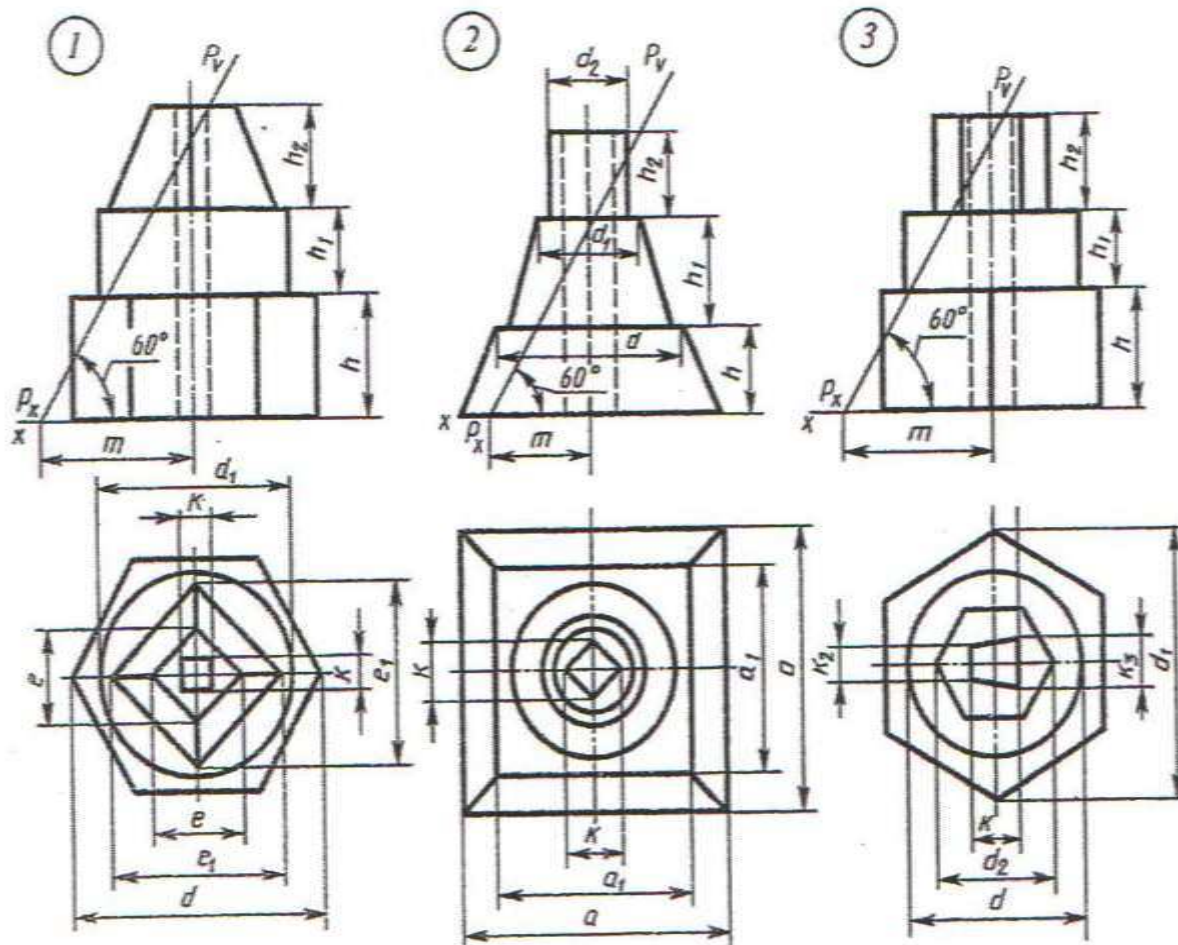
32-njy variant



İçi boşlukly kesilen geometriki jisimiň üç proyeksiýada çyzgysyny ýerine ýetirmeli.  
Aksonometriki proyeksiýasyny gurmaly



# ÝUMUŞ 44

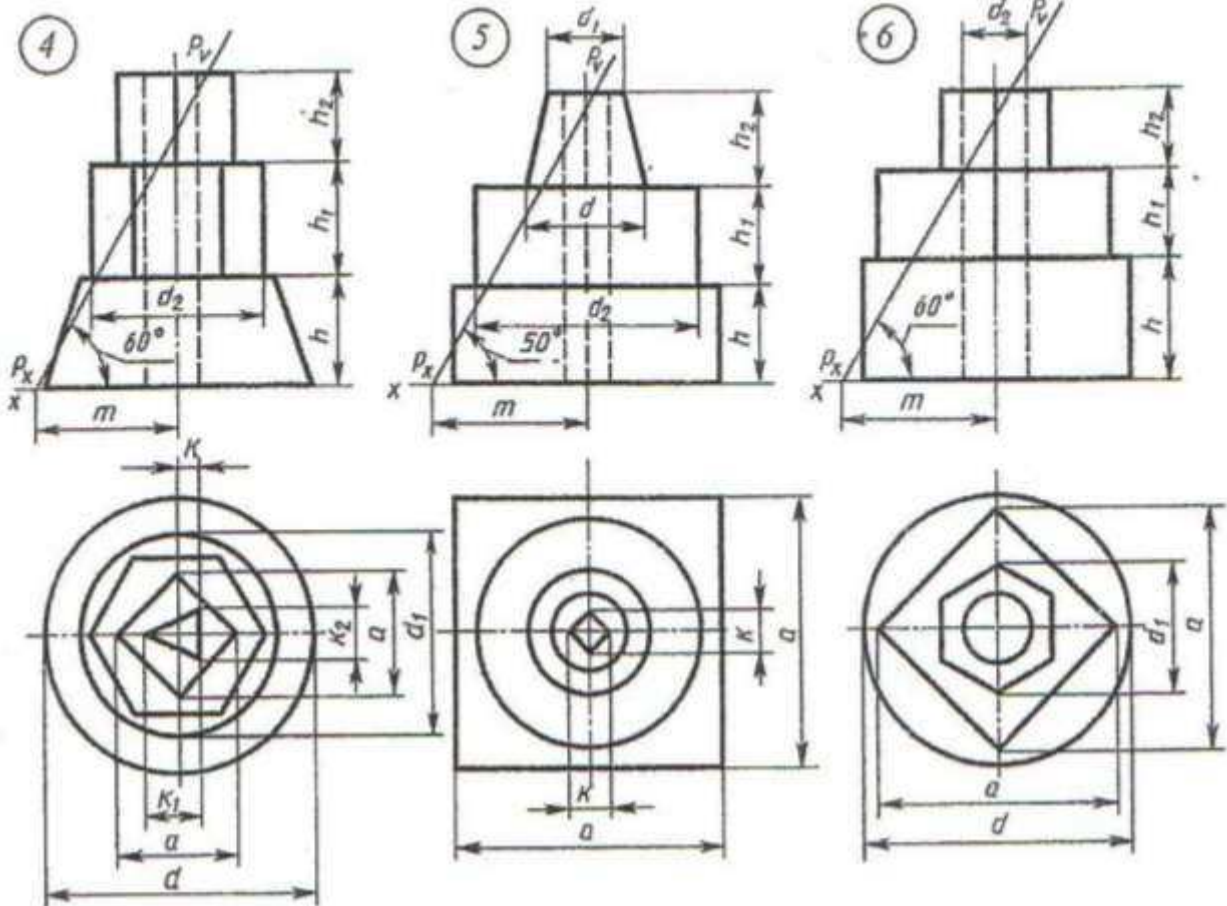


Ýumuş 1	wariantlar					Ýu- muş 2	wariantlar					Ýu- muş 3	wariantlar				
	1	2	3	4	5		6	7	8	9	10		11	12	13	14	15
$d$	90	90	90	90	80	$d$	58	58	55	58	50	$d$	75	75	60	60	60
$d_1$	68	70	72	70	65	$d_1$	40	40	40	35	40	$d_1$	100	90	90	90	90
$h$	40	38	35	40	35	$d_2$	30	30	30	25	25	$d_2$	45	40	50	45	50
$h_1$	30	30	25	25	25	$h$	30	28	35	40	35	$h$	45	40	40	35	35
$h_2$	35	30	25	25	30	$h_1$	35	32	40	20	40	$h_1$	25	30	25	30	35
$e$	60	60	62	60	55	$h_2$	30	30	15	35	15	$h_2$	30	25	30	30	30
$e_1$	30	30	28	30	25	$a$	90	90	90	90	90	$k$	10	8	12	12	12
$k$	12	12	12	14	10	$a_1$	65	65	65	65	70	$k_1$	20	16	22	24	24
$m$	55	50	45	35	30	$k$	20	18	14	12	12	$k_2$	12	10	10	12	10
						$m$	42	38	30	35	38	$k_3$	60	58	40	38	30
												$m$	50	50	50	50	50

İçi boşlukly nusganyň çyzgysyny göçürmeli we üç proyeksiýada tamamlamaly. Kesilen şekiliň hakyky ululygyny tapmaly



# ÝUMUŞ 44



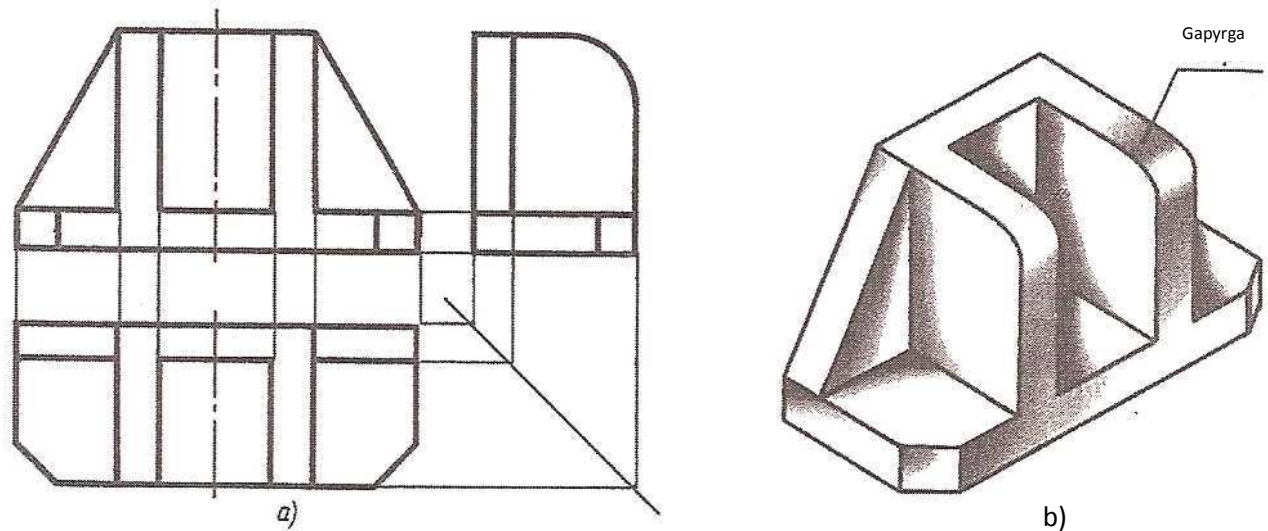
Ýu- muş 4	wariantlar					Ýu- muş 5	wariantlar					Ýu- muş 6	wariantlar				
	16	17	18	19	20		21	22	23	24	25		26	27	28	29	30
$d$	95	95	95	95	95	$d$	40	50	45	50	45	$d$	90	90	80	90	85
$d_1$	70	70	70	70	72	$d_1$	25	30	30	35	35	$d_1$	45	60	50	50	45
$d_2$	60	60	62	60	62	$d_2$	78	75	70	80	80	$d_2$	30	35	25	25	20
$h$	37	40	45	40	50	$h$	35	30	35	30	25	$h$	45	40	40	45	35
$h_1$	38	40	45	40	35	$h_1$	30	35	28	30	35	$h_1$	20	25	30	25	30
$h_2$	32	30	25	30	25	$h_2$	25	20	25	30	30	$h_2$	25	25	25	25	25
$k$	8	8	8	8	8	$k$	18	20	20	20	24	$a$	80	80	70	72	70
$k_1$	20	20	20	20	20	$a$	90	95	90	95	90	$m$	55	45	40	50	40
$k_2$	16	16	16	16	16	$m$	55	50	45	55	40						
$a$	45	45	40	45	44												
$m$	50	43	45	40	50												

İç boşlukly nusganyň çyzgysyny göçürmeli we üç proyeksiýada tamamlamaly. Kesilen şekiliň hakyky ululygyny tapmaly

### 13. Nusganyň iki proyeksiýasy boýunça üçünji proyeksiýasyny gurmak

Çyzgyny okamaklyk, haýsyda bolsa bir zadyň giňişläkdäki (göwrümleýin) keşbiniň tekiz şekillendirmegiň (proýektirlemegiň) esasynda bolup geçýär.

Önümçilikde çyzgyny okamaklyk has çylşyrymlydyr we ol diňe maşyngurluşyk çyzgyny bilmekligi dälde, eýsem şaýyň ýasalyşynyň tehnologiýa ýagdaýyna degişli maglumatlary hem bilmekligi talap edýär. Okuw nusgasyny ýa-da şaýlaryň çyzgysyny okamaklyga başlamazdan öň dürli çylşyrymlylykdaky okuw nusgalarynyň asyl şekilinden birnäçe çyzgylary ýerine ýetirmeklik gerek.



52-nji surat

Mysal üçin 52-nji e suratda nusganyň çyzgysyny okamaklyk talap edilýär.

Şekillendirilen nusgany hyýalymyzda ýönekeý geometriki şekillere bölýäris we şol geometriki şekilleriň üç proyeksiýadaky şekillendirilişini göz önüne getirýäris, şeýlelikde nusganyň umumy görnüşini bilýäris. 52-nji b suratda nusganyň doly şekili bilen tanyşyp, aksonometriki proyeksiýasyny ýerine ýetirýäris, ol bolsa okalan çyzgynyň dogrydygyny kesgitleýär.

Häzirki ýagdaýda çyzgy okalanda, çyzgynyň ähli proyeksiýalaryny ulanmak we doly göz önüne getirmek hökmandyr.

Şeýlelikde, eger çyzgy okalanda profil proyeksiýasy ulanylmasa, onda 52-nji b suratda aksonometriki şekilde gapyrgadaky aýlawlaryň ýerine ýetirilmezligi mümkin, eger-de gorizontaly proyeksiýany ulanmasak, 52-nji a suratda onda esasyň burçlary kesilmän galdyrylmagy mümkin.

Esasanam berlen iki proyeksiýa boýunça üçünji proyeksiýany gurmaklygynyň düzgünlerini özleşdirmek wajypdyr.

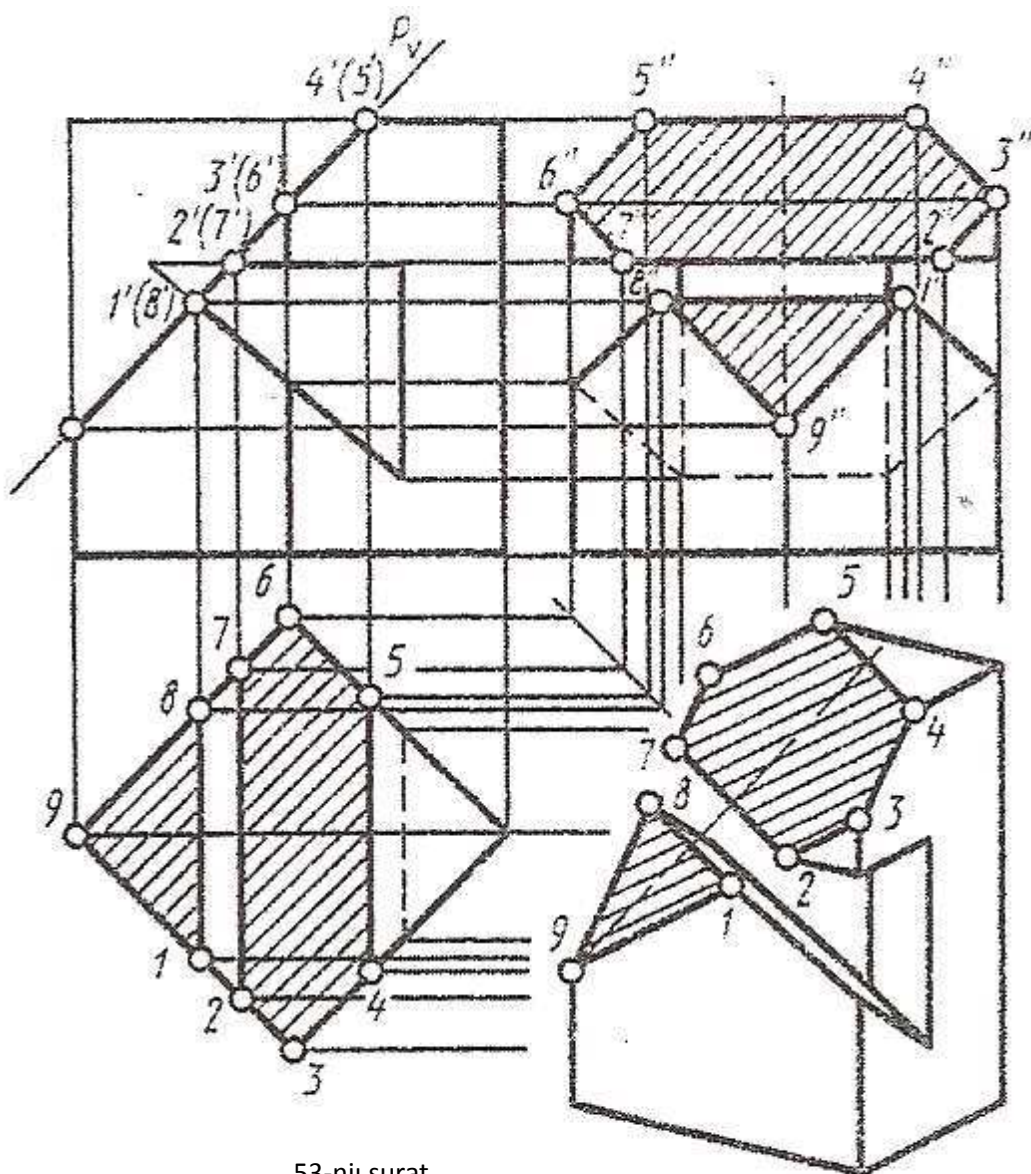
Bu esasy ýumuş boýunça çyzgyny okamak we düzmek talyplarda kynçylyk döredýär, şonuň üçinem öňi bilen iki sany nusganyň asyl gornüşinden kompleks çyzgylaryny ýerine ýetirmek maslahat berilýär.

Kompleks çyzgyny ýerine ýetirmek üçin alnan nusga çylşyrymly bolmaly dälär.

Talyplar birinji nusga boýunça üç proyeksiýada çyzgyny ýerine ýetirmeli.

Ikinji nusga boýunça iki proyeksiýany ýerine ýetirip, üçünji proyeksiýany nusgasyz şol iki proyeksiýa esasynda gurmaly.

Iki proyeksiýany şeýle kabul etmeli, gelejekde şolar boýunça üçünji proyeksiýany gurmaklyga şert döredilmeli.



53-nji surat



**Ýumuş 45:** nusganyň iki proyeksiýasy boýunça onuň üçünji proyeksiýasyny gurmaklyk hödürlenýär.

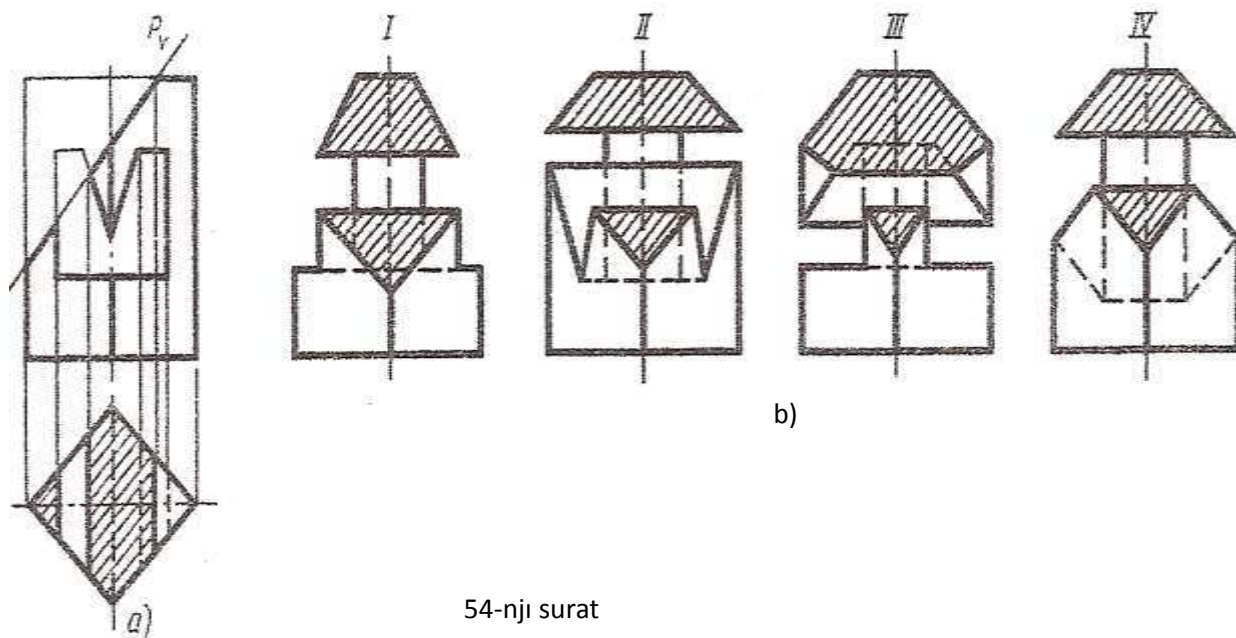
Ýumuş 46...49: Değişli nusganyň okuna perpendikulýar ýerleşen içi boşlukly kesilen nusganyň berlen iki proyeksiýasy esasynda üçünjisini ýerine ýetirmeklige değişli birnäçe meseleler hödürlenýär.

Meseläniň çözgüdine başlamak bilen nusganyň berlen iki proyeksiýadaky çyzgysyny okamak gerek, nusga girýän her bir geometriki elementleriň ölçeglerine we geometriki şekiline düşünp, soňra içi boşlukly, değişi prizmanyň merkezine perpendikulýar ýerleşen nusganyň üçünji proyeksiýasyny ýerine ýetirmeli. (53-nji surat). Birinji nobatda kesişýän üstleriň berlen geometriki figura we olaryň kesiginiň çäklerindäki serhediniň görnüşi görkezilýär. Soňra baglanyşyk çyzygyň kömegi bilen profil proyeksiýasy gurulýar. Şekli aýdyňlaşdyrmak üçin kesik ştrihlenýär. Çyzgy kesigiň hakyky ululygyny tapmazdan ýerine ýetirilýär.

Içi boşlukly nusganyň çyzgysy boýunça aksonometriki proyeksiýasy gurulsa meseläniň çözgüdi gowy bolardy.

54-nji a suratda berlen iki proyeksiýa boýunça 54-nji b suratdaky şekillerden peýdalanyňp üçünji proyeksiýasyny saýlap almak meselesini ýerine ýetirmek hödürlenýär.

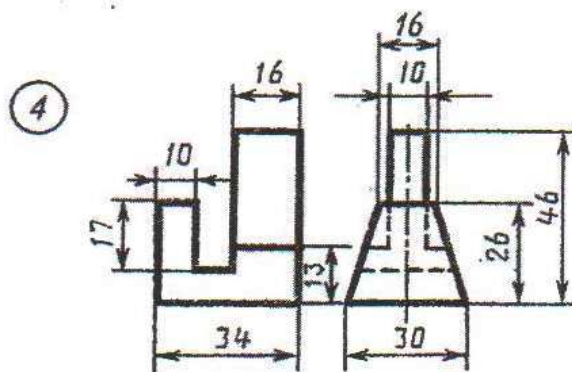
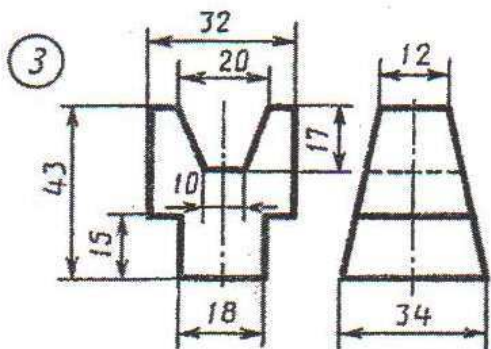
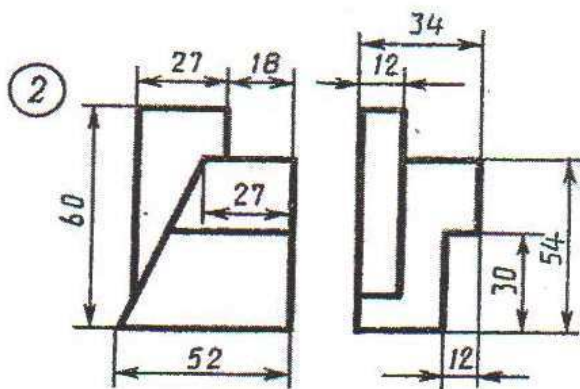
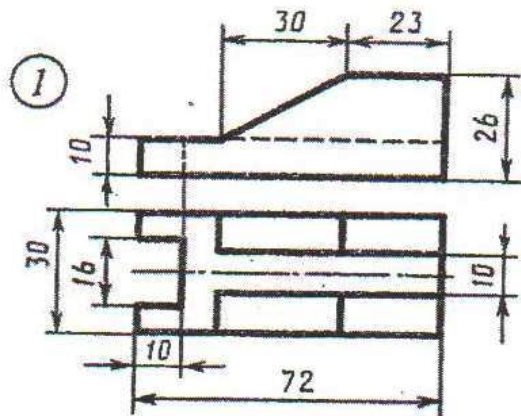
53-nji suratda ýumuşlary ýerine ýetirmegiň mysaly görkezilen.



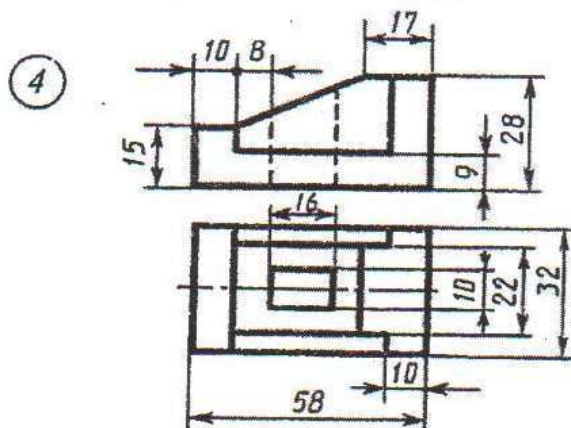
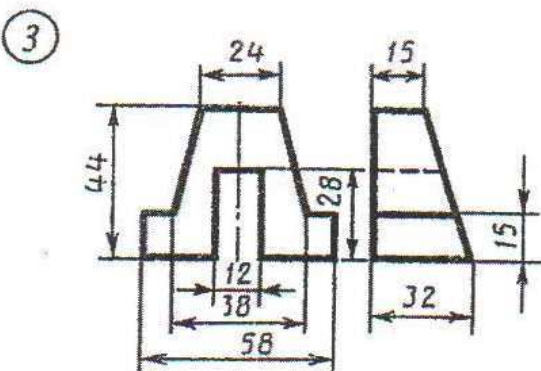
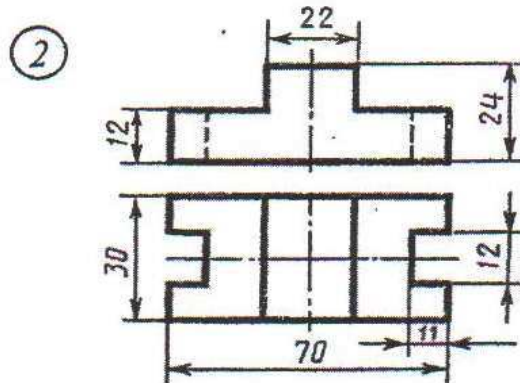
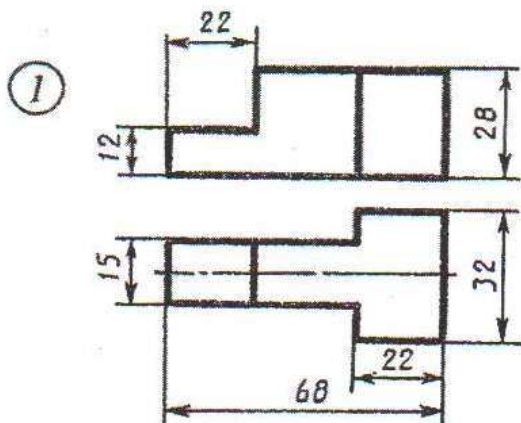
54-nji surat

# YUMUŞ 45

1-nji variant



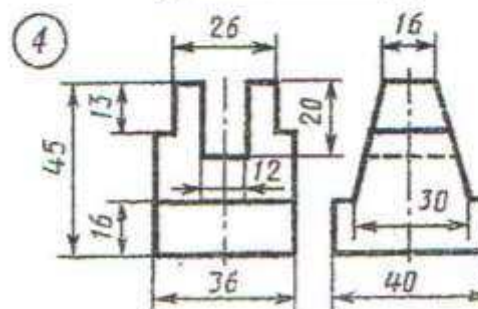
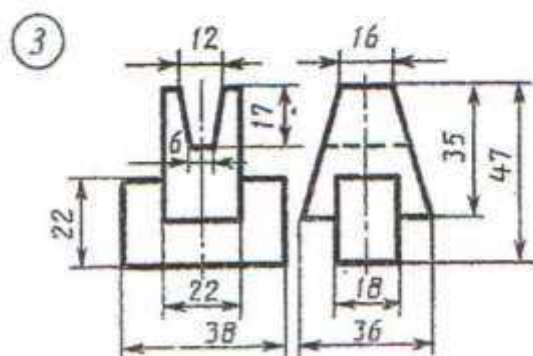
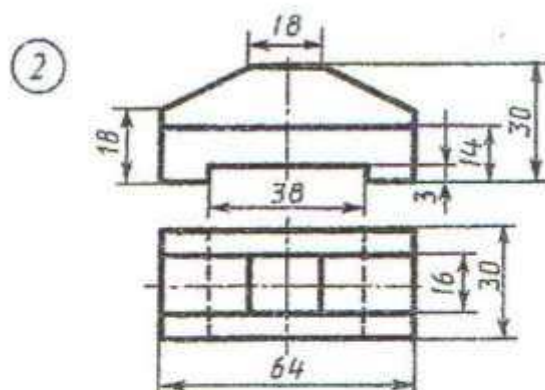
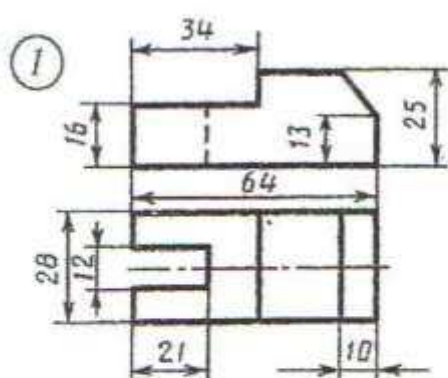
2-nji variant



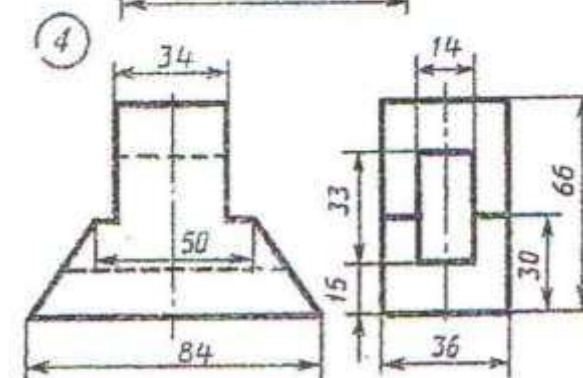
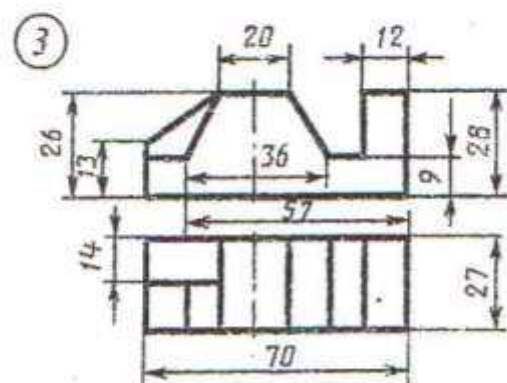
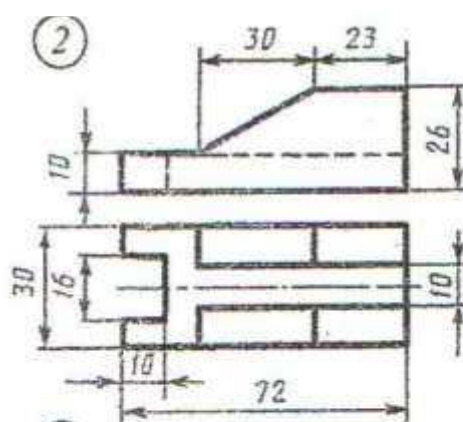
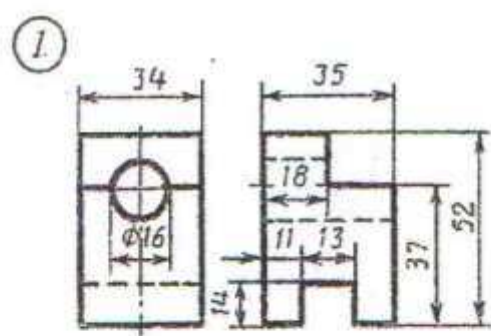
Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

# ЎУМУШ 45

3-nji variant



4-nji variant

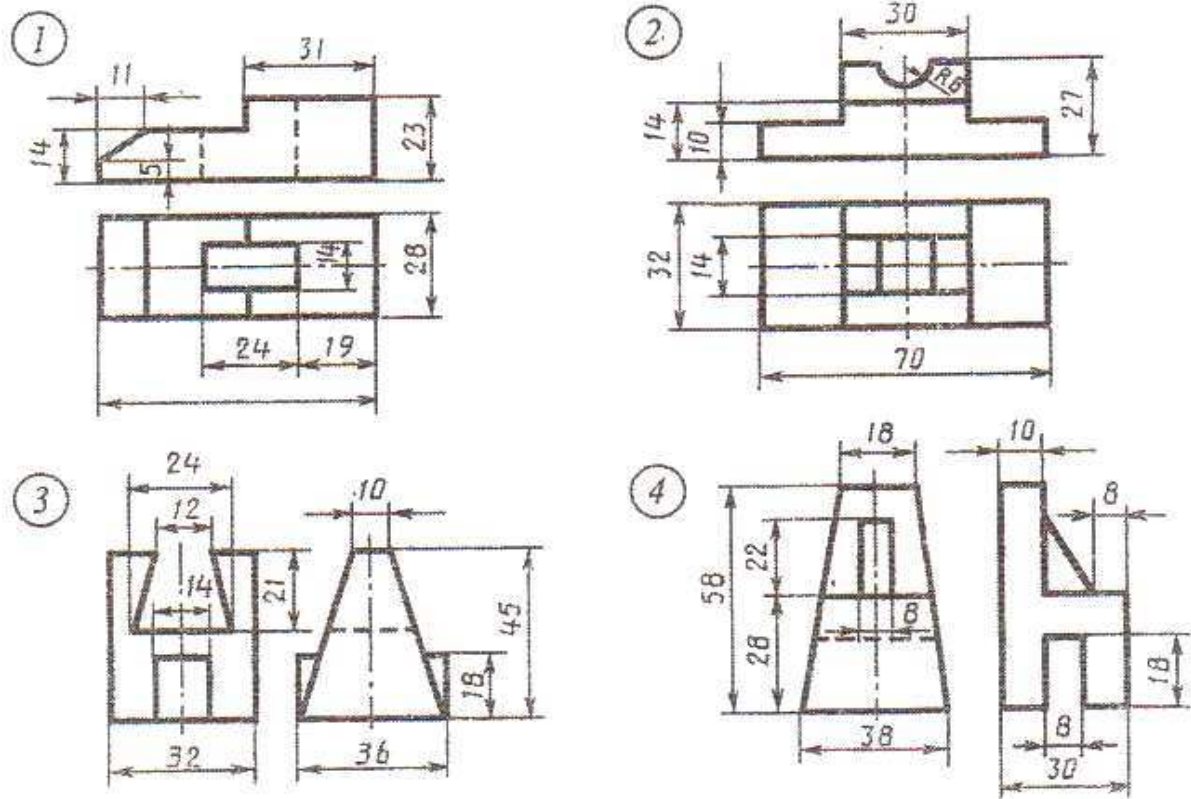


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

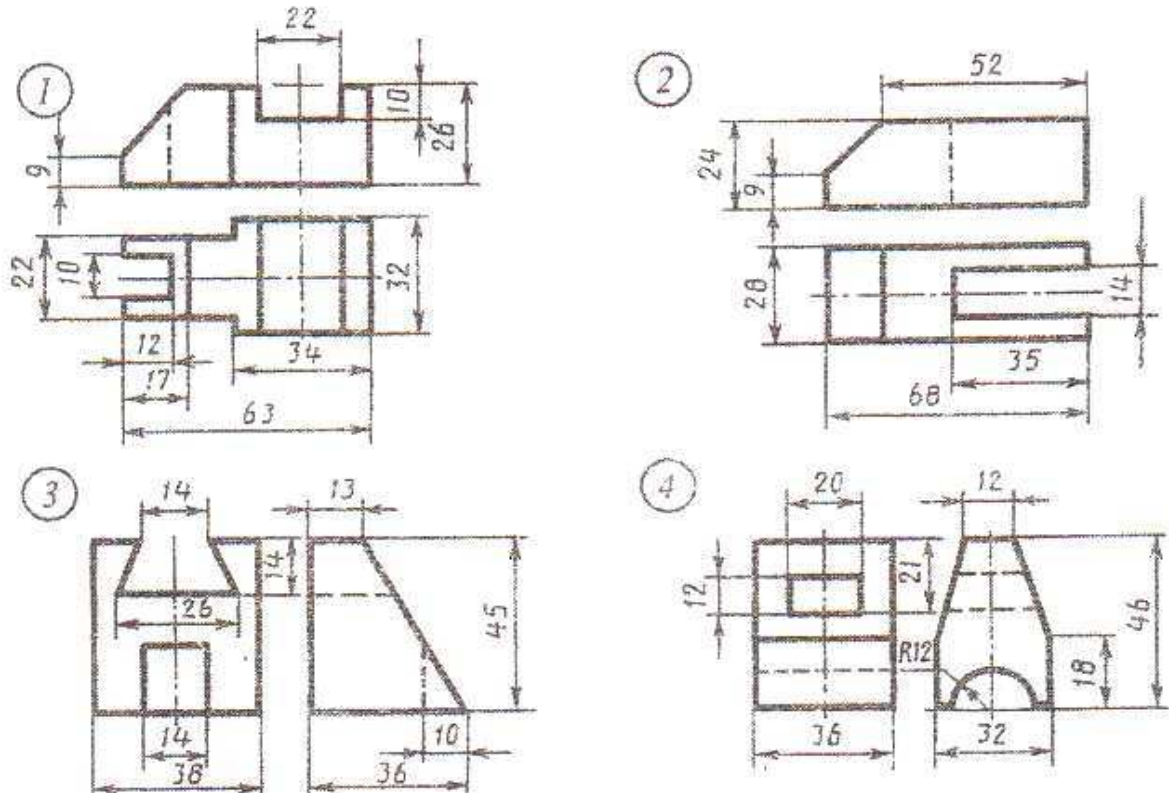


# Ýumuş 45

5-nji variant



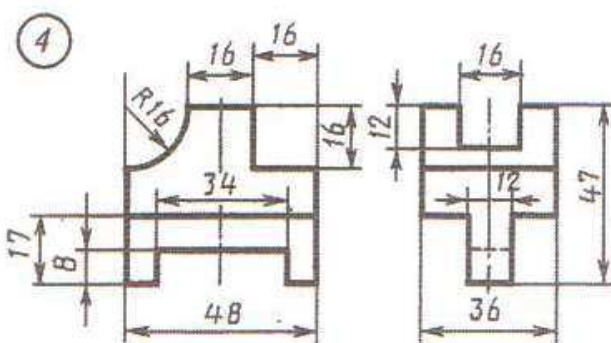
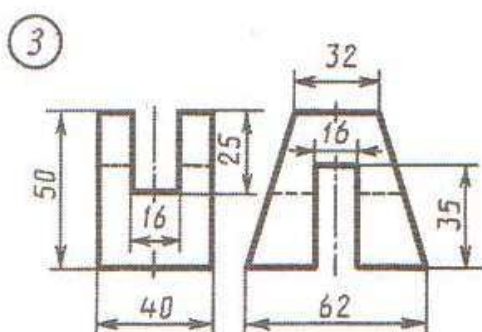
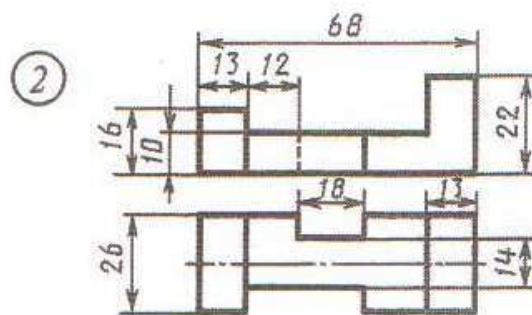
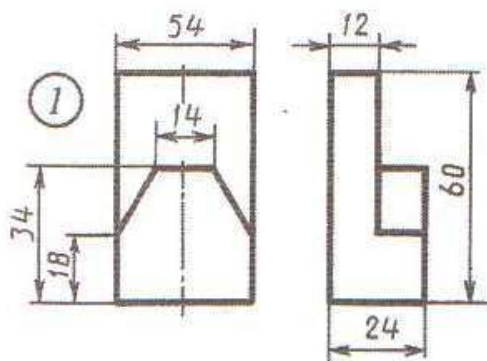
6-nji variant



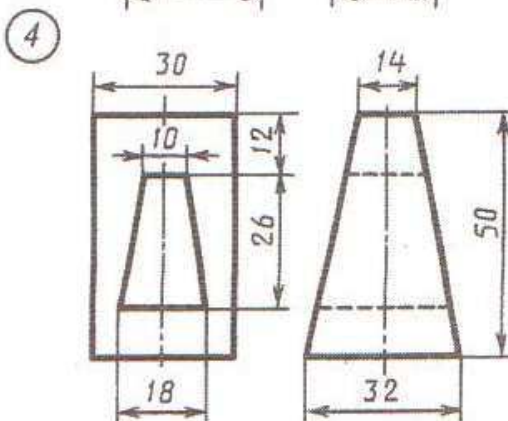
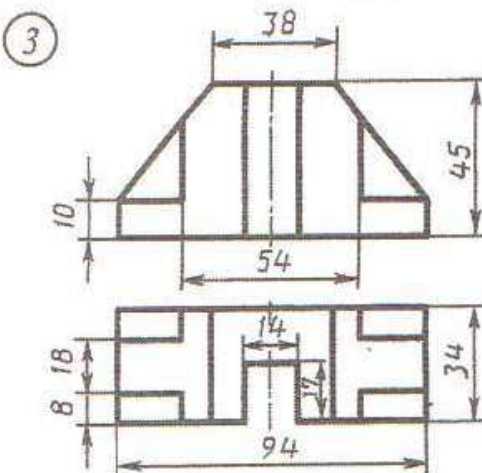
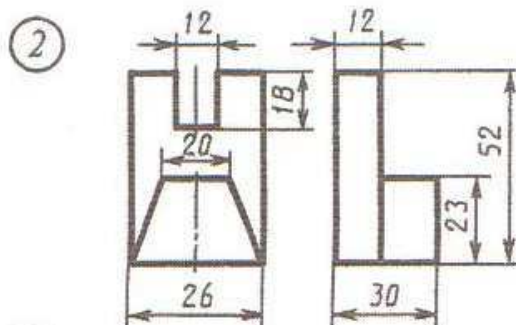
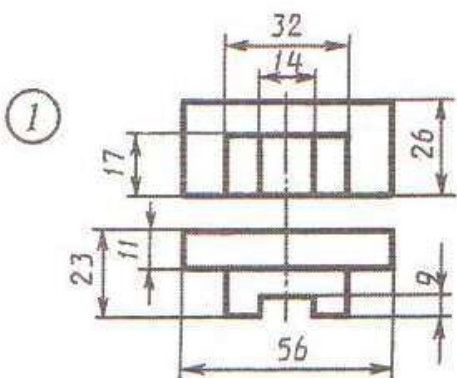
Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

# Ýumuş 45

7-njy wariant



8-nji wariant

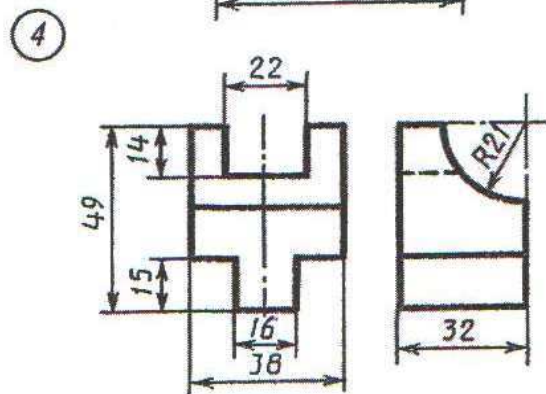
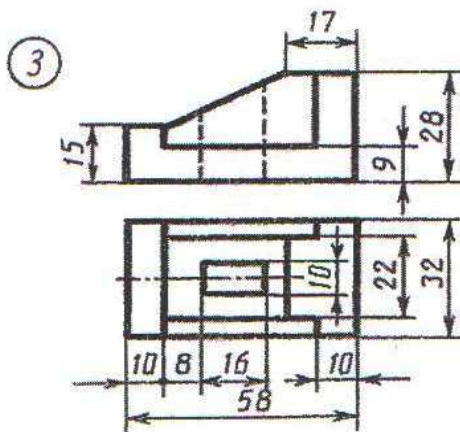
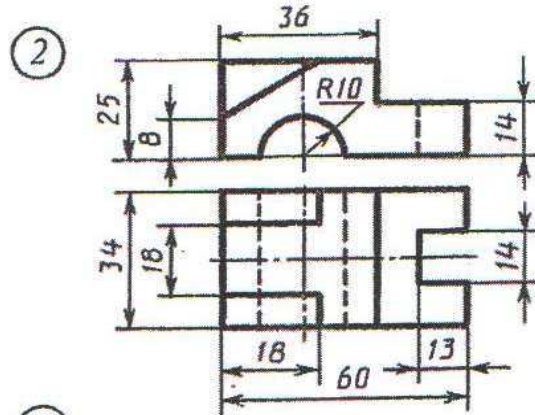
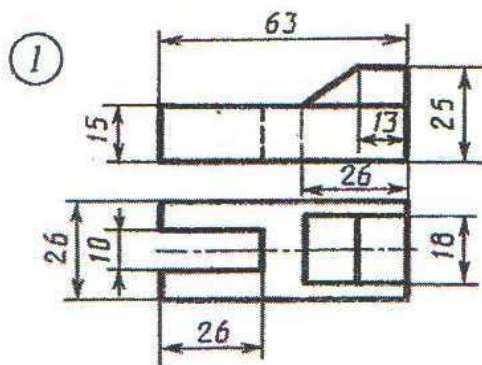


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly

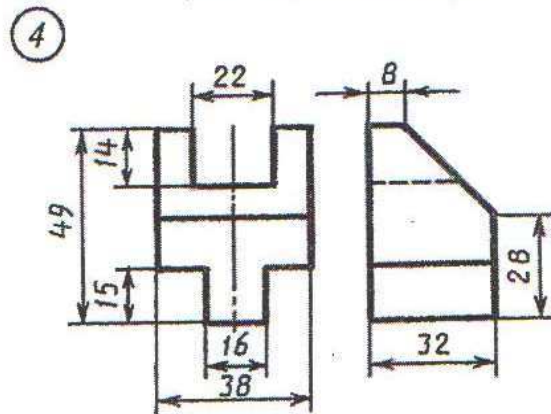
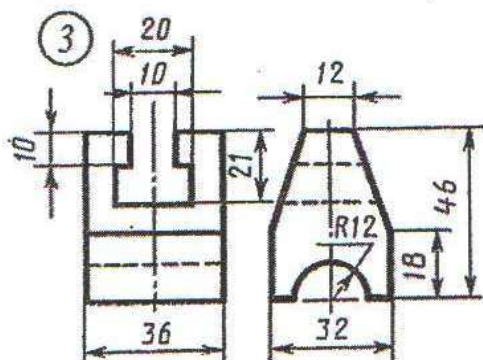
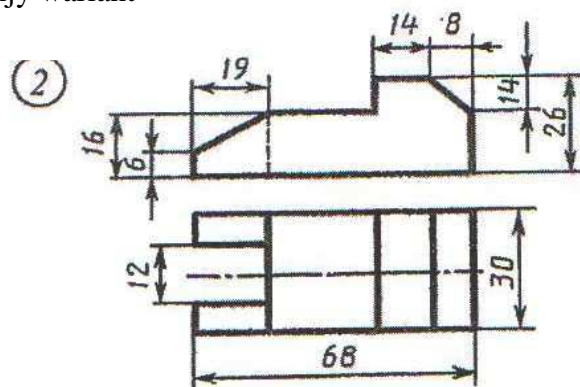
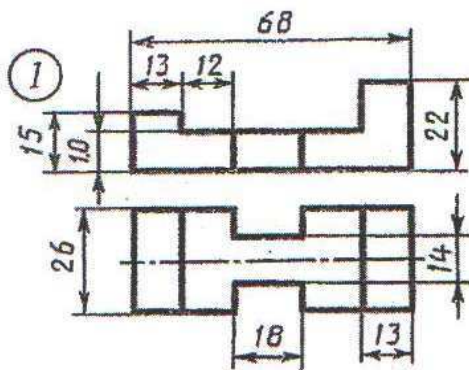


# ÝUMUŞ 45

9-njy variant



10-njy variant

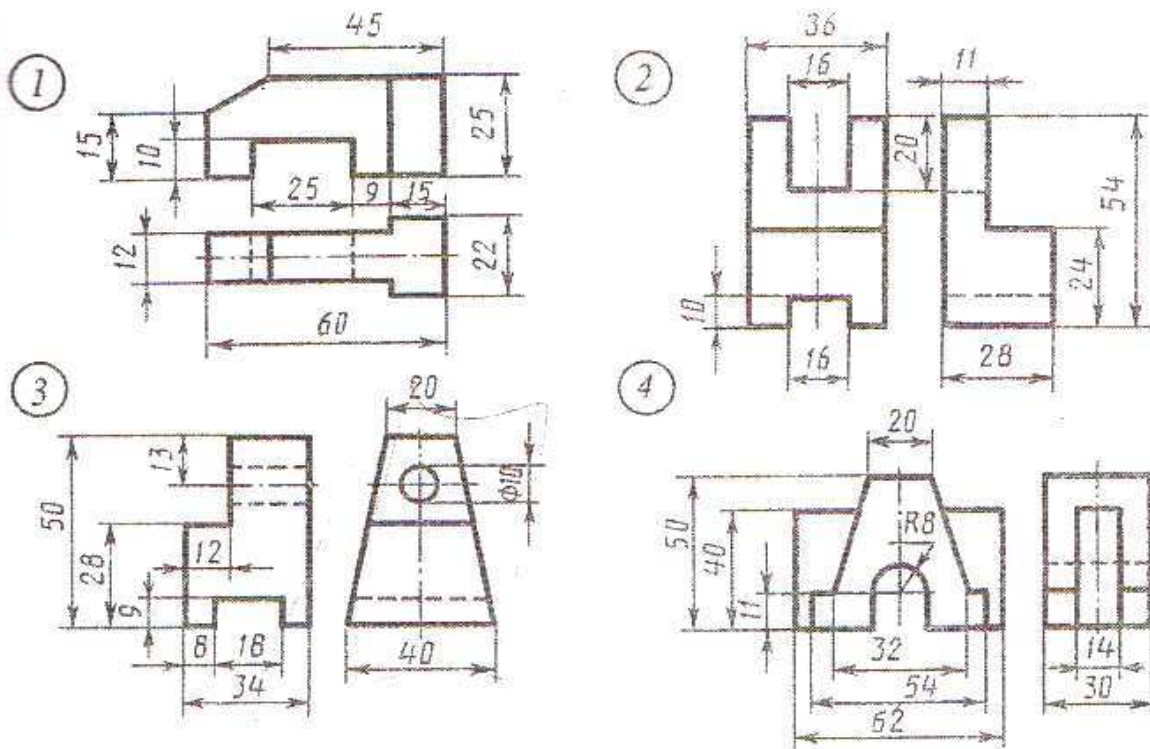


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

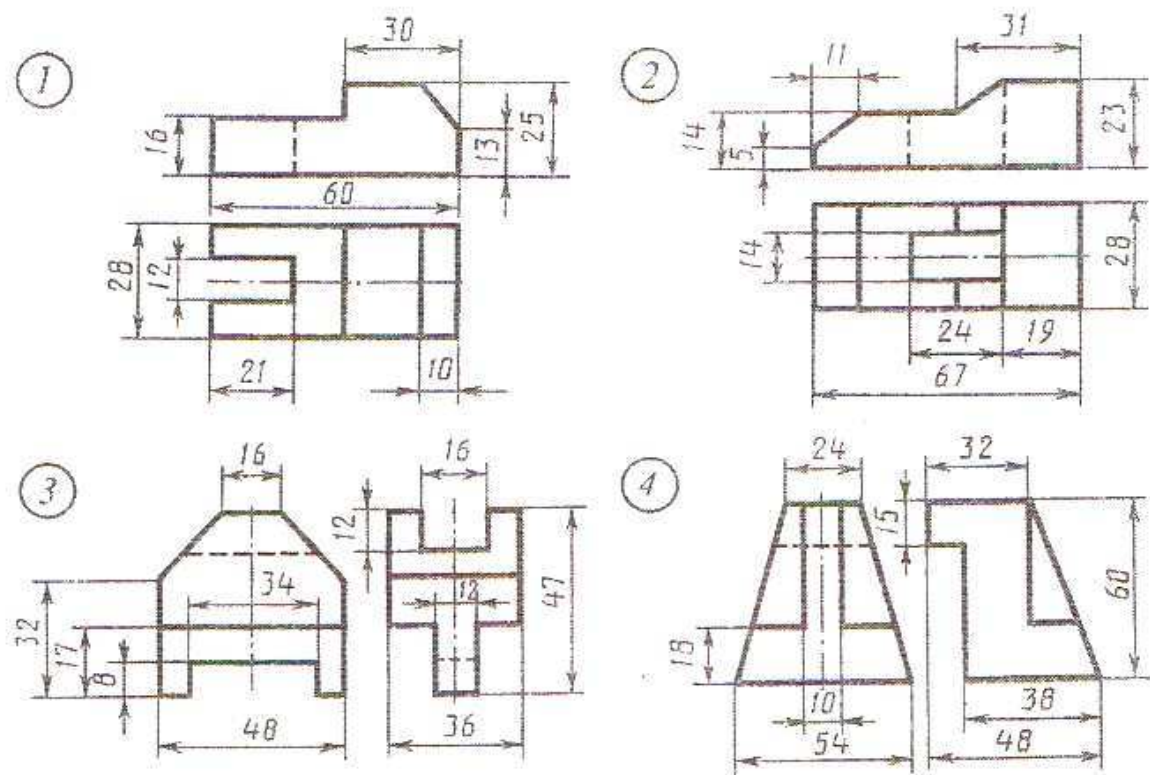


# Ýumuş 45

## 11-nji variant



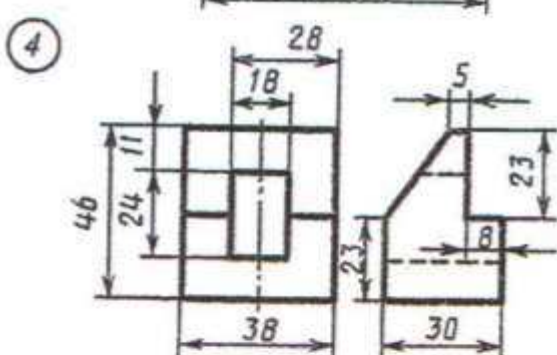
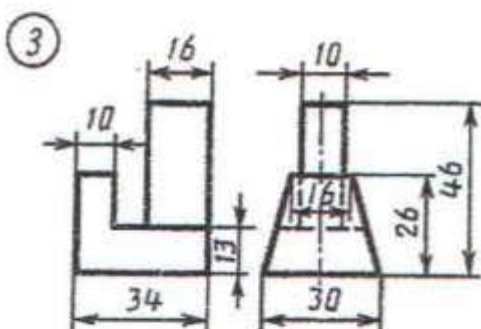
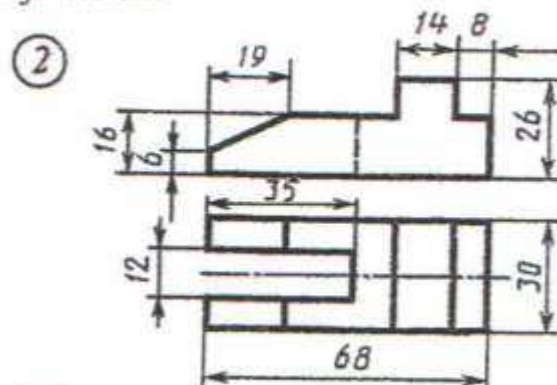
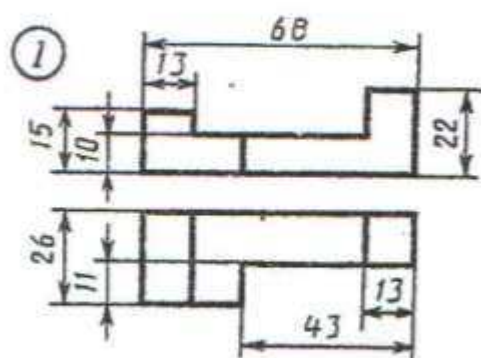
## 12-nji variant



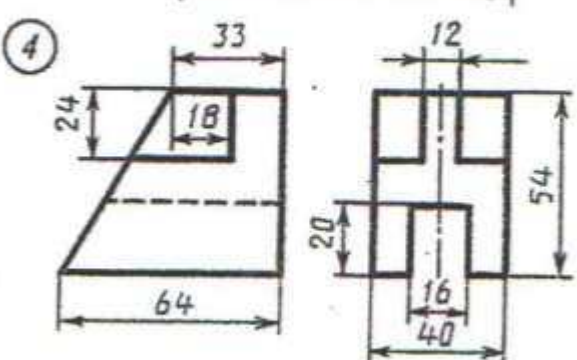
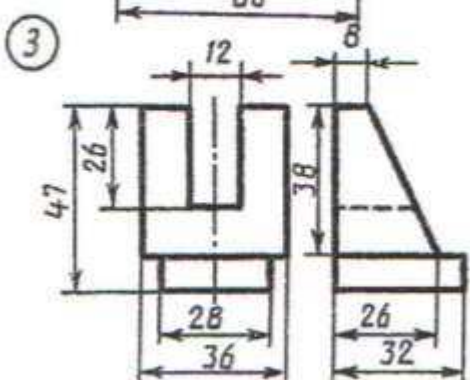
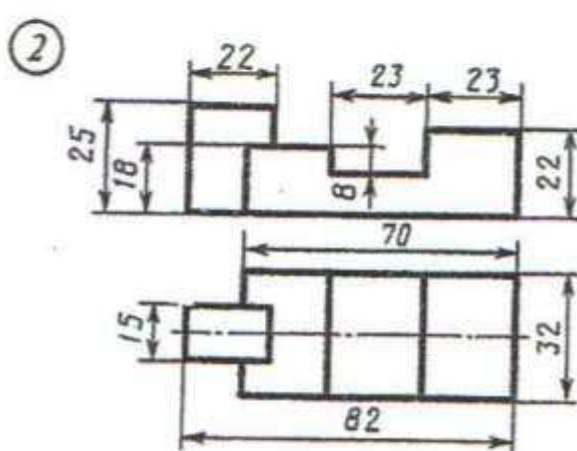
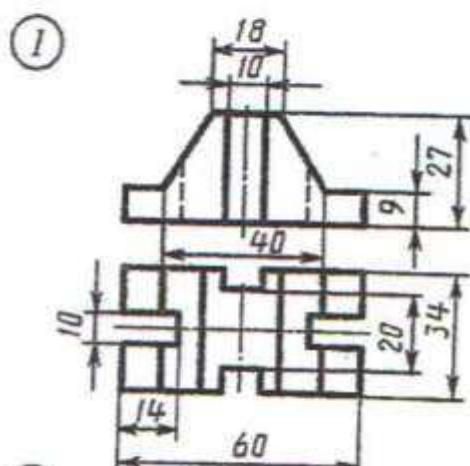
Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly

# ÝUMUŞ 45

13-nji variant



14-nji variant

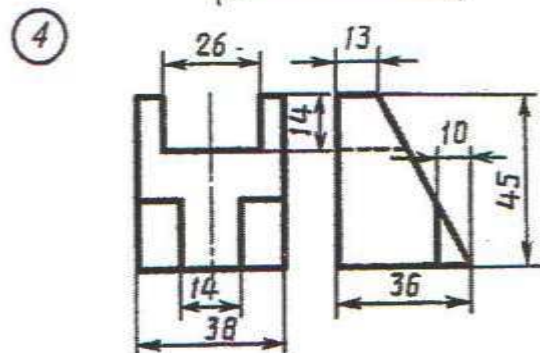
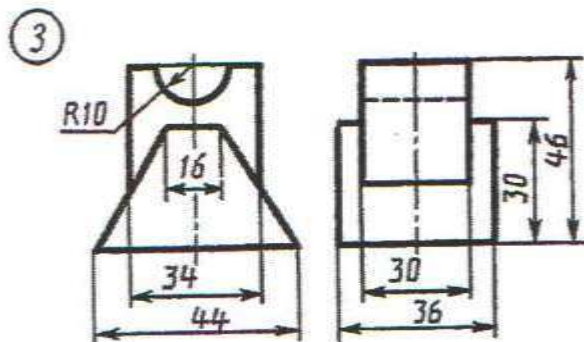
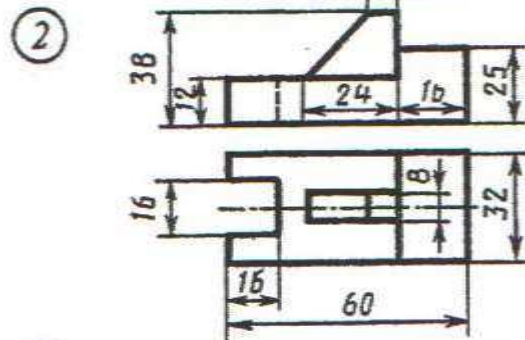
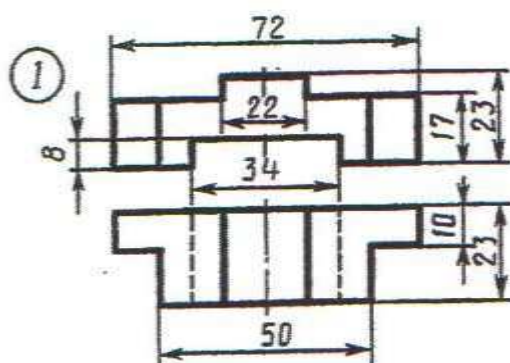


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

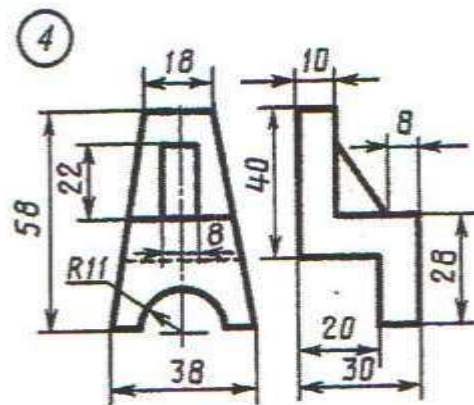
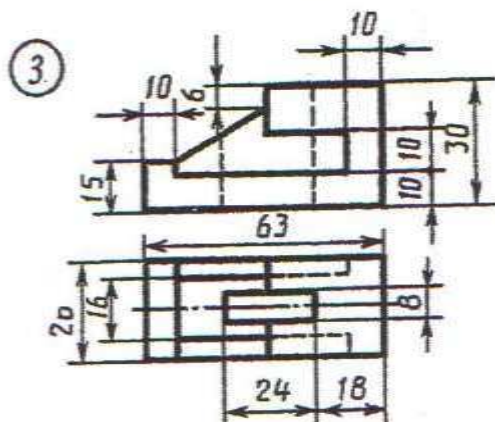
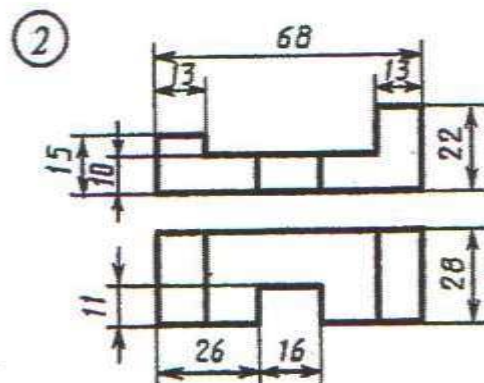
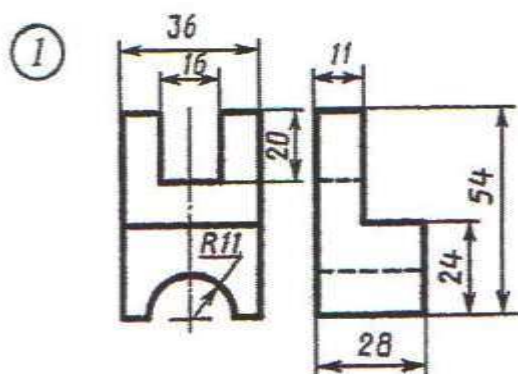


# YUMUŞ 45

15-nji variant



16-njy variant

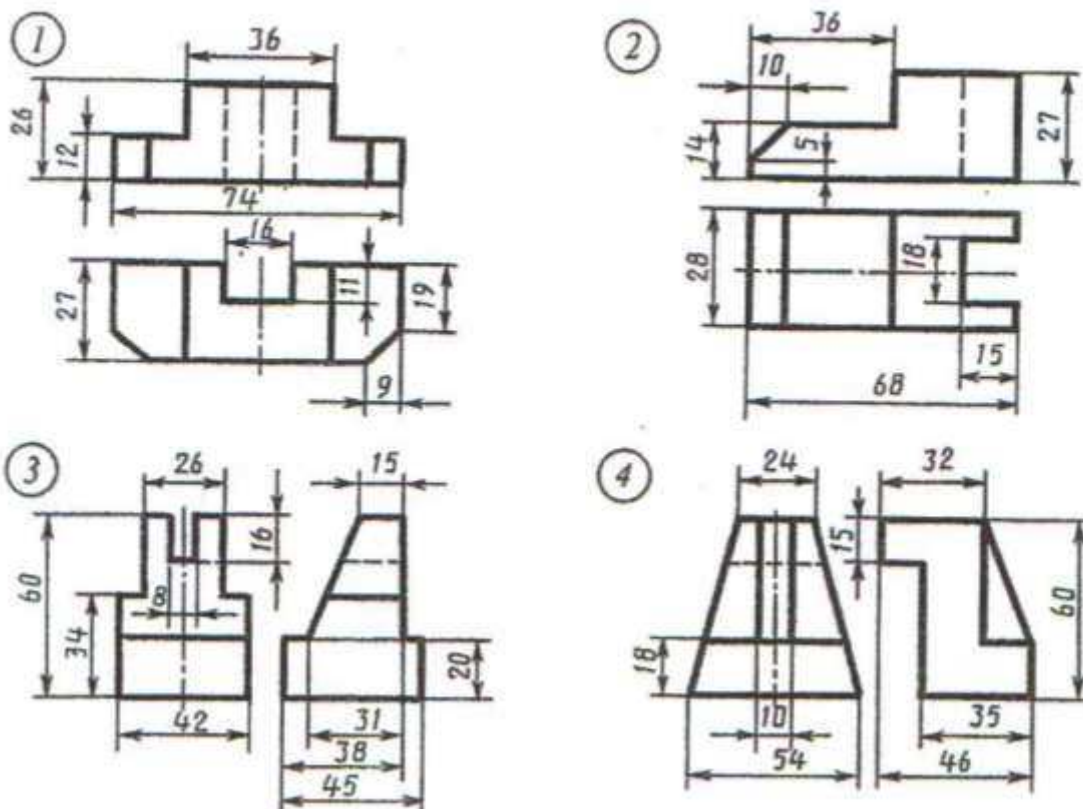


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

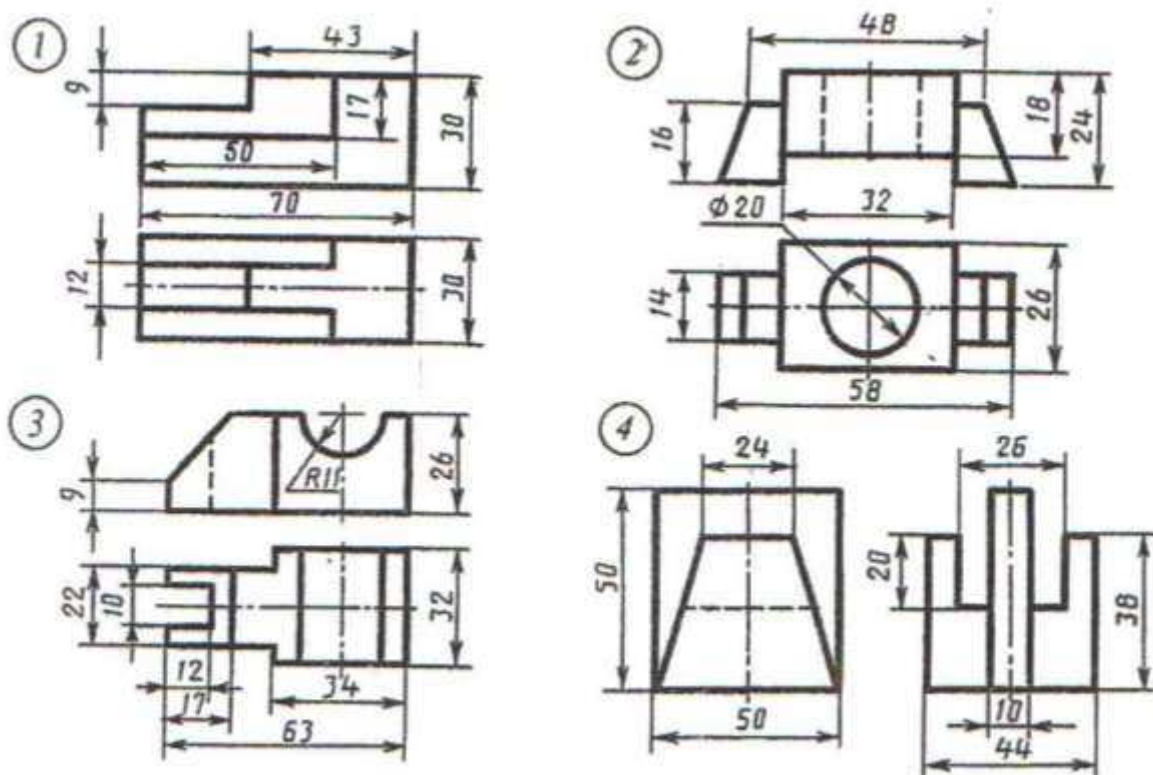


# ÝUMUŞ 45

17-nji variant



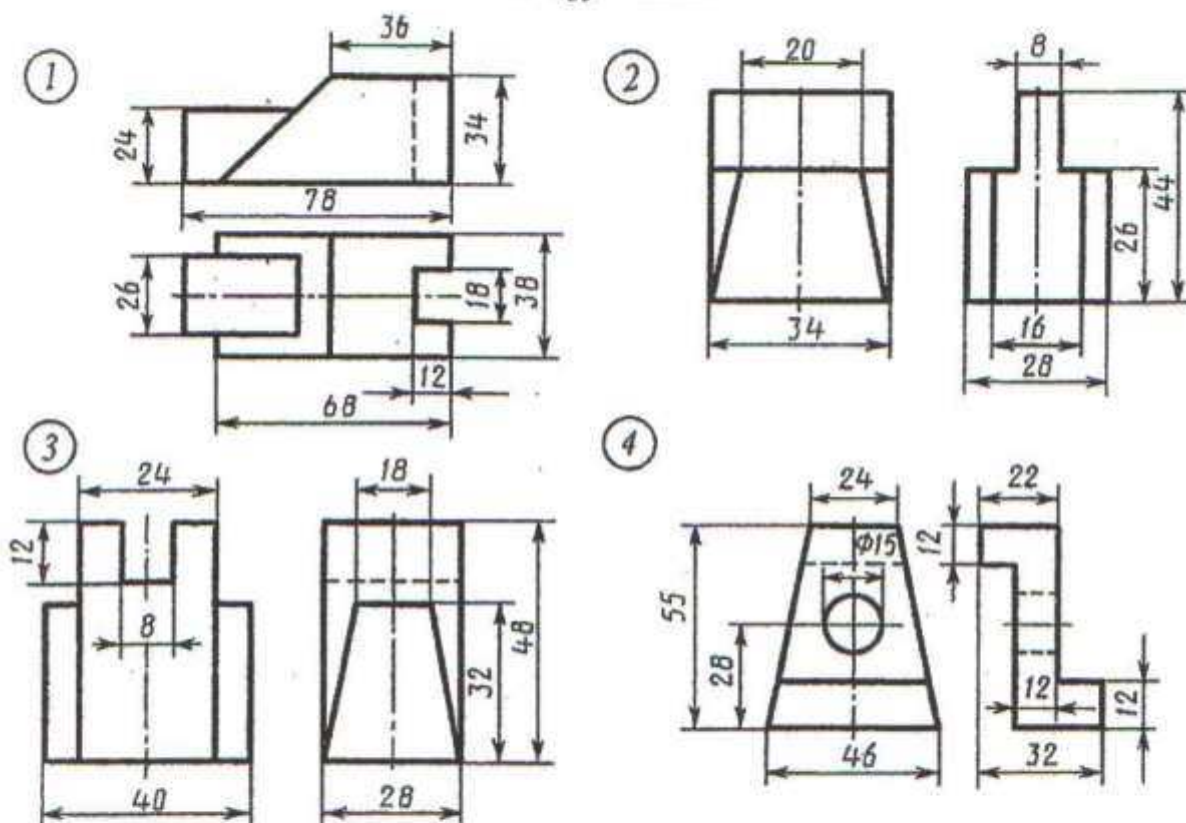
18-nji variant



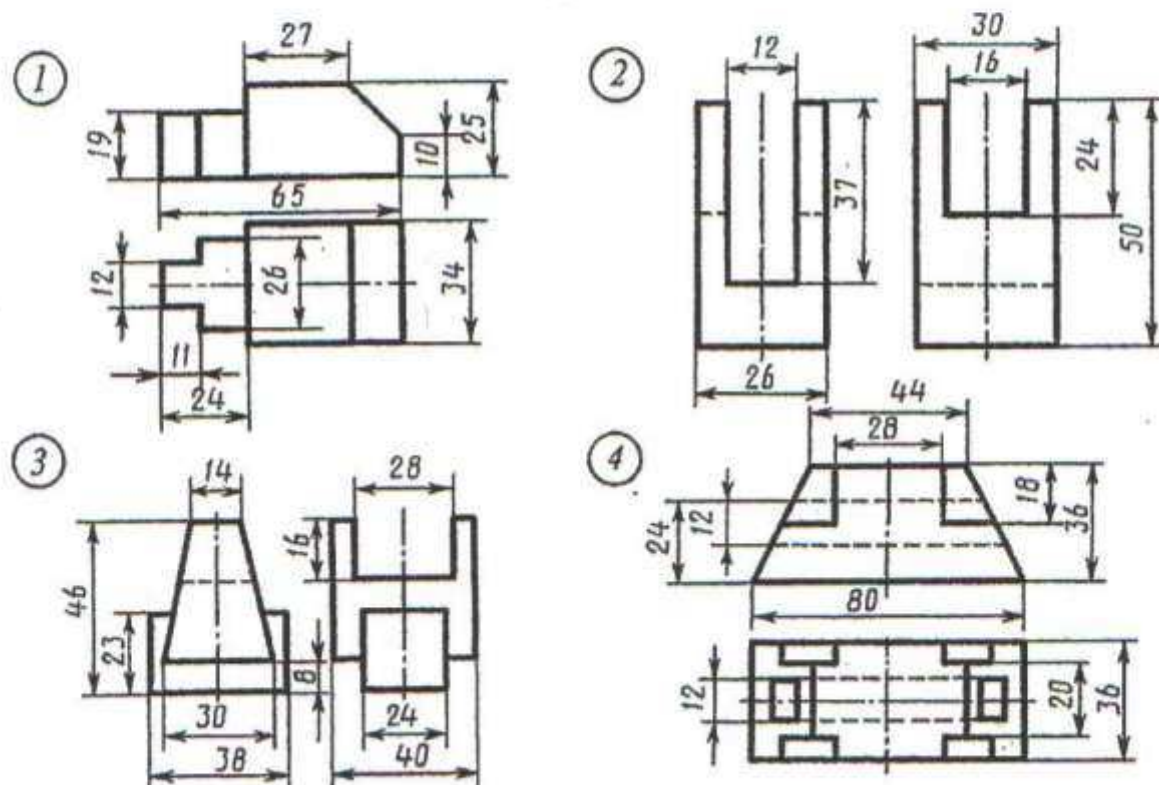
Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

# YUMUŞ 45

19-njy variant



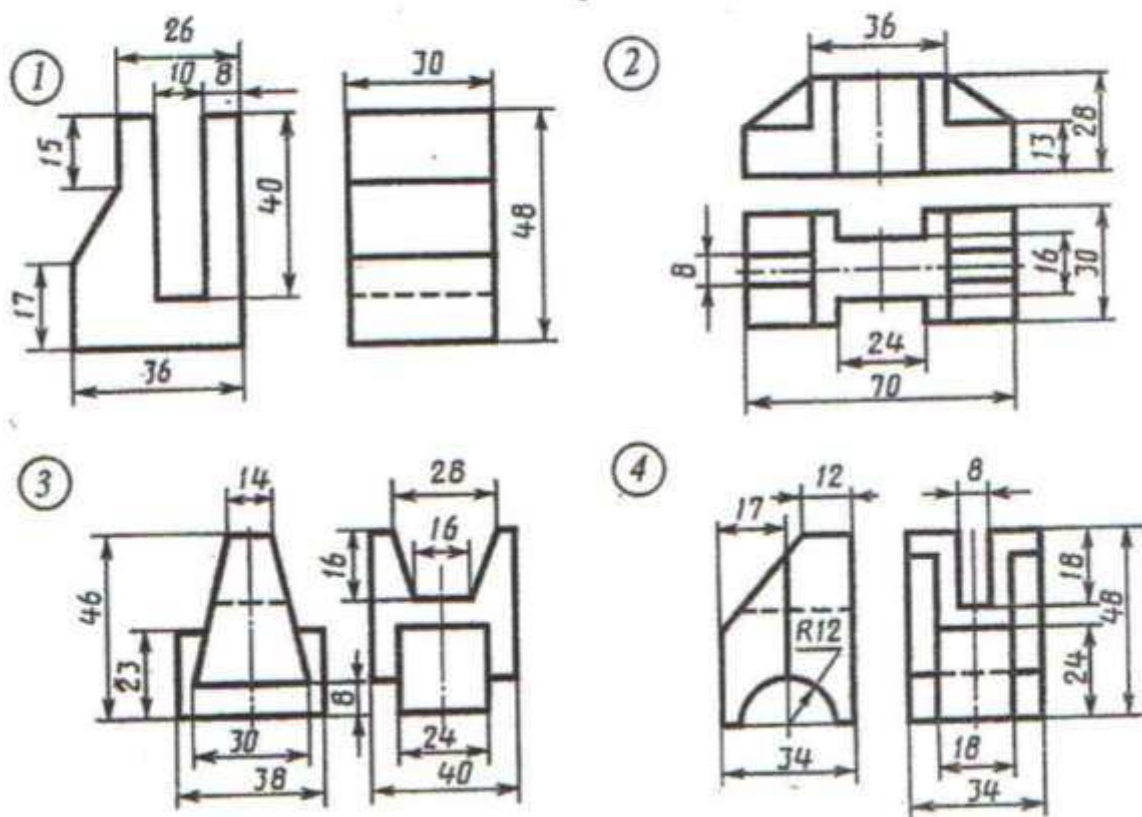
20-nji variant



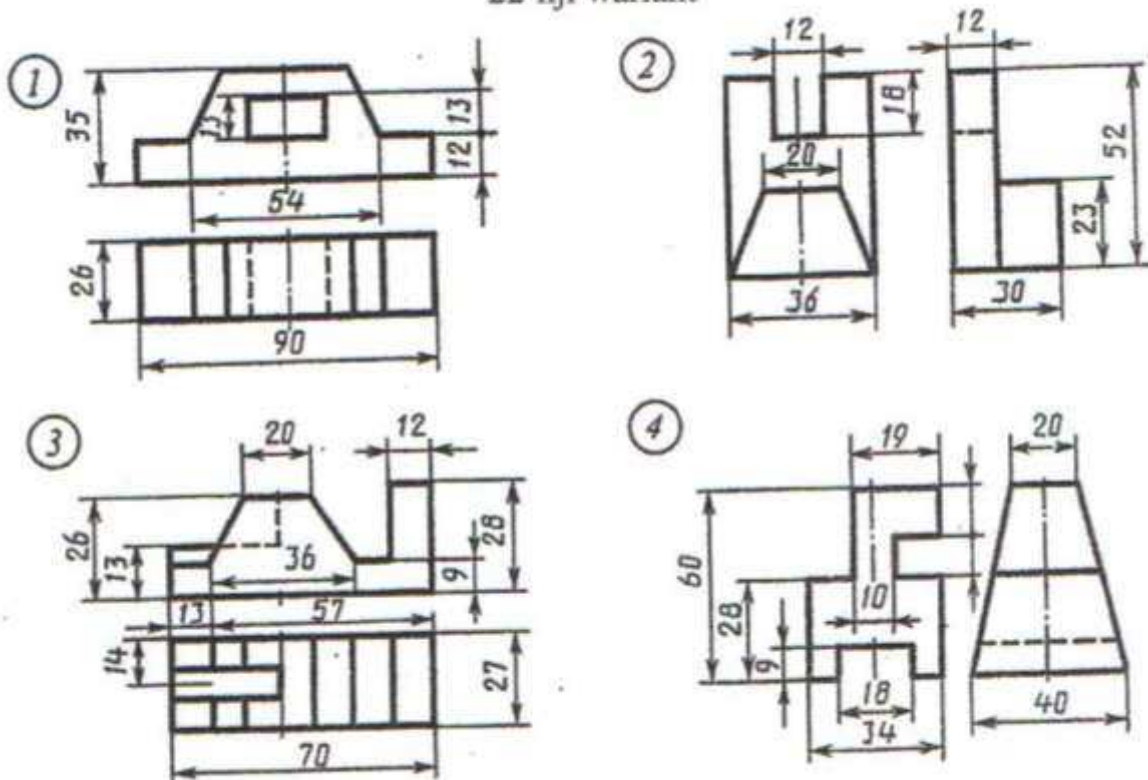
Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

# YUMUŞ 45

21-nji variant



22-nji variant

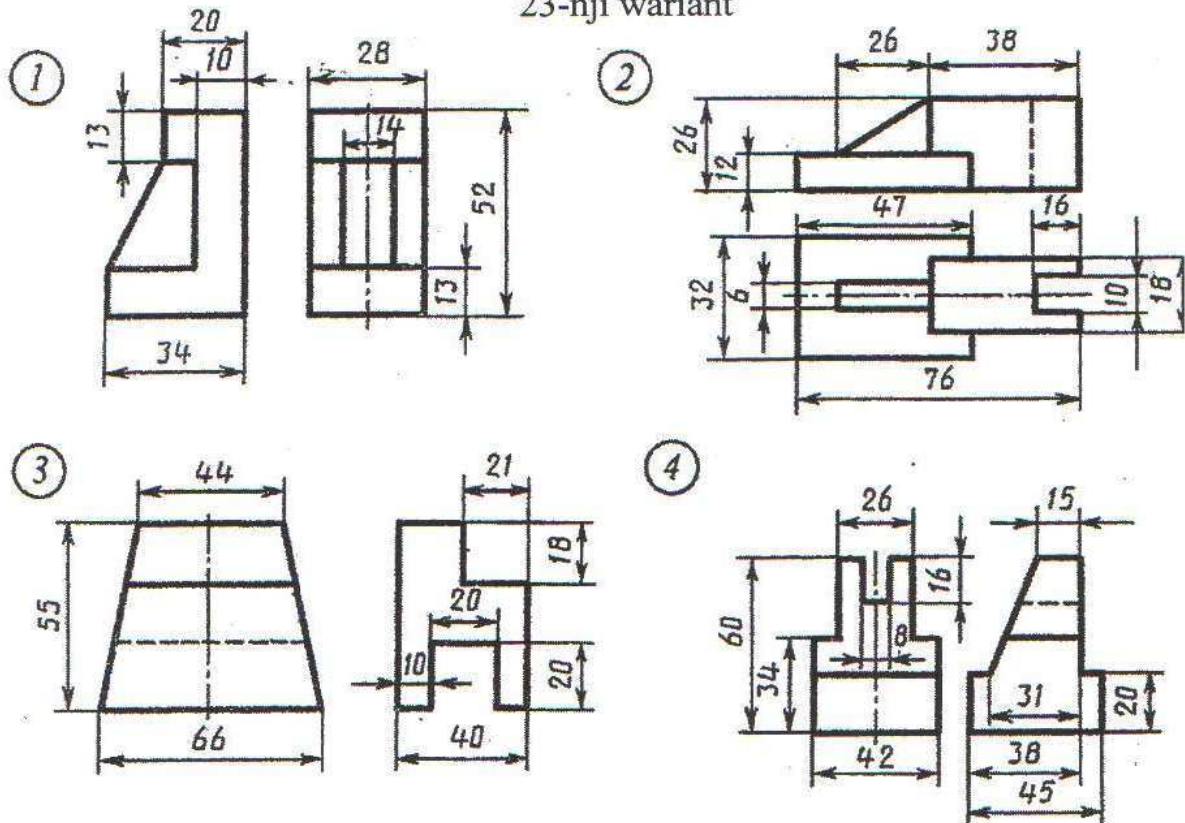


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

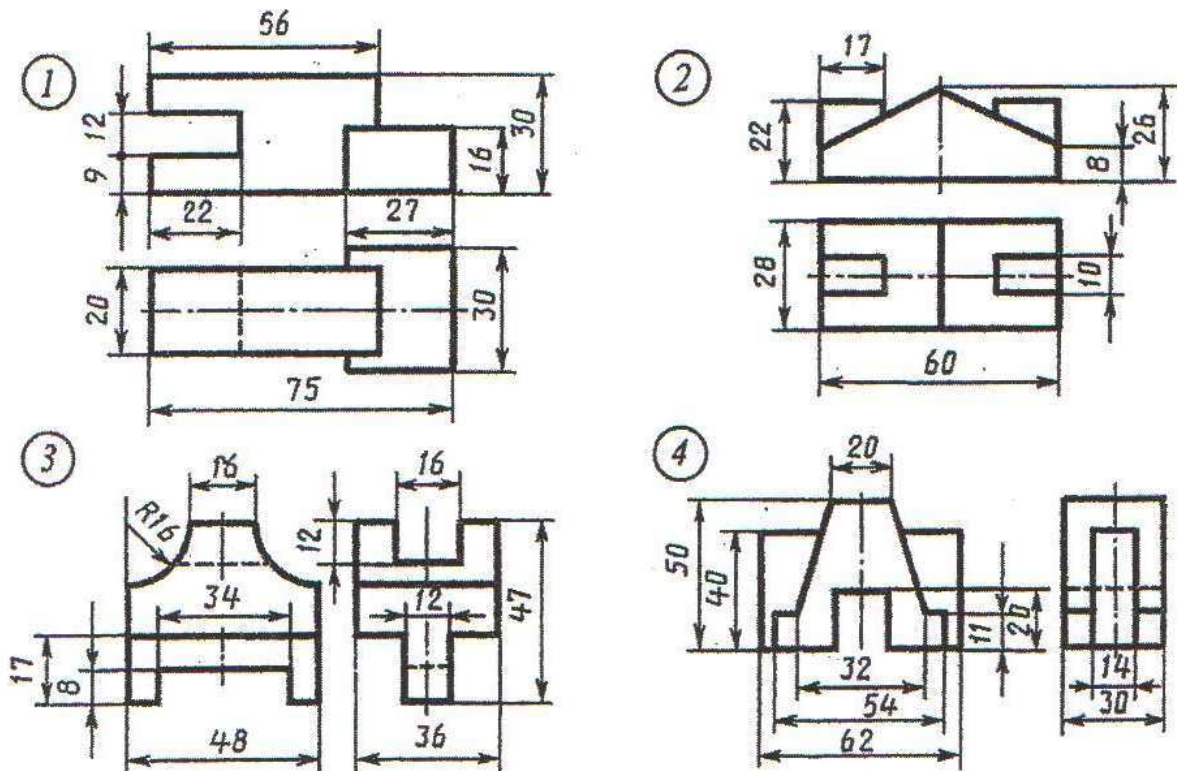


# YUMUŞ 45

23-nji variant



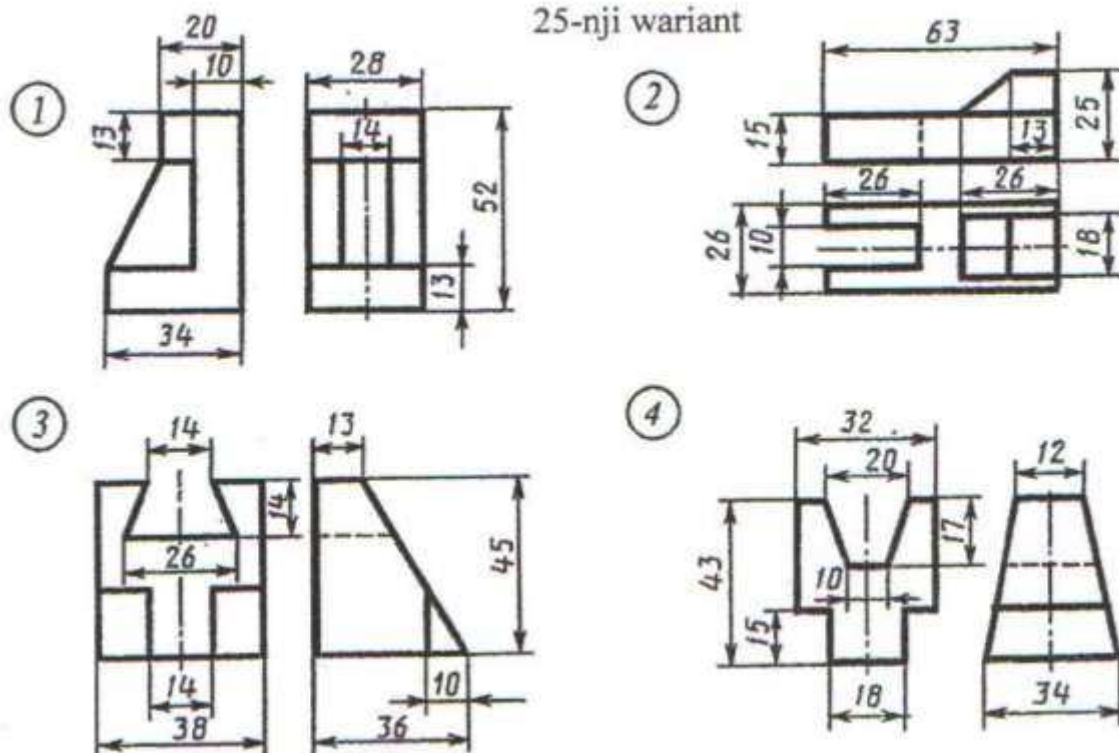
24-nji variant



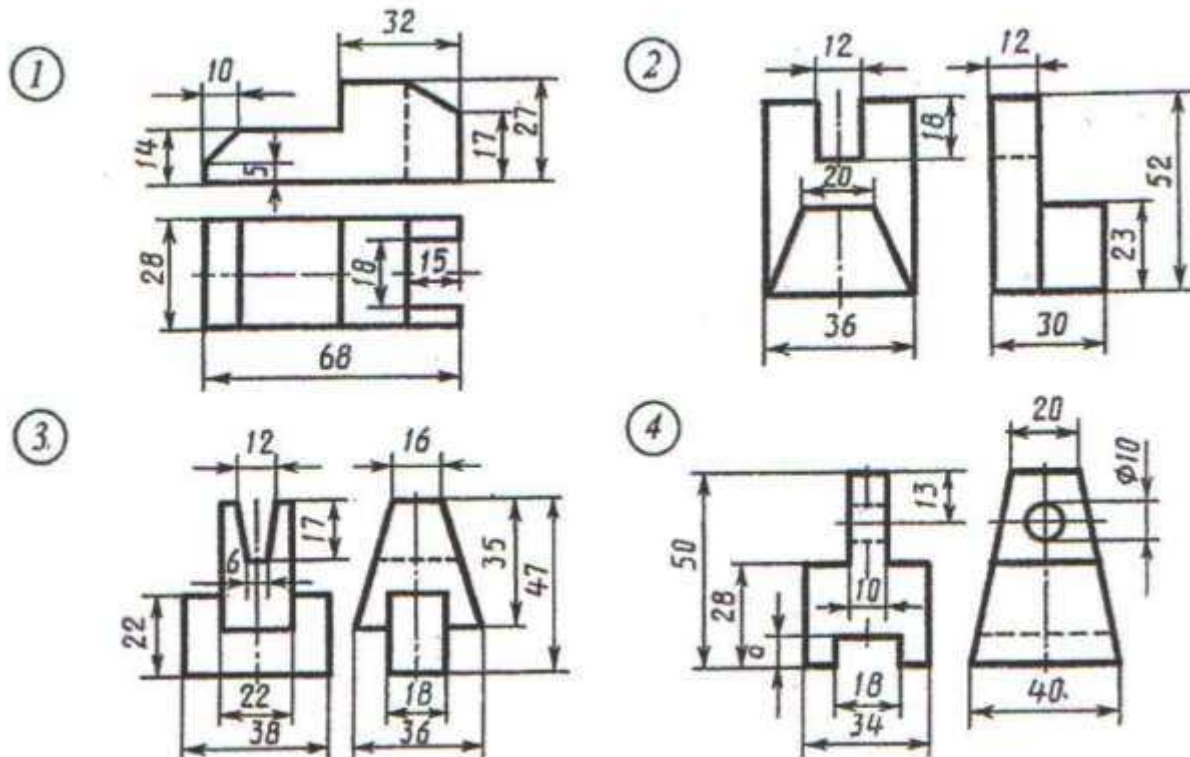
Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

# YUMUŞ 45

25-nji variant



26-njy variant

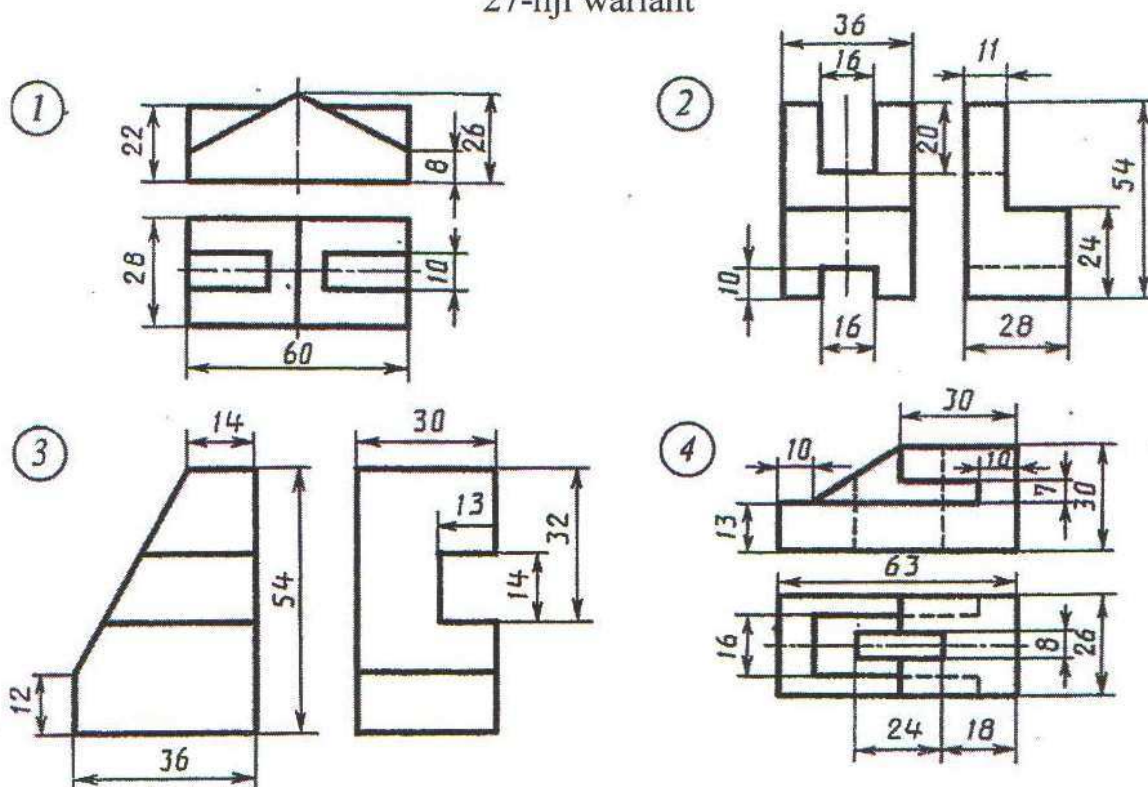


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

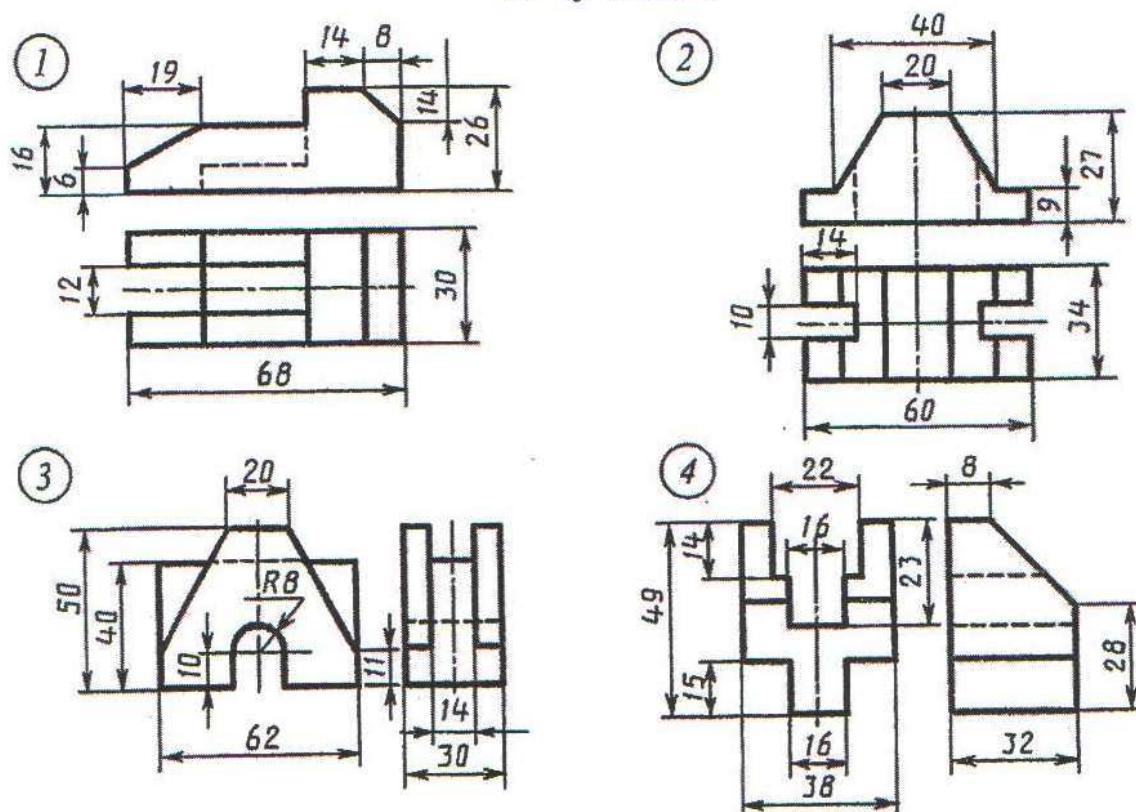


# YUMUŞ 45

27-nji variant



28-nji variant

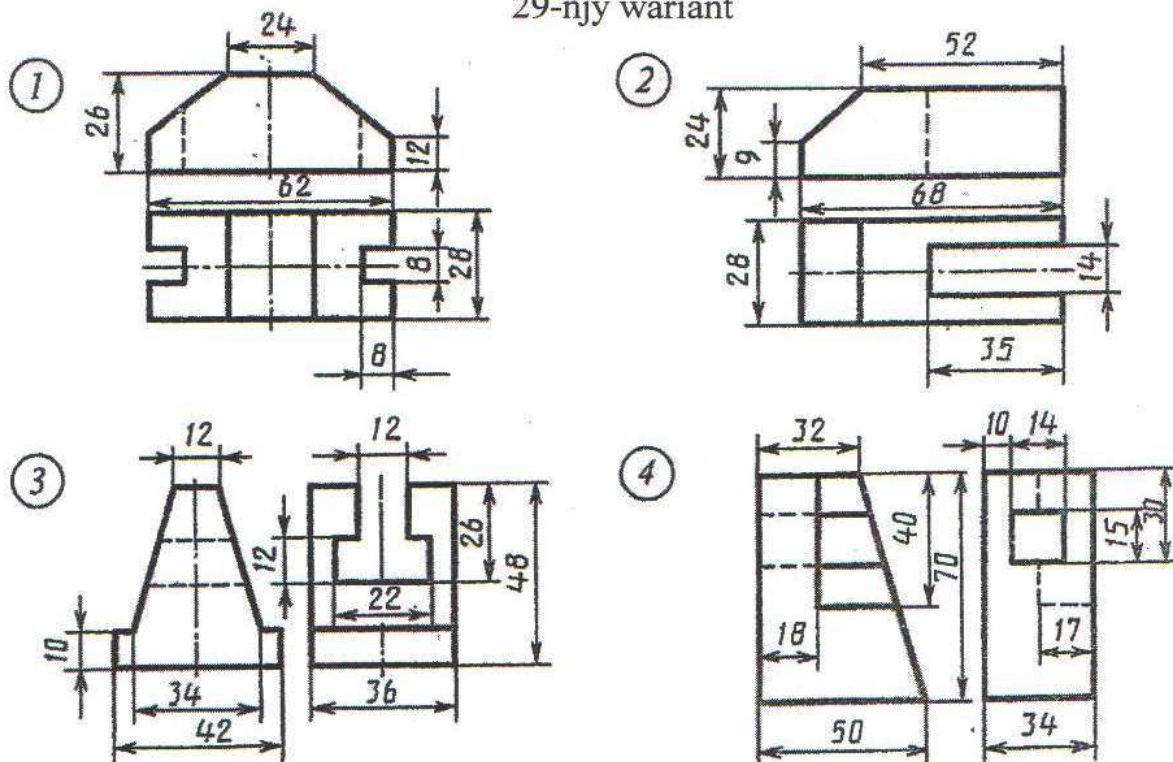


Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

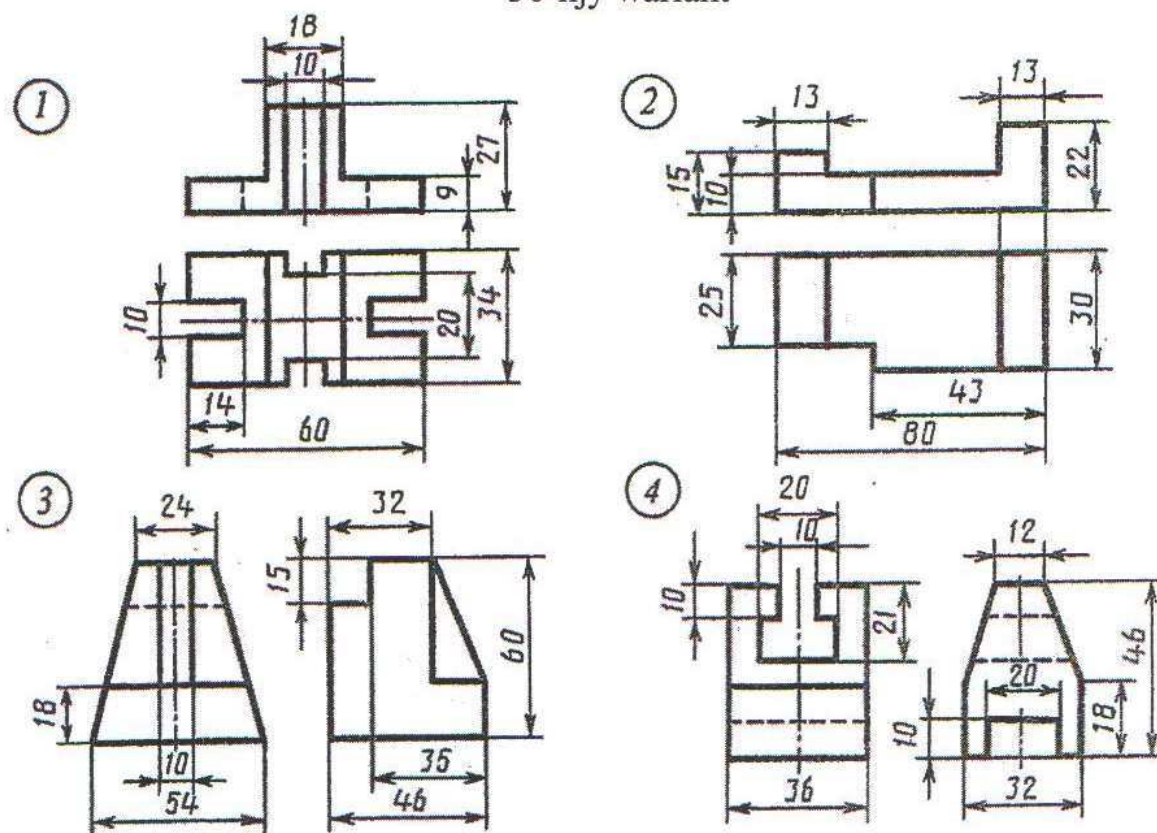


# YUMUŞ 45

29-njy variant

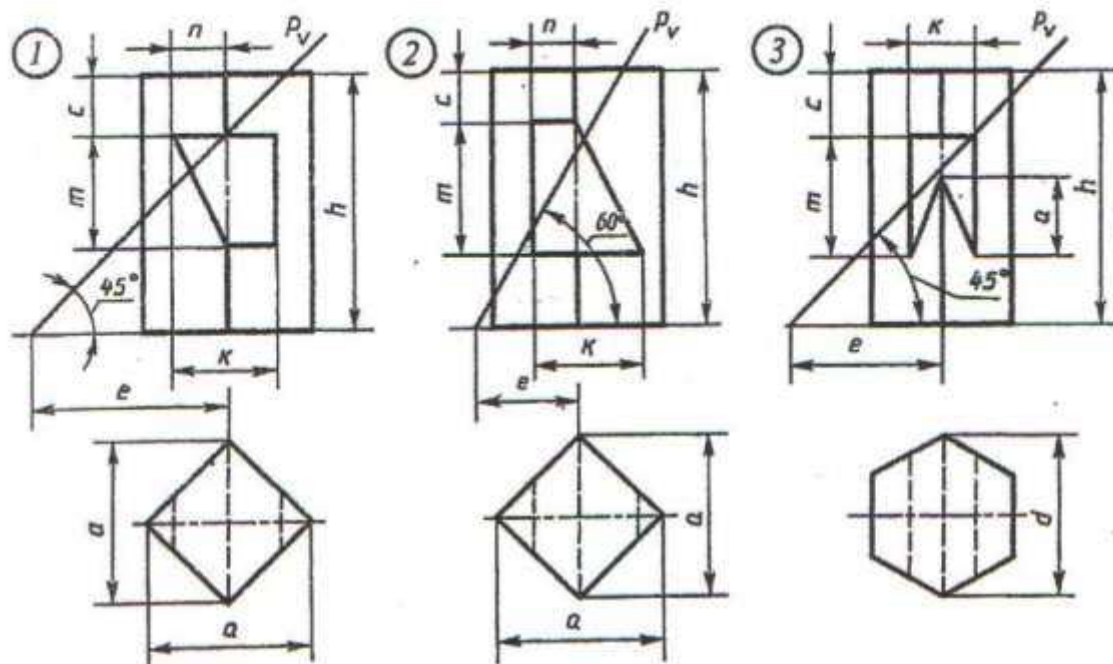


30-njy variant



Nusganyň berlen iki proyeksiýasy boýunça üçünjisini gurmaly.

# YUMUŞ 46

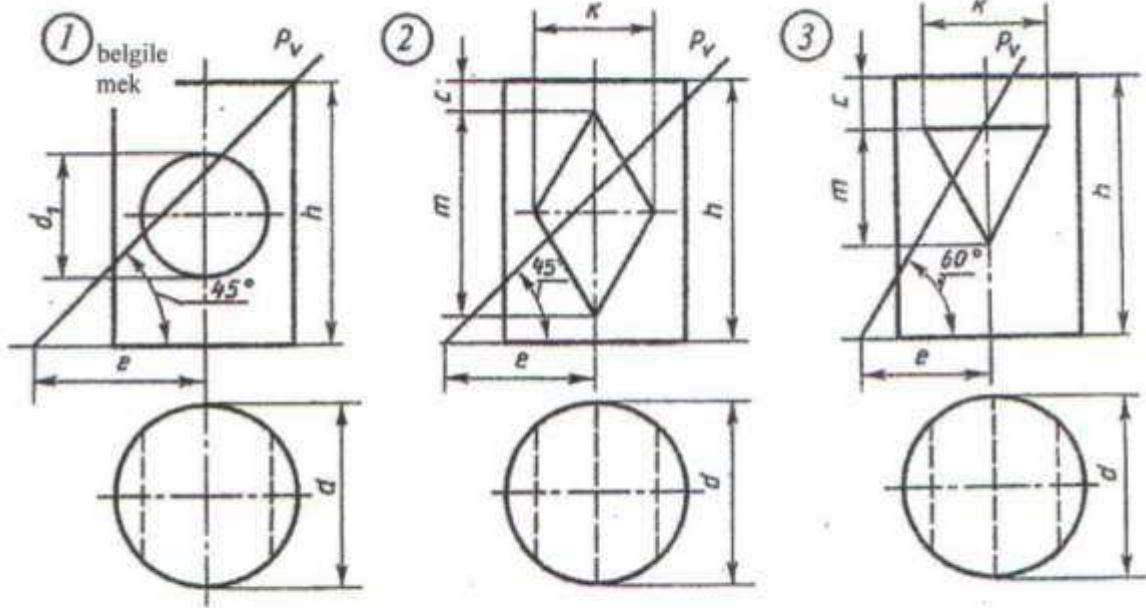


Yumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	a	50	48	52	52	46	54	50	48	52	50	46	54	50	48	52
	h	62	70	65	60	72	64	58	70	66	60	72	65	58	70	64
	c	12	13	10	12	10	10	10	12	12	10	13	10	12	10	18
	m	30	35	32	28	34	30	28	36	30	30	34	32	32	35	36
	n	15	16	20	14	17	20	16	15	20	15	14	20	14	17	20
	k	30	25	35	32	24	35	28	26	20	32	24	36	30	23	30
	e	40	33	43	42	32	44	38	31	42	40	34	45	42	32	26
Yumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	a	50	54	48	52	54	50	50	52	48	52	50	50	50	54	48
	h	60	65	70	60	66	72	60	64	70	60	65	72	62	66	70
	c	8	17	9	10	16	10	8	18	9	10	17	10	8	18	9
	m	42	33	44	43	32	45	44	34	43	43	32	44	42	34	45
	n	10	15	12	12	14	13	10	15	12	22	14	13	20	15	11
	k	30	35	32	28	37	35	24	34	32	42	35	34	43	37	32
	e	25	33	32	26	34	33	25	33	31	40	34	34	40	32	32
Yumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	d	60	60	64	58	62	62	62	62	66	60	60	64	58	62	66
	h	65	70	72	66	72	74	64	68	74	65	70	72	66	72	74
	c	15	20	20	14	21	19	15	19	21	15	22	20	16	20	20
	m	40	36	36	38	37	38	42	35	36	40	34	38	38	35	36
	k	28	26	40	26	28	42	28	26	38	26	28	40	28	26	40
	a	15	20	27	13	22	25	14	20	27	15	23	25	15	20	27
	e	35	45	54	36	44	58	34	45	59	36	44	57	35	45	56

Içi boşlukly prizmanyň çyzgysyny üç proyeksiýada ýerine ýetirmeli



# YUMUŞ 47

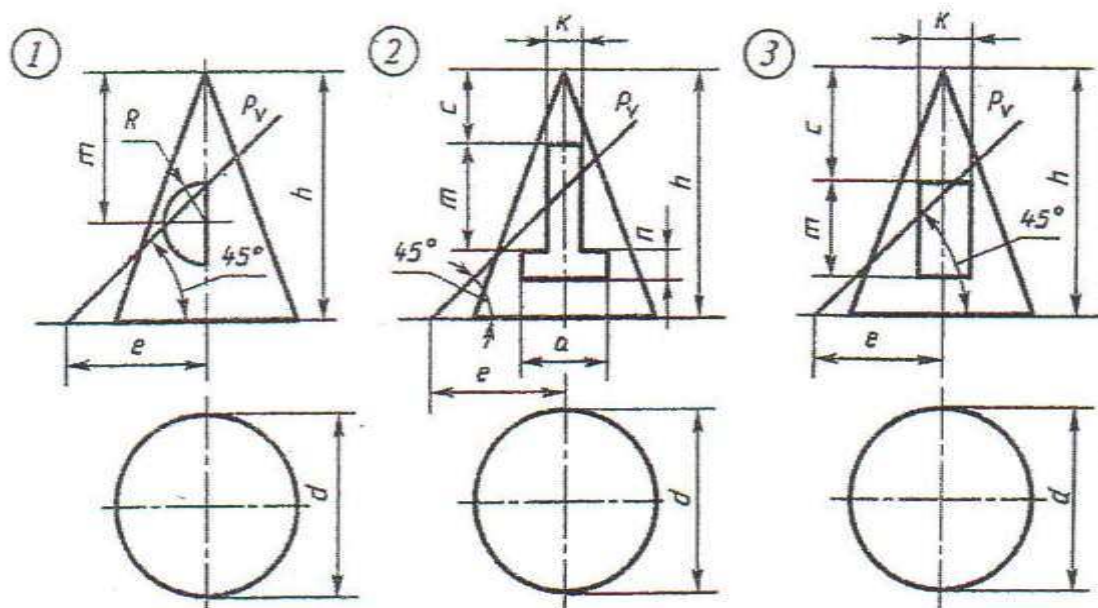


Yumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	d	50	52	54	48	50	54	48	48	52	54	50	55	52	48	50
	h	65	70	72	70	68	72	70	68	70	68	70	75	74	65	68
	d <sub>1</sub>	30	35	36	30	32	40	30	32	36	35	34	35	38	36	32
	e	43	45	42	40	42	45	40	40	45	43	42	54	44	40	43
Yumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	d	52	50	56	52	50	52	54	46	54	52	50	54	55	54	52
	h	70	68	74	86	72	70	65	68	72	70	70	72	75	74	72
	c	8	6	20	10	8	5	10	8	5	12	9	10	10	8	7
	m	50	40	45	45	44	54	50	50	50	48	52	52	50	48	56
	k	36	30	36	34	36	24	26	30	24	30	34	26	32	30	32
	e	36	32	35	35	36	54	55	40	53	55	54	55	56	52	54
Yumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	d	52	46	45	50	52	48	45	50	54	50	45	50	52	52	45
	h	70	65	64	70	72	66	66	70	70	68	64	70	70	70	60
	c	14	14	10	15	14	12	10	14	14	13	10	15	15	15	10
	e	32	23	25	25	29	26	26	28	30	25	30	20	23	30	26
	m	34	28	40	50	48	30	40	50	46	32	40	50	46	34	40
	k	42	36	36	40	42	38	36	40	42	38	38	40	42	38	38

İçi boşlukly silindriň çyzgysyny üç proyeksiýada ýerine ýetirmeli



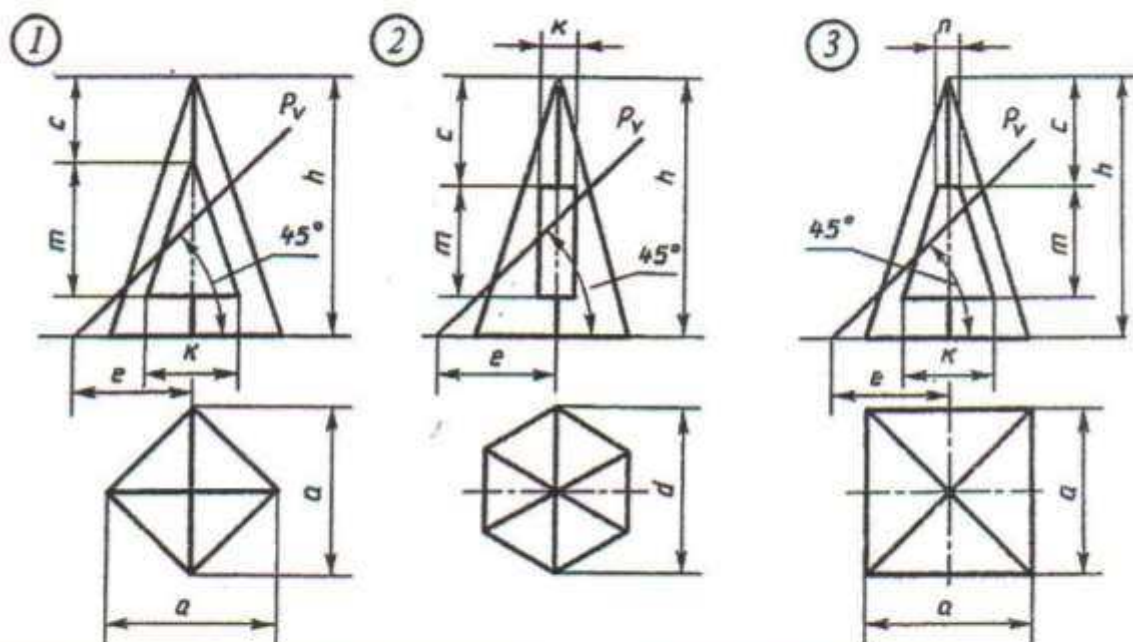
# YUMUŞ 48



Ýumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	d	50	50	75	50	78	70	50	50	70	50	48	74	50	52	70
	h	60	70	45	62	70	46	64	68	47	65	70	44	68	70	47
	m	38	45	30	40	46	28	36	44	28	35	45	29	38	45	28
	R	13	14	15	12	14	15	13	12	15	10	14	15	12	14	15
	e	35	25	32	35	30	35	30	28	35	32	20	37	34	29	32
Yumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	d	50	60	70	52	62	70	50	60	68	48	62	72	50	60	70
	h	70	64	60	75	62	63	72	66	60	70	64	62	70	62	60
	c	22	25	24	20	24	25	20	25	24	20	24	25	22	25	24
	m	30	20	33	28	20	22	28	20	22	28	20	22	30	20	22
	a	20	20	22	20	18	22	22	22	22	22	20	22	20	20	22
	k	12	16	16	12	16	16	12	16	16	12	16	16	12	16	16
	n	12	12	10	10	12	10	10	12	10	10	12	12	10	12	10
	e	40	36	35	37	36	37	36	36	64	35	36	38	36	36	35
Ýumuşyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	d	72	68	64	74	68	64	74	66	64	74	68	64	74	66	65
	h	60	58	65	60	56	64	62	60	66	60	58	64	62	58	65
	c	26	17	25	28	18	24	28	16	26	28	16	25	26	16	24
	m	30	30	24	32	32	26	33	35	28	34	32	26	31	30	28
	k	22	14	20	18	14	20	22	14	18	20	14	20	22	14	18
	e	36	30	40	35	37	38	35	35	36	30	37	38	34	36	36

İçi boşlukly konusyň çyzgysyny üç proyeksiýada ýerine ýetirmeli

# ÝUMUŞ 49



Ýumu- şyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	<i>h</i>	70	65	55	72	70	64	54	70	72	65	55	70	68	64	54
	<i>a</i>	64	60	70	56	62	60	70	56	64	62	70	56	62	60	72
	<i>m</i>	40	45	35	36	38	44	35	36	40	45	36	35	38	44	34
	<i>k</i>	30	22	40	38	28	20	38	40	30	22	40	38	30	20	38
	<i>c</i>	10	12	8	22	12	14	10	22	10	12	8	22	12	14	10
	<i>e</i>	40	35	35	40	40	34	35	30	40	36	35	30	40	35	36
Ýumu- şyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	<i>d</i>	60	54	56	66	60	56	54	68	60	54	58	66	60	54	52
	<i>h</i>	55	60	70	48	55	62	70	48	55	60	70	48	55	62	70
	<i>m</i>	20	24	20	18	21	24	20	22	20	24	22	20	21	24	22
	<i>c</i>	25	23	37	34	24	22	36	34	25	22	35	34	24	22	36
	<i>k</i>	16	14	22	28	16	14	20	28	16	14	22	28	16	14	20
	<i>e</i>	30	35	30	40	30	35	30	40	30	35	40	40	30	35	30
Ýumu- şyň №	belgile mek	wariantlar														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	<i>a</i>	60	50	54	62	60	50	54	62	60	50	54	62	60	52	54
	<i>h</i>	70	58	65	58	70	56	65	58	70	58	65	58	70	56	65
	<i>m</i>	25	34	30	25	25	35	30	25	25	34	30	25	25	35	30
	<i>c</i>	30	10	20	28	39	10	20	28	30	10	20	28	30	10	20
	<i>n</i>	14	0	6	10	14	0	6	10	14	0	6	10	12	0	6
	<i>k</i>	30	26	22	22	30	24	22	22	30	26	24	22	30	24	24
	<i>e</i>	40	35	36	35	40	35	38	35	40	35	34	36	40	35	34

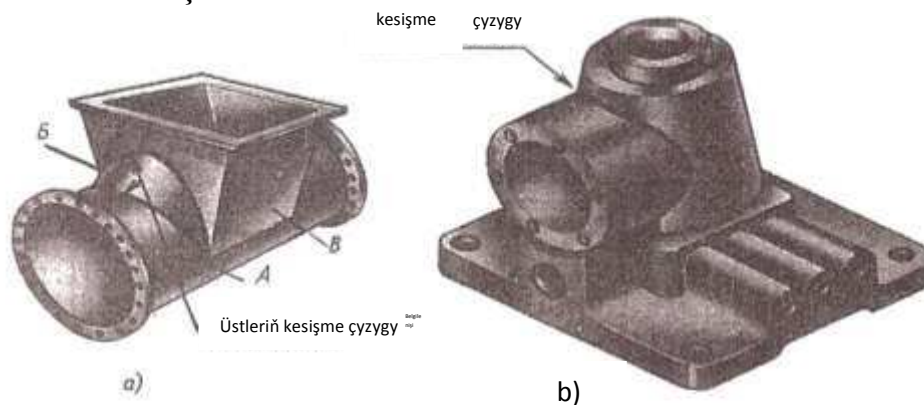
İçi boşlukly piramidanyň çyzygysyny üç proyeksiýada ýerine ýetirmeli



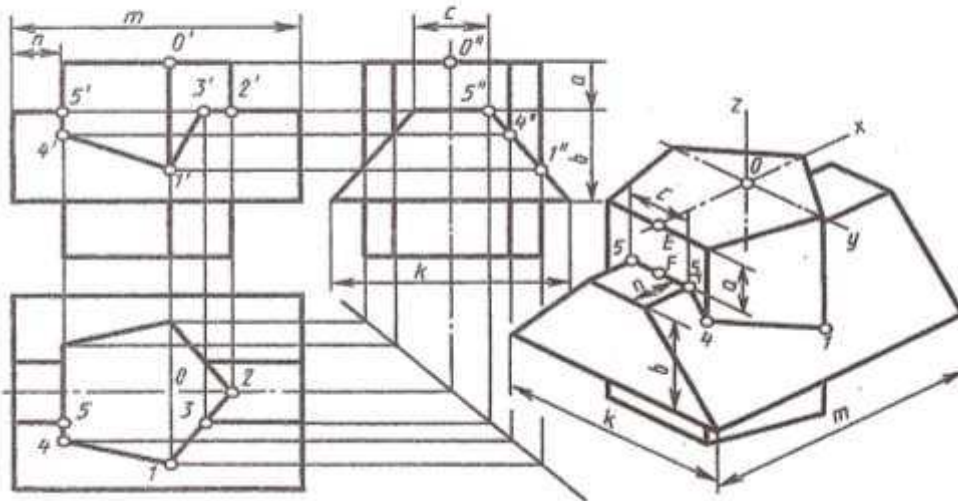
## 14. Geometriki figuralaryň üstleriniň özara kesişmesi

Maşyn şaýlarynyň çyzgylarynda dürli üstleriň kesişme çyzyklary köp gabat gelýär. Kähalatlarda bu çyzyklar çylşyrymly lekal egrileri bolup durýarlar, şeýle proýeksiýany gurmak üçin köp sanly esasy nokatlary tapmak möhüm bolýar.

Kesişme çyzygyny gurmaklyk has takyklygy talap edýär, mysal üçin turbageçirijileriň, howany arassalaýjy gurnamanyň, uly gaplaryň, maşyn kuzowlarynyň (gapaklarynyň), stanoklaryň we başga enjamlaryň çyzgylary ýerine ýetirilende, meselede, ýokardaky mysaldaky ýaly gurluş talap edilýär, 55-nji a, b suratlarda silindrik üst bilen çäklenen, konus B üst bilen kesişýän we piramidanyň B üsti bilen bunker şekillendirilen.



55-nji surat



56-njy surat

Iki sany köpgranlygynyň kesişme çyzygyny gurmak üçin, birinji köpgranlygynyň gapyrgasy bilen ikinji köpgranlygynyň tarapynyň we ikinji köpgranlygynyň gapyrgasy bilen birinji köpgranlygynyň tarapynyň kesişme nokady tapylýar. Tapylan nokatlary birikdirýärler we döwür çyzyk alynýar, onuň kesimi bolsa köpgranlyklaryň biriniň taraplarynyň ikinjisiniň taraplary bilen kesişme çyzygyny berýär (56-njy surat).

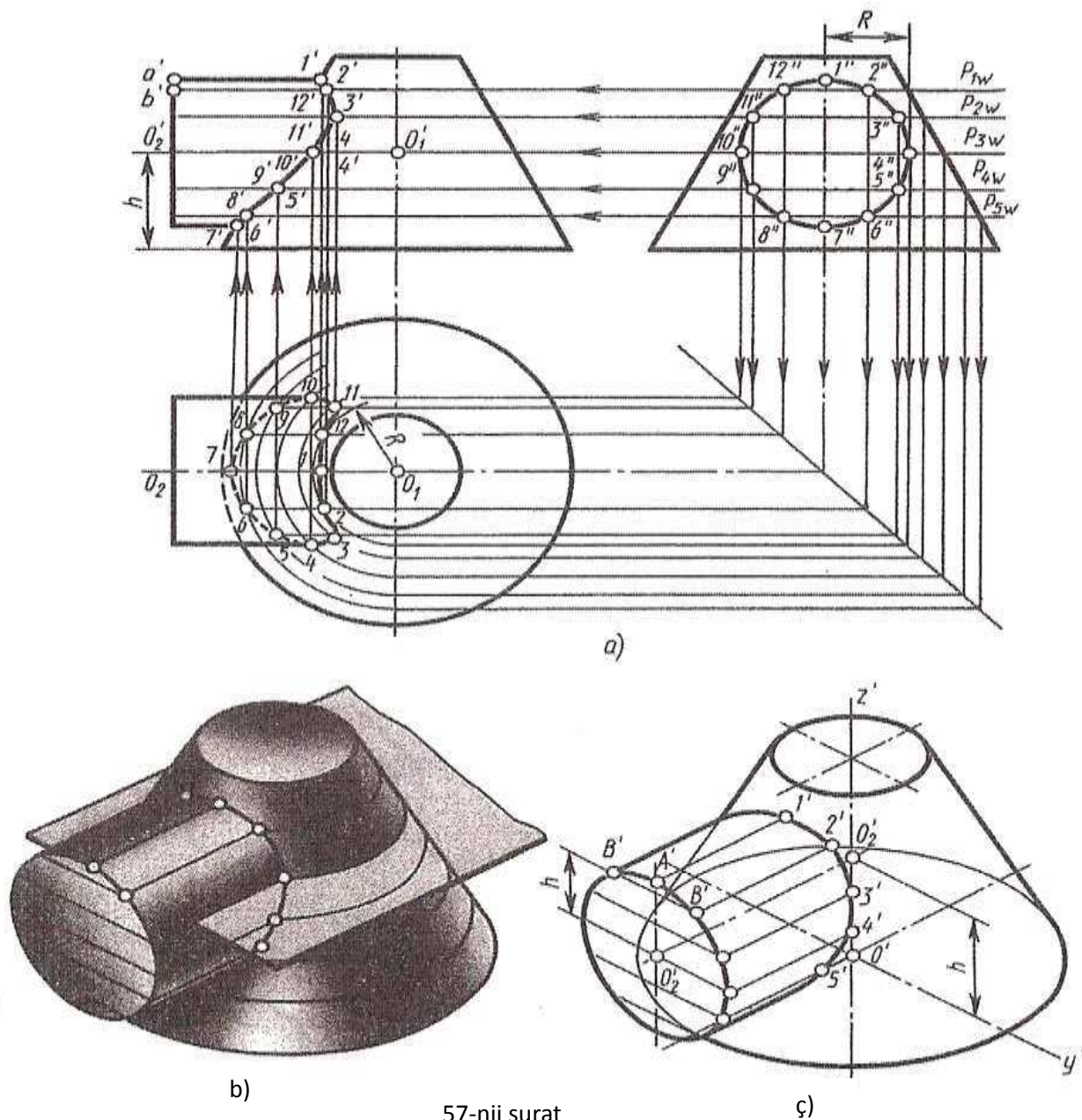
Aýlanma üstleriň kesişme çyzygyny düzgün boýunça kömekçi kesiji P tekizliklerden peýdalanyp gurulýar 57-nji a suratda.



Her bir kömekçi tekizlik, şol bir wagtda berlen iki üsti laýyk gelyän çyzyklar bilen kesýär 57-nji b suratda, şol çyzyklar özara nokatlarda kesişip berlen üstleriň kesişme çyzygyny kesgitleýär. Kömekçi tekizlikleriň sany, üstleriň kesişme çyzygyny gurmak üçin ýeterlik nokatlar tapylyança geçirilýär.

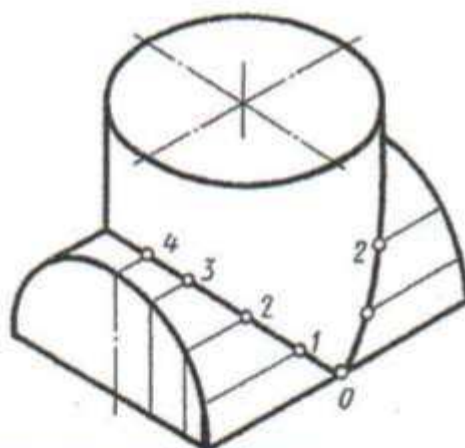
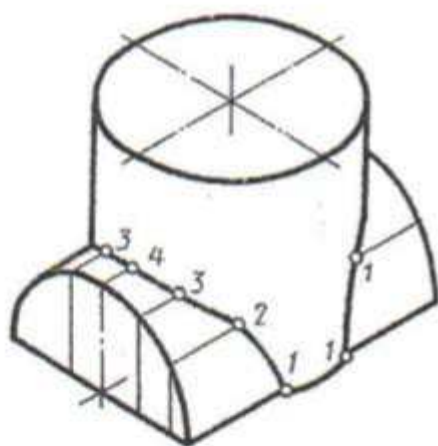
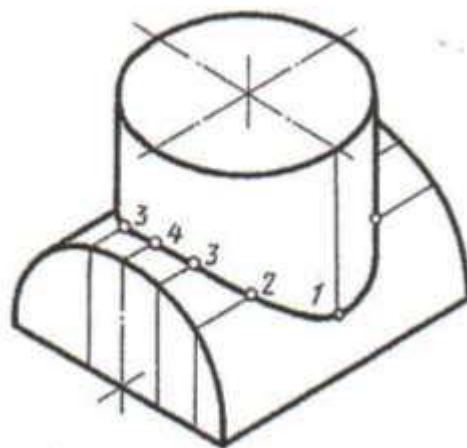
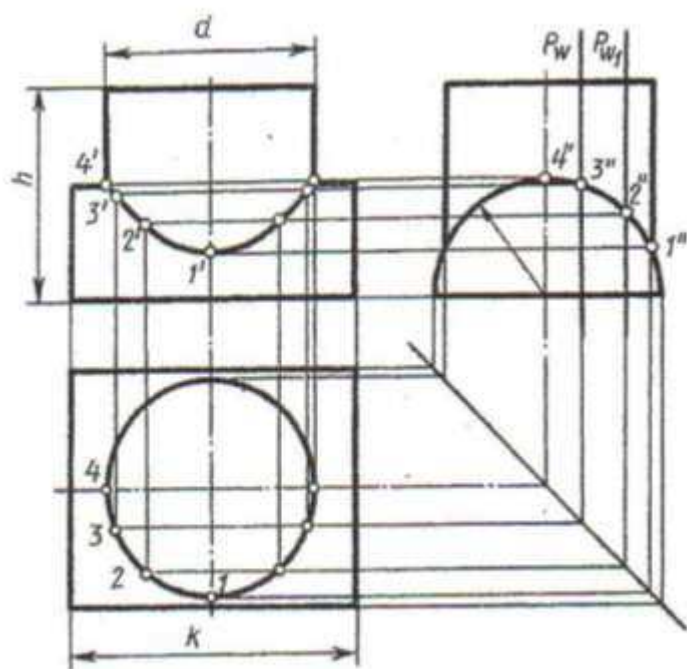
Ýumuşda üstleriň kesişme çyzygyny tapmaklyk bilen aksonometriki proyeksiýasyny gurmaklygyda göz önünde tutulýar.

**50...57 ýumuşlarda** geometriki figuralaryň üstleriniň kesişme çyzygyny gurmaklyga degişli meseleleri çözmek talap edilýär.



57-nji surat

# YUMUŞ 50



Belgi- lemek	variantlar													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
$R$	45	40	42	45	42	40	45	44	40	45	40	45	45	35
$d$	80	90	88	85	95	45	80	94	45	85	90	90	80	80
$h$	80	85	85	85	86	80	85	90	90	88	80	94	90	80
$k$	110	105	110	110	115	105	110	105	108	100	105	110	105	100

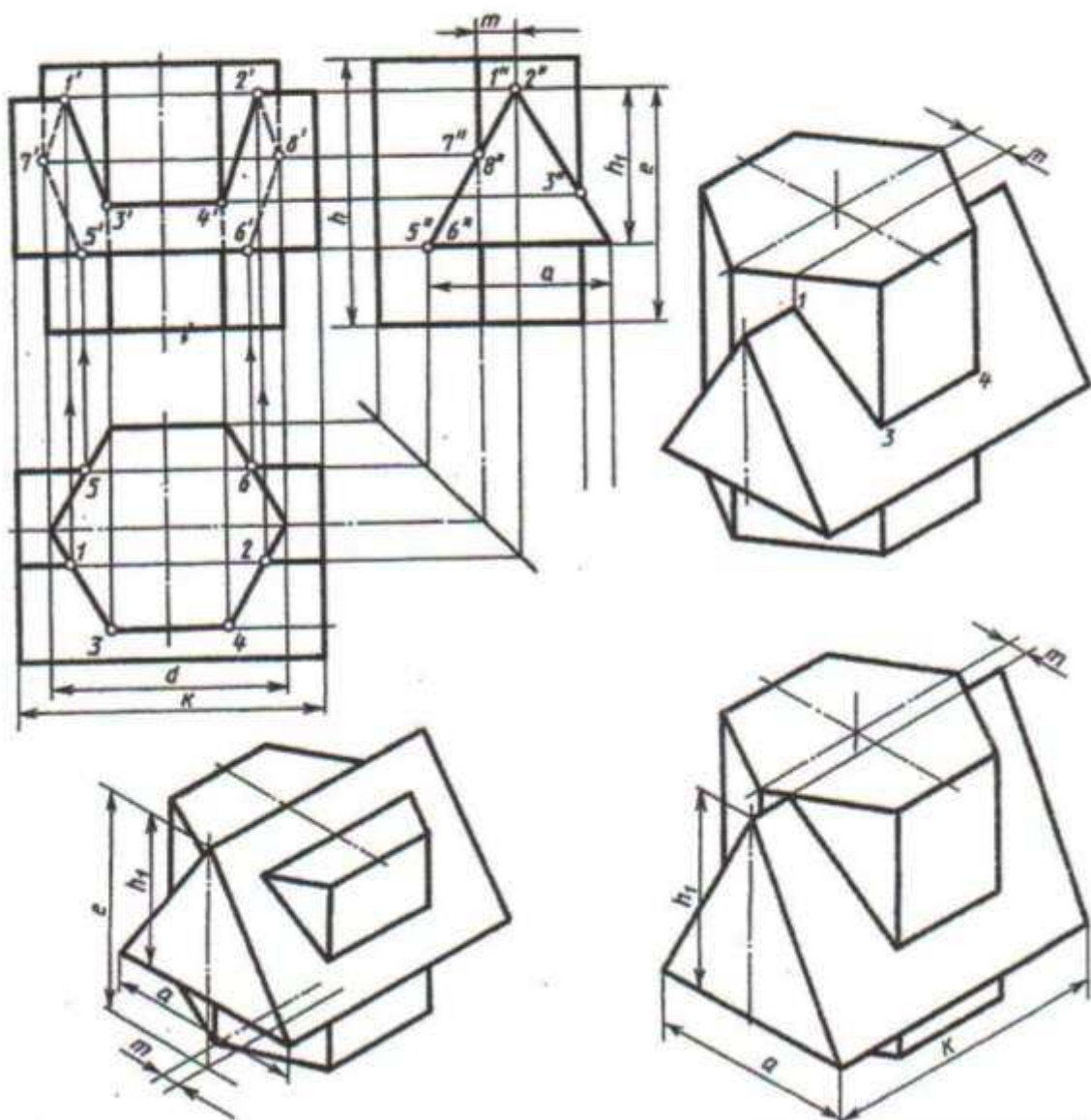
  

Belgi- lemek	variantlar															
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
$R$	44	45	40	42	45	35	40	45	40	44	45	35	40	45	35	42
$d$	95	85	90	90	85	80	85	85	88	95	80	80	80	85	75	88
$h$	90	85	85	88	86	88	80	85	95	85	90	85	90	88	85	84
$k$	115	105	100	115	110	100	115	110	110	115	105	100	105	110	100	110

Silindrlerin üstleriniñ kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly



# YUMUŞ 51



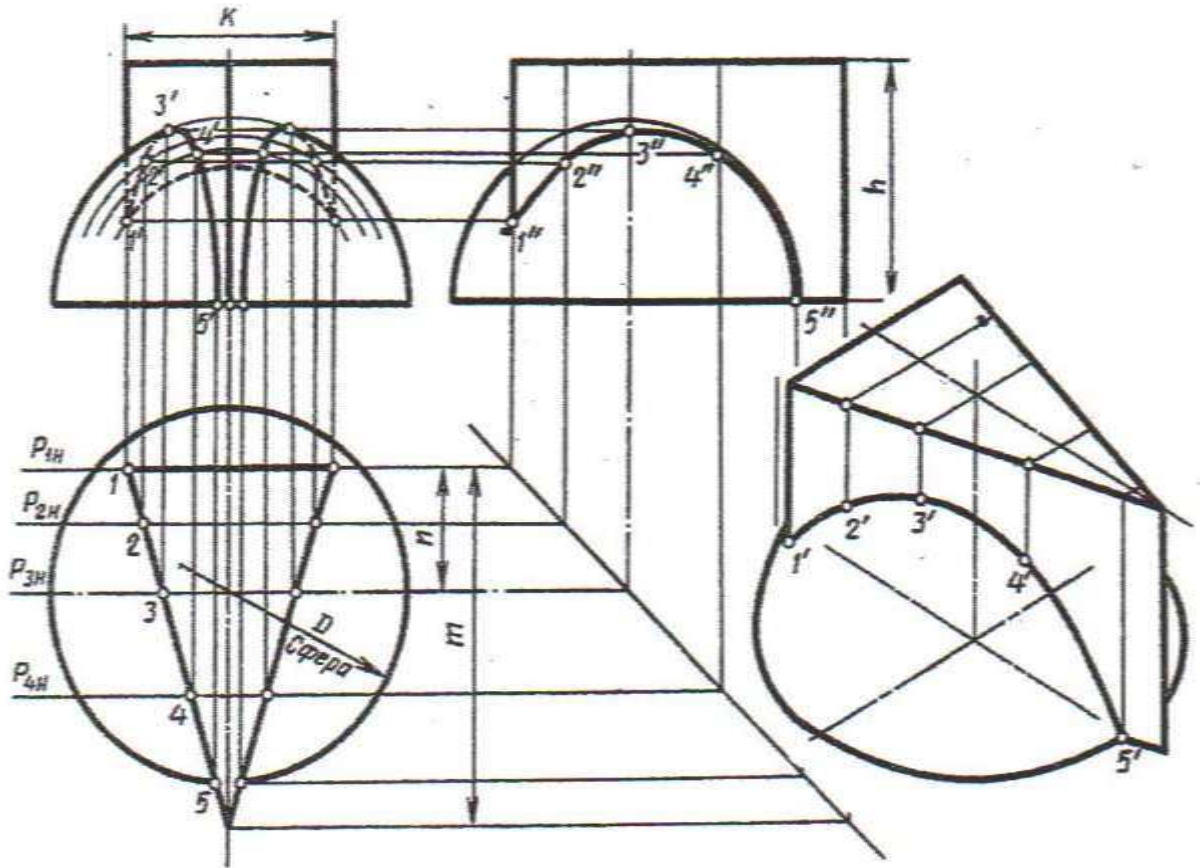
Belgi- lemek	variantlar													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
d	55	54	70	56	55	54	70	56	54	56	70	54	55	54
h	65	72	70	68	64	72	68	68	65	71	70	68	62	72
m	10	8	16	16	10	8	14	16	9	8	14	16	10	8
e	55	72	75	60	56	72	76	60	55	71	75	60	55	72
h <sub>1</sub>	38	45	48	40	38	45	47	40	38	45	48	40	38	45
a	44	45	52	40	44	45	50	40	44	45	52	40	44	45
k	74	84	108	70	74	84	110	70	74	84	110	70	74	84

Belgi- lemek	variantlar															
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	70	56	55	54	70	56	55	54	70	56	55	54	70	56	55	54
h	70	68	65	72	68	70	65	72	68	70	65	72	70	68	65	72
m	15	16	10	8	14	16	10	8	15	16	10	8	14	16	10	8
e	76	60	55	72	77	60	55	72	76	60	55	72	75	60	54	72
h <sub>1</sub>	47	40	38	45	48	40	38	45	47	40	38	45	48	40	38	45
a	50	40	44	45	52	40	44	45	52	40	44	45	52	40	44	45
k	108	72	74	84	110	70	74	84	108	70	74	84	110	75	74	84

Prizmalaryň üstleriniň kesişme çyzygyny we aksonometriki proyeksiýasy guraly

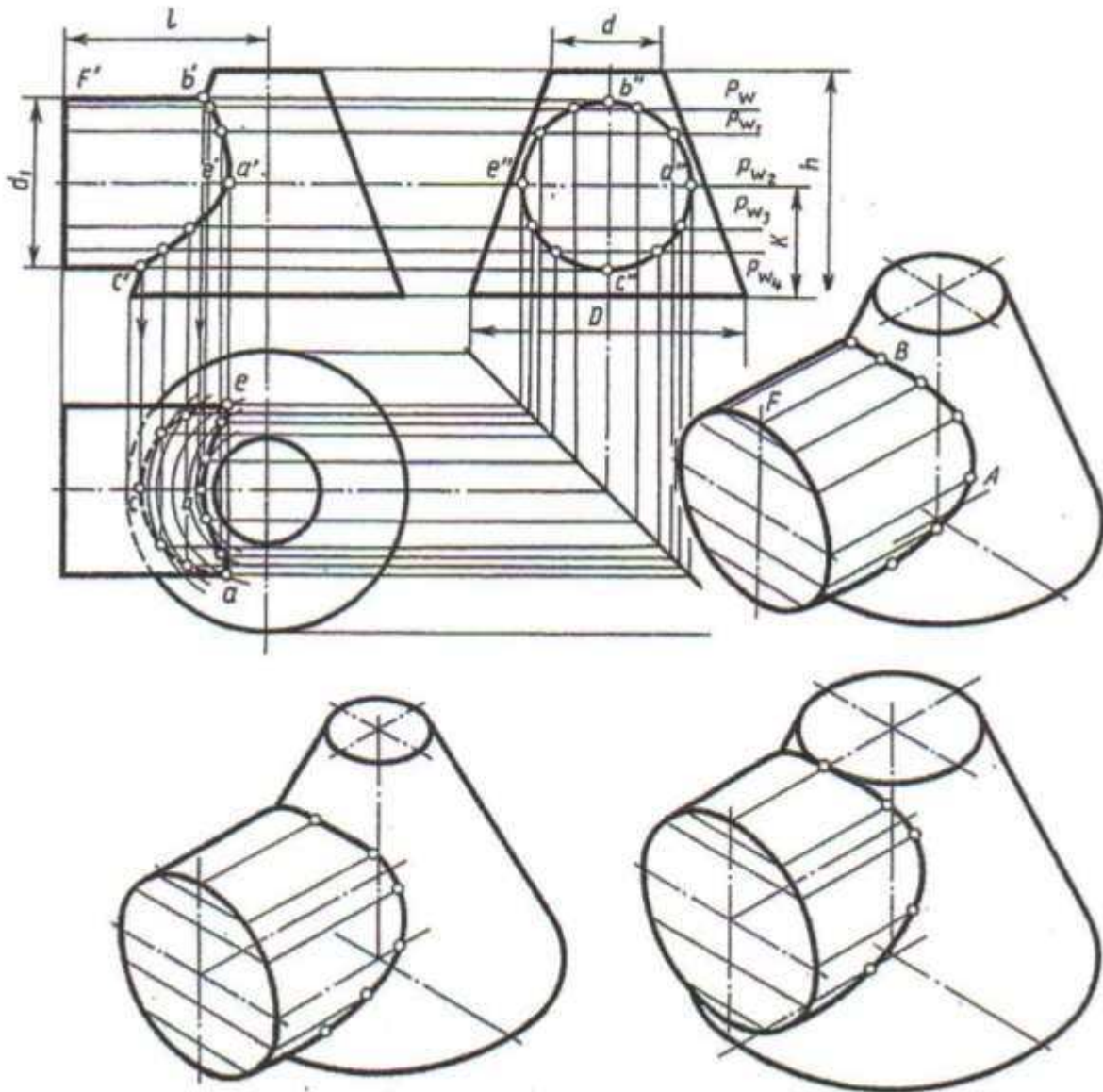




Wari- antlar	D	n	m	k	h	Wari- antlar	D	n	m	k	h
1	80	30	70	60	60	16	82	32	82	68	64
2	90	45	85	70	65	17	90	40	90	80	68
3	95	35	90	50	70	18	88	40	80	50	70
4	85	30	88	60	65	19	86	0	43	96	65
5	92	50	46	100	60	20	80	30	40	90	60
6	88	28	80	70	60	21	90	30	80	80	65
7	86	30	80	60	60	22	92	0	60	92	68
8	90	35	35	80	65	23	88	30	100	35	62
9	92	32	90	60	65	24	85	35	80	40	60
10	85	30	55	70	65	25	80	30	90	90	64
11	80	35	80	60	65	26	84	25	80	40	60
12	90	45	95	70	60	27	86	44	94	60	55
13	85	35	80	40	65	28	88	40	84	70	65
14	80	40	80	50	62	29	90	0	45	90	65
15	86	36	70	96	70	30	85	35	70	100	65

Şaryň we prizmanyň üstleriniň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly

# YUMUŞ 53



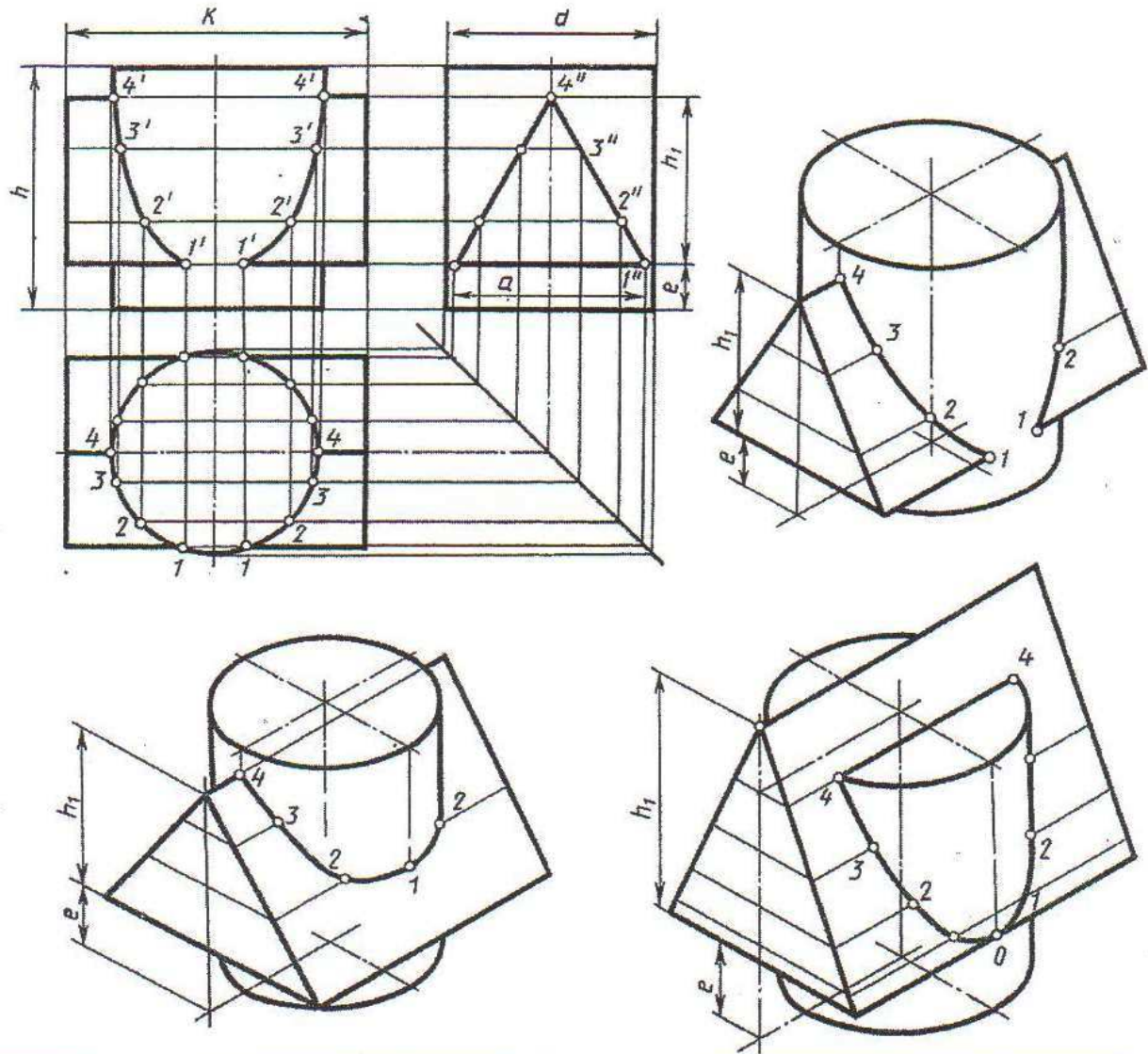
Belgi- lemek	variantlar													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>D</i>	60	70	70	62	70	70	60	70	72	62	70	70	60	70
<i>d</i>	24	20	22	24	20	22	24	20	22	24	20	22	24	20
<i>h</i>	50	45	46	50	45	46	52	45	46	50	45	46	52	45
<i>k</i>	25	23	22	24	23	21	25	23	22	24	23	21	25	23
<i>l</i>	42	40	45	40	40	44	40	40	45	40	40	44	40	40
<i>d</i>	36	32	38	35	32	38	36	32	38	35	32	38	36	32

Belgi- lemek	variantlar															
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<i>D</i>	72	62	70	60	70	72	62	70	60	70	72	62	70	60	70	62
<i>d</i>	22	24	20	24	22	22	24	20	24	22	23	24	20	24	22	24
<i>h</i>	46	50	45	52	46	45	50	45	52	46	45	50	45	52	46	50
<i>k</i>	22	24	23	25	21	22	24	23	25	21	22	24	23	25	20	24
<i>l</i>	45	40	40	40	44	45	40	40	40	44	45	40	40	40	44	40
<i>d</i>	38	35	32	36	38	38	35	32	36	38	36	35	32	36	38	35

Konusyň we silindriň üstleriniň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly





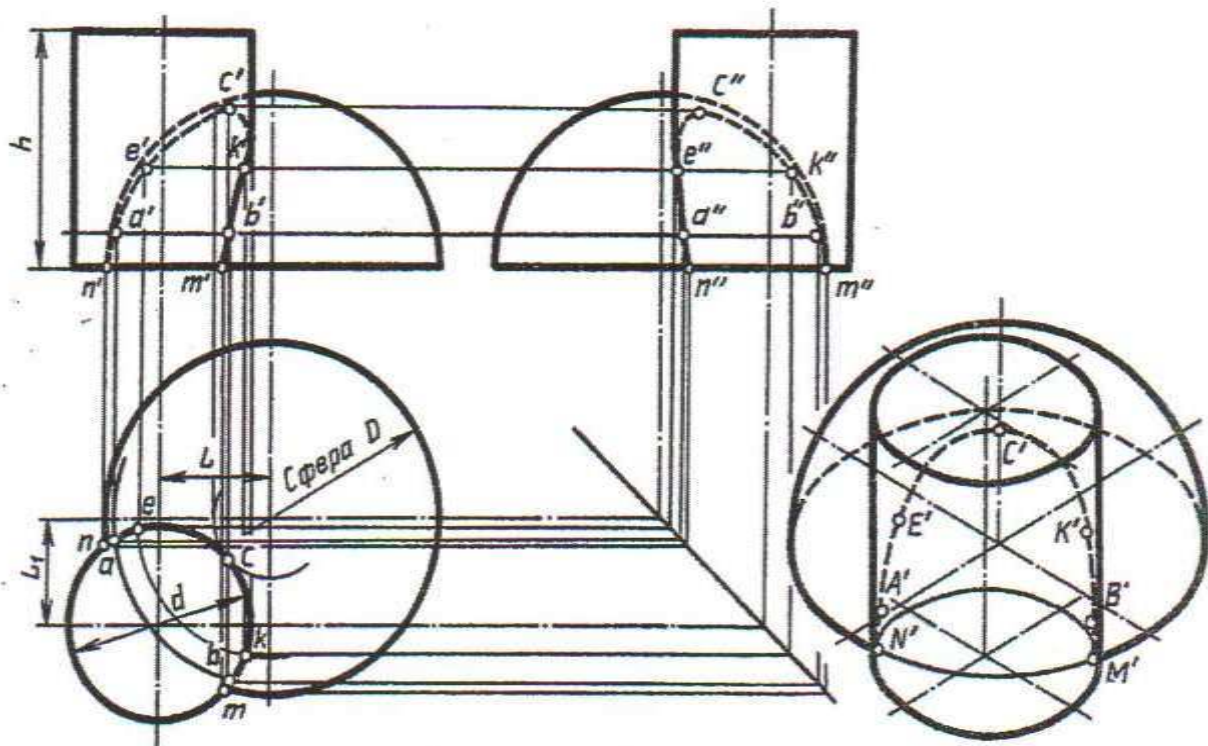
Belgi- lemek	wariantlar													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
$d$	50	55	54	52	55	54	56	50	55	54	52	55	54	56
$h$	60	65	70	70	60	60	62	60	65	70	70	60	60	62
$h_1$	45	53	50	56	50	50	52	45	53	50	56	50	50	52
$e$	12	12	15	14	20	18	20	12	12	15	14	20	18	20
$a$	46	52	64	60	55	64	52	46	52	64	60	55	64	52
$k$	75	74	76	70	70	72	72	75	74	76	70	70	72	72

Belgi- lemek	wariantlar															
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
$d$	50	55	54	52	55	54	56	50	55	54	52	55	54	56	50	55
$h$	60	65	70	70	60	60	62	60	65	70	70	60	60	62	60	65
$h_1$	45	53	50	56	50	50	52	45	53	50	56	50	50	52	45	53
$e$	12	12	15	14	20	18	20	12	12	15	14	20	18	20	12	12
$a$	46	52	54	60	55	64	52	46	52	64	60	55	64	52	46	52
$k$	75	74	76	70	70	72	72	75	74	76	70	70	72	72	75	74

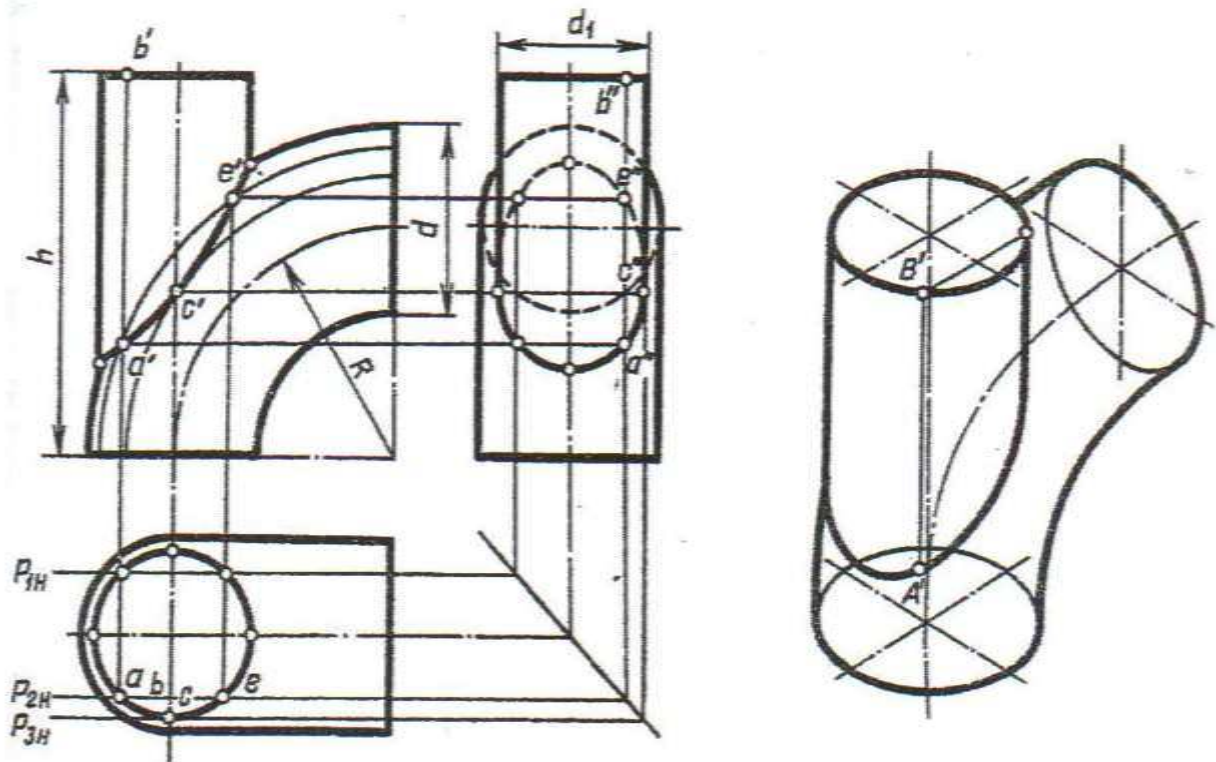
Silindriň we prizmanyň üstleriniň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly





Wari- antlar	D	d	h	L	L <sub>1</sub>	Wari- antlar	D	d	h	L	L <sub>1</sub>
1	70	36	50	22	25	16	80	42	50	21	22
2	78	40	50	25	28	17	72	36	45	22	25
3	76	38	48	27	24	18	78	40	50	35	22
4	78	40	50	25	22	19	76	38	48	27	25
5	76	38	48	27	25	20	80	42	50	26	28
6	80	42	50	26	28	21	72	36	50	24	28
7	72	36	45	22	24	22	76	38	48	22	20
8	74	34	46	20	22	23	78	36	46	26	26
9	70	36	45	22	24	24	80	44	56	25	25
10	78	40	50	25	22	25	74	40	50	24	26
11	71	36	45	22	24	26	82	46	54	24	28
12	74	34	46	20	22	27	72	36	50	24	28
13	70	36	50	22	25	28	82	48	50	26	30
14	78	40	56	25	28	29	88	46	56	26	32
15	76	38	48	27	24	30	80	45	56	26	22

Silindriň we şaryň üstleriniň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly



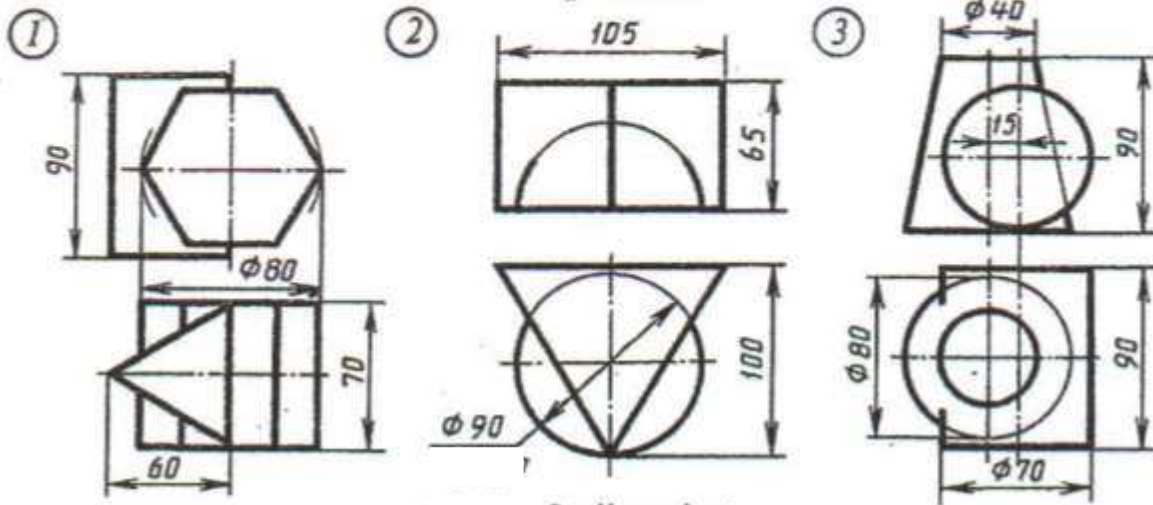
Wari- antlar	$d$	$d_1$	$h$	$R$	Wari- antlar	$d$	$d_1$	$h$	$R$
1	40	36	80	50	16	38	38	78	48
2	42	39	80	54	17	46	36	80	50
3	44	40	90	55	18	44	40	80	54
4	40	36	78	52	19	40	36	80	50
5	40	36	80	50	20	42	30	90	52
6	44	40	90	54	21	50	42	90	55
7	38	38	80	50	22	44	40	90	55
8	42	38	80	52	23	38	38	78	48
9	60	50	90	55	24	44	40	90	52
10	36	36	78	48	25	48	42	90	50
11	40	36	80	50	26	44	44	90	52
12	46	40	90	54	27	46	42	88	50
13	38	34	80	50	28	40	36	80	52
14	42	30	80	52	29	42	38	88	52
15	44	40	90	55	30	44	40	82	50

Toruň we silindriň üstleriniň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly

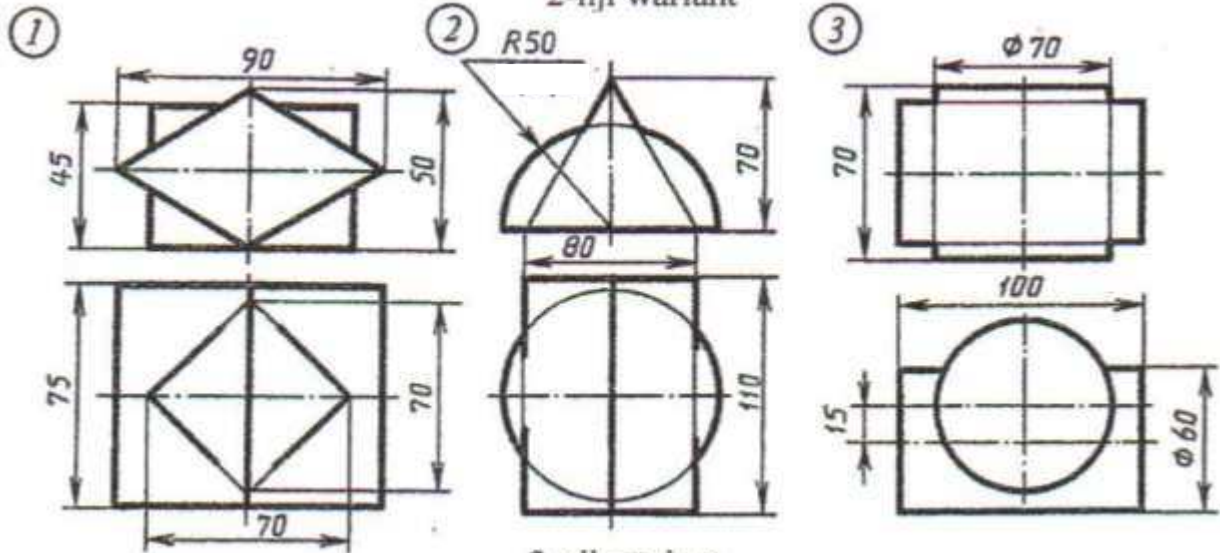


## YUMUŞ 57

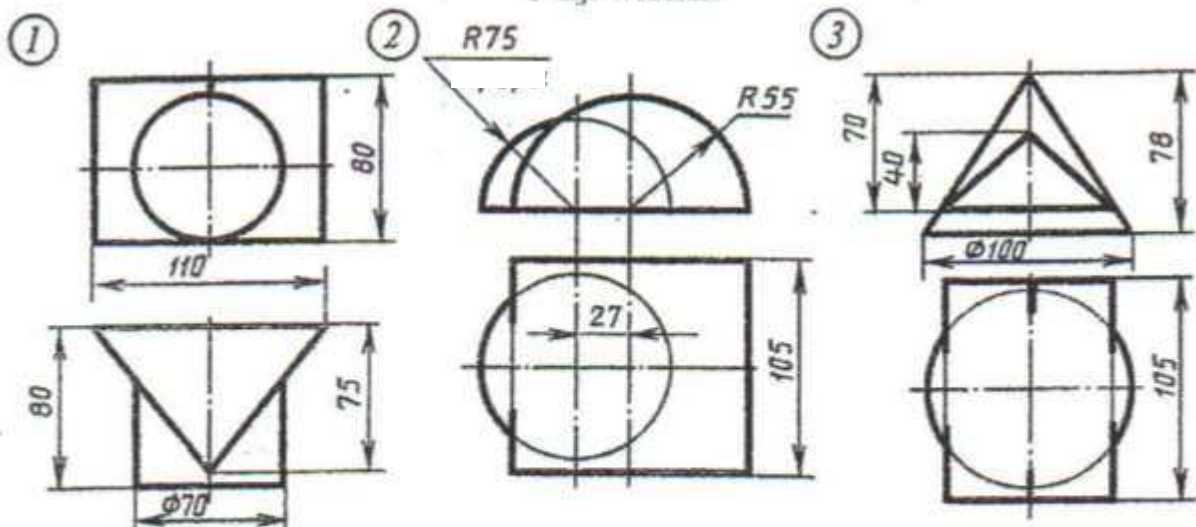
1-nji variant



2-nji variant



3-nji variant

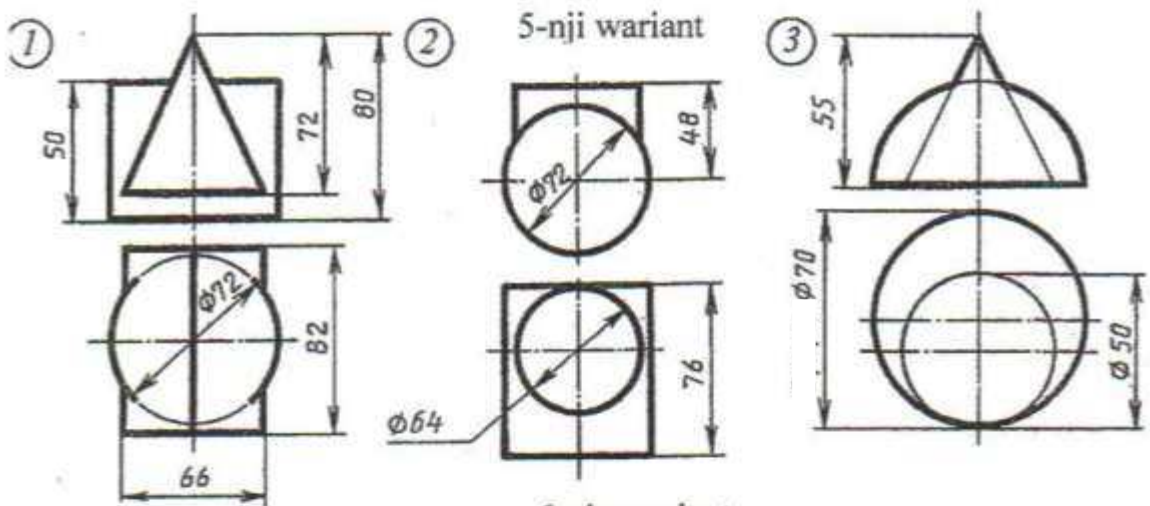
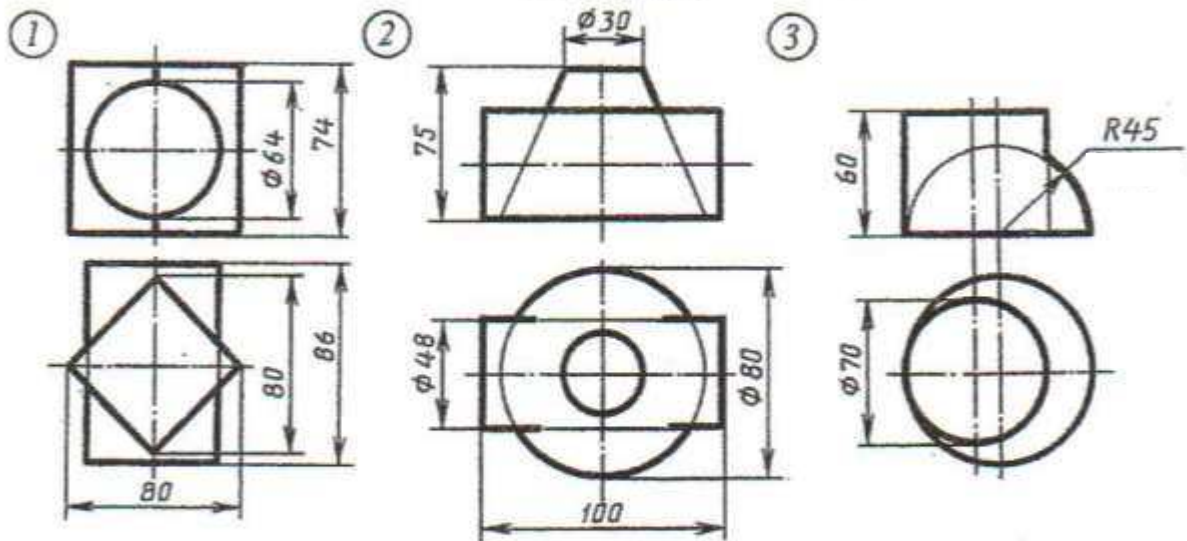


Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.

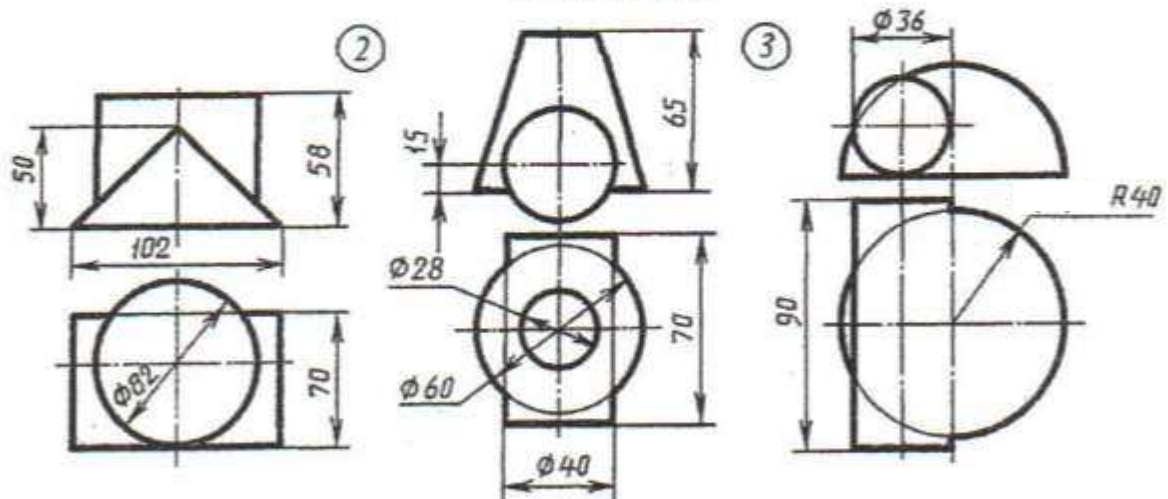


# YUMUŞ 57

4-nji variant



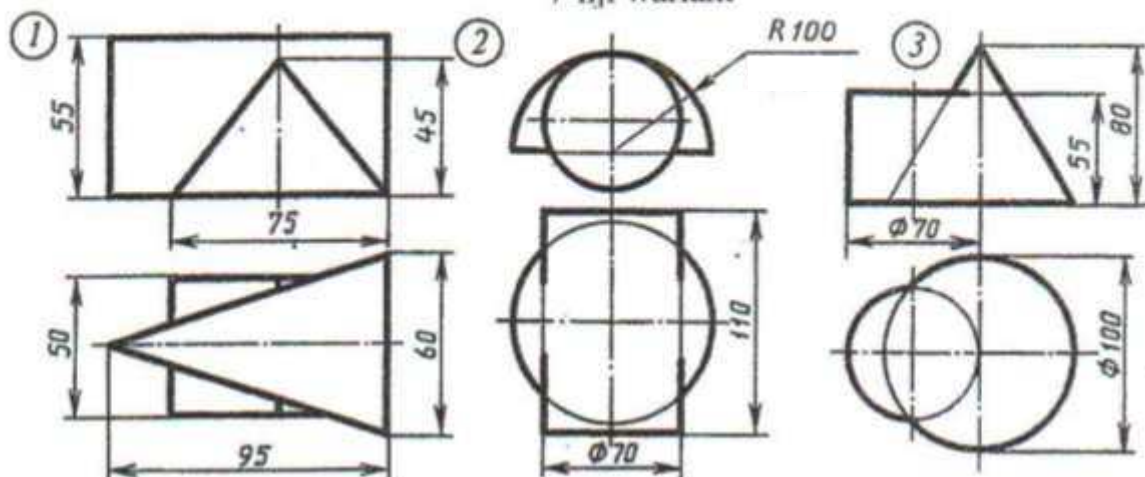
6-njy variant



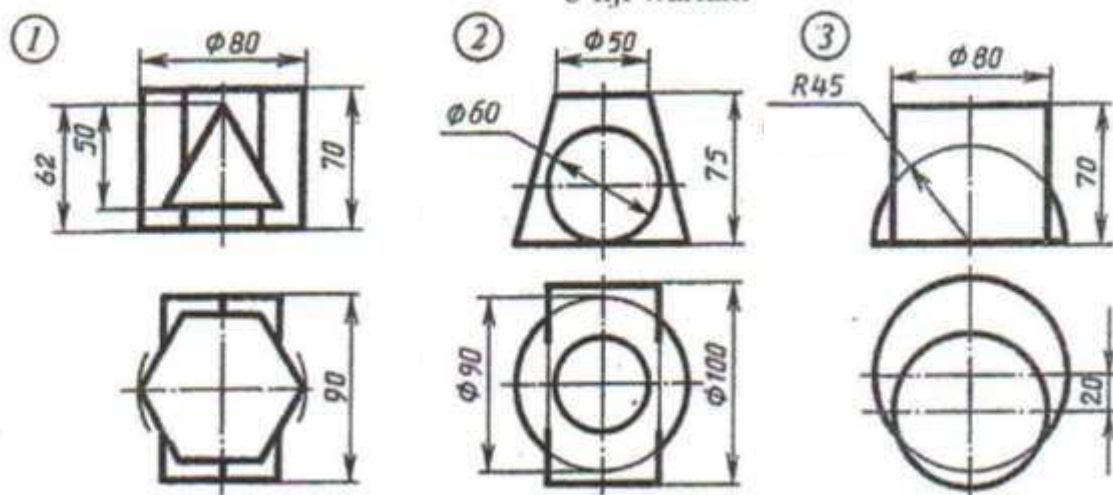
Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.

## YUMUŞ 57

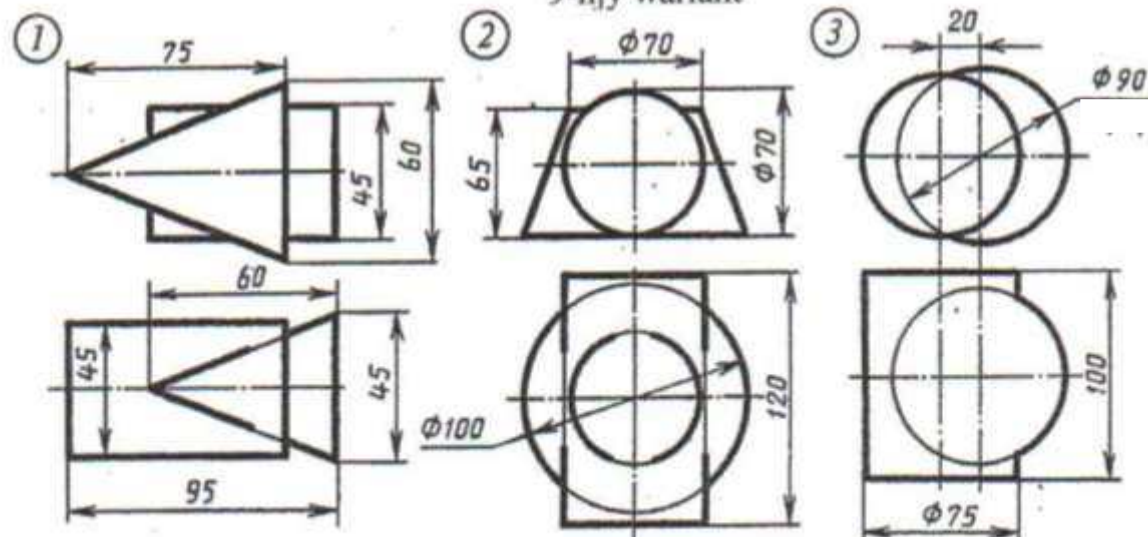
7-nji variant



8-nji variant



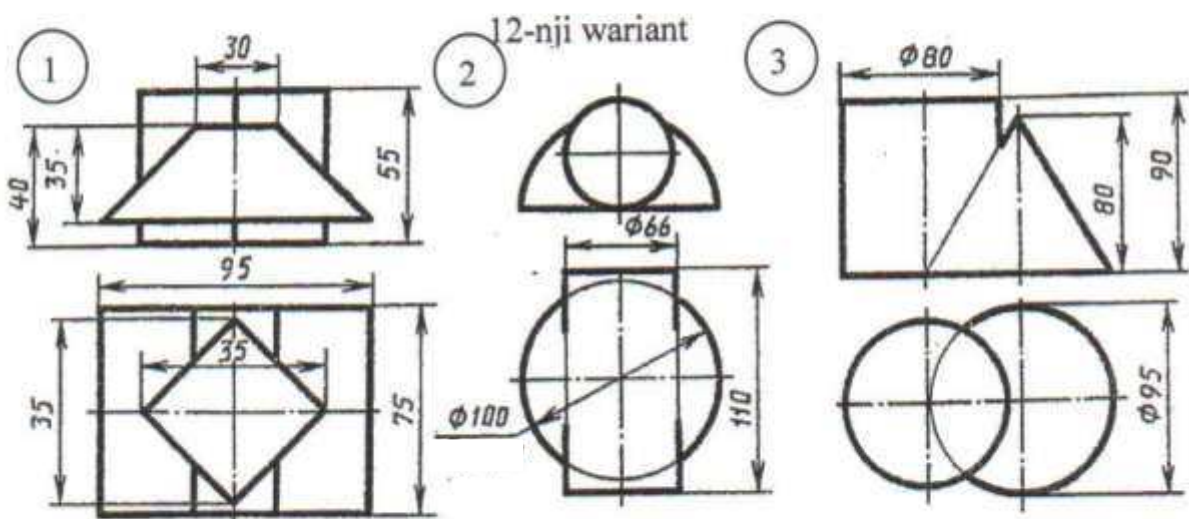
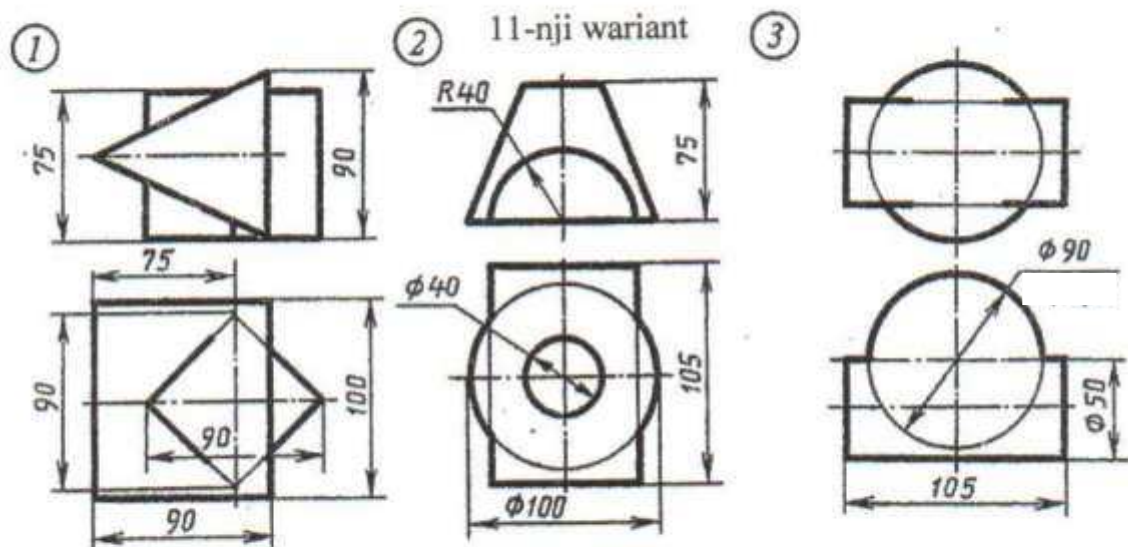
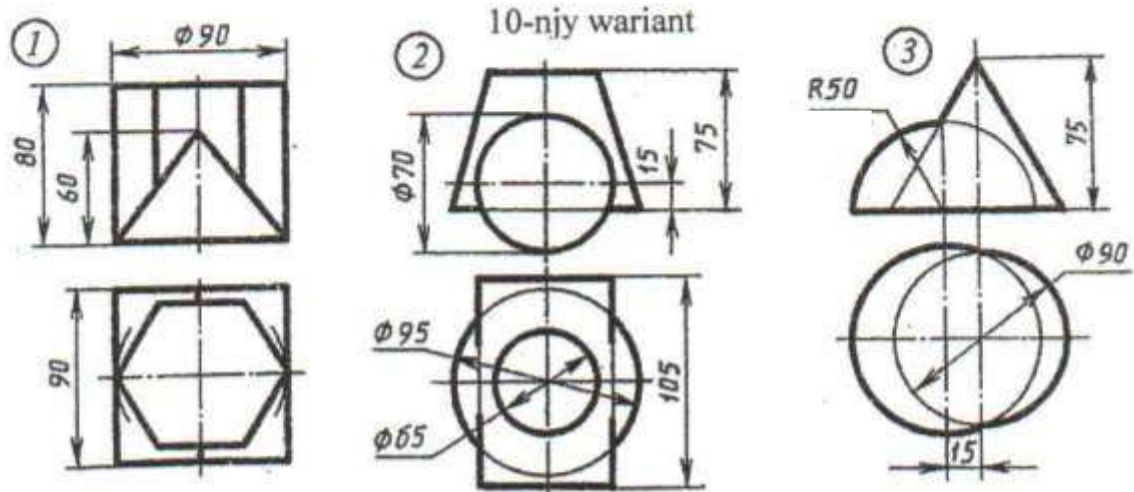
9-nji variant



Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.



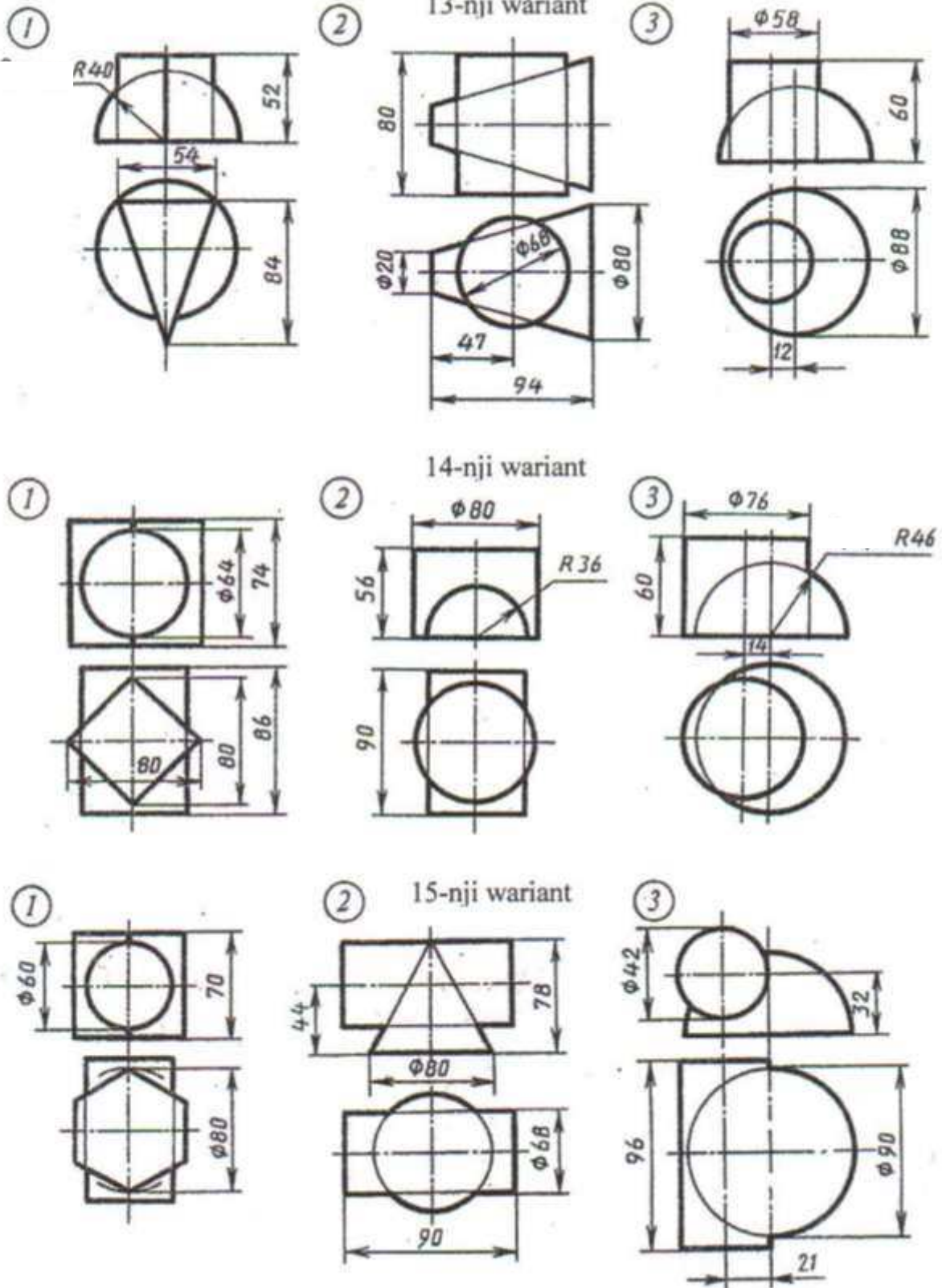
# YUMUŞ 57



Şkillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.



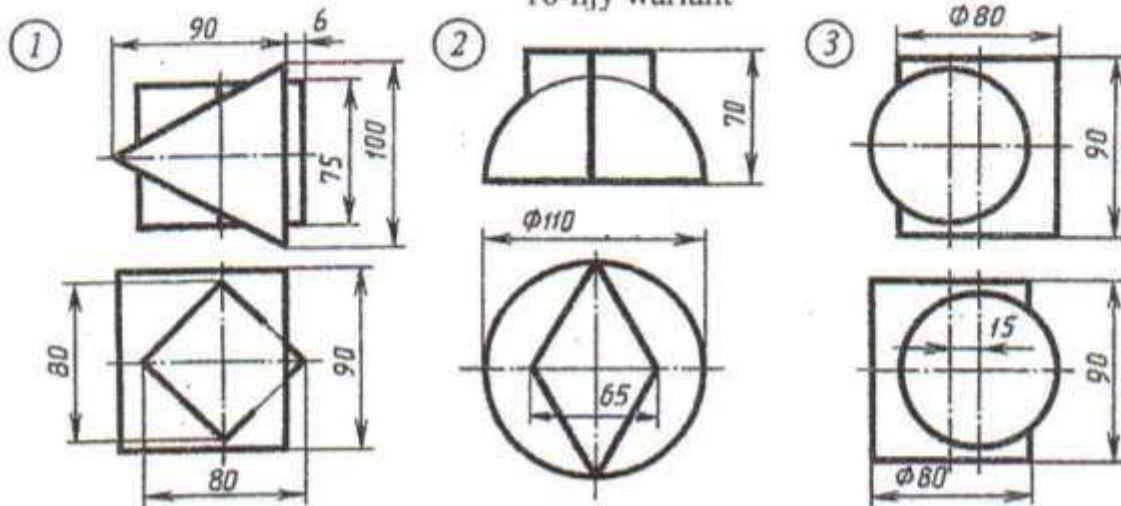
## ÝUMUŞ 57



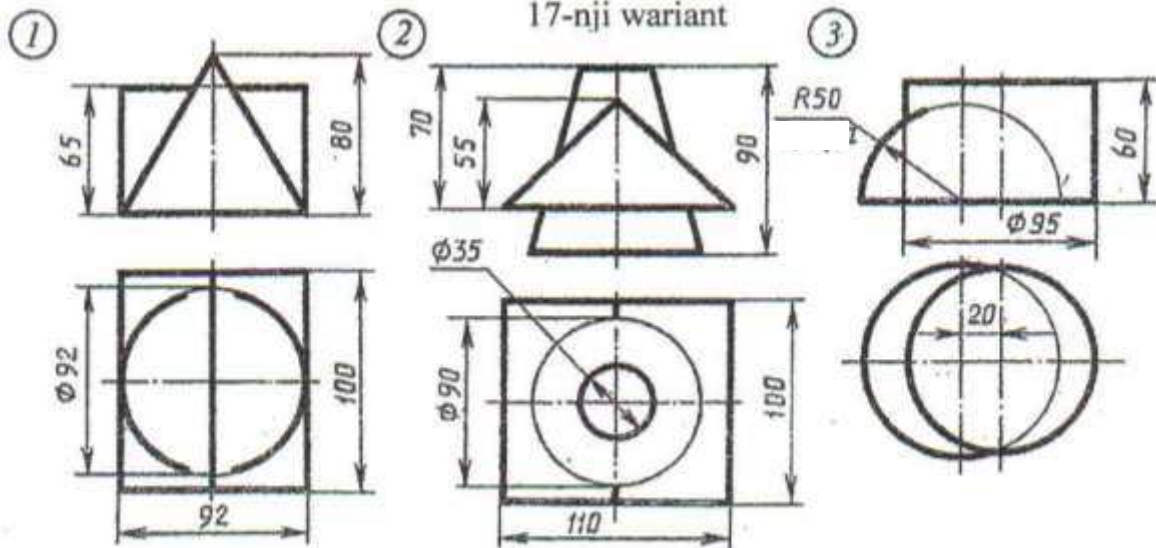
Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.

# YUMUŞ 57

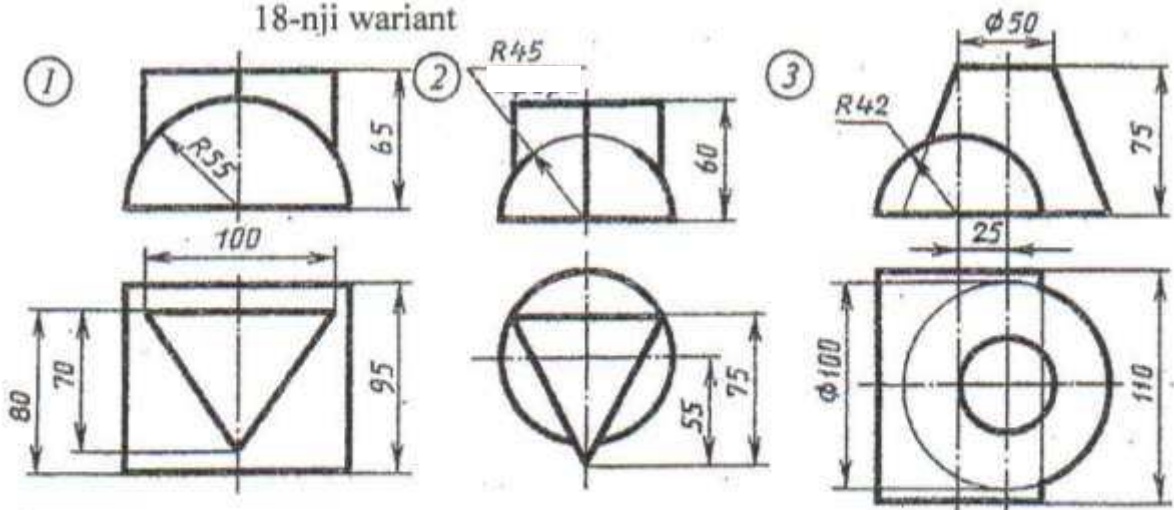
16-njy variant



17-nji variant



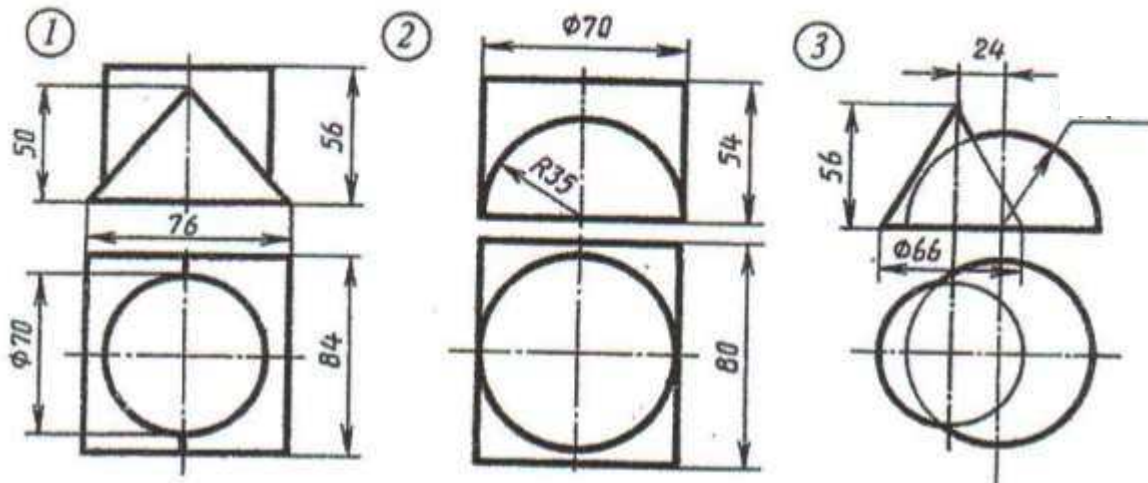
18-nji variant



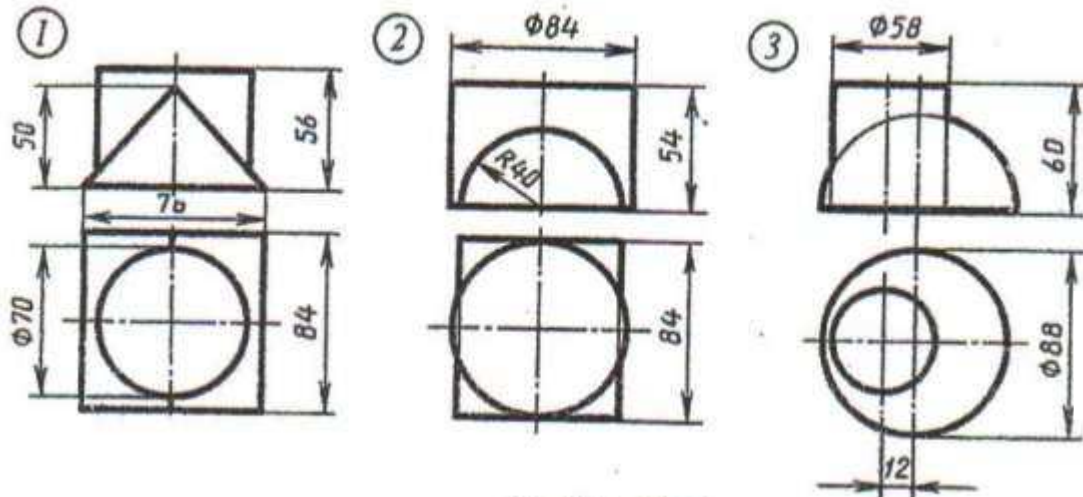
Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.

## YUMUŞ 57

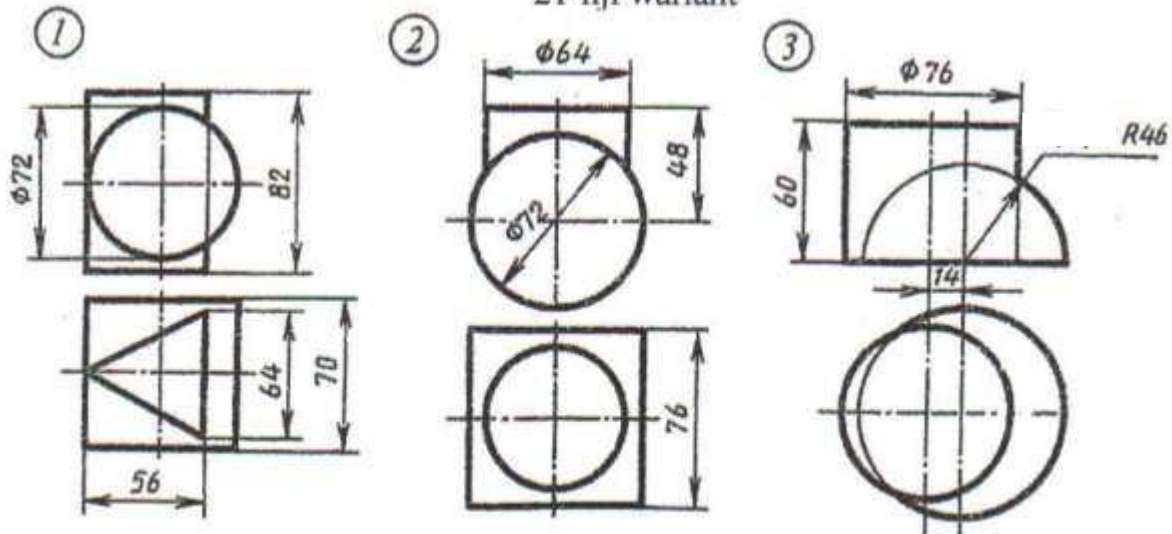
19-njy variant



20-nji variant



21-nji variant

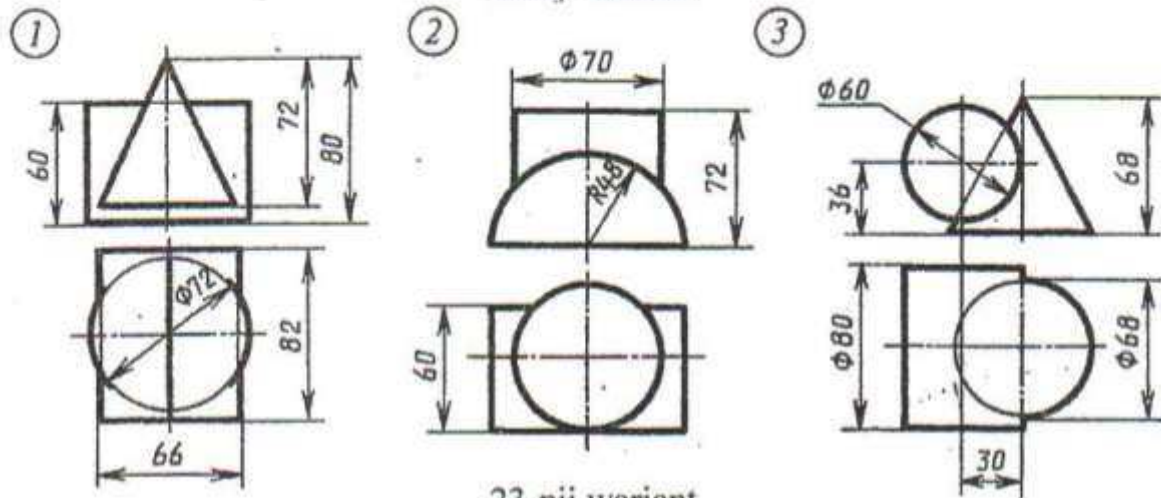


Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.

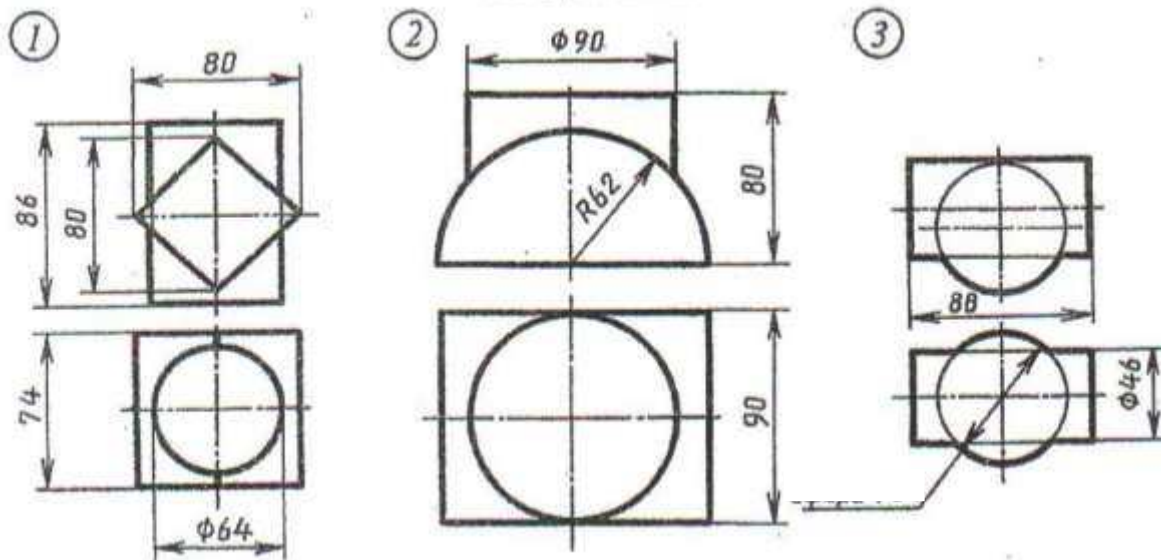


## YUMUŞ 57

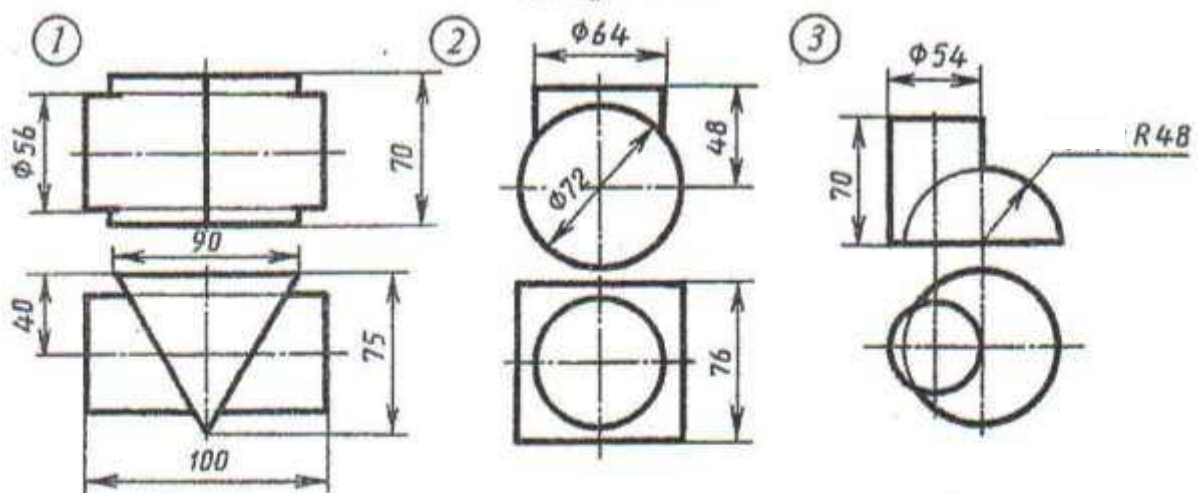
22-nji variant



23-nji variant



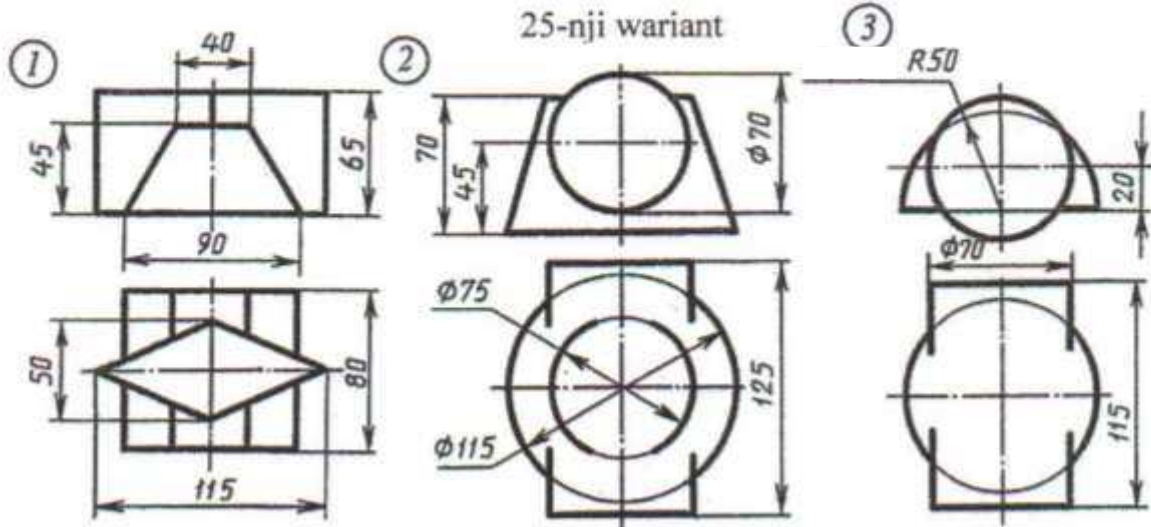
24-nji variant



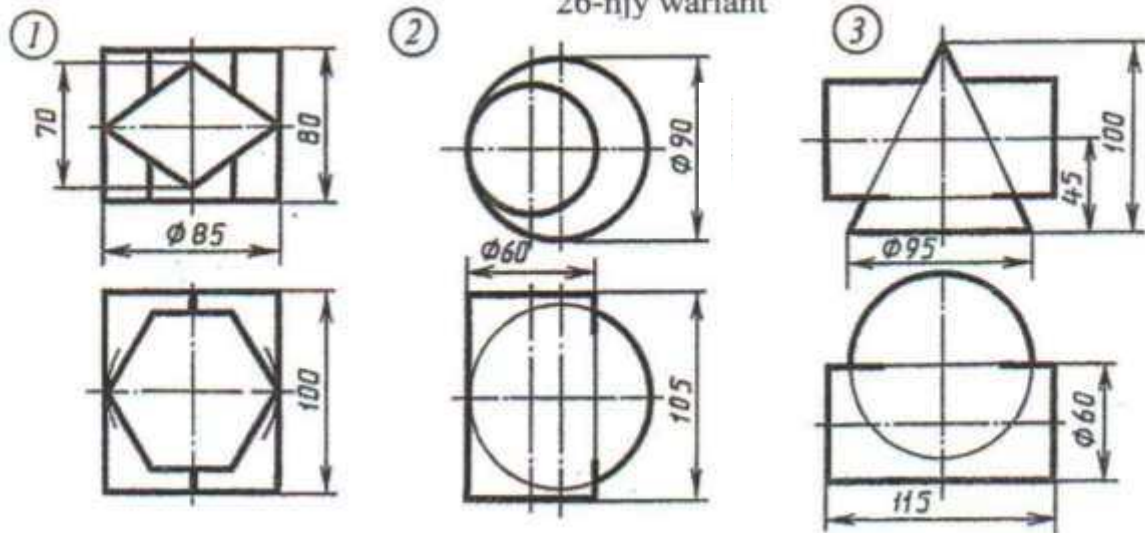
Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.

## YUMUŞ 57

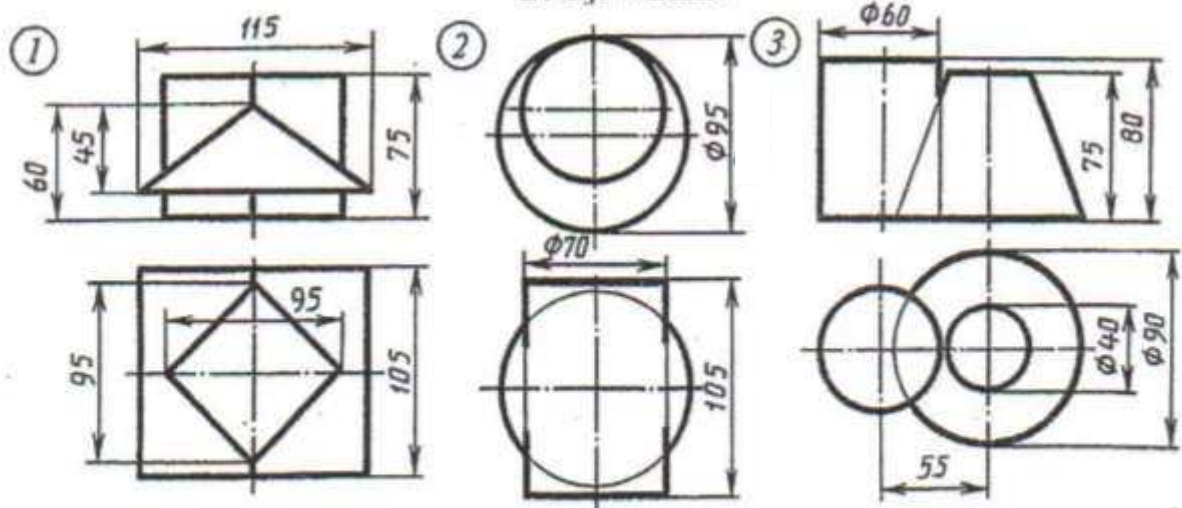
25-nji variant



26-nji variant



27-nji variant

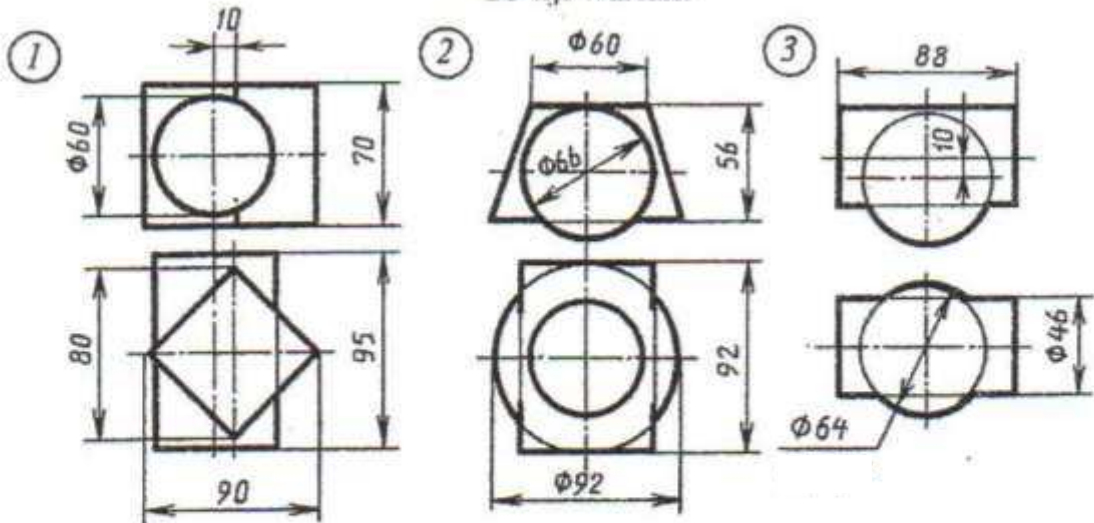


Şekillendirilen geometriki jisimiň çyzygyny üç proyeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proyeksiýasy gurmaly.

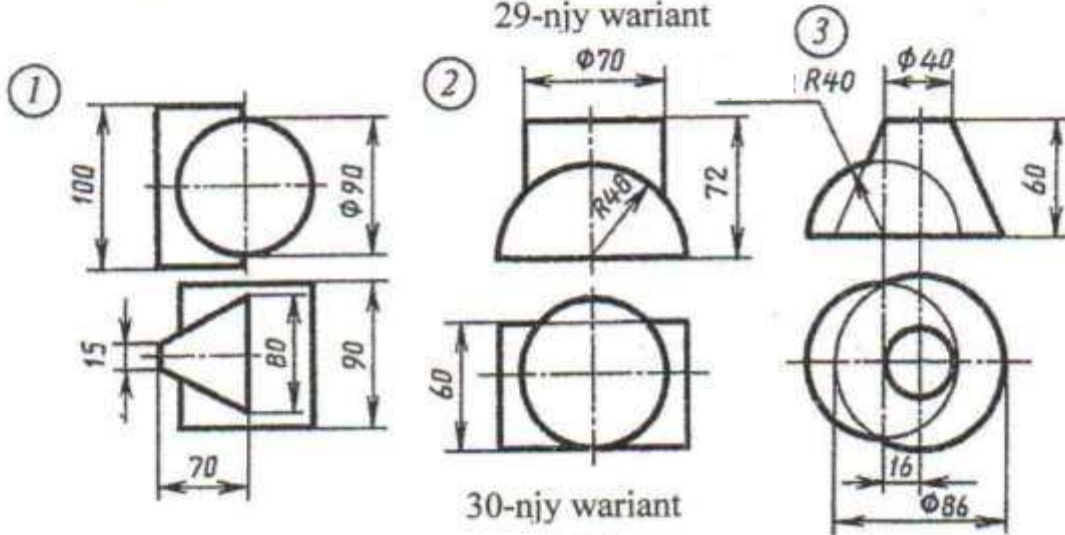


# YUMUŞ 57

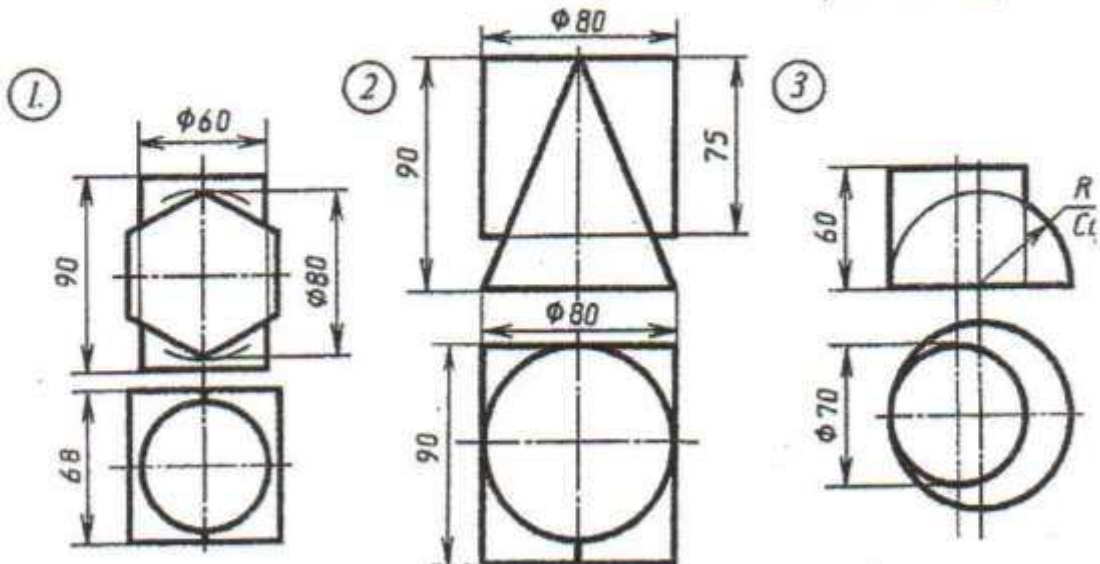
28-nji variant



29-nji variant



30-nji variant



Şkillendirilen geometriki jisimiň çyzygyny üç proýeksiýada ýerine ýetirmeli. Bu üstleriň kesişme çyzygyny we aksonometriki proýeksiýasy gurmaly.



### 15. Nusganyň çyzgylaryny ýaryklary ulanmak bilen ýerne ýetirmek

Içi boşlukly zadyň içki görünmeýän suduryň okly çyzyklary, köplenç ştrihli çyzyklar bilen şekillendirilýär.

Eger nusganyň ýa-da zadyň içki sudury çylşyrymly bolsa, onda köp sanly ştrihli çyzyklar özaralarynda we tutuş sudur çyzyklary bilen ýygy-ýygýdan kesişerler, bu bolsa çyzgyny okamaklyga kynçylyk döredەر köp halatlarda nusganyň içki keşbi barada nädogry netijelere barar, şol sebäpli şyzgylarda nusganyň şertli şekillendirilişi ýaryklar ulanylýar.

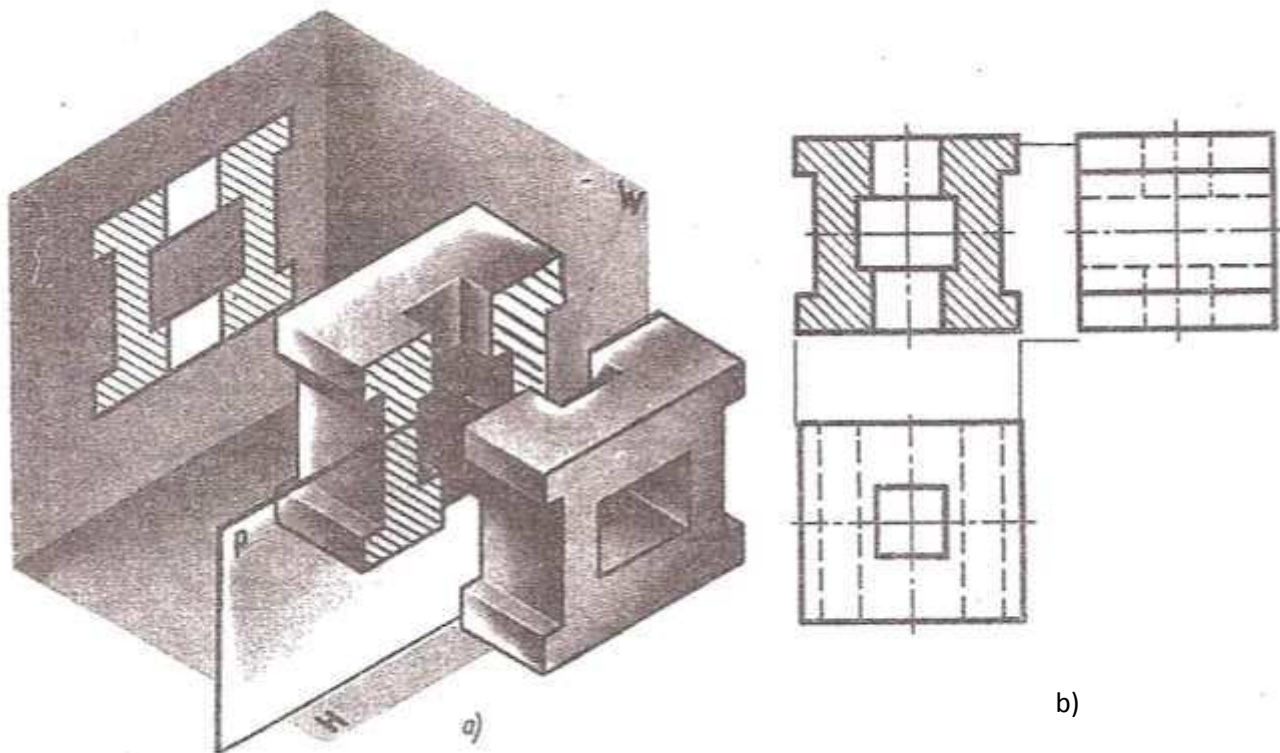
Bu ýagdaýda içi boşlyk nusga hyýalda tekizlik arkaly kesilýär (bölünýär) özünem, haýsyda bolsa bir şekiller tekizligine –H,V ýa-da W parallel edilip alynýar.

Nusganyň kesiji tekizligiň önünde ýerleşen bölegi hyýalyda daşlaşdyrylýar (aýrylýar) nusganyň kesiji tekizlik we şekiller tekizliginiň aasyndaky bölegi tekizligi mydamyky usul bilen praejektirlenýär şonda görünmeýän suduryň çyzygy görünür we ştrih bilen şekilendirilmän tutuş esasy çyzyk bilen çyzylar.

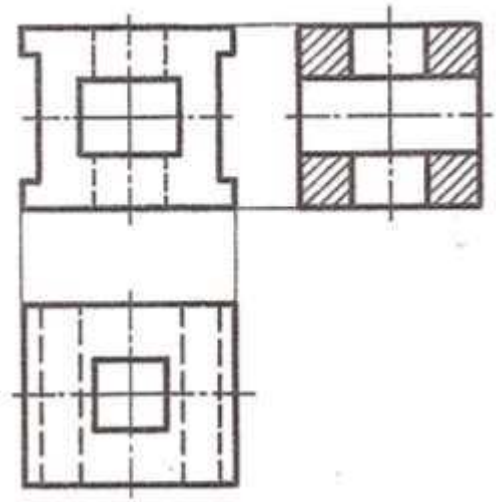
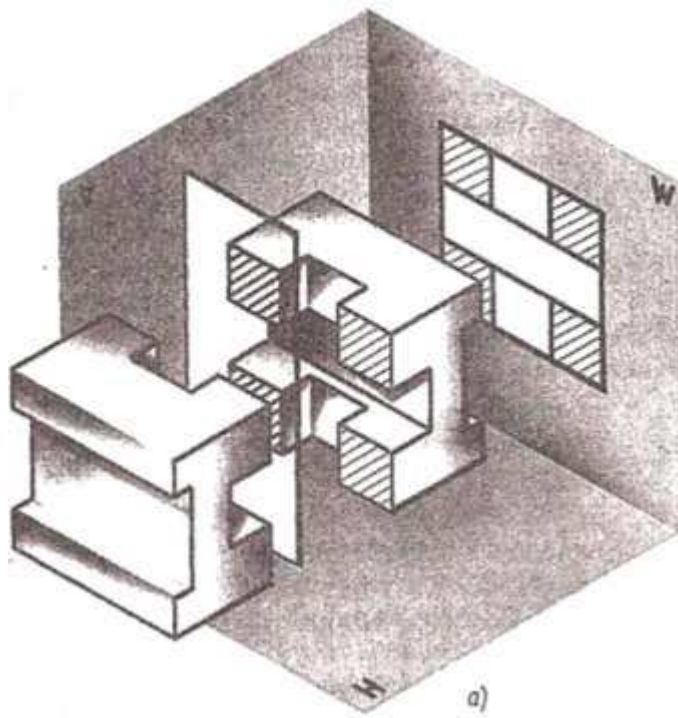
Kesiji tekizlidäki ýerleşen şekiliň kesik çyzgysyny aýdyňlaşdyrmak üçin 45 burçly tutuş inçe parallel çyzyklar bilen ştrihleýärler.

Gorizantal şekiller tekizligine kesiji tekizligiň ýerleşişine görä ýaryklar-wertikal we gorizantal ýaryklara bölünýärler.

Wertikal (dik) ýarykda kesiji tekizlik gorizantal şekiller tekizligine perpenduklýar ýerleşýär.

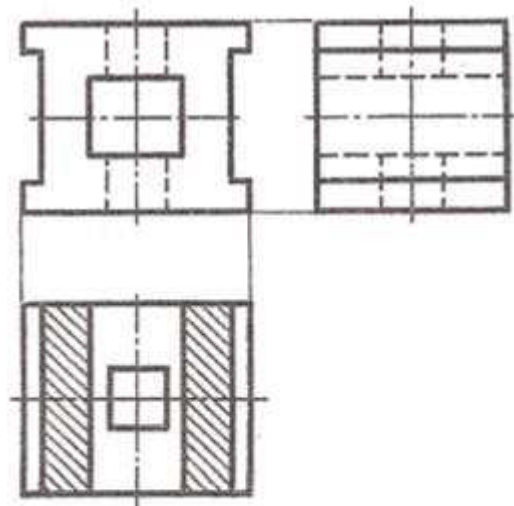
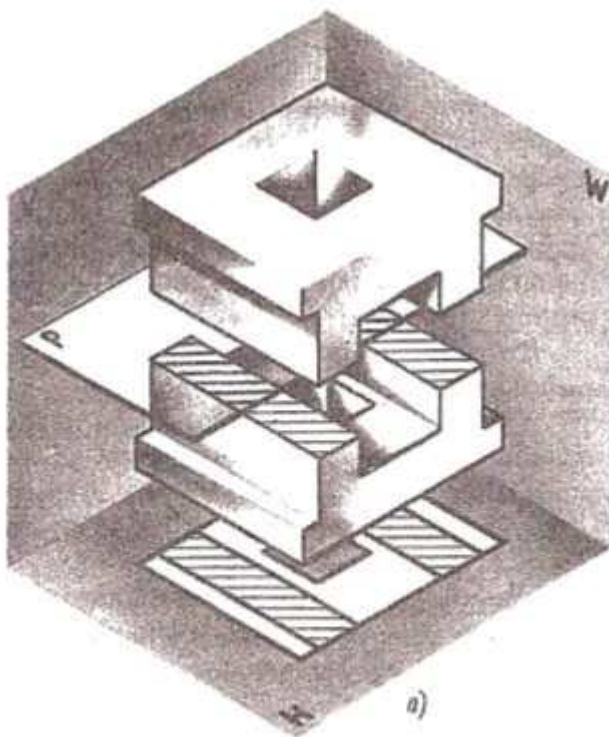


58-nji surat



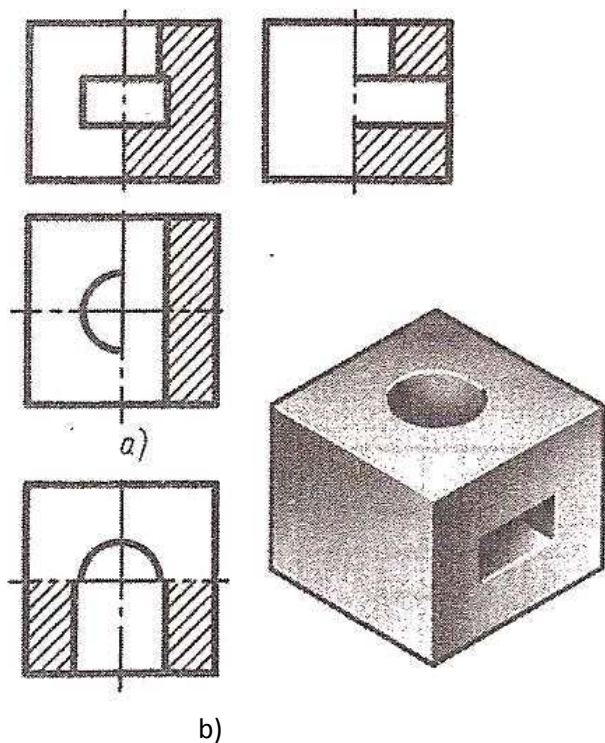
b)

59-njy surat



b)

60-njy surat



61-njl surat

Eger kesiji P tekizlik U tekizlige parallel ýerleşse, onda wertikal ýaryga frantal ýaryk diýilýär 58 a .b suratlarda ,eger kesiji tekizlik W tekizlige parallel bolsa , onda profil ýaryk diýilýär 59 a.b suratlarda .

Gorizantal ýarykda kesiji tekizlik 1t tekizligine paralleldir 60a.b suratlar .

Eger haýsyda bolsa bir nusganyň proyeksiýasynda simmetriýa oky bolan şekil görkezilse 61a suratda, onda ýaryk ýerine ýetirgende simmetriýa okunda çep tarapdaky görnüş bilen simmetriýa okundan sag tarapdaky gönüşiň ýarygynyň bölegini birikdirmek bolar .

Egerde ýaryk gorizantal tekizlik bilen ýerne ýetirilse, onda-da görnüşüň ýaryny ýarygyň ýary bilen birikdirilse bolar , şol ýagdaýda ýaryk wertikal (dik) simmetriýa okundan sagda 61a surat ýa-da gorizantal simmetriýa okundan aşakda ýerleşdirilýär 61b surat .

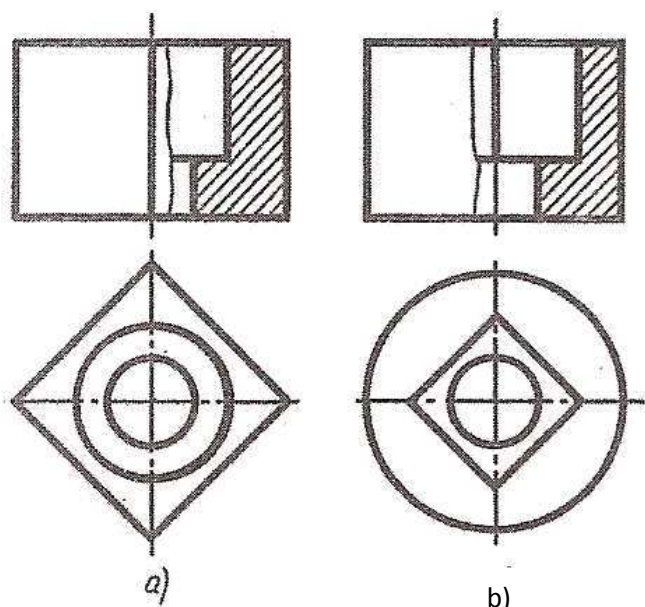
Görnüşüň ýary bilen , ýarygyň ýarysyny ştrih punktirli ok çyzygy (simmetriýa oky ) bilen bölýärler .

Egerde zadyň daşky üstünde haýsydyr bir sudyr çyzygy simmetriýa ok çyzygyna gabat gelse , Mysal üçin 62a suratda prizmanyň gapyrgasy , onda ýaryk ýarysyndan sähelçe kiçiräk edilýär.

Eger şoňa meňzeş sudyr çyzygy

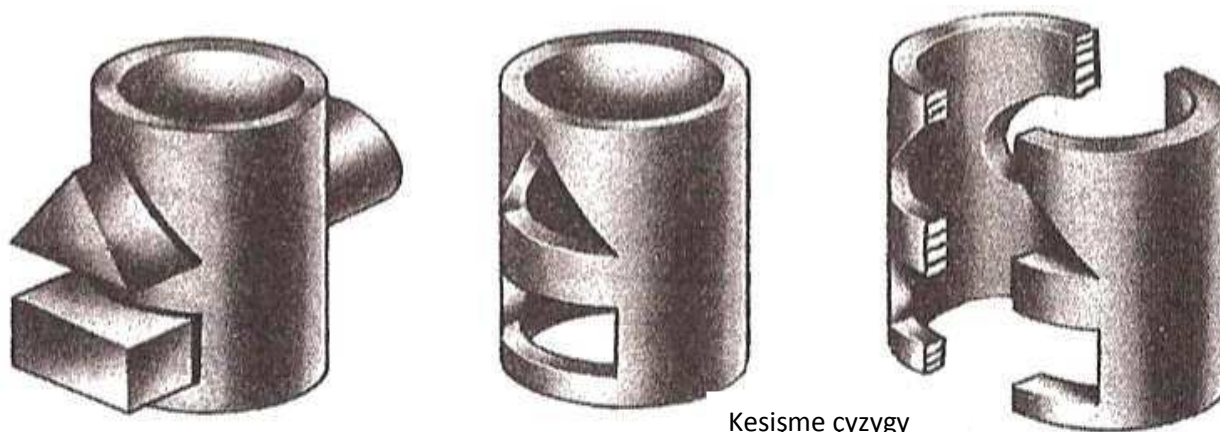
zadyň içki üstüniň simmetriýa okuna gabat gelse , onda 62 b surat ýaryk ýasyndan sähelçe ulurak edilýär.

Şeýle ýagdaýlarda görnüşüň we ýarygyň bölünme çyzygy inçe tutuş tolkyn çyzyk bilen elde şekillendirilýär.

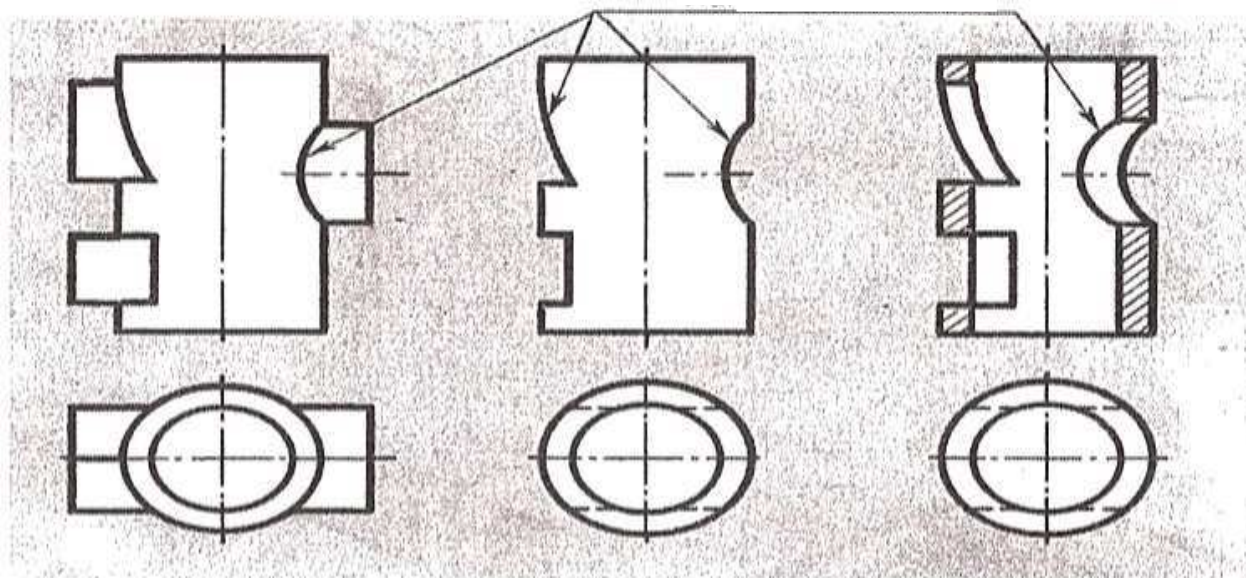


62-njl surat

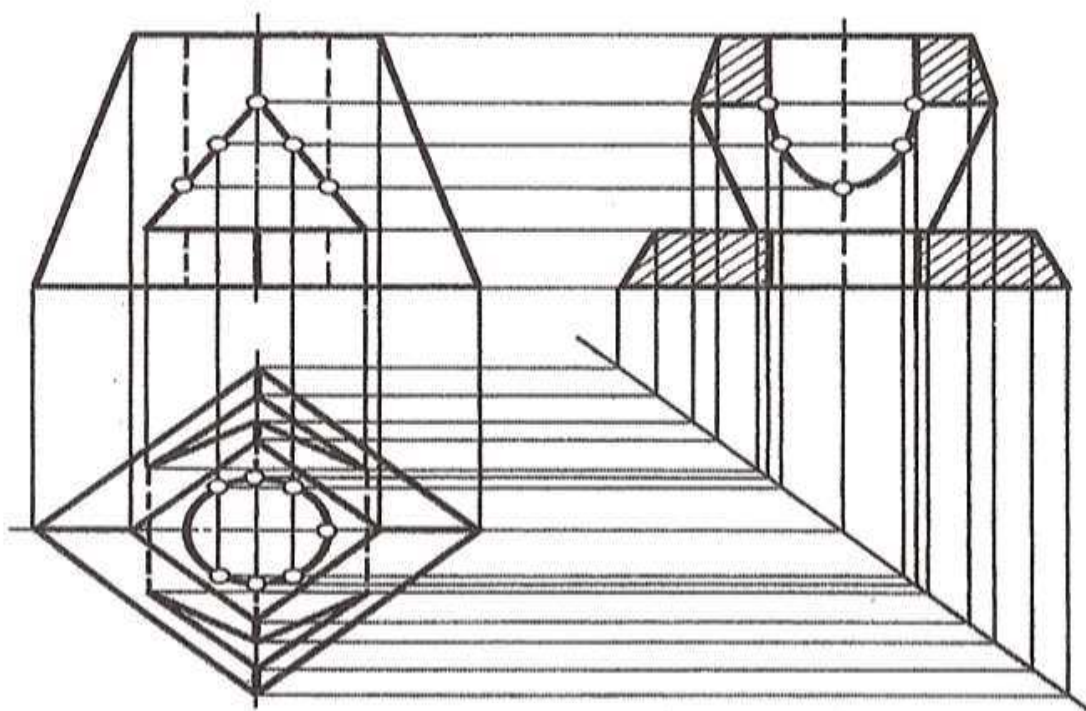




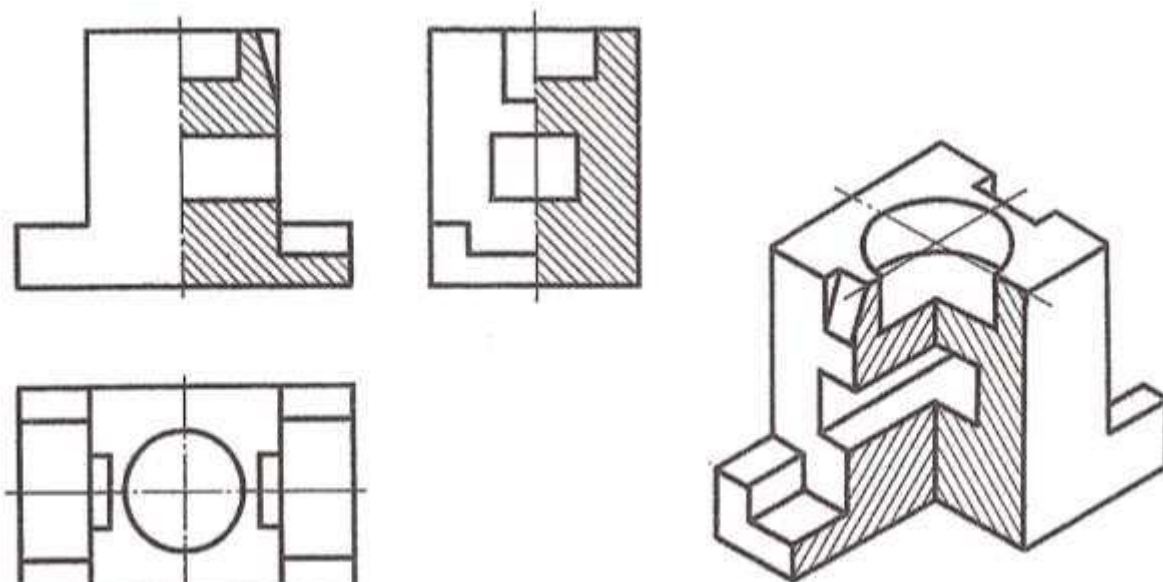
Kesişme çyzygy



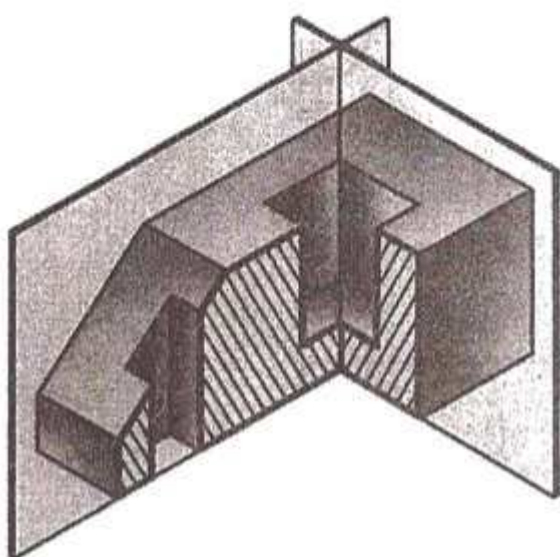
63-nji surat



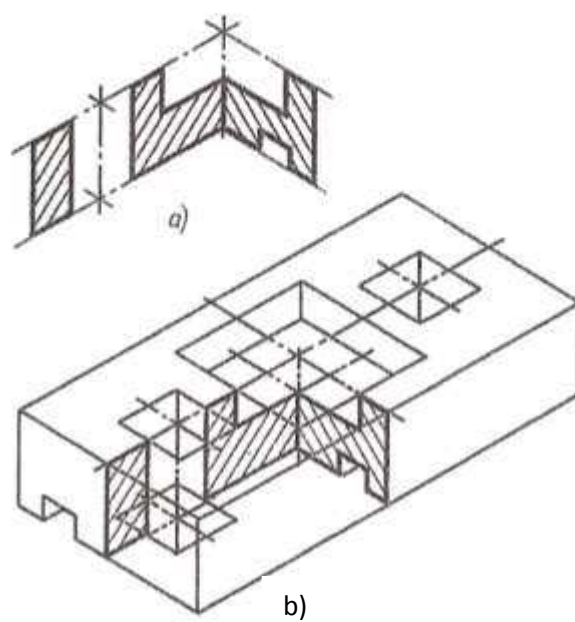
64-nji surat



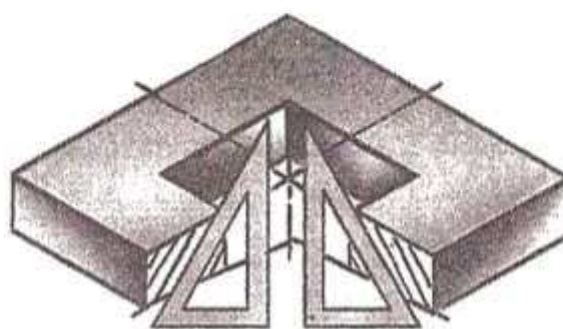
65-nji surat



66-nyi surat



67-nji surat



68-nji surat

Ýaryklar ýerine ýetirilende nusganyň içki we daşgy şekili barada özümizde anyk düşünje bolmagy hökmandyr .

58 ýumuşda içi boşlykly, kesişýän deşikleri bilen üstleriň kesişme çyzygyny emele getirýän profil ýarygyny ulanmak bilen üç preýeksýasyny ýerine ýetirmek hödürleniýär: 63 - 64 suratda 58 ýumuşyň ýerine ýetirilşiniň mysaly berlen, profil ýarykda üstleriň kesişme çyzygy gurulan.

Üstleriň kesişme çyzygy dürli sudurly deşigi bolan şaýlaryň ýa-da nusgalaryň çyzgylary ýerne ýetirlende gabat gelýär 63 surat.

Ýumuş 59 nusganyň aksanometriki praýeksiýasy esasynda onuň ýarygyny ulanmak bilen çyzgysyny gurmak talap edilýar.

Her warýant iki meseleden durýar . Birinji işi frontal ýarygy ulanmak bilen , ikinjisi gorizontal ýarygy ulanmak bilen ýerne ýetirilýär.

60 ýumuşda ýarygyň shemadaky görkezilişini ulanmak bilen, nusganyň iki praýeksiýasy esasynda üçinji praýeksiýasyny gurmaly, öňki çäregini kesip aýrmak bilen aksanometriki praýeksiýasyny gurmaly. 65 suratda meseläniň ýerine ýetirilşine mysal getirilen.

Zadyň içki şekiliniň aksonometriki praýeksýasyny ýerne ýetirmek üçin „şaýyň bir çäreginiň kesigi ulanylýar.

Aksonometriki praýeksiýalarda ýarygy iki usul bilen gurup bolýar.

Birinji usul . Başda inçe çyzyk bilen aksonometriki praýeksýa gurulýar . Soňra 66-njy suratdaky ýaly  $x$  we  $y$  oklara tarap kesiji tekizligi ugrykdyryp kesmek ýerne ýetirilýär. Zadyň şekilendirlen bölegi aýrylýar, soňra kesik ştrihlenýär we şekil tutuş ýogyn çyzyk bilen geçirilýär.

Ikinji usul . Başda şekiliň kesiginiň aksonometriki praýeksiýasy gurulýar 67a suratda, soňra kesiji tekizliklerden aňyrd aýyrylýar .

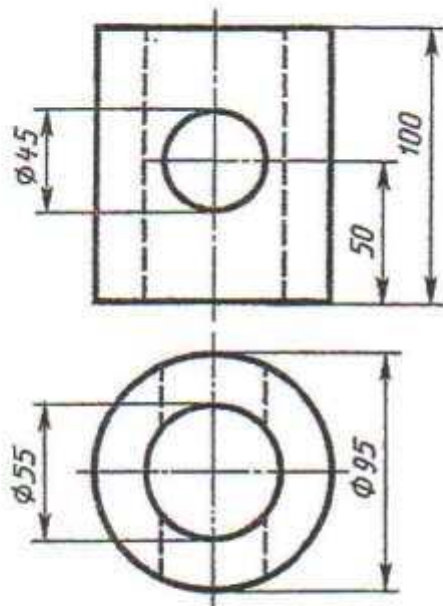
Zadyň şekiliniň çyzgysy tamamlanýar 67b surat. Bu usul çyzgyda artyk çyzyklary ýerine ýetirmeden boşadýar, gurluşy sadalaşdyrýar.

Aksanometriki praýeksiýada kesigiň şertli çyzyklary, 68 suradaky ýaly 30we 60gradus burçly, üçburç çyzgyçlar bilen goýulýar.

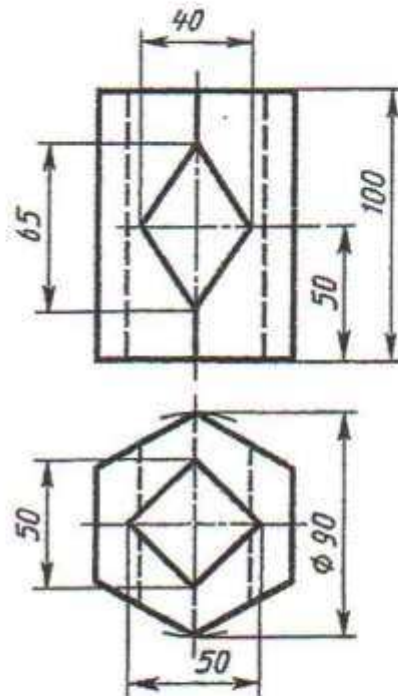
Ýerine ýetirilen komplekis çyzgylarda ölçegleri goýmaly.



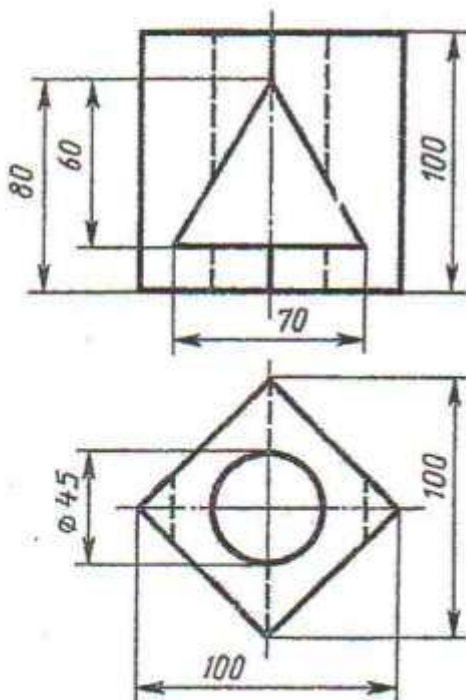
1-nji variant



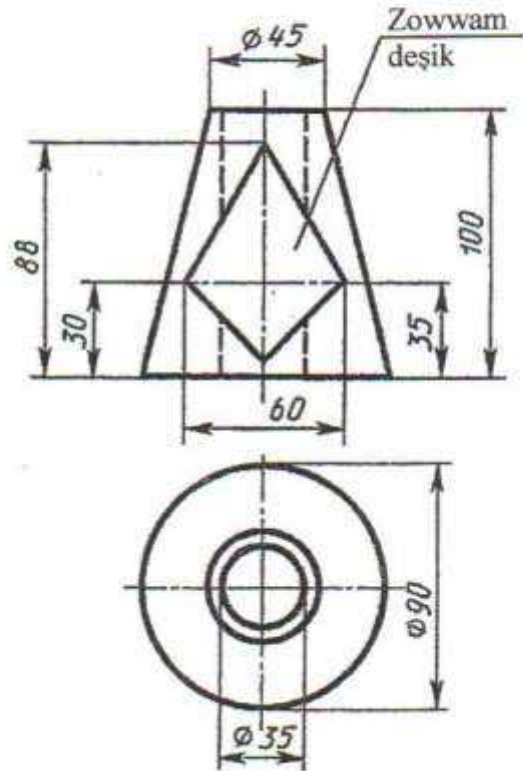
2-nji variant



3-nji variant

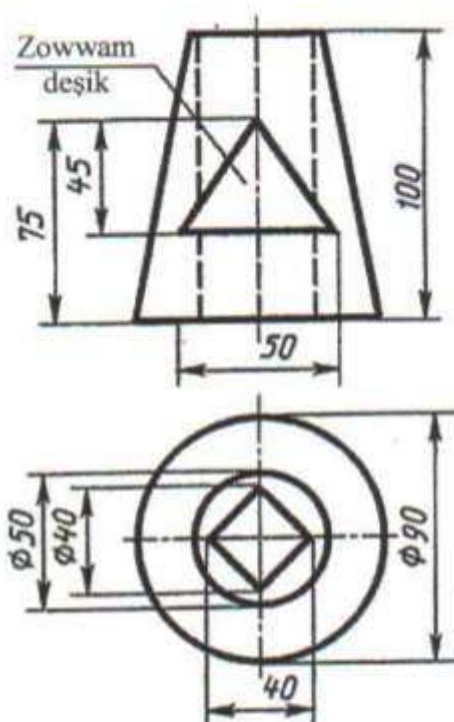


4-nji variant

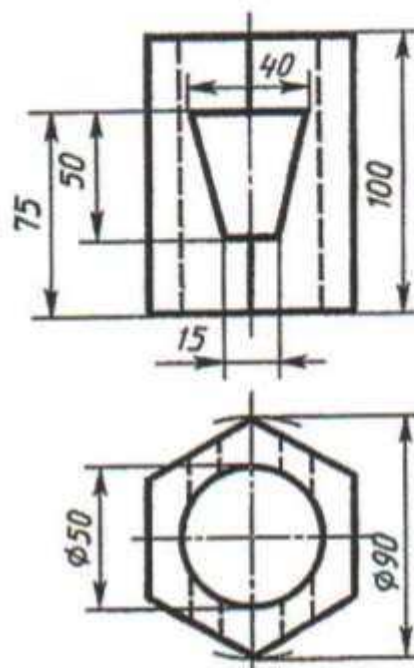


Içi boşlukly geometriki jisimiň üç proyeksiýadaky çyzgysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli. 4-nji wariandyň gorizontel proyeksiýasyndaky ýetmeýän çyzyklary gurmaly

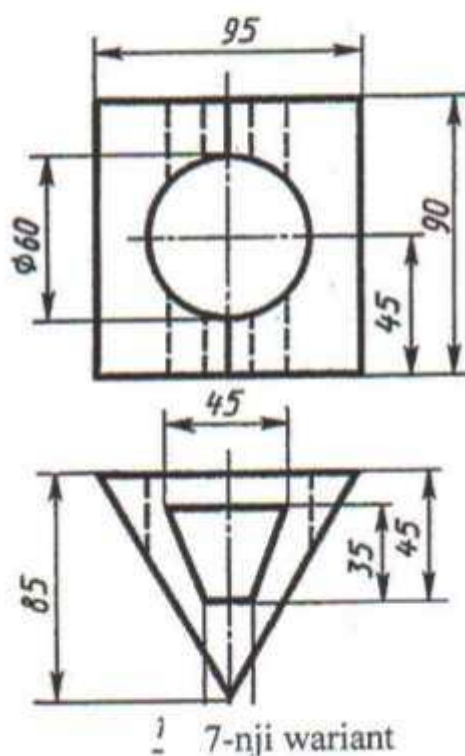
5-nji variant



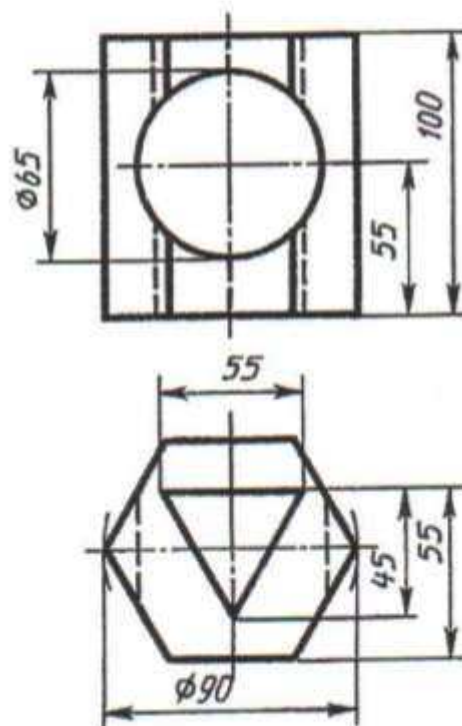
6-njy variant



7-nji variant



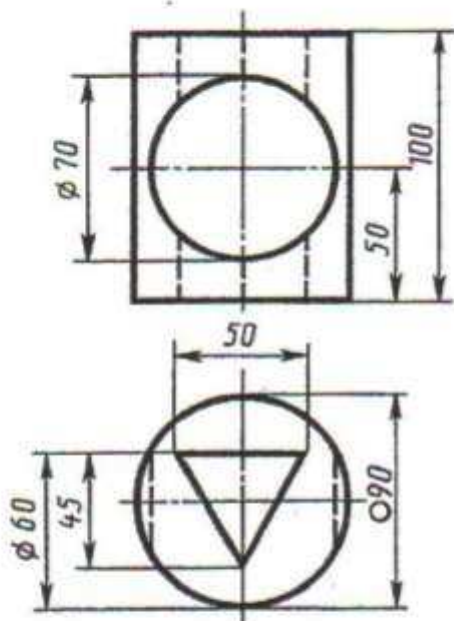
8-nji variant



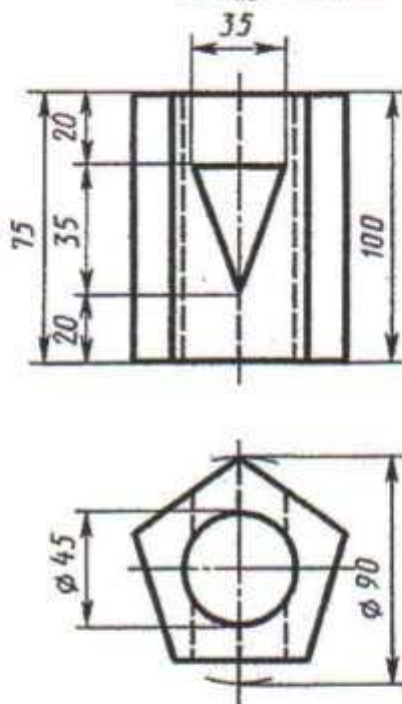
İçi boşlukly geometriki jisimiň üç proyeksiýadaky çyzgysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli. 5-nji wariandyň gorizontaı proyeksiýasyndaky ýetmeýän çyzyklary gurmaly.

# ÝUMUŞ 58

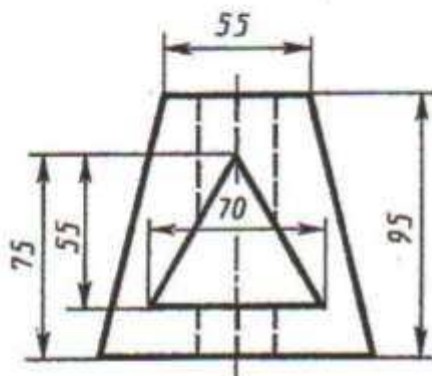
9-njy wariant



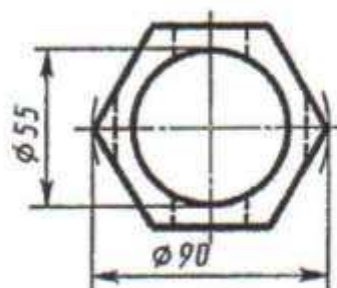
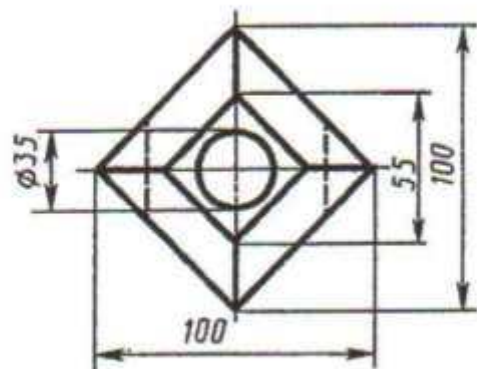
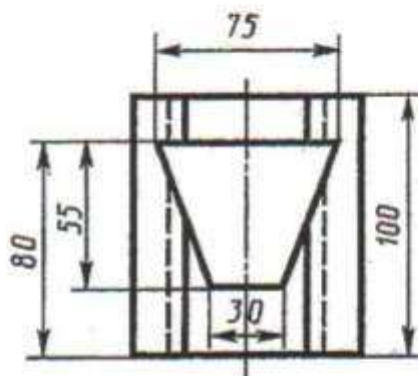
10-njy wariant



11-nji wariant



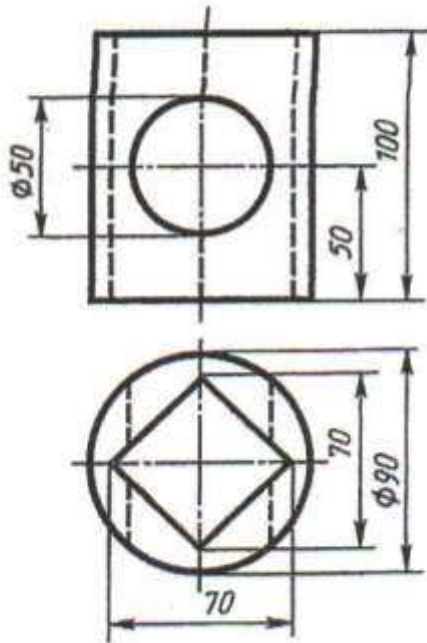
12-nji wariant



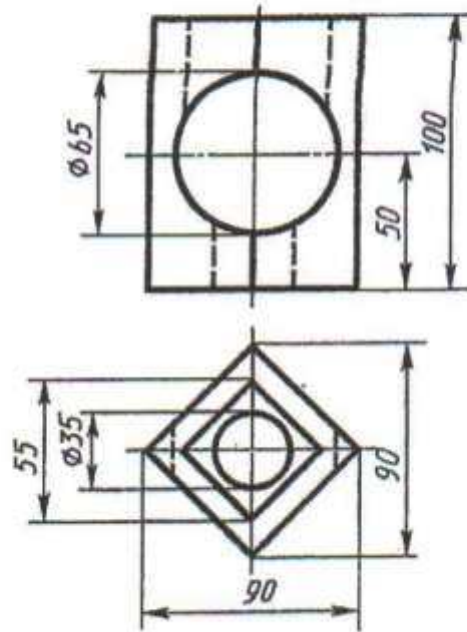
İçi boşlukly geometriki jisimiň üç proyeksiýadaky çyzgysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli. Wariandyň gorizontaly proyeksiýasyndaky ýetmeýän çyzyklary gurmaly.



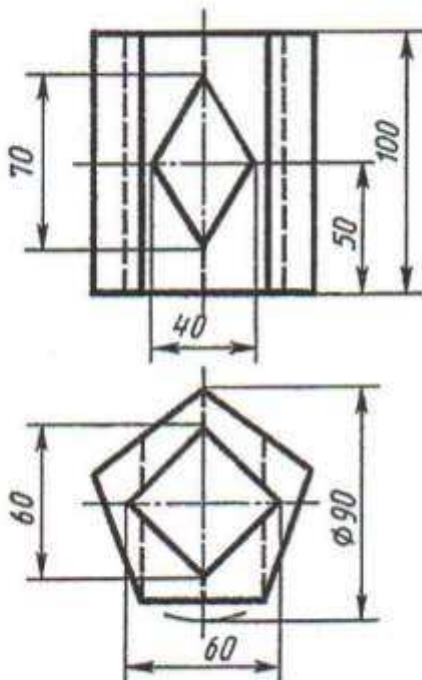
13-nji variant



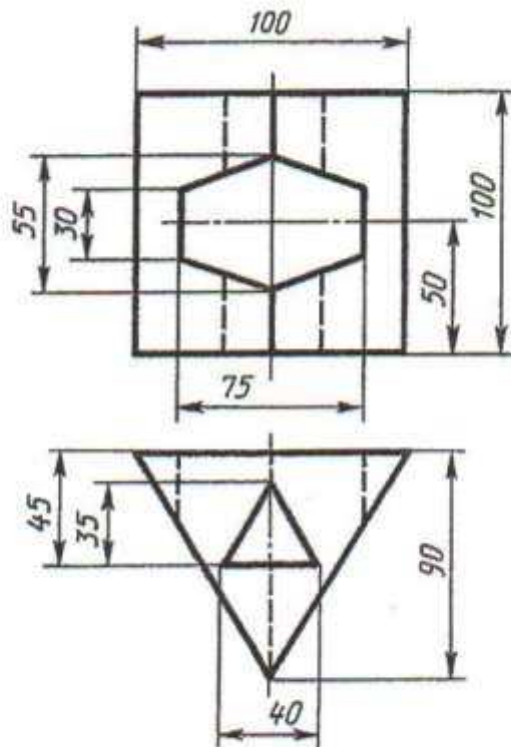
14-nji variant



15-nji variant



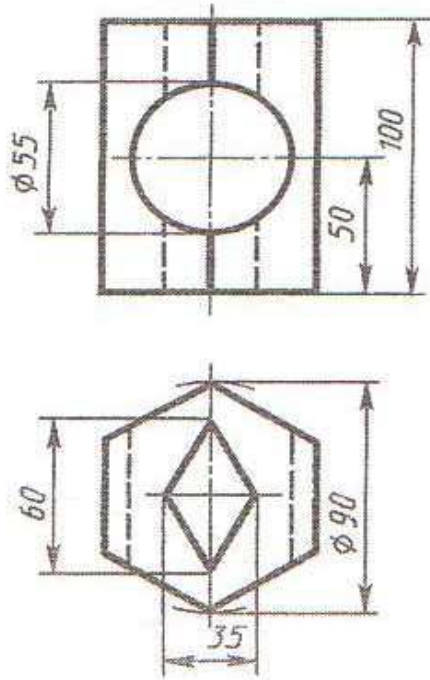
16-njy variant



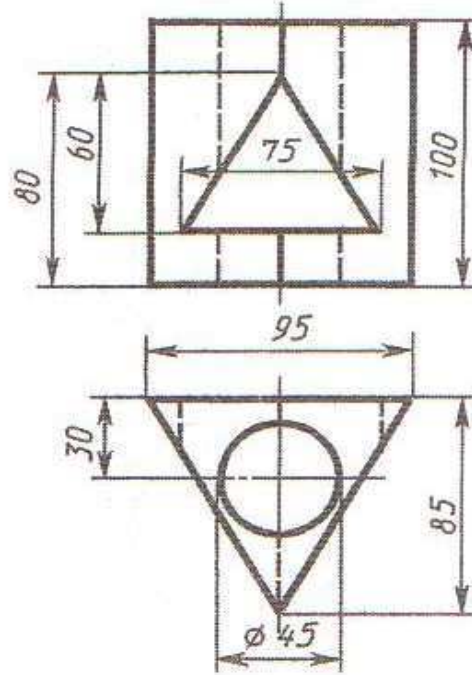
Içi boşlukly geometriki jisimiň üç proyeksiýadaky çyzygysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli.

# ÝUMUŞ 58

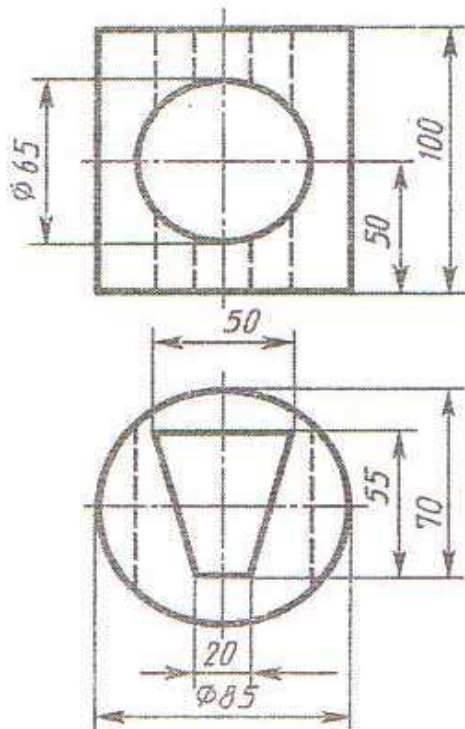
17-nji variant



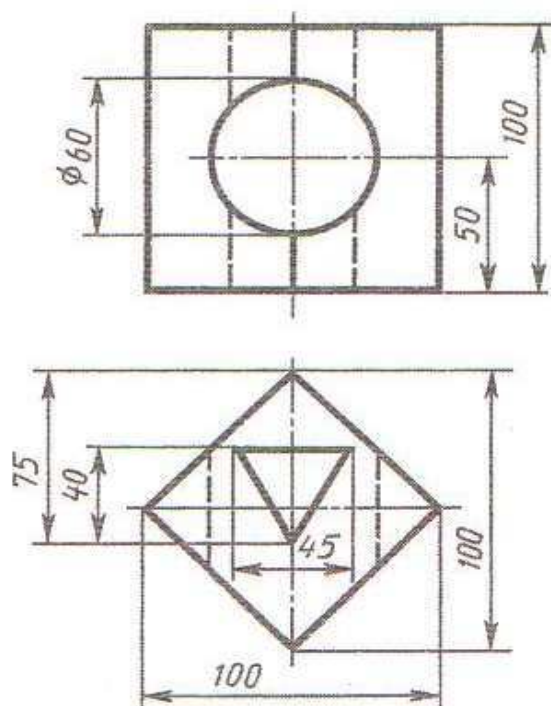
18-nji variant



19-nji variant

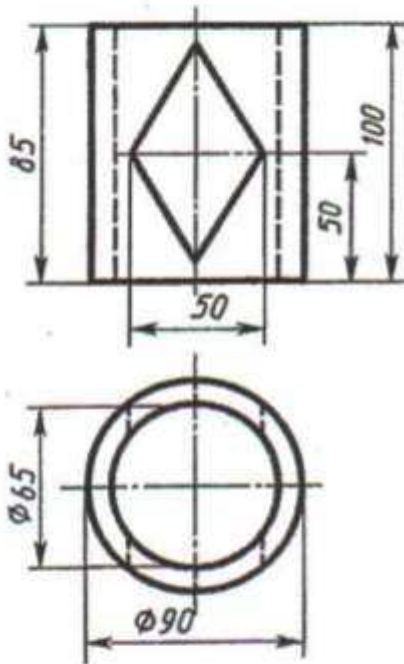


20-nji variant

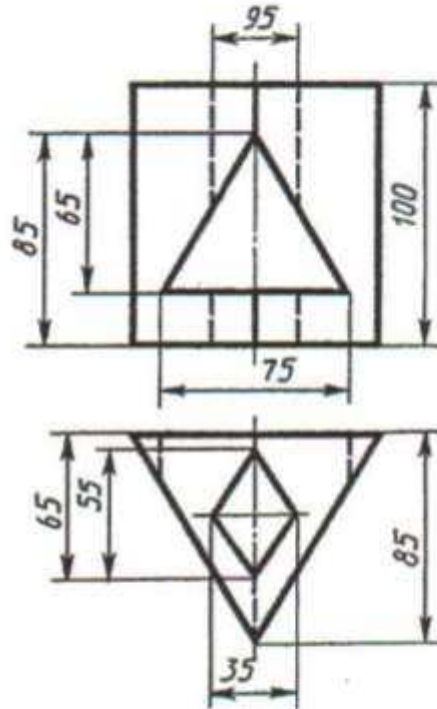


Içi boşlukly geometriki jisimleriň üç proyeksiýadaky çyzgysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli

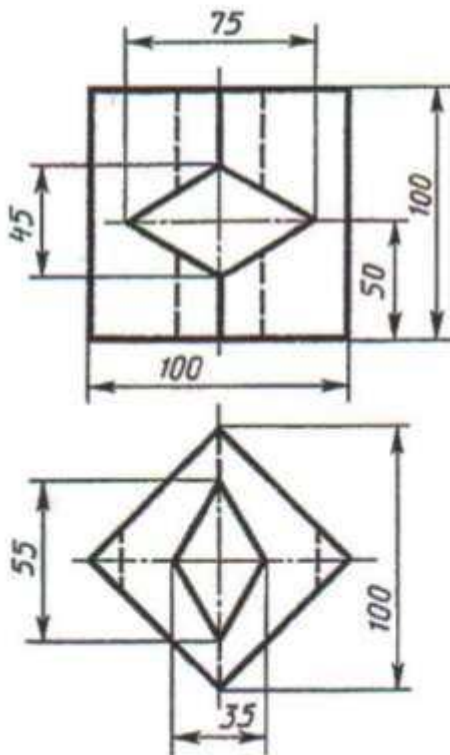
21-nji variant



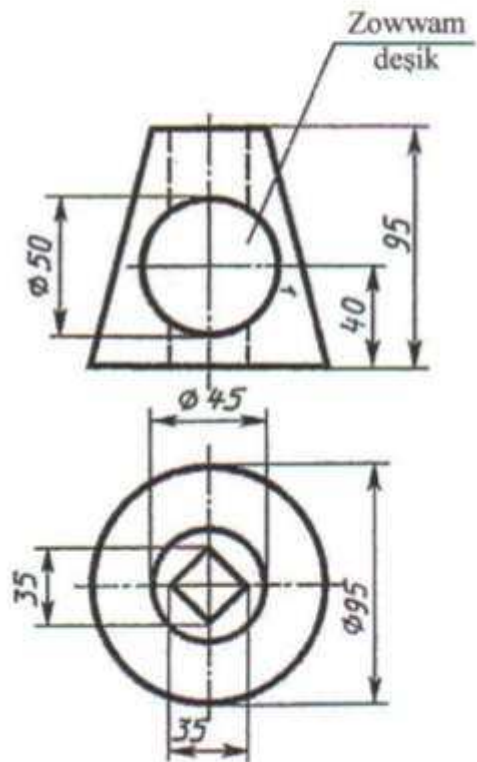
22-nji variant



23-nji variant



24-nji variant

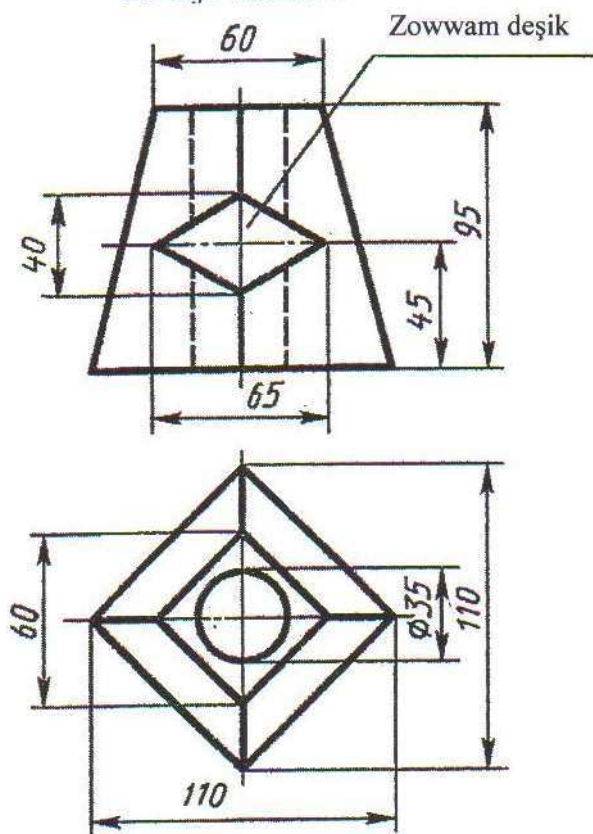


Içi boşlukly geometriki jisimiň üç proyeksiýadaky çyzygysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli.

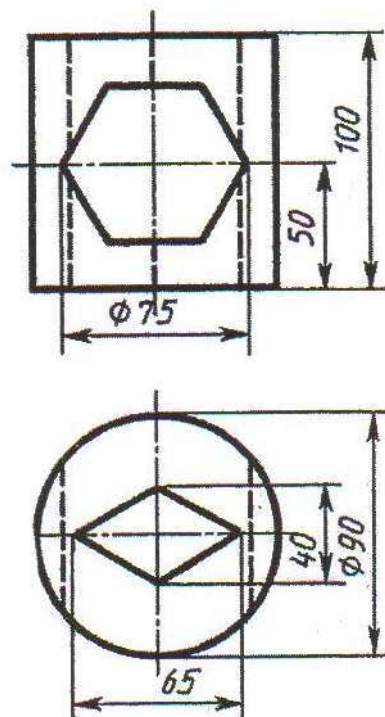


## ÝUMUŞ 58

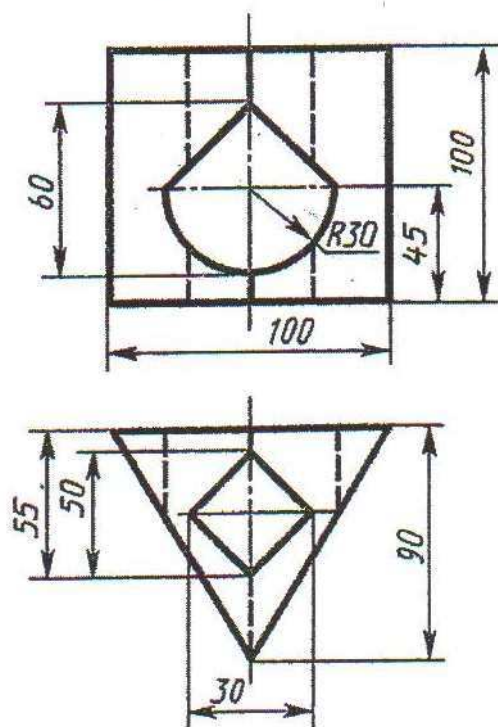
25-nji wariant



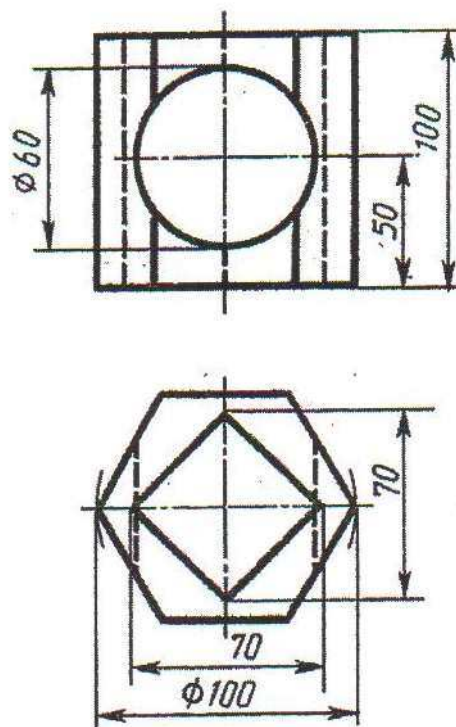
26-njy wariant



27-nji wariant



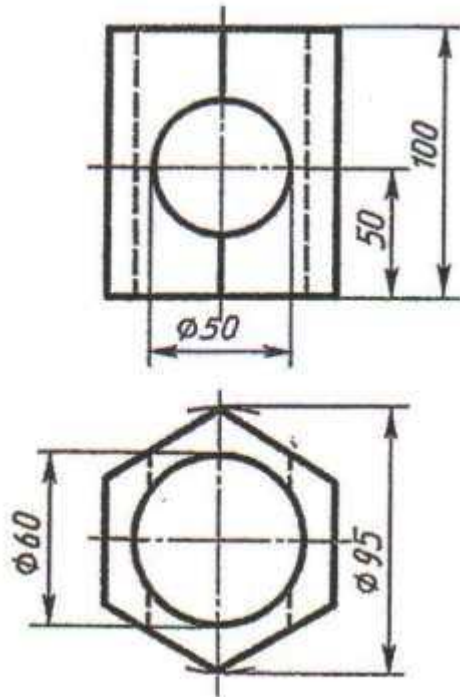
28-nji wariant



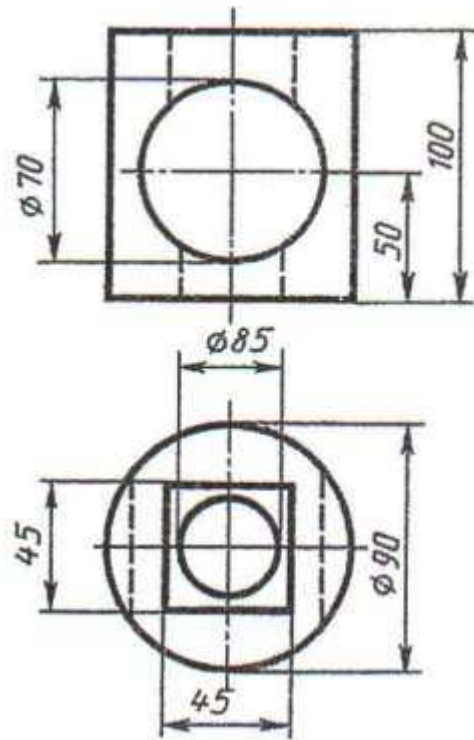
Içi boşlukly geometriki jisimiň üç proyeksiýadaky çyzgysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli. 25-nji wariantyň gorizontaly proyeksiýasyndaky ýetmeýän çyzyklary gurmaly

# YUMUŞ 58

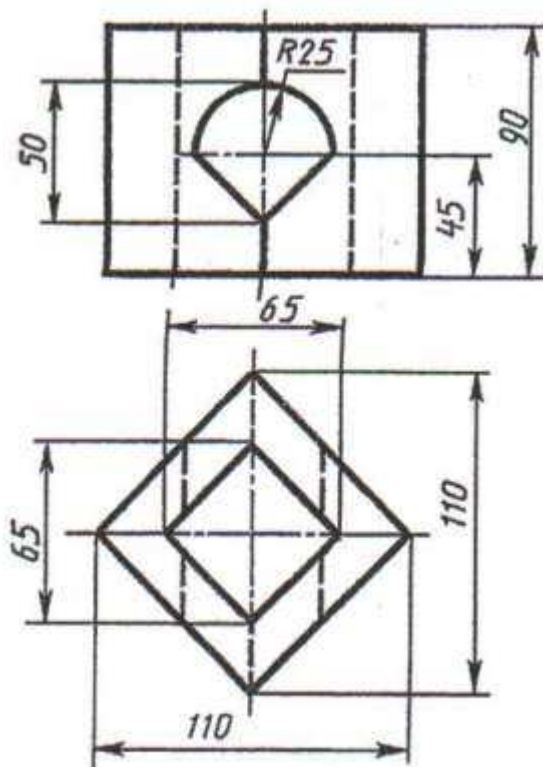
29-njy variant



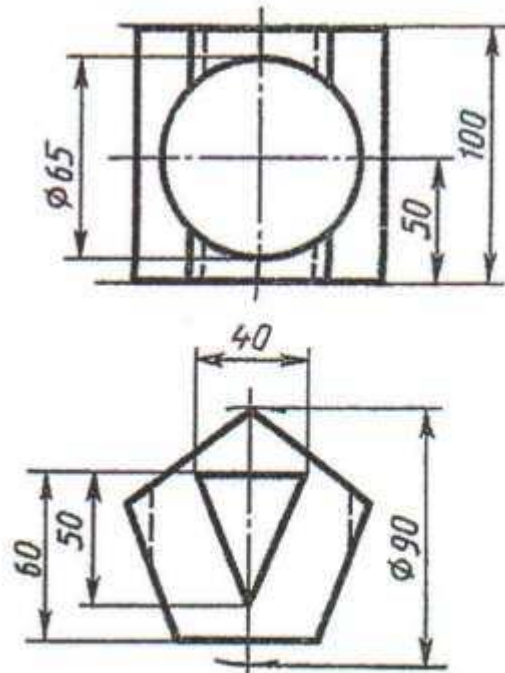
30-njy variant



31-nji variant



32-nji variant

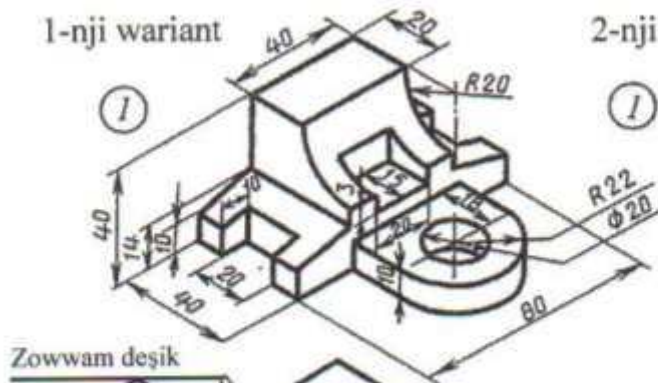


Içi boşlukly geometriki jisimiň üç proyeksiýadaky çyzygysyny profil ýarygyny ulanmak bilen ýerine ýetirmeli.

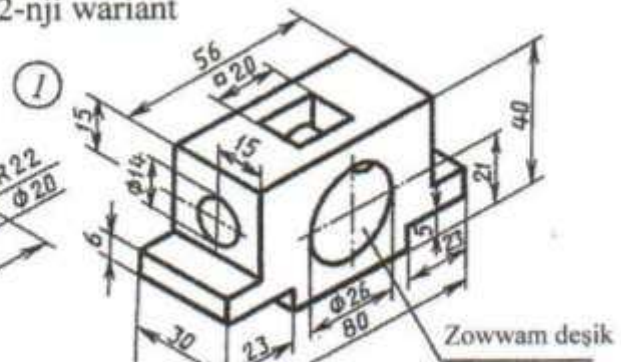


## ÝUMUŞ 59

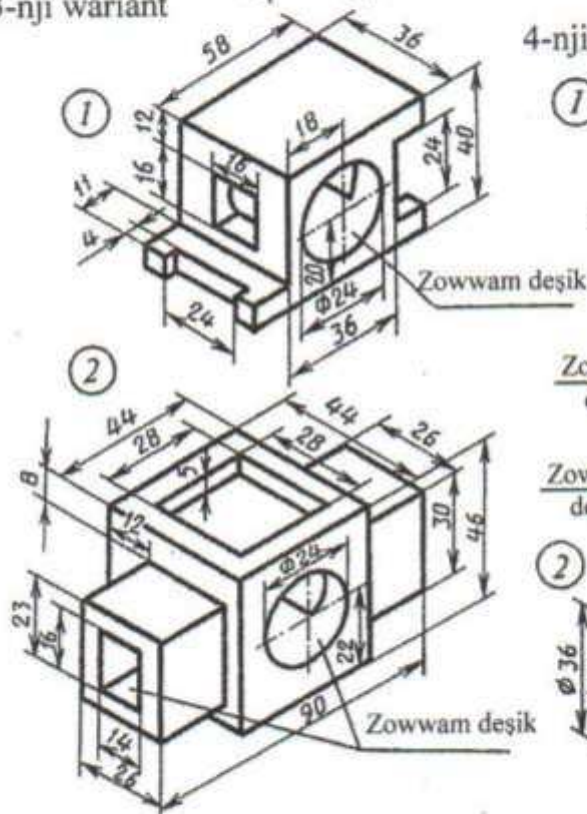
1-nji variant



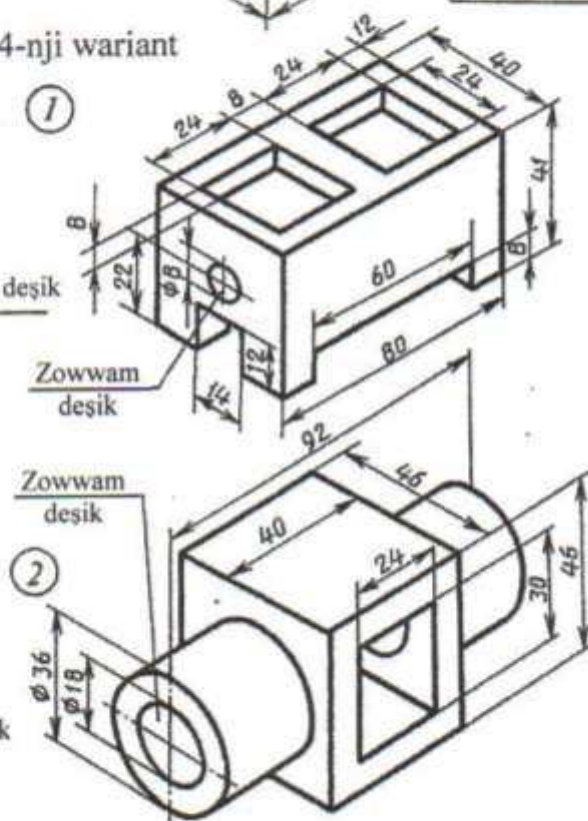
2-nji variant



3-nji variant



4-nji variant



Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyzgysyny gurmaly

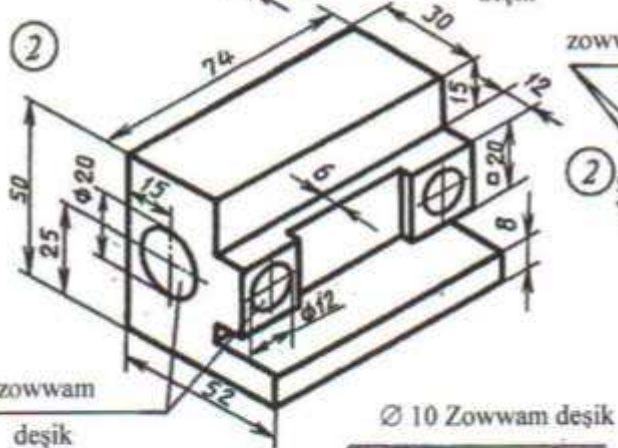
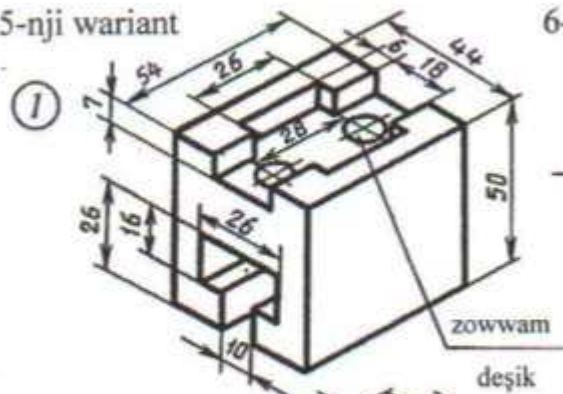
Mesele 1 – frontal ýarygyny ýerine ýetirmek bilen

Mesele 2 – gorizontaý ýarygyny ýerine ýetirmek bilen

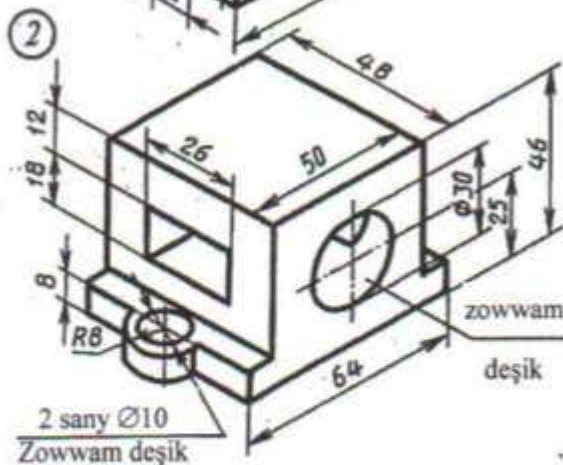
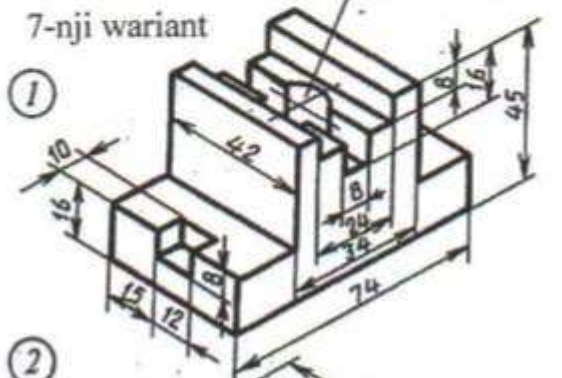


## YUMUŞ 59

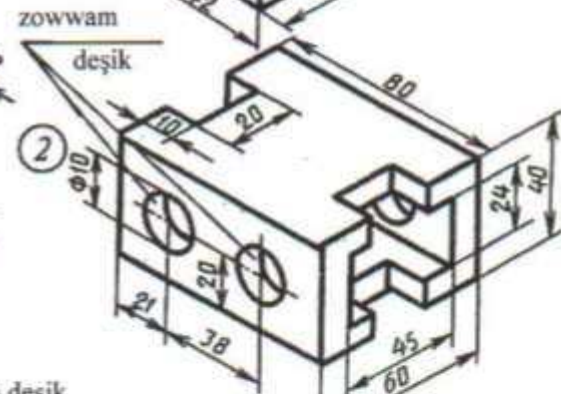
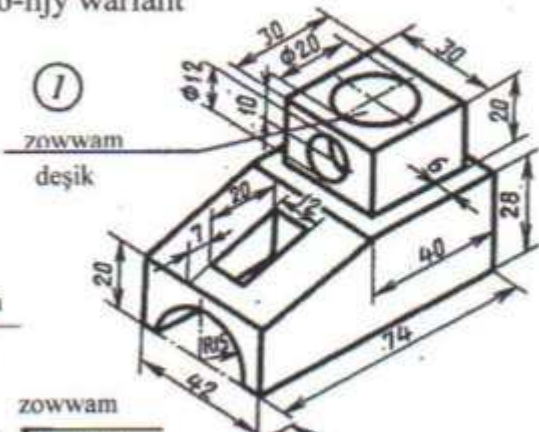
### 5-nji variant



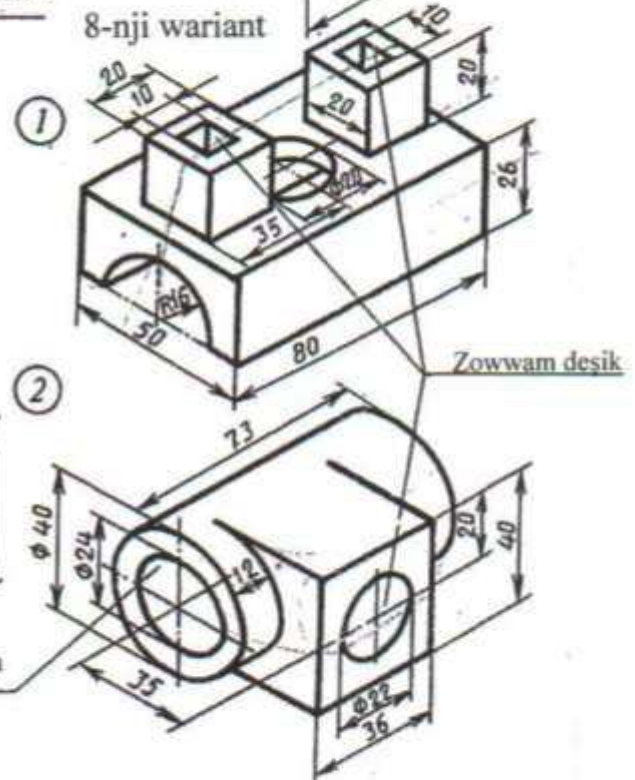
7-nji variant



6-njy variant



8-nji variant

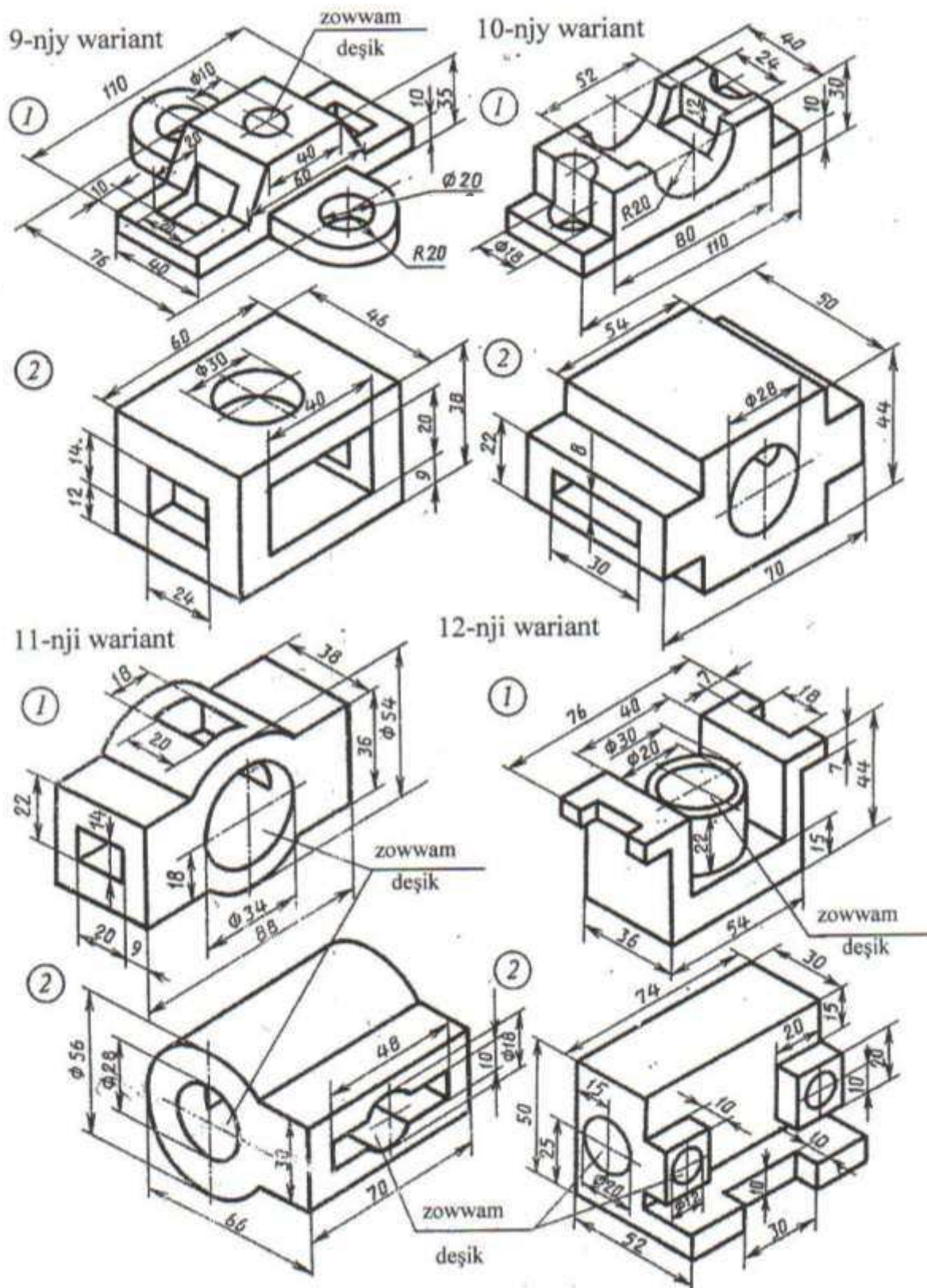


Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyzgysyny gurmaly.

Mesele 1 – frontal yarygyny ýerine ýetirmek bilen.

Mesele 2 – gorizontal ýarygyny ýerine ýetirmek bilen.

## YUMUŞ 59



Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyzgysyny gurmaly.

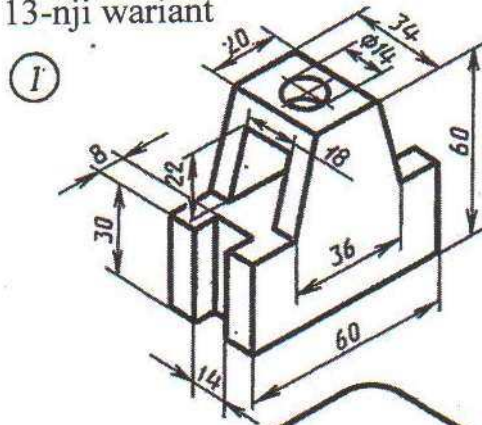
Mesele 1 – frontal ýarygyny ýerine ýetirmek bilen.

Mesele 2 – gorizontel ýarygyny ýerine ýetirmek bilen.

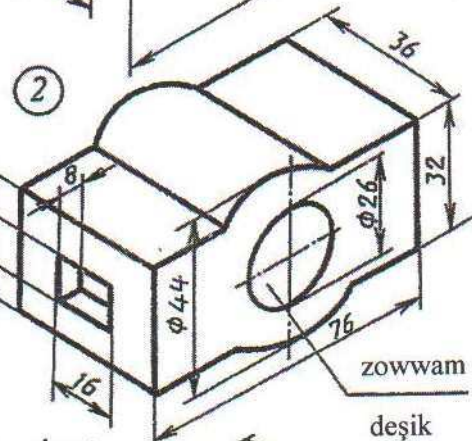
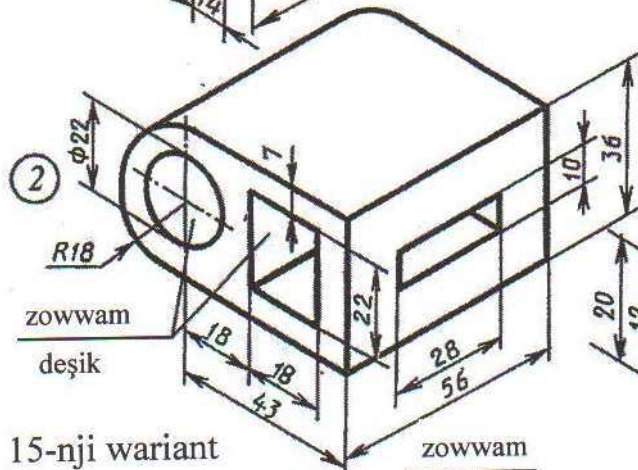
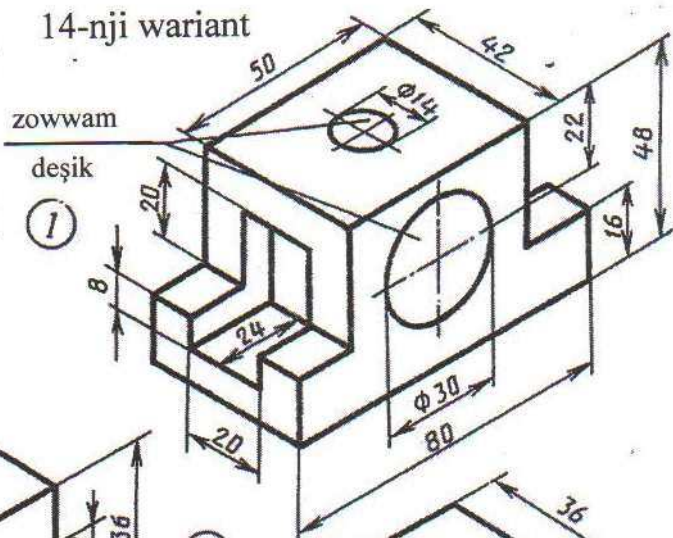


# YUMUŞ 59

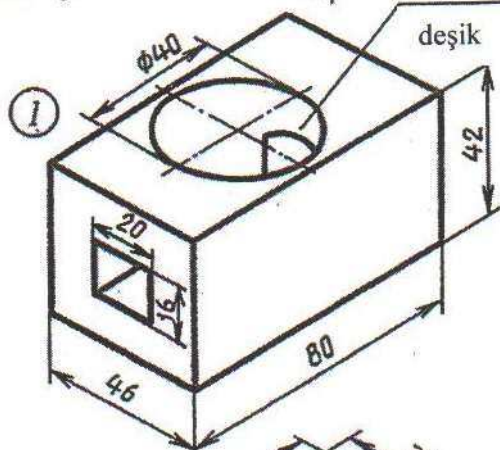
13-nji variant



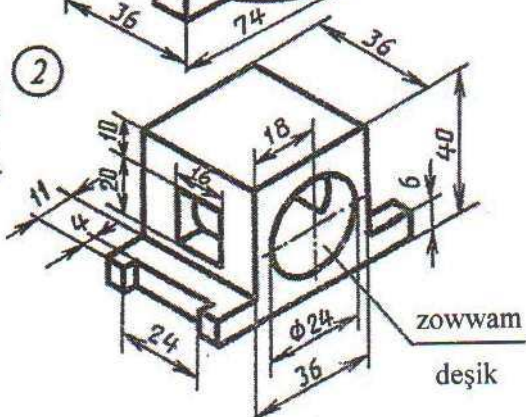
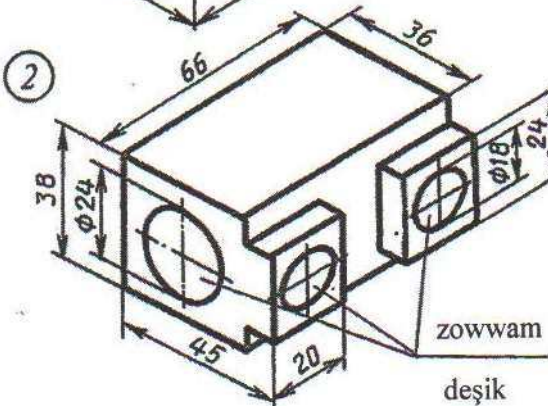
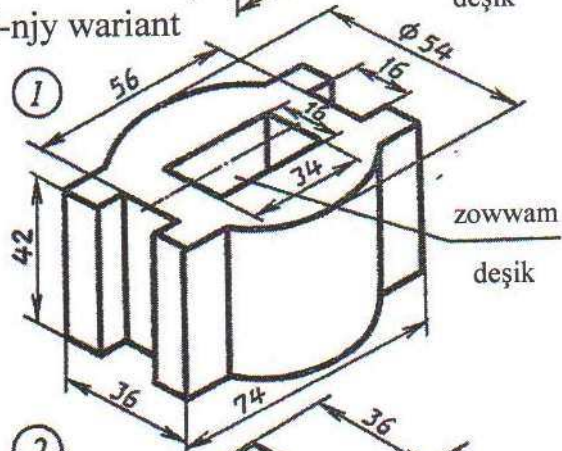
14-nji variant



15-nji variant



16-nji variant



Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyrgysyny gurmaly.

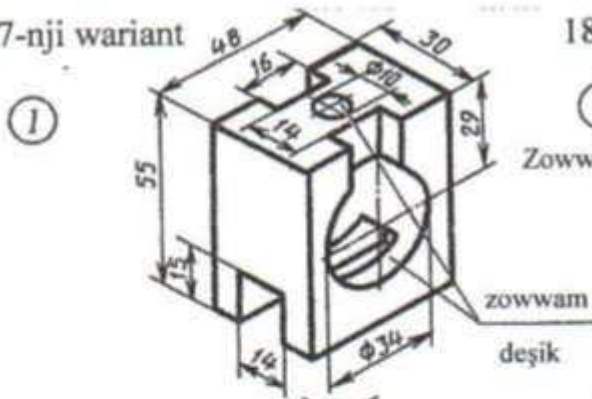
Mesele 1 – frontal ýarygyny ýerine ýetirmek bilen.

Mesele 2 – gorizontaý ýarygyny ýerine ýetirmek bilen.

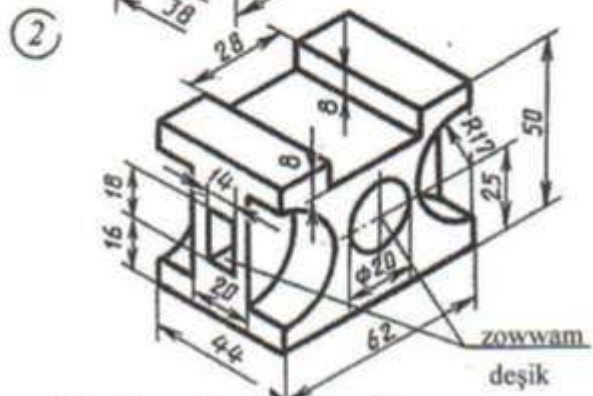
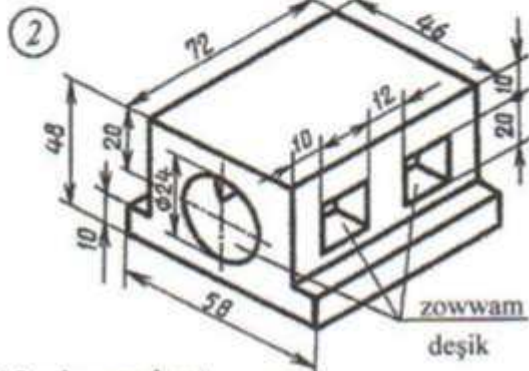
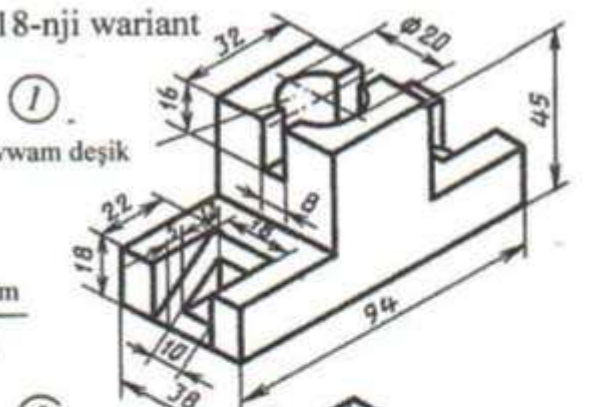


## YUMUŞ 59

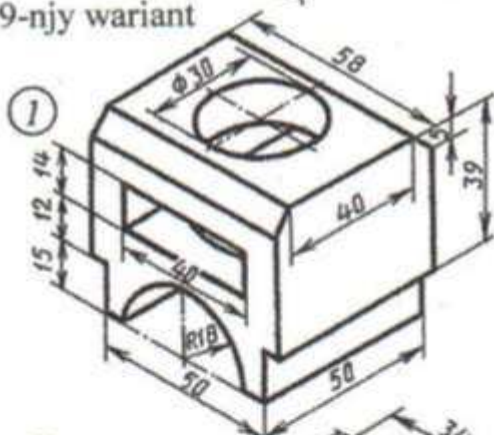
17-nji variant



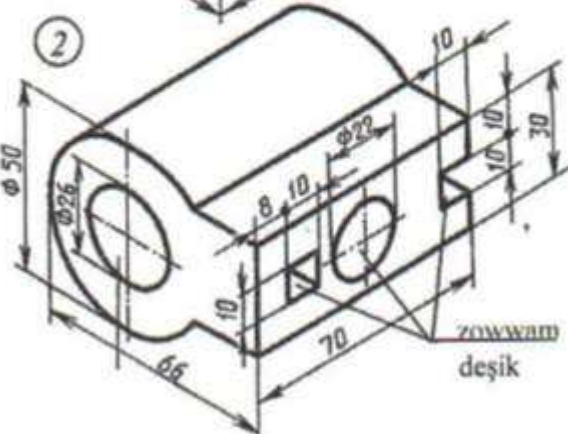
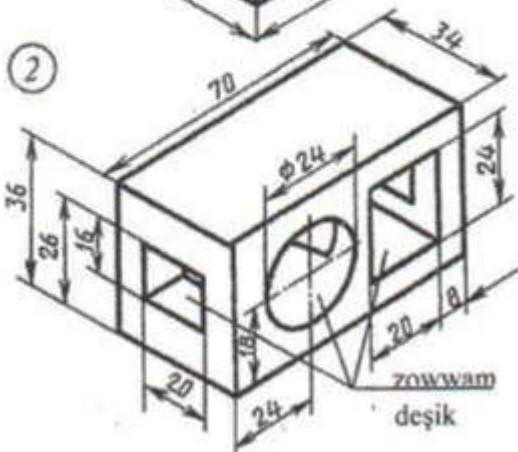
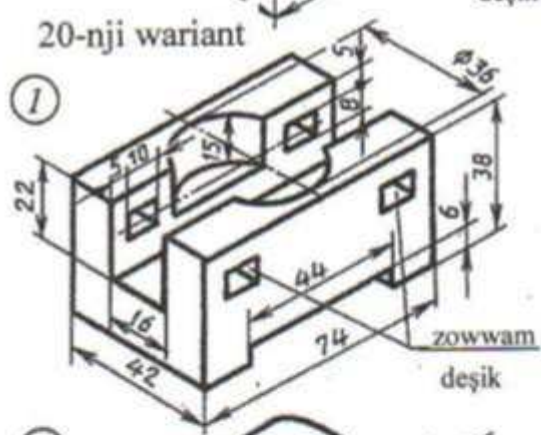
18-nji variant



19-nji variant



20-nji variant

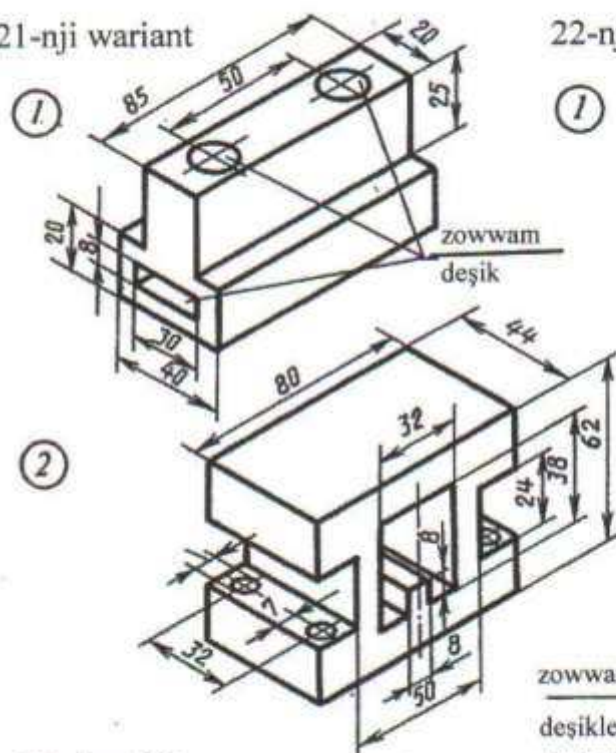


Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyzgysyny gurmaly.

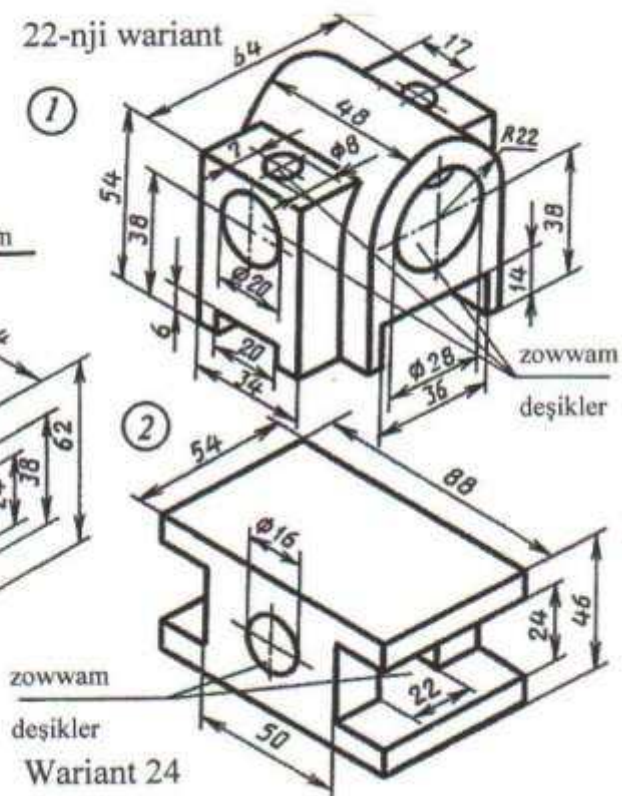
Mesele 1 – frontal ýarygyny ýerine ýetirmek bilen.

Mesele 2 – gorizontaly ýarygyny ýerine ýetirmek bilen.

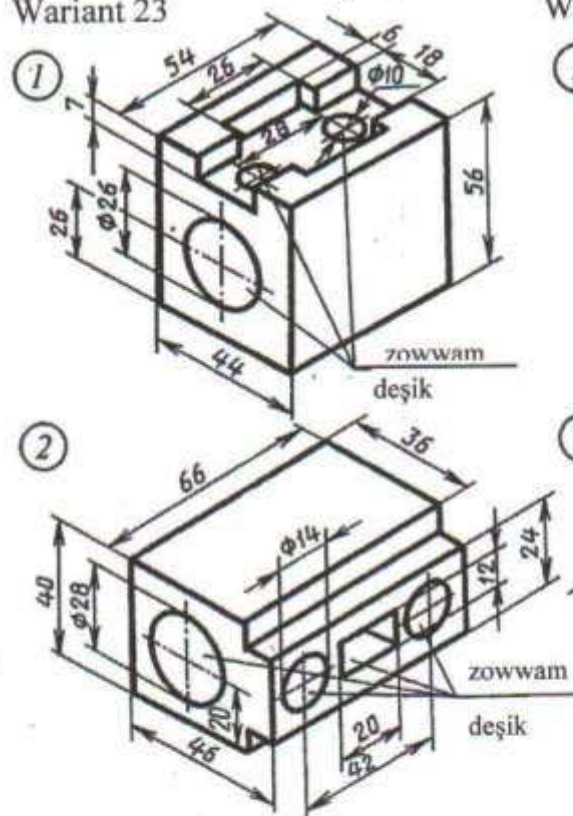
21-nji variant



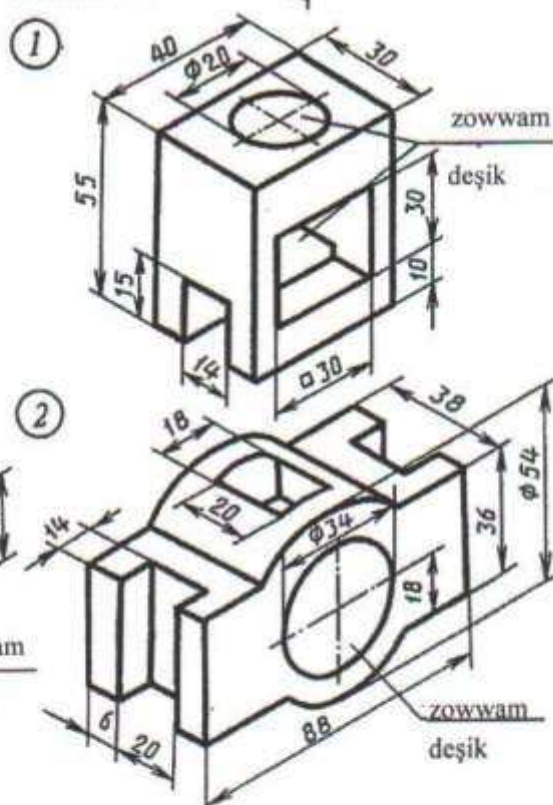
22-nji variant



Wariant 23



Wariant 24



Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyzgysyny gurmaly.

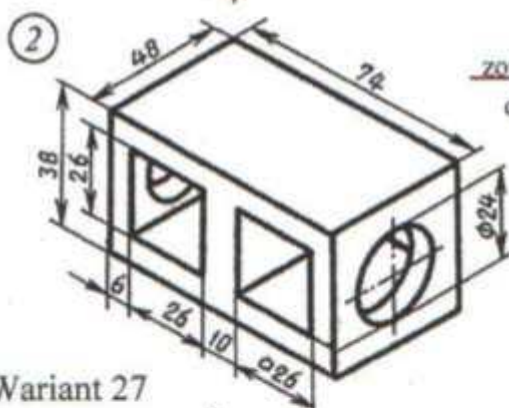
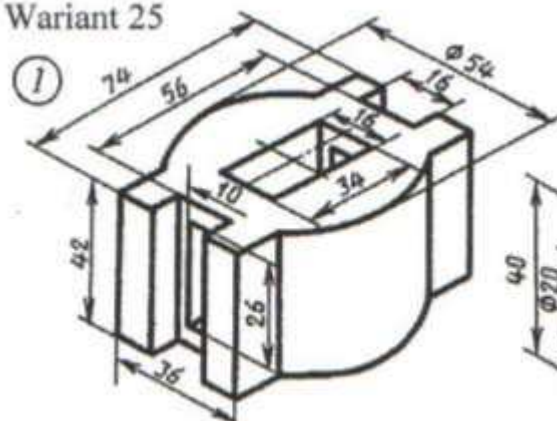
Mesele 1 – frontal ýarygyny ýerine ýetirmek bilen.

Mesele 2 – gorizontall ýarygyny ýerine ýetirmek bilen.

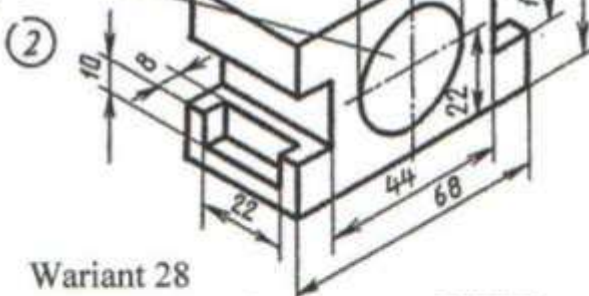
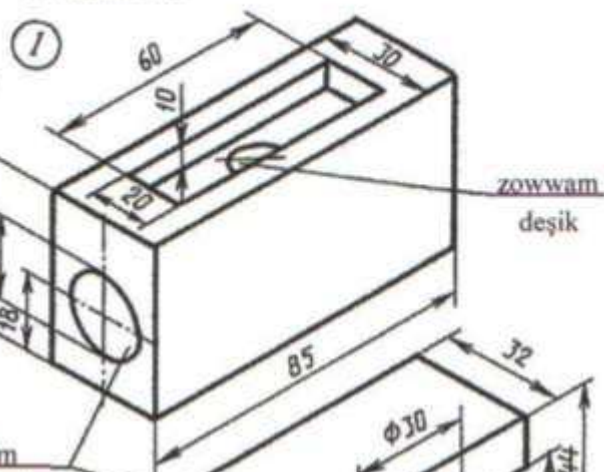


## YUMUŞ 59

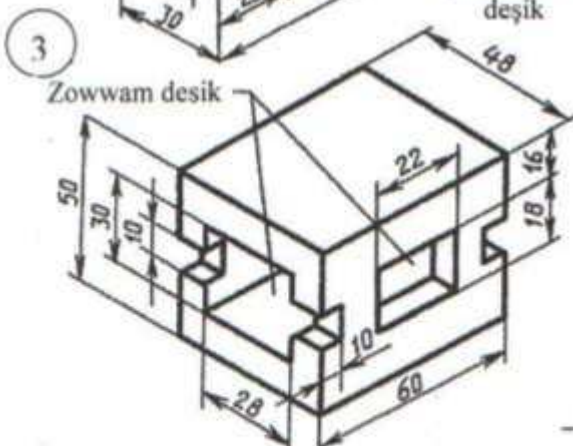
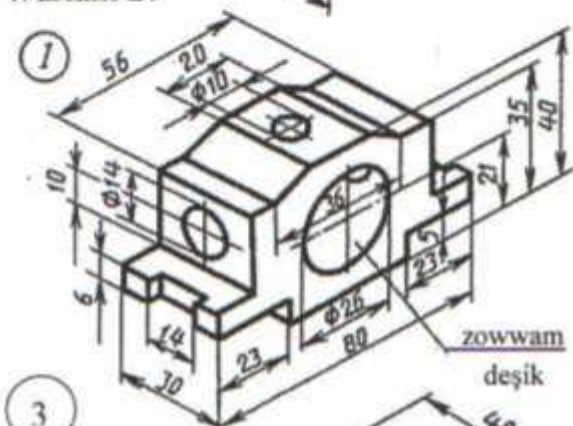
Wariant 25



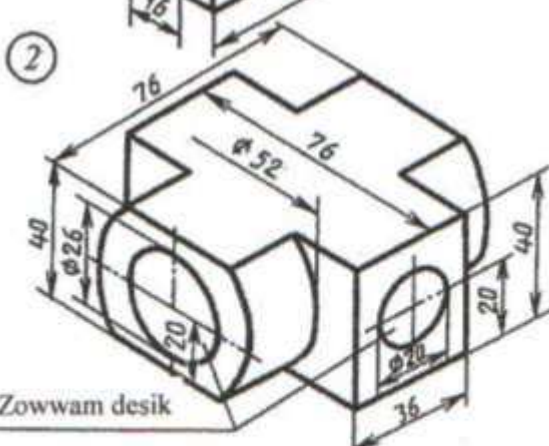
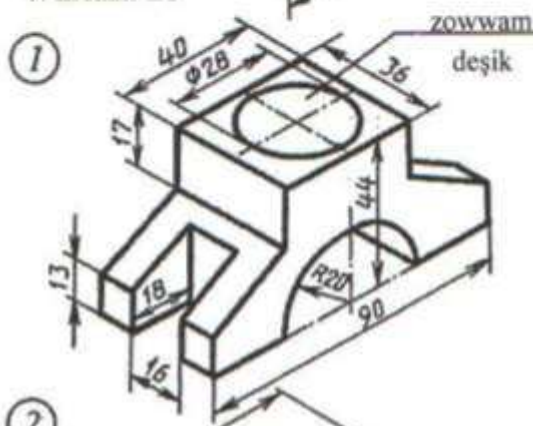
Wariant 26



Wariant 27



Wariant 28



Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyzgysyny gurmaly.

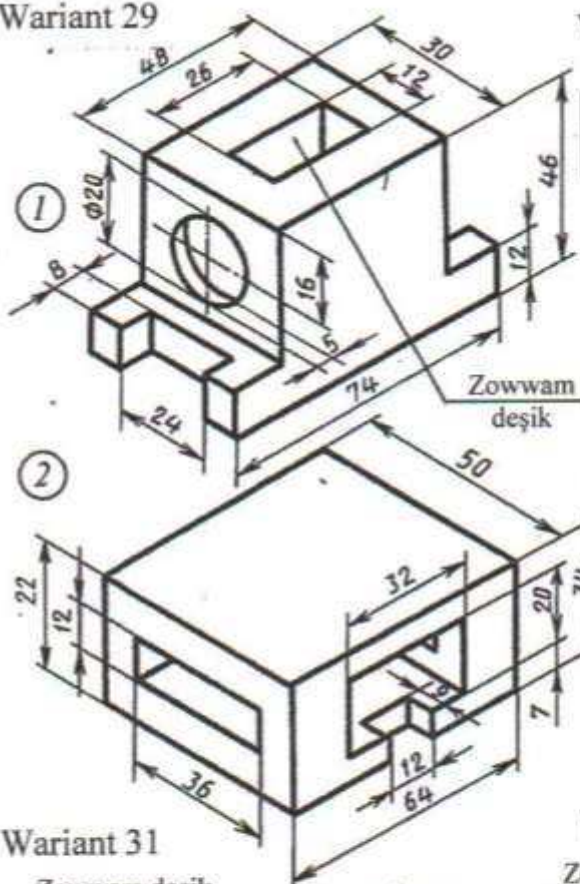
Mesele 1 – frontal ýarygyny ýerine ýetirmek bilen.

Mesele 2 – gorizontaý ýarygyny ýerine ýetirmek bilen.

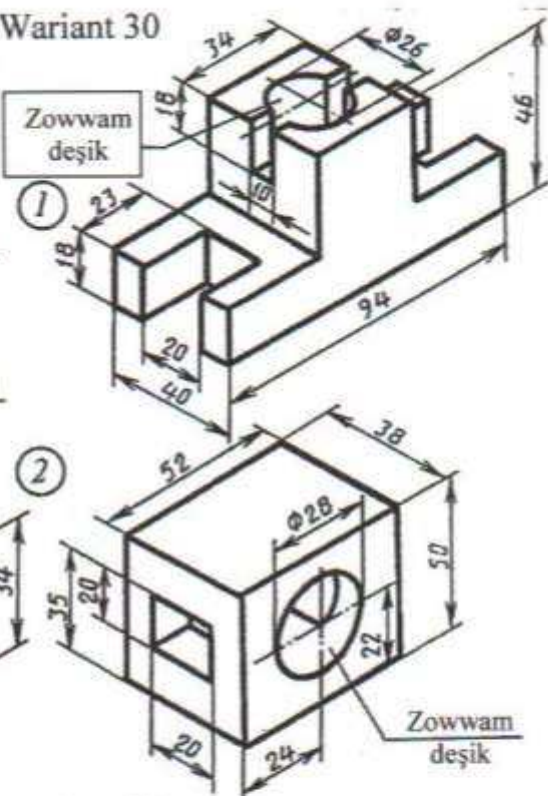


## ÝUMUŞ 59

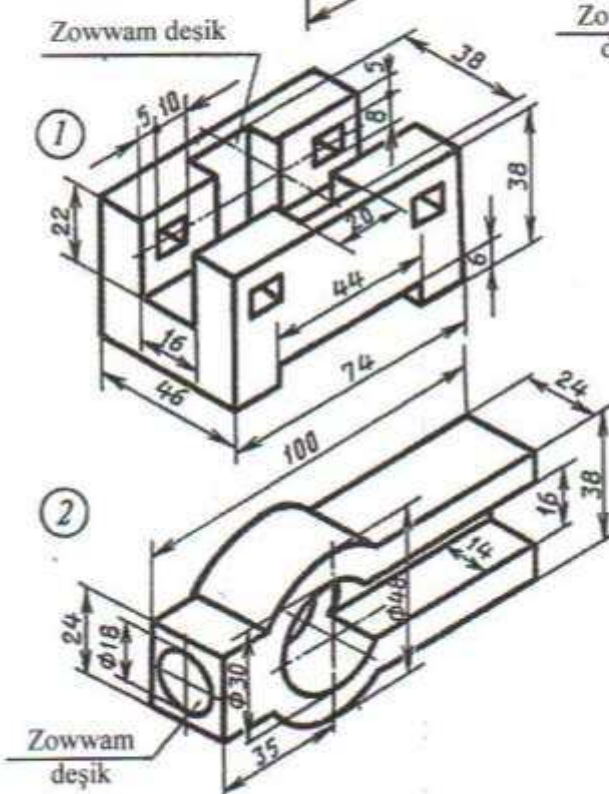
Wariant 29



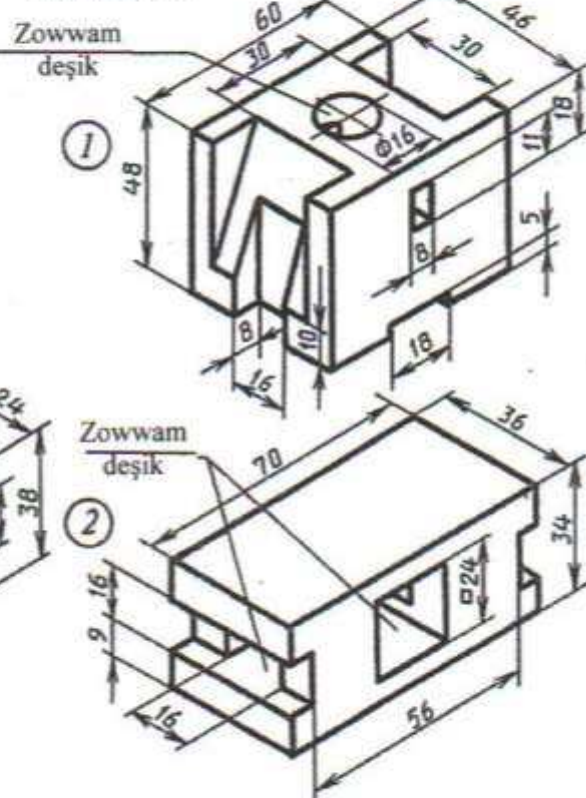
Wariant 30



Wariant 31



Wariant 32



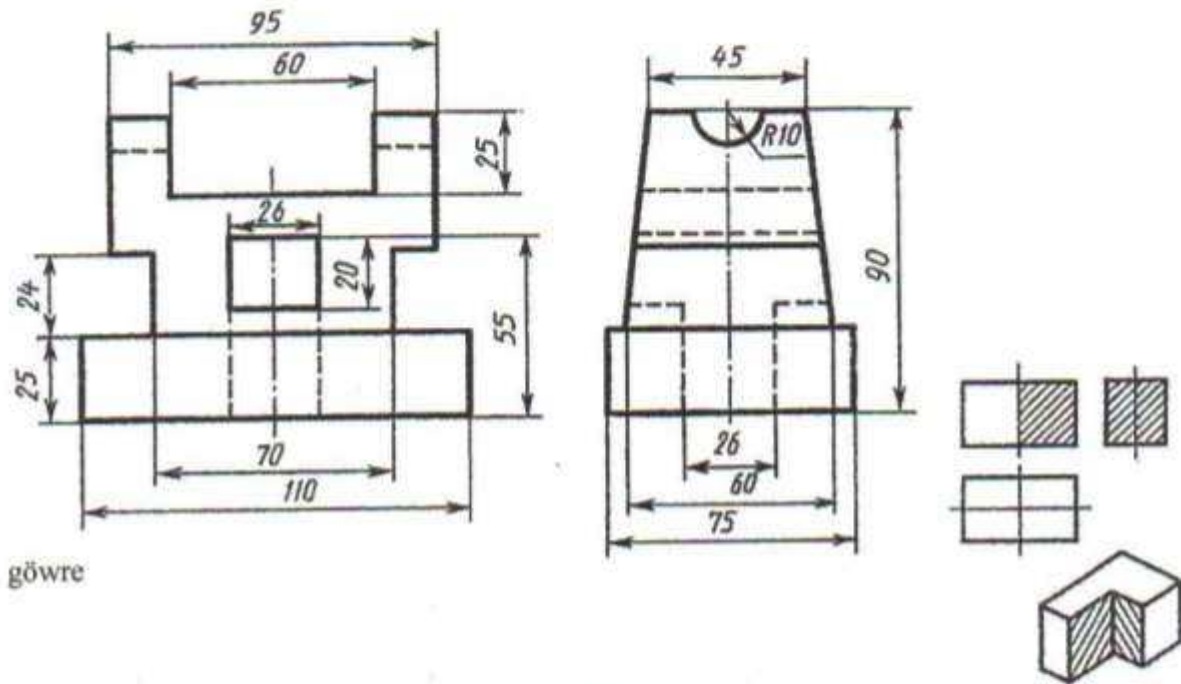
Nusganyň aksonometriýa proyeksiýasy esasynda onuň üç proyeksiýadaky çyzgysyny gurmaly.

Mesele 1 – frontal ýarygyny ýerine ýetirmek bilen.

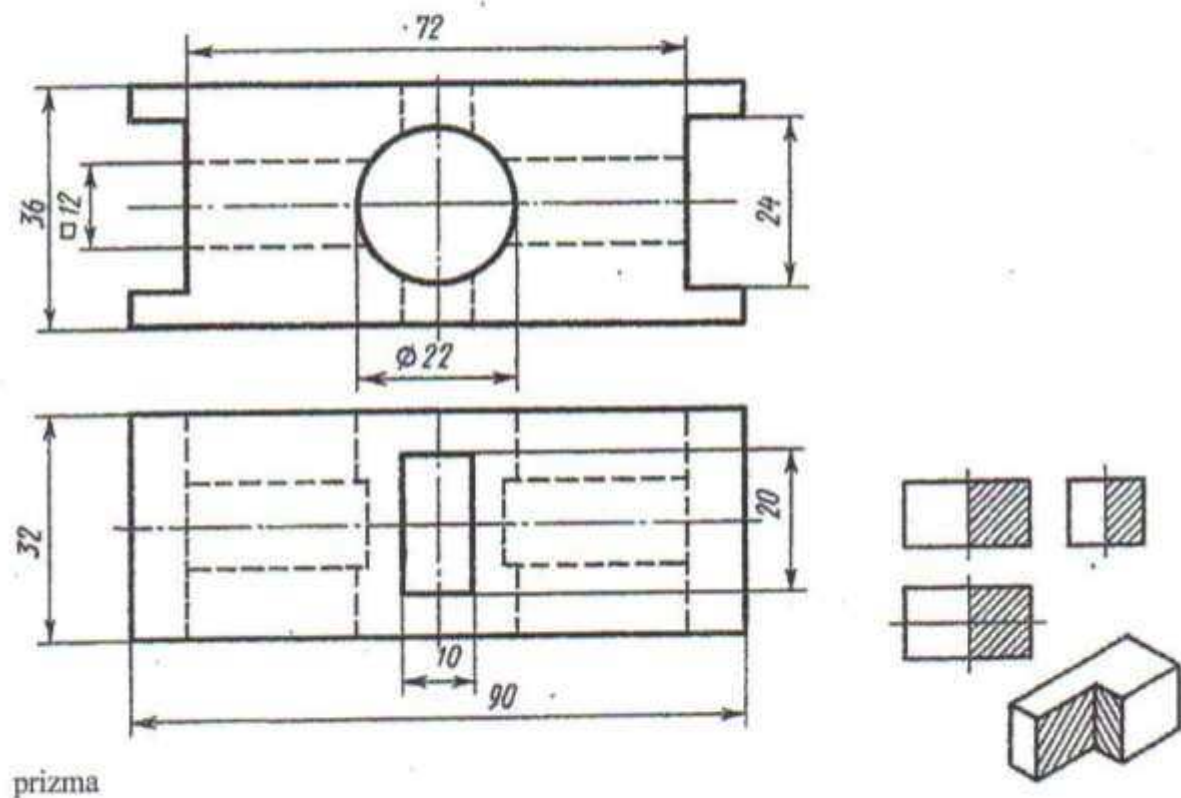
Mesele 2 – gorizontaý ýarygyny ýerine ýetirmek bilen.

# ÝUMUŞ 60

## Wariant 1



## Wariant 2

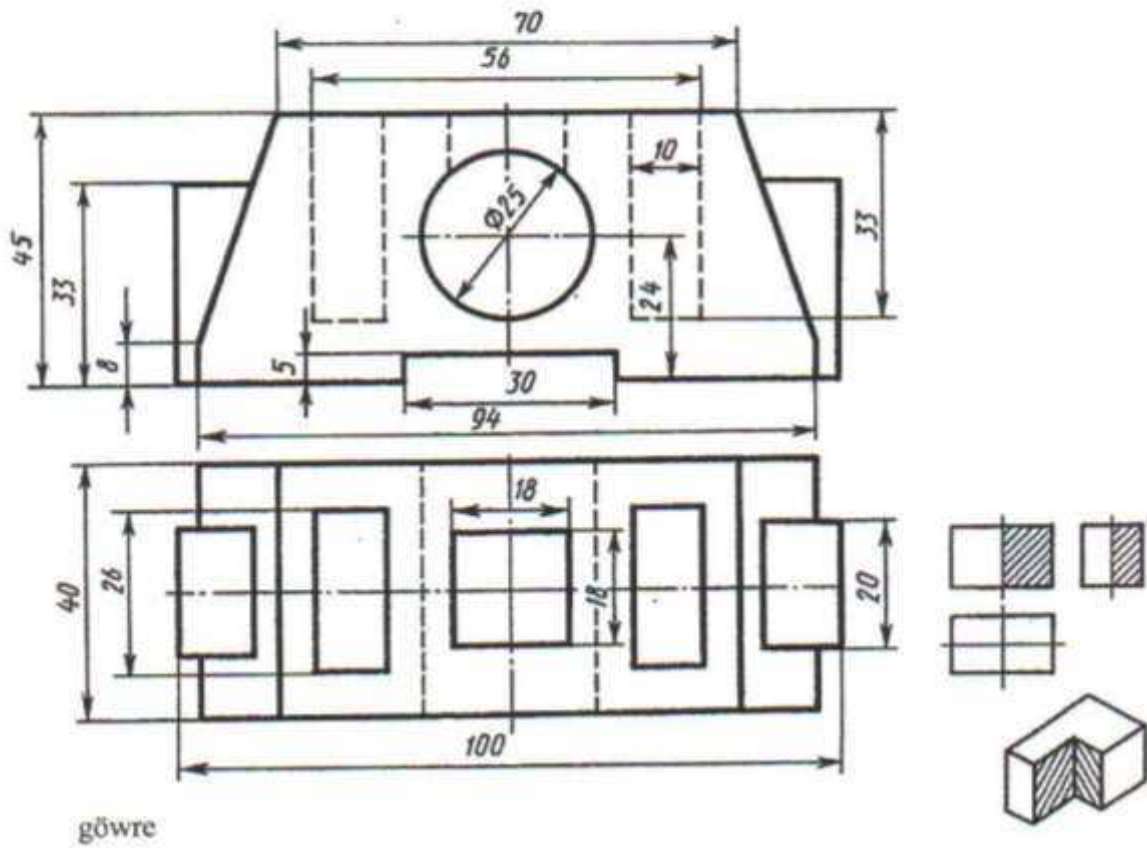


Berlen iki proyeksiýa esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriýa proyeksiýasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçeğleri goýmaly.

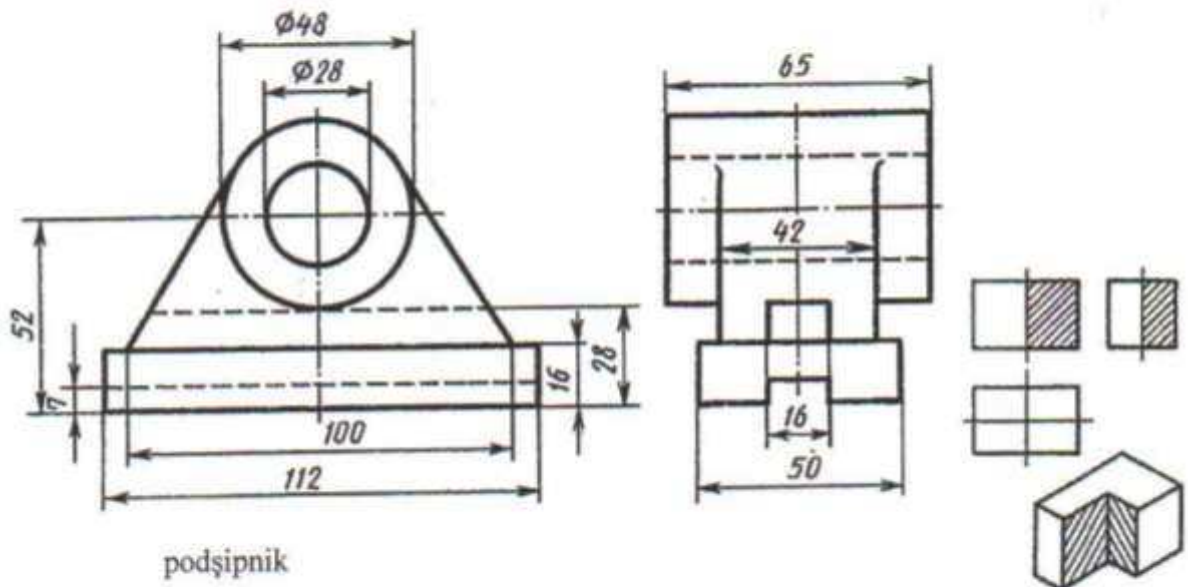


# ÝUMUŞ 60

Wariant 3



Warian 4

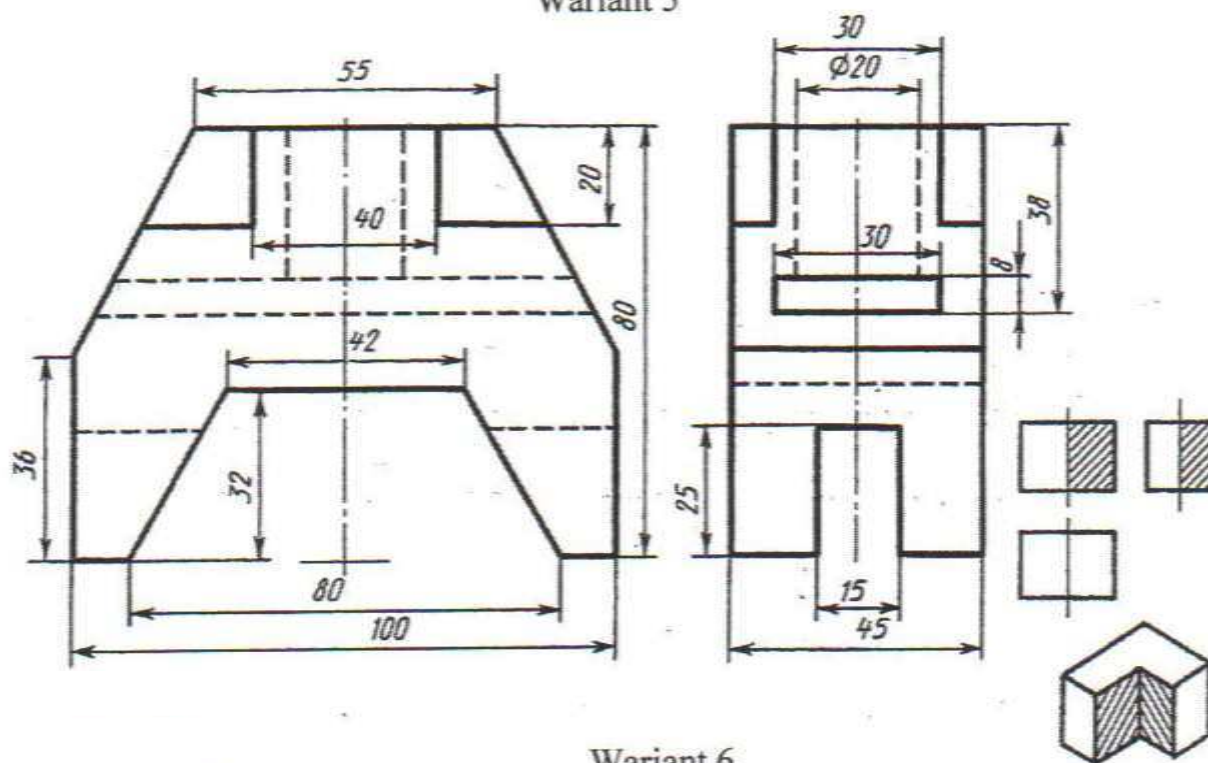


Berlen iki proyeksiýa esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriýa proyeksiýasynyň öňdäki çäryegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçegleri goýmaly.

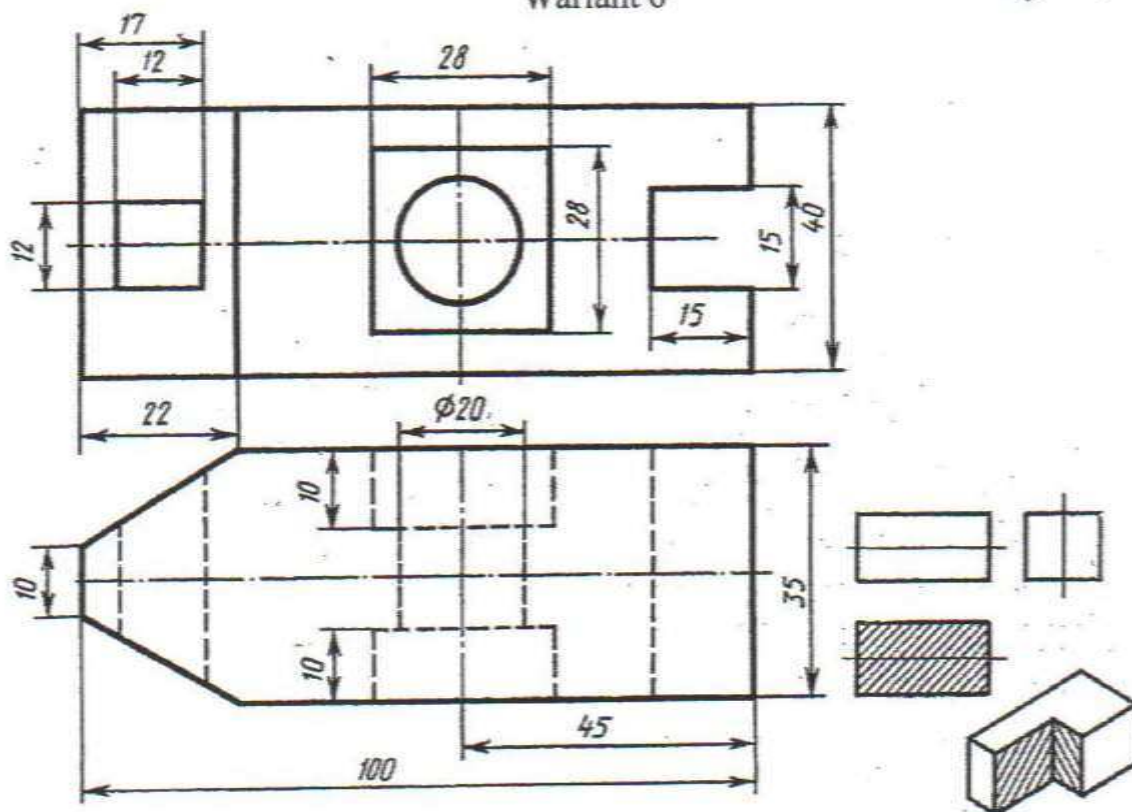


# ÝUMUŞ 60

## Wariant 5

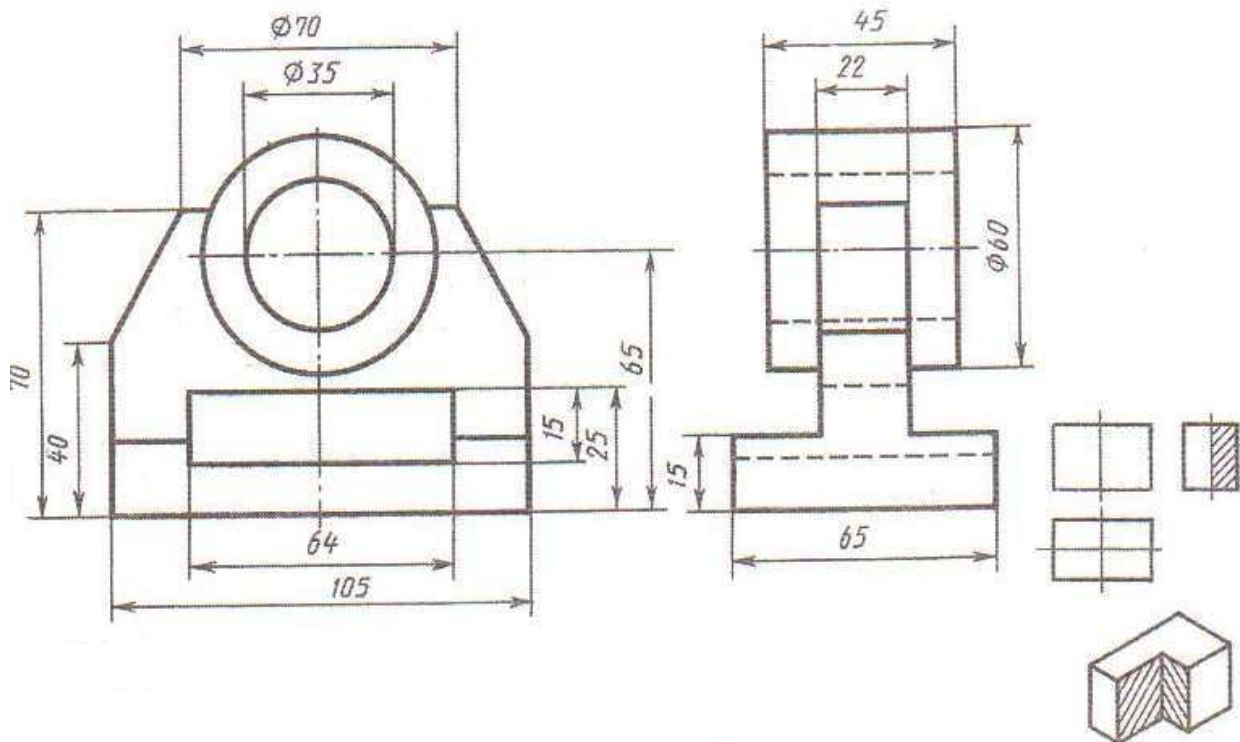


## Wariant 6

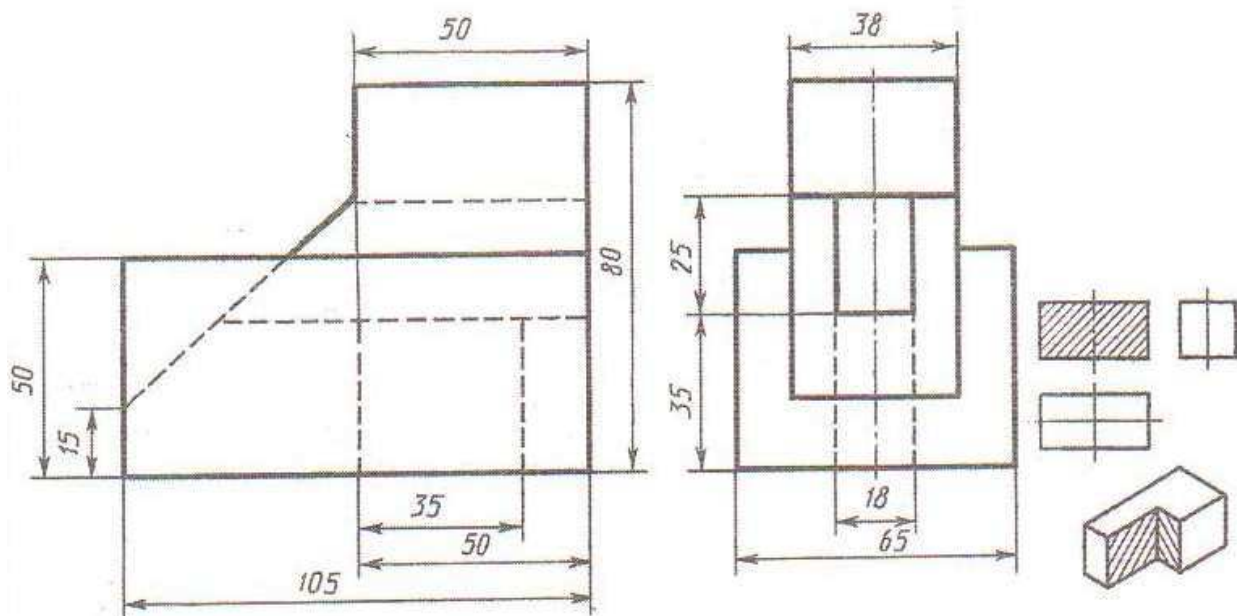


Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiýasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçegleri goýmaly.

7-nji variant

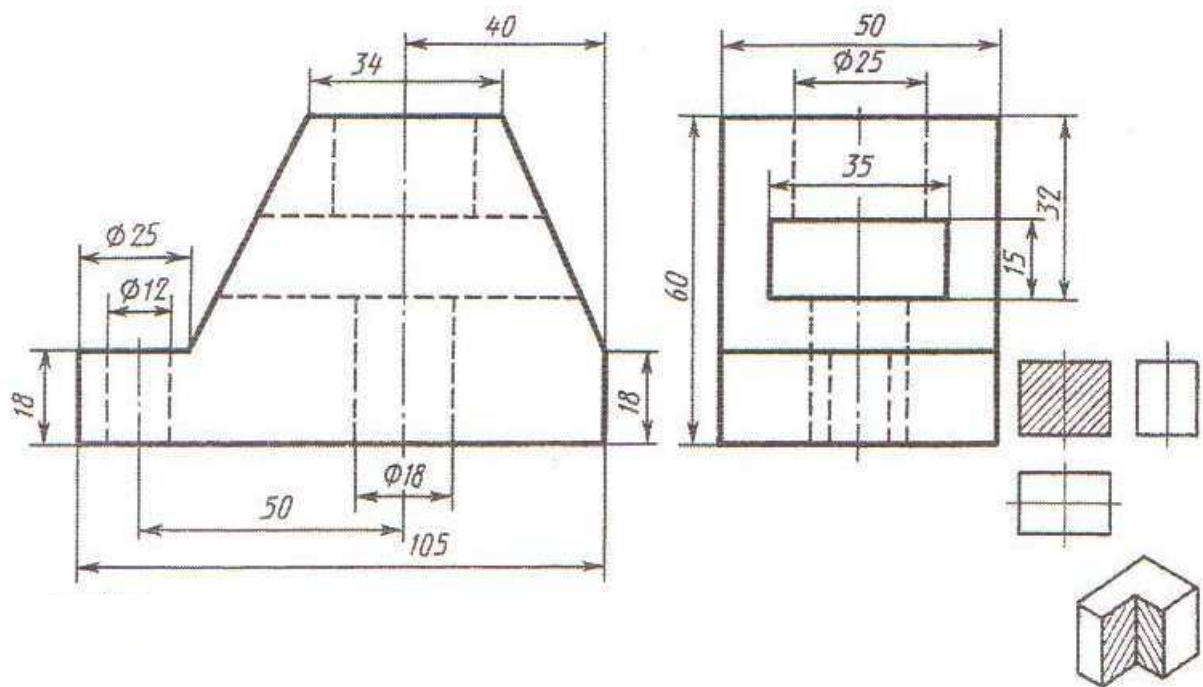


8-nji variant

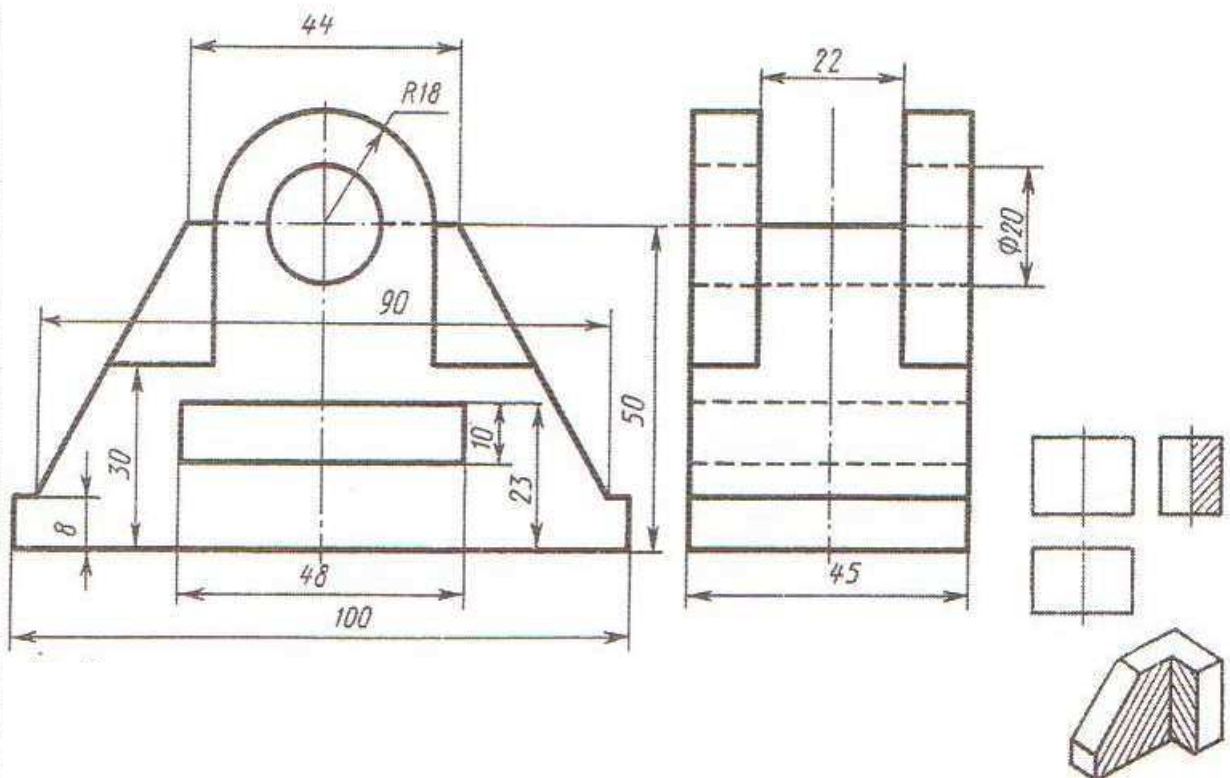


Berlen iki proyeksiya ssasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiýasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçegleri goýmaly.

9-njy variant



10-njy variant

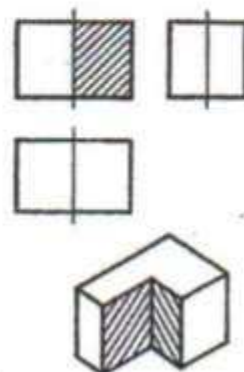
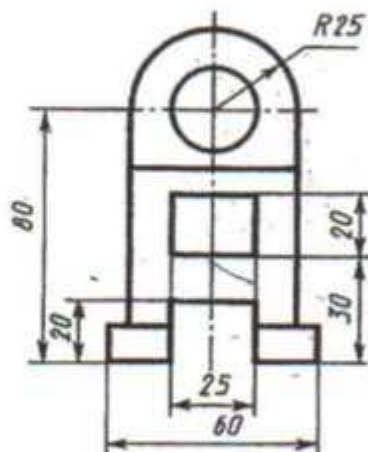
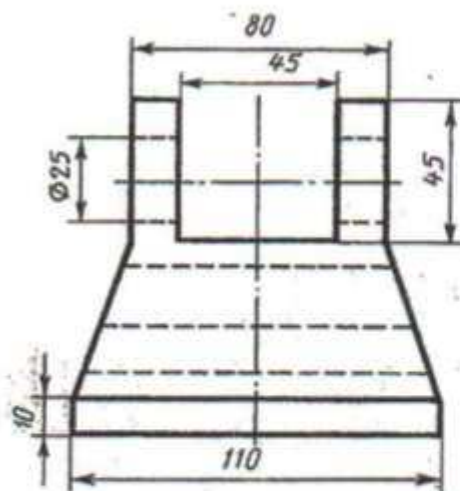


Berlen iki proyeksiya ssasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiýasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçegleri goýmaly.



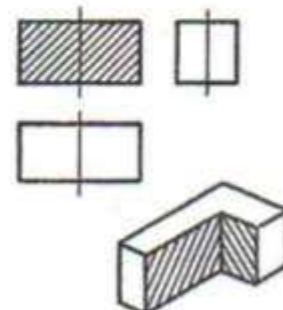
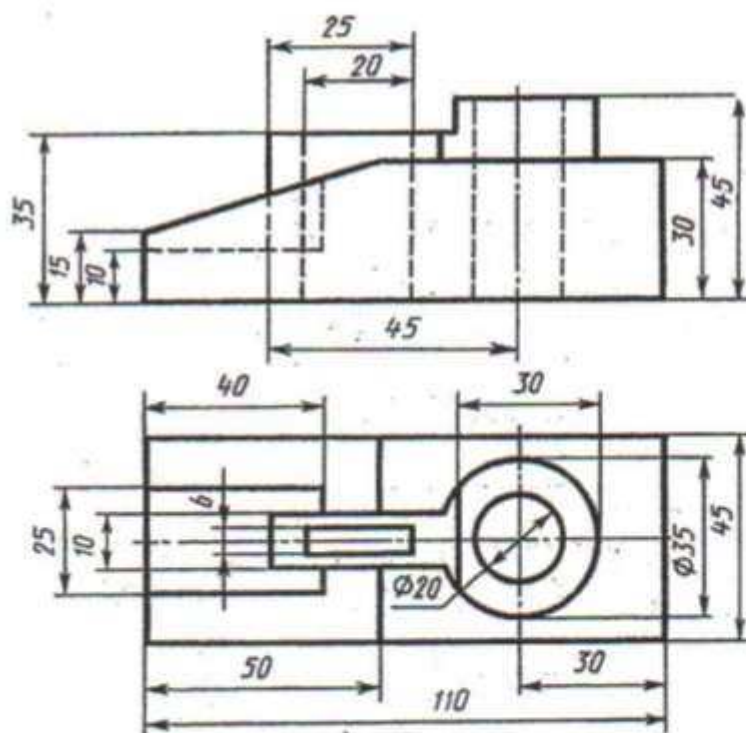
# YUMUŞ 60

Wariant 11



Dayanç

Wariant 12

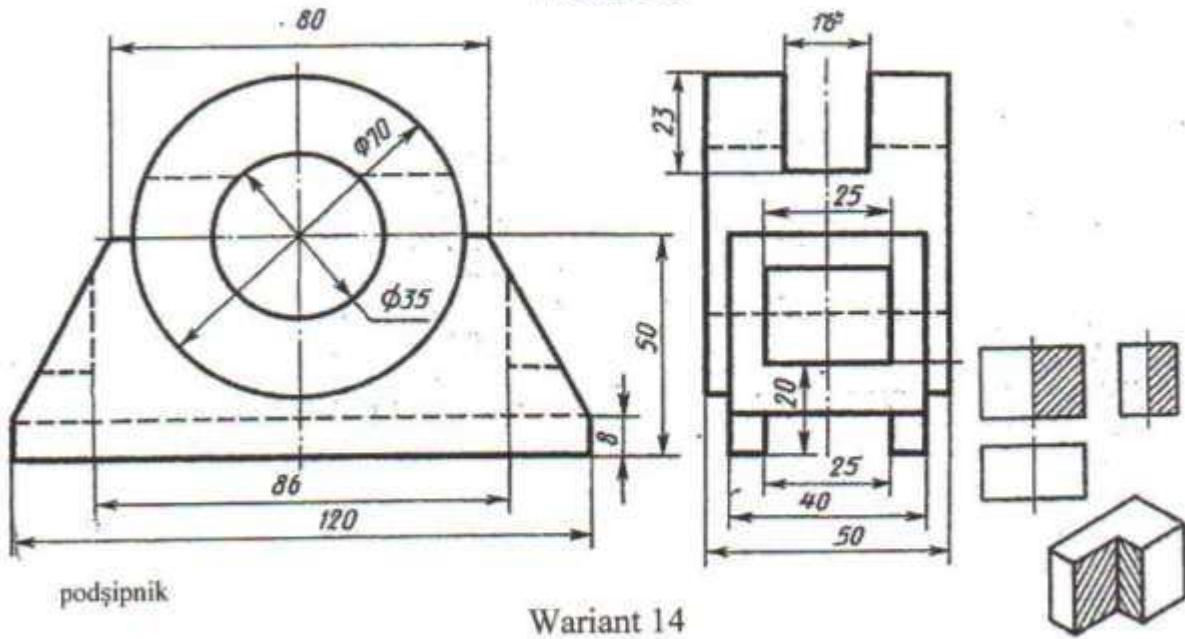


wilka

Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiyasynyň öňdäki çäryegini kesip aýyrmak bilen üçünji proyeksiyasyny gurmaly. Ölçegleri goýmaly.

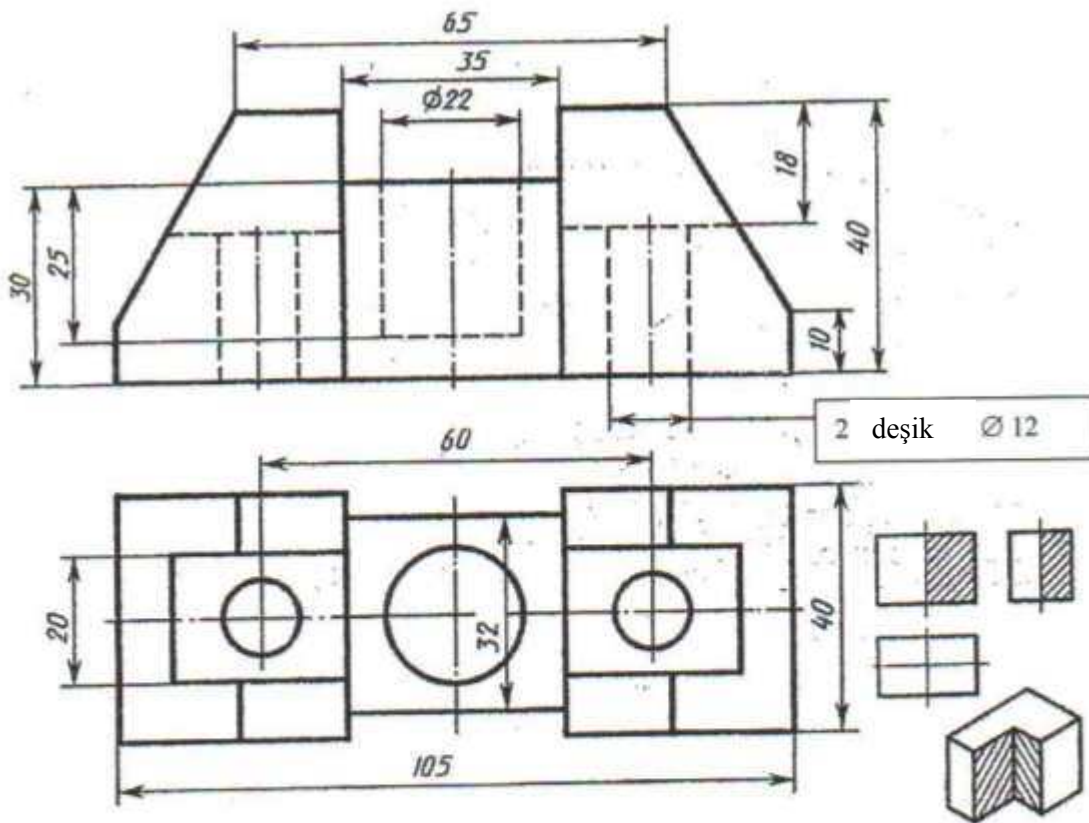
# ÝUMUŞ 60

Wariant 13



podšipnik

Wariant 14



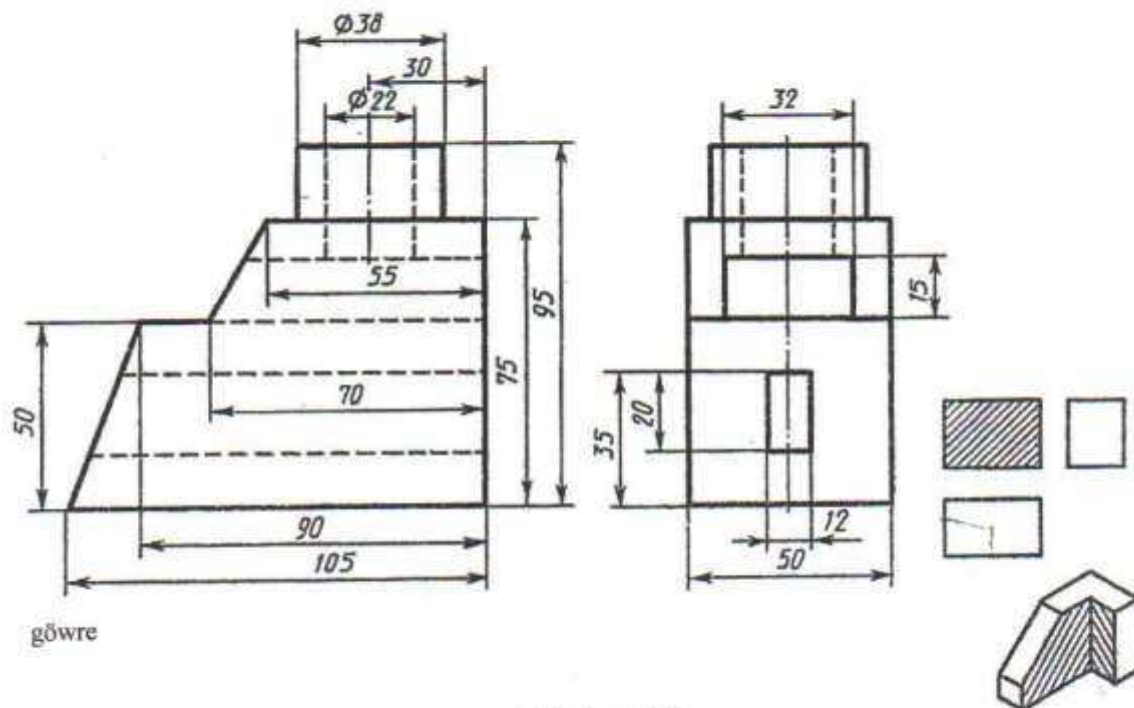
2 deşik  $\phi 12$

Daban

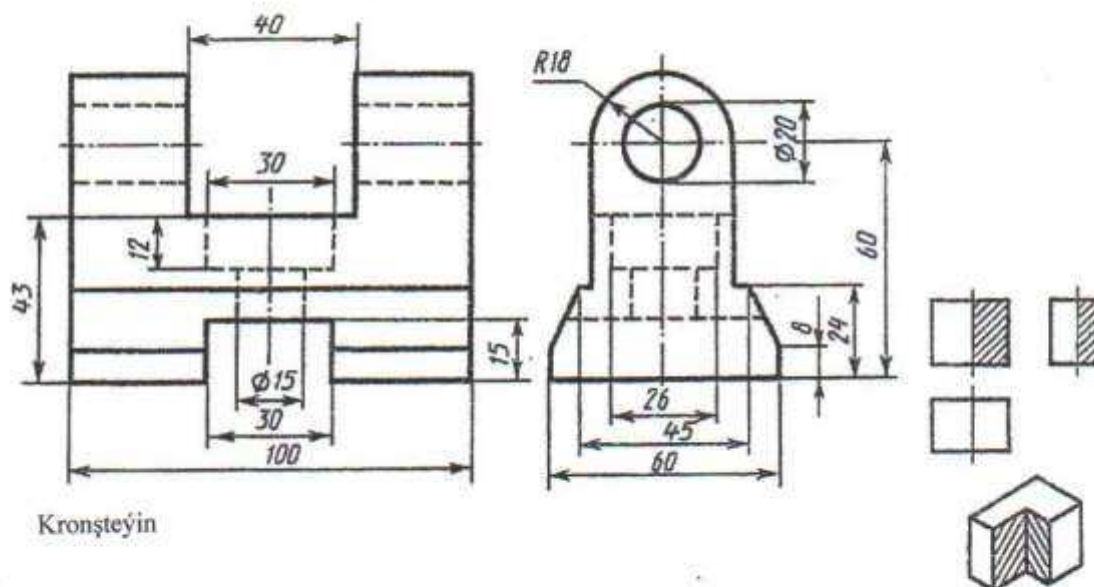
Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiyasynyň öňdäki çäryegini kesip aýyrmak bilen üçünji proyeksiyasyny gurmaly. Ölçegleri goýmaly.

## YUMUŞ 60

### Warant 15



### Variant 16

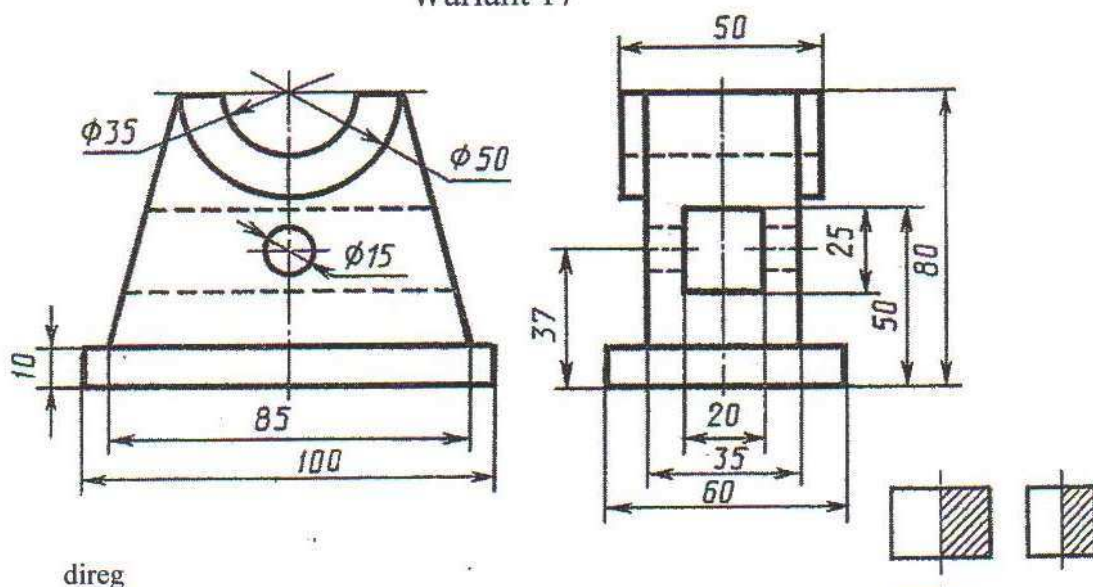


Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriýa proyeksiýasynyň öňdäki çäryegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçegleri goýmaly.



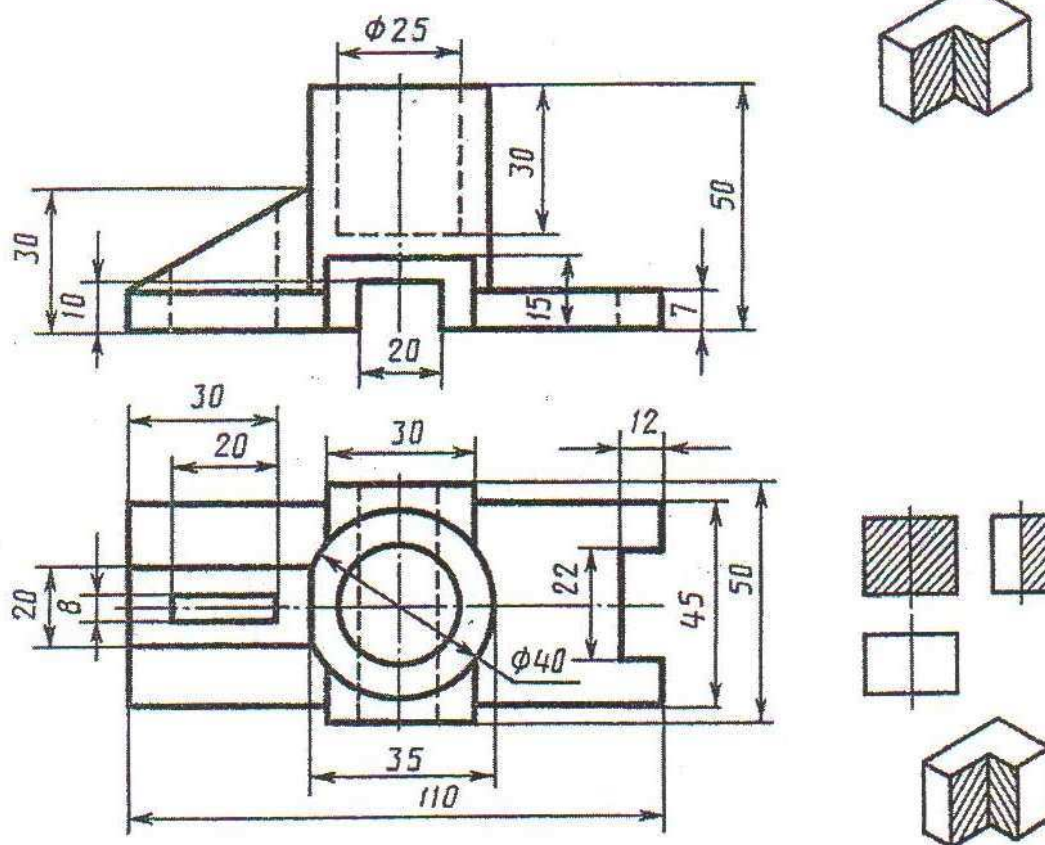
# YUMUŞ 60

Wariant 17



direg

Wariant 18

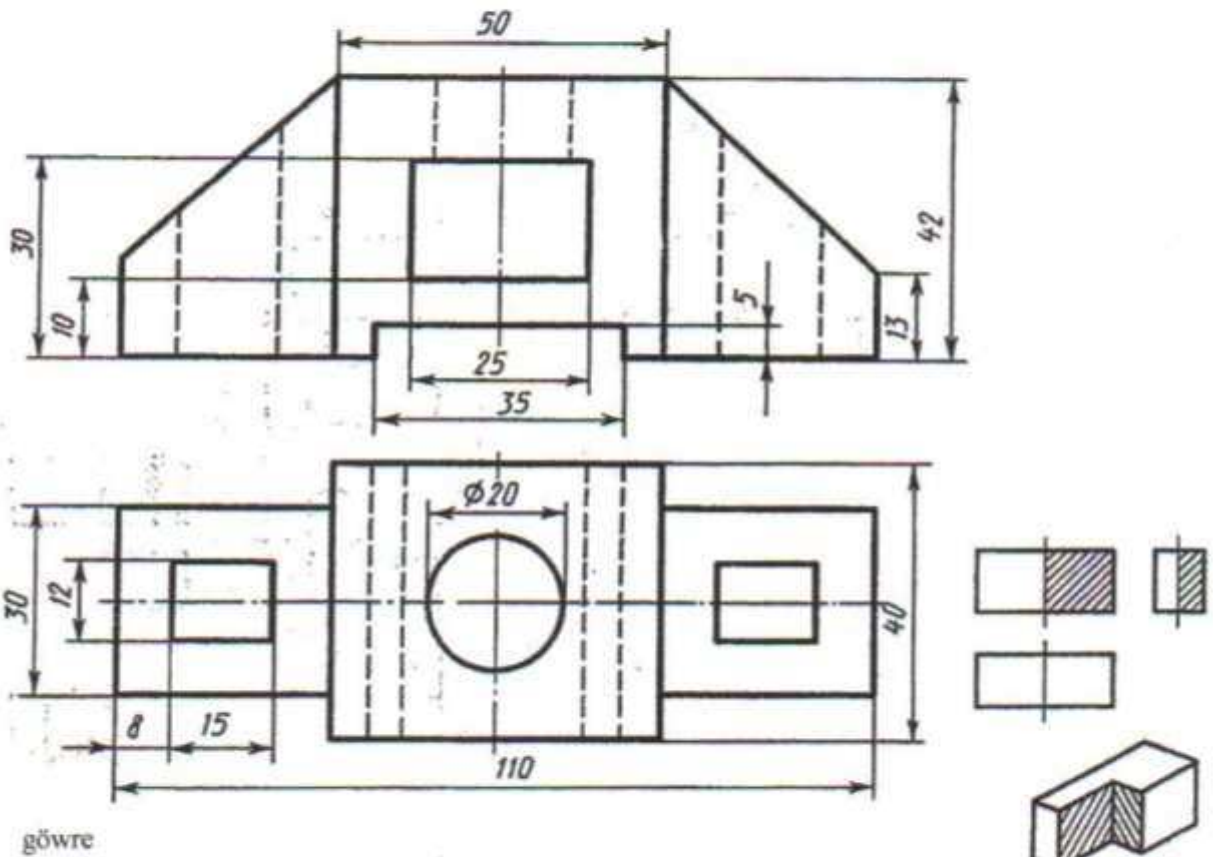
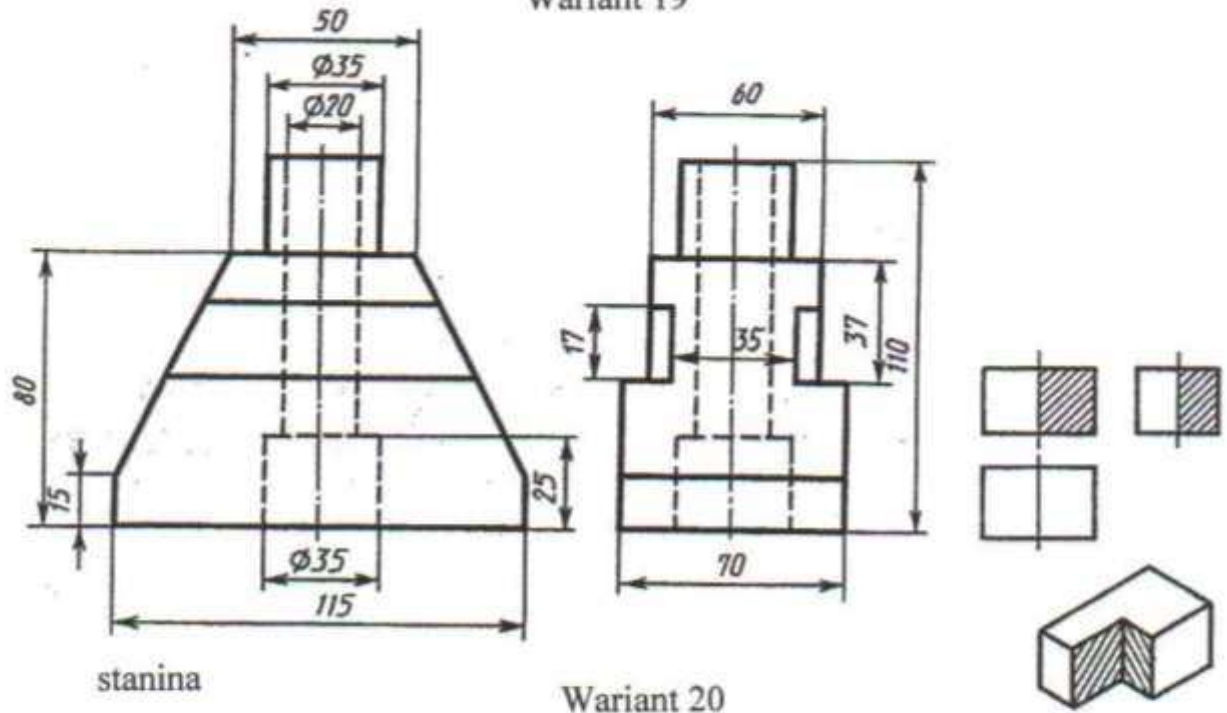


göwre

Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiyasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiyasyny gurmaly. Ölçegleri goýmaly.

# ÝUMUŞ 60

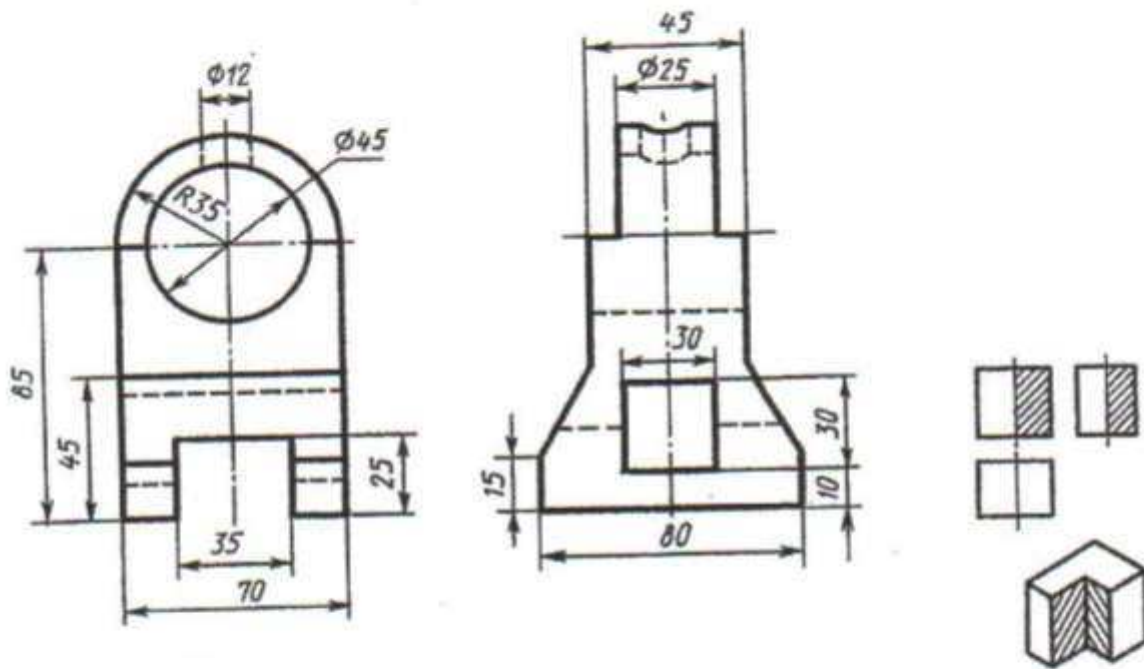
## Wariant 19



Berlen iki proyeksiýa esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriýa proyeksiýasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçepleri goýmaly.

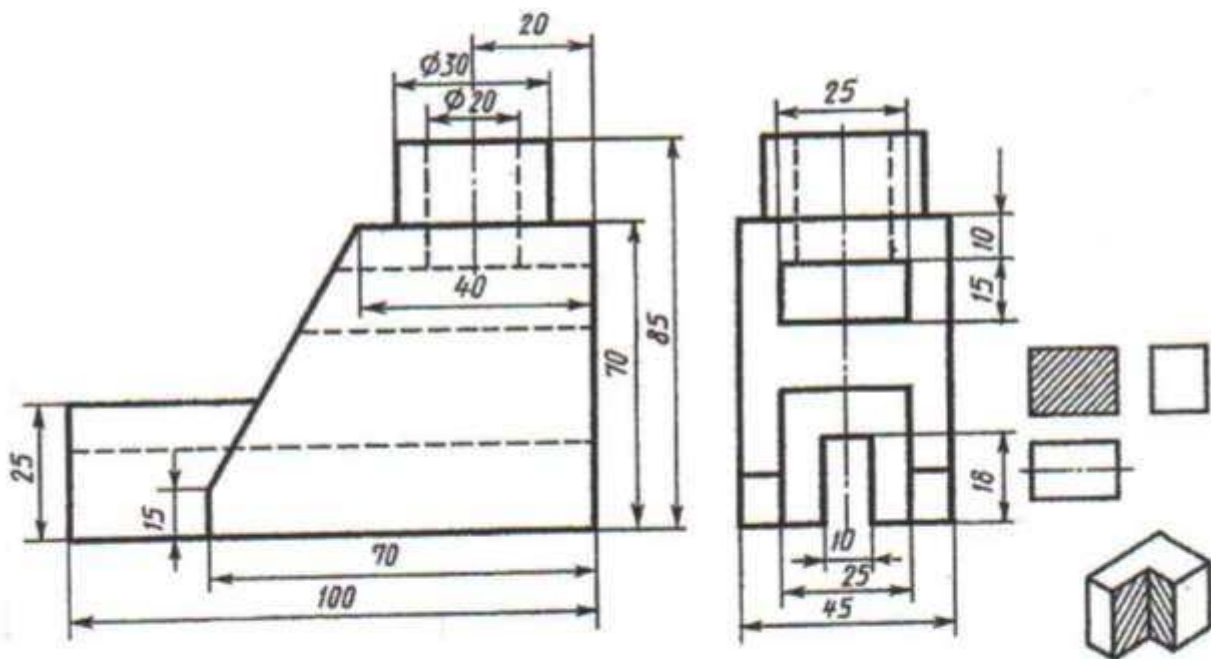
# YUMUŞ 60

Wariant 21



kronşteýin

Wariant 22



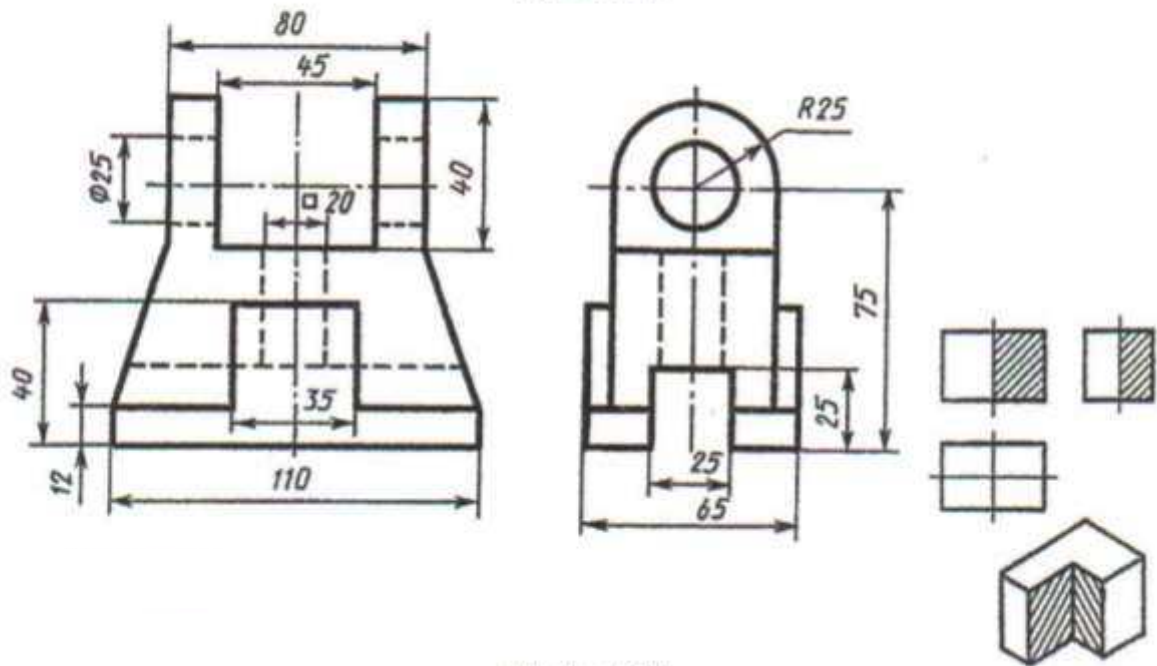
direg

Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiyasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiyasyny gurmaly. Ölçepleri goýmaly.

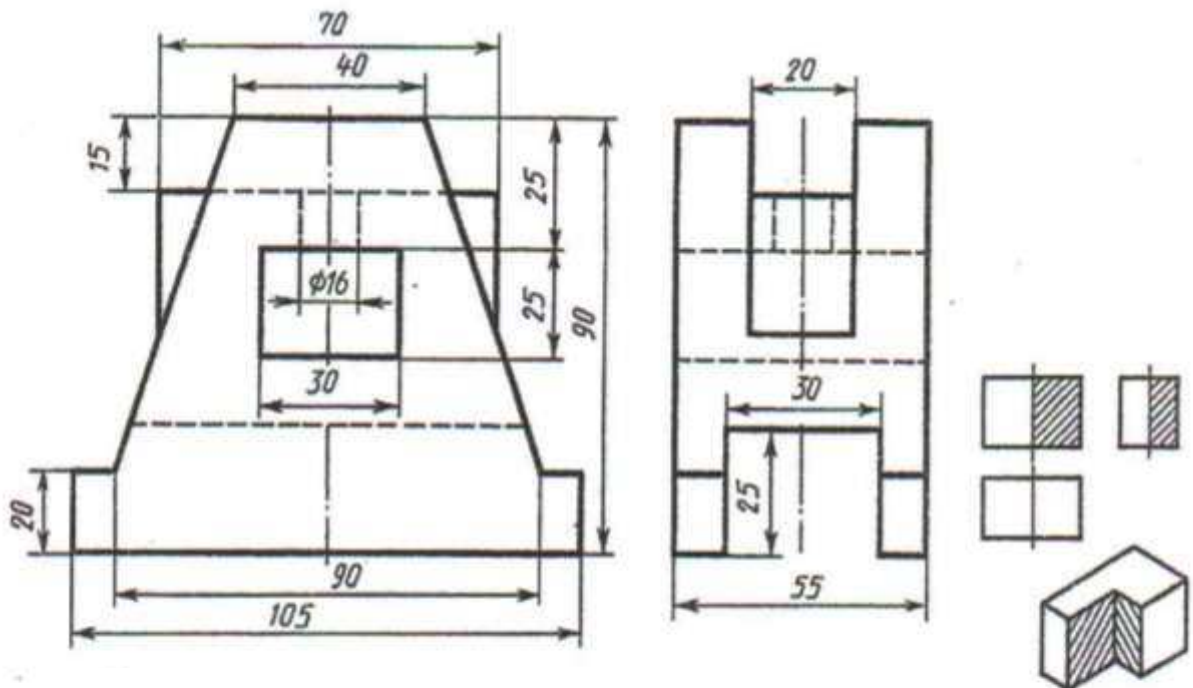


# YUMUŞ 60

Wariant 23



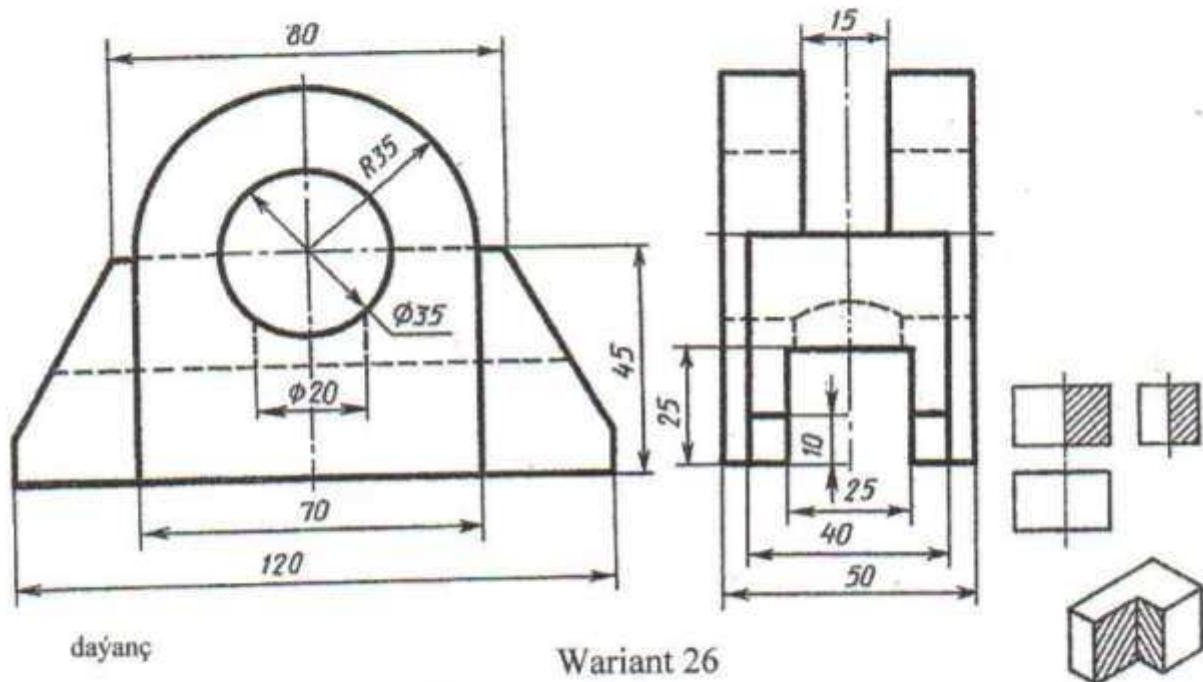
Wariant 24



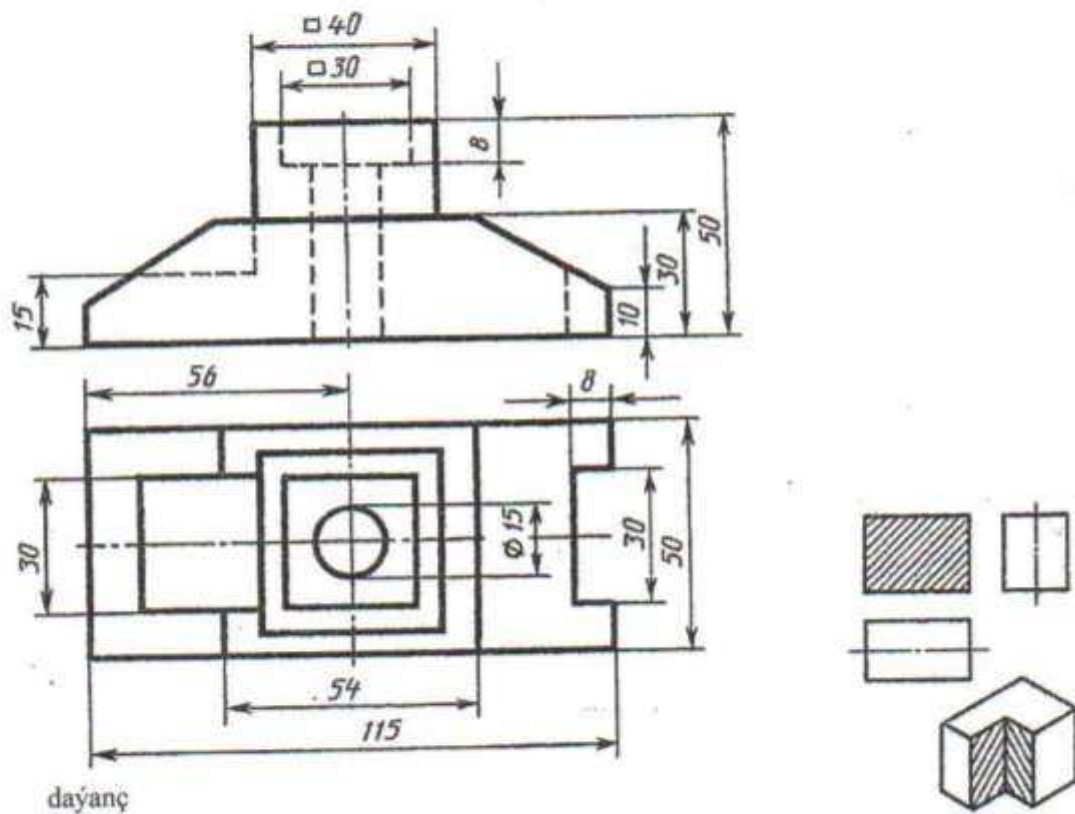
Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiyasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiyasyny gurmaly. Ölçeqleri goýmaly.

# ÝUMUŞ 60

## Wariant 25



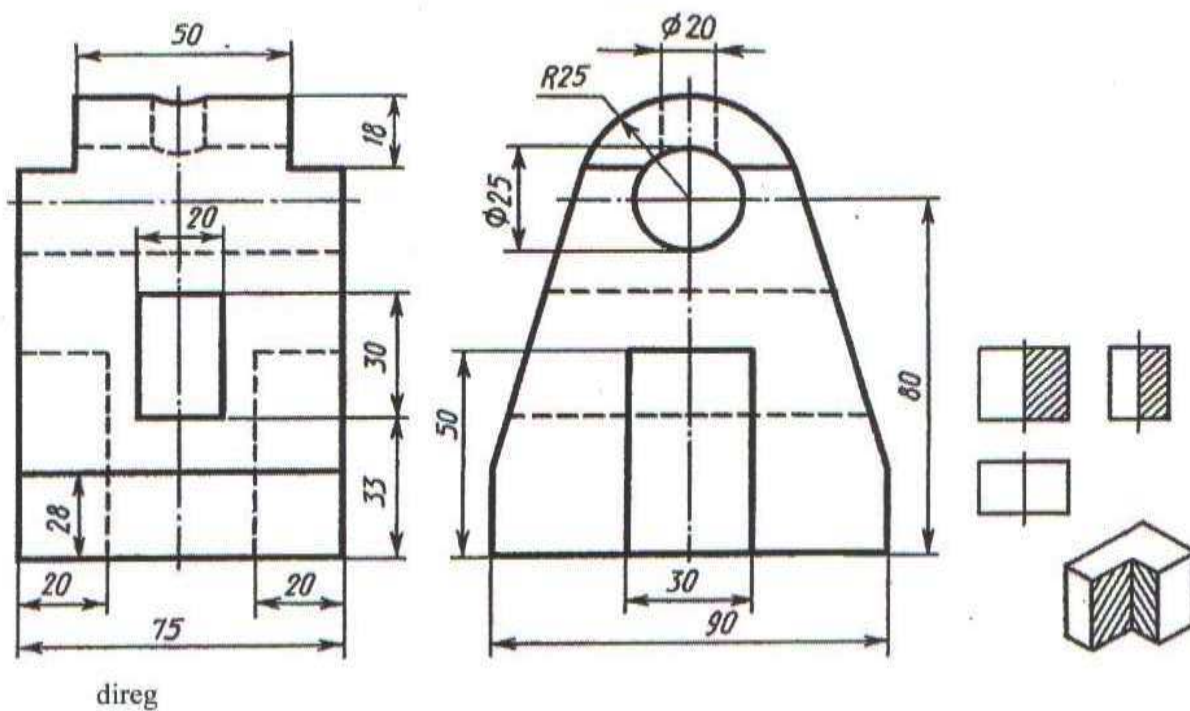
## Wariant 26



Berlen iki proyeksiýa esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriýa proyeksiýasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçegleri goýmaly.

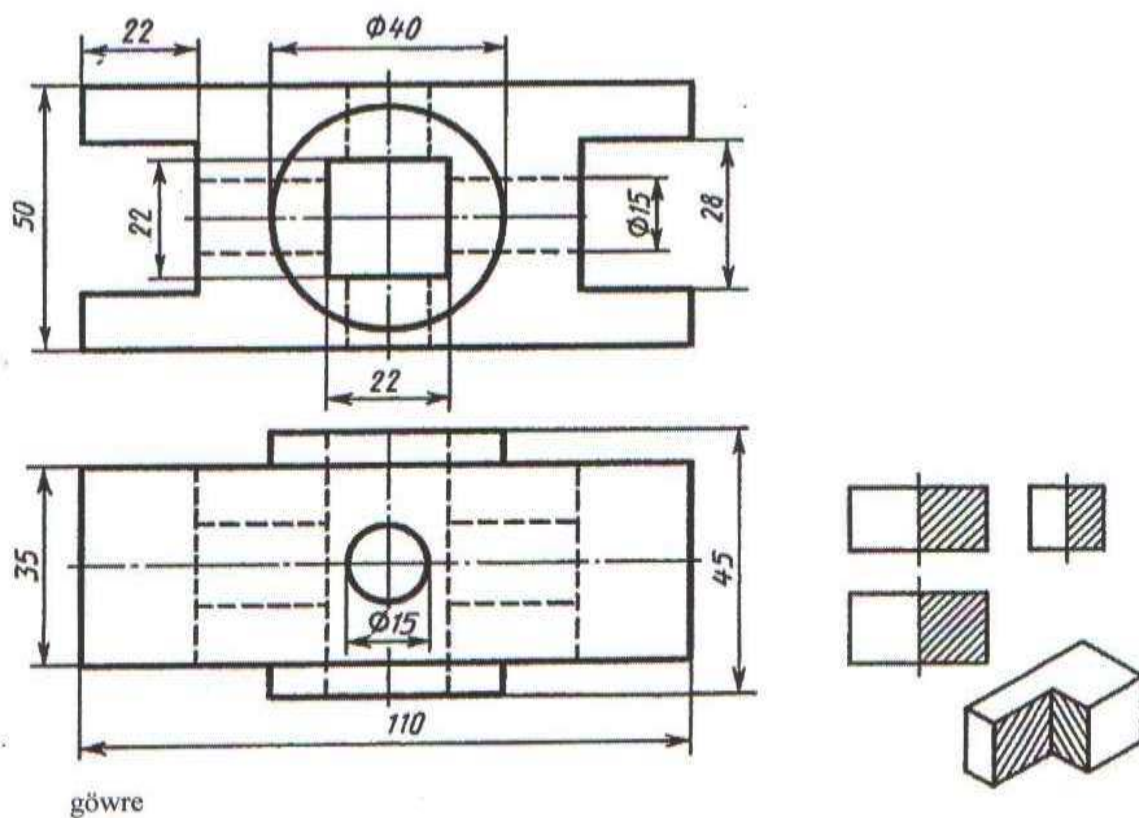
# ÝUMUŞ 60

Wariant 27



direg

Wariant 28



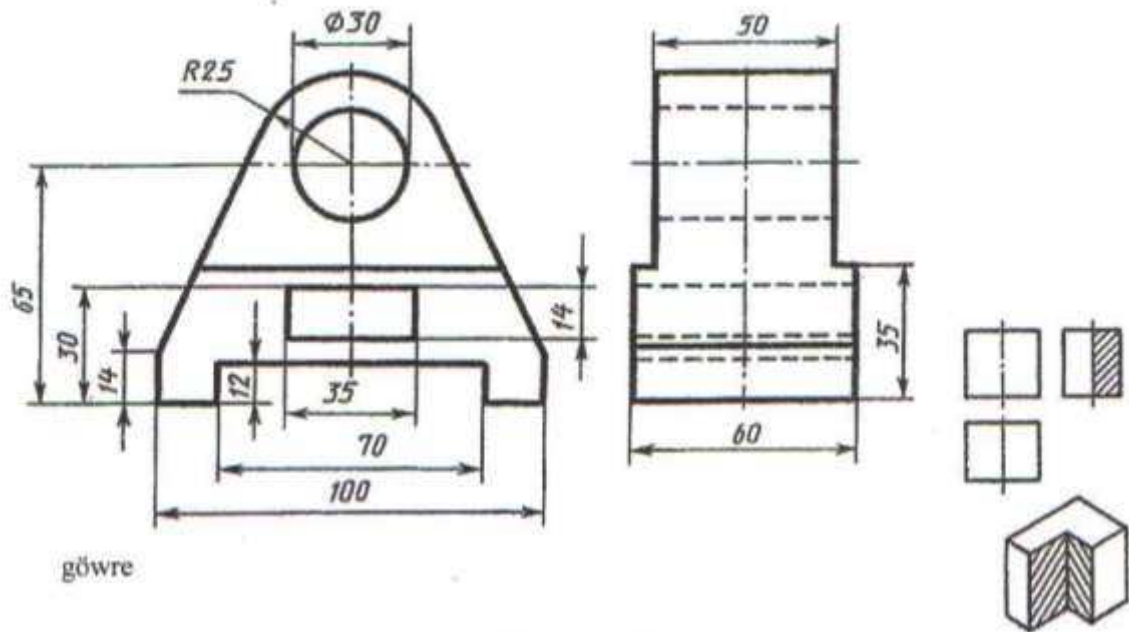
göwre

Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiýasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiýasyny gurmaly. Ölçegleri goýmaly.

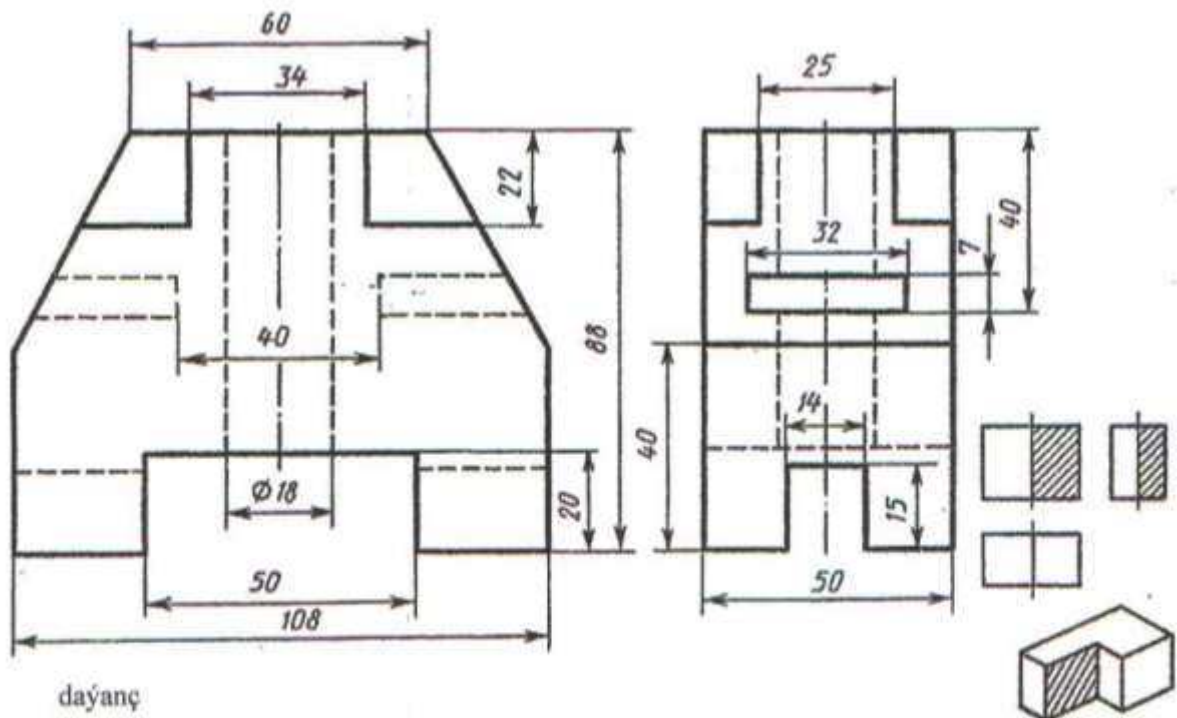


# YUMUŞ 60

## Wariant 29



## Wariant 30



Berlen iki proyeksiya esasynda ýaryklary ulanmak bilen, shemada görkezilişi ýaly okuw nusgasynyň izometriya proyeksiyasynyň öňdäki çäýegini kesip aýyrmak bilen üçünji proyeksiyasyny gurmaly. Ölçegleri goýmaly.

## BARLAG IŞI

Barlag işi maksatnamada göz önüne tutulan esasy üç temany öz içine alýar.  
Barlag işi 30-40 minudyň dowamynda ýerine ýetirilmeli.

Barlag işinde üç sany ýumuş berilýär: 61-nji ýumuş aksonometriki  
projeksiýasy esasynda nusganyň kompleks çyzgysyny tapmaly, 62-nji ýumuş  
berlen iki projeksiýasy esasynda üçünjisini tapmaly . 63-nji ýumuşda içi boşlukly  
nusganyň profil projeksiýasyny tapmaly.

Barlag işini kabul etmek üçin mugallym ýörite soragly , jogaby ýazylar ýaly  
tablisaly - sowalnamany düzýär we wariantlar boýunça talyplara paýlaýar.  
Talyplar şol tablisaly- sowalnama öz dogry jogaplaryny belleýärler.

### Tablisaly sowalnamanyň görnüşi

Sowalnama №	Ýumuş 61		Ýumuş 62		Ýumuş 63	
Ýumuş	20	24	2	23	10	12
Jogaby						

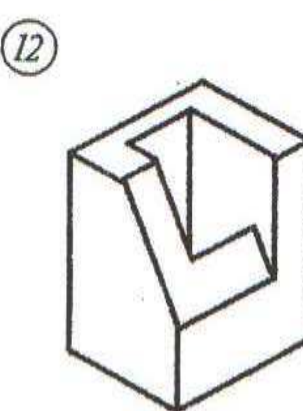
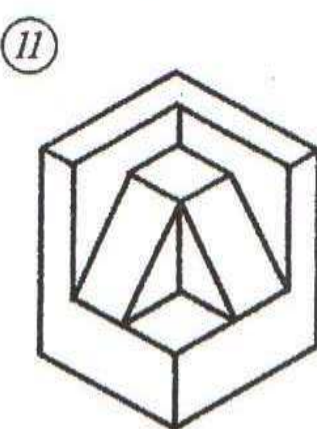
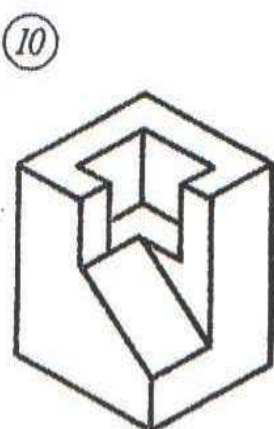
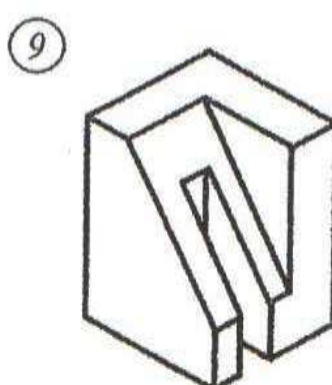
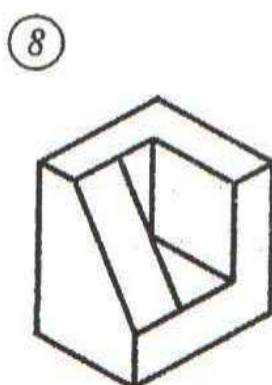
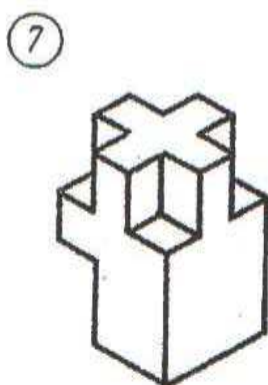
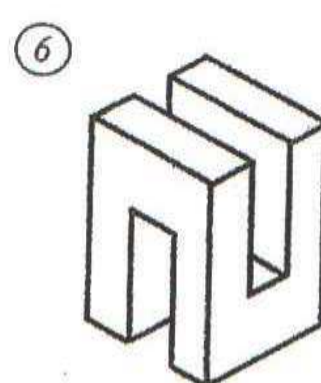
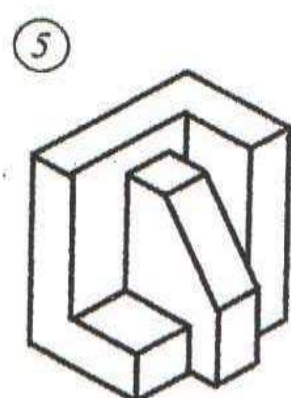
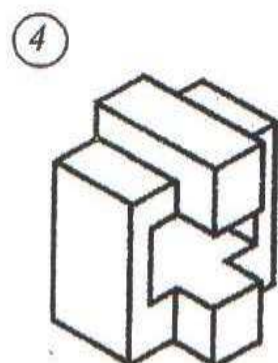
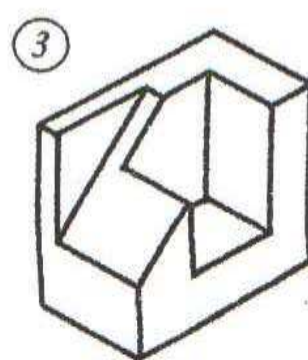
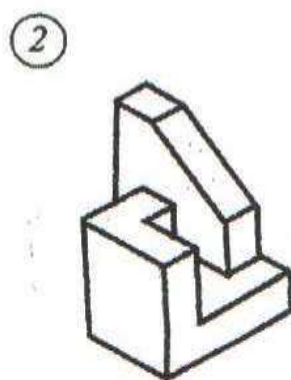
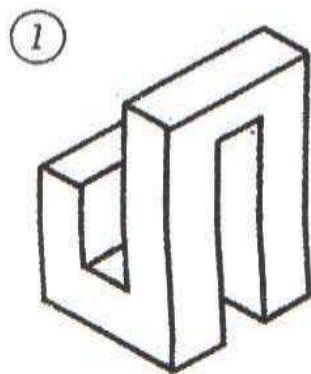
### Jogabynyň ýazylyşy

Sowalnama №	Ýumuş 61		Ýumuş 62		Ýumuş 63	
Ýumuş	20	24	2	23	10	12
Jogaby	13a	24a	85	145	96	126

### Sowalnamanyň tablisasy

Sowalnama №		Ýumuş 61	Ýumuş 62	Ýumuş 63	Sowalnama №		Ýumuş 61	Ýumuş 62	Ýumuş 63
1	Mesele Jogaby	1 10	5 4	22 24	16	Mesele Jogaby	1 24	5 23	12 22
2	Mesele Jogaby	20 24	2 23	10 12	17	Mesele Jogaby	10 24	2 4	10 24
3	Mesele Jogaby	4 12	7 9	14 20	18	Mesele Jogaby	12 22	7 22	14 18
4	Mesele Jogaby	2 22	8 22	13 18	19	Mesele Jogaby	2 4	8 9	13 20
5	Mesele Jogaby	21 17	2 17	19 17	20	Mesele Jogaby	3 17	2 3	8 19
6	Mesele Jogaby	3 5	1 3	6 8	21	Mesele Jogaby	5 21	1 17	6 17
7	Mesele Jogaby	7 23	3 19	1 21	22	Mesele Jogaby	7 8	3 14	1 9
8	Mesele Jogaby	6 8	6 14	2 9	23	Mesele Jogaby	6 23	6 19	2 21
9	Mesele Jogaby	9 15	10 11	3 11	24	Mesele Jogaby	9 18	10 24	3 23
10	Mesele Jogaby	11 18	12 24	5 23	25	Mesele Jogaby	11 15	11 12	5 11
11	Mesele Jogaby	13 19	13 21	7 16	26	Mesele Jogaby	13 16	13 16	7 15
12	Mesele Jogaby	14 16	15 16	4 15	27	Mesele Jogaby	14 19	15 21	4 16
12	Mesele Jogaby	10 23	5 22	13 14	28	Mesele Jogaby	10 24	5 17	13 22
14	Mesele Jogaby	19 24	7 17	8 22	29	Mesele Jogaby	19 23	7 22	8 14
15	Mesele Jogaby	2 14	22 24	10 15	30	Mesele Jogaby	21 22	24 16	10 18

# ÝUMUŞ 61

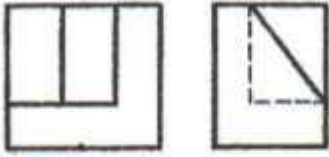


Nusganyň izometriýa proyeksiýasy esasynda onuň kompleks çyzgysyny tapmaly.

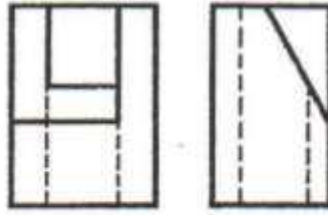


YUMUŞ 61

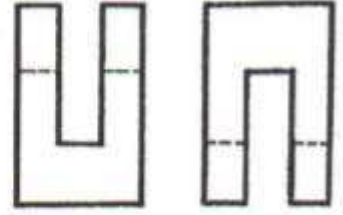
4a



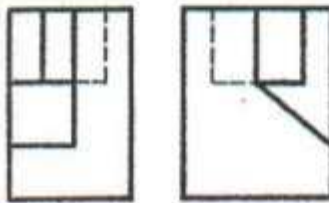
12a



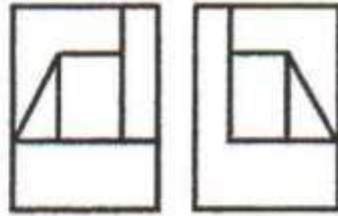
10a



3a



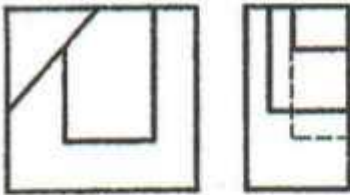
1a



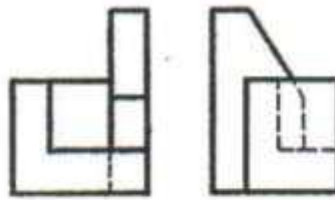
8a



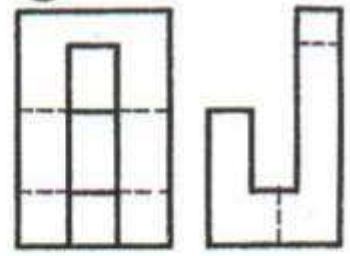
2a



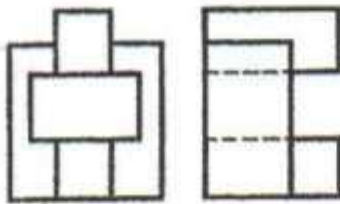
9a



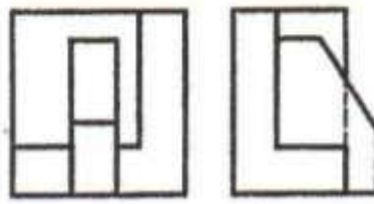
11a



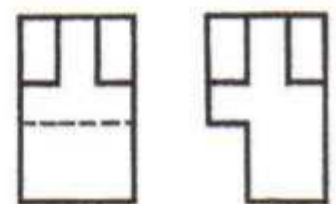
5a



7a



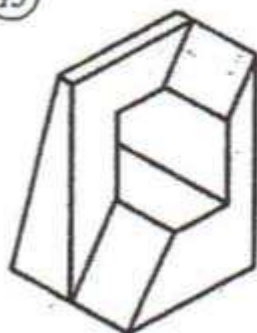
6a



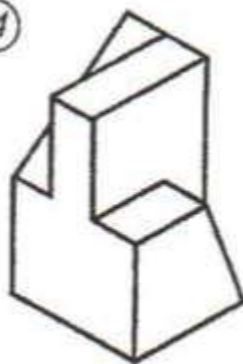
Jogaby.

# YUMUŞ 61

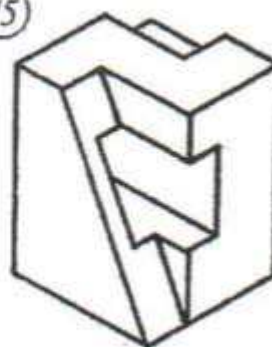
13



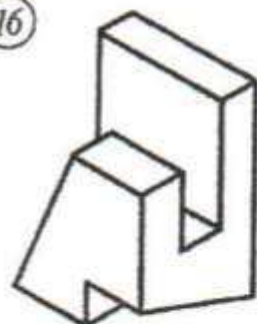
14



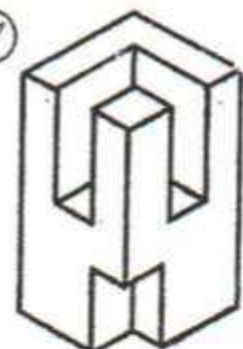
15



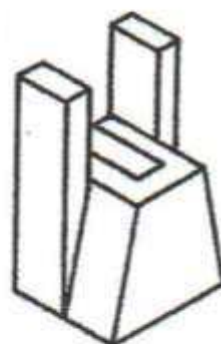
16



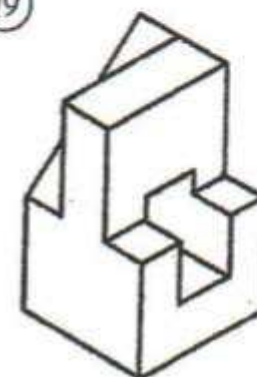
17



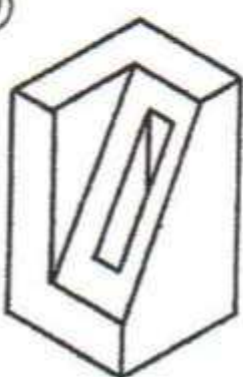
18



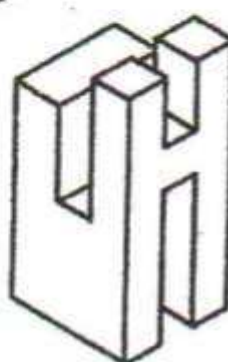
19



20



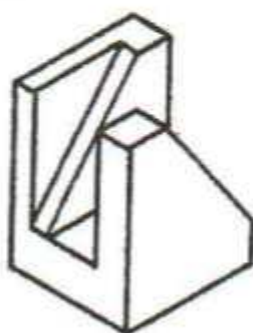
21



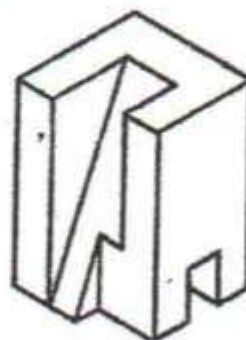
22



23



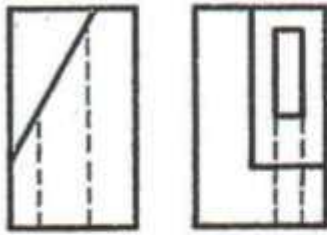
24



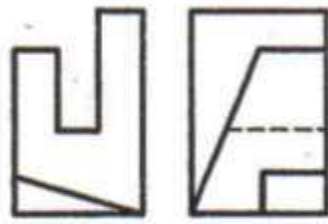
Nusganyň izometriýa proyeksiýasy esasynda onuň kompleks çyzygysyny tapmaly.

# YUMUŞ 61

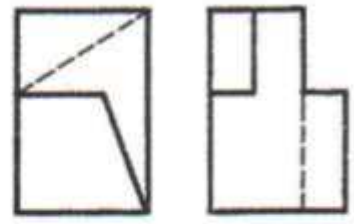
13a



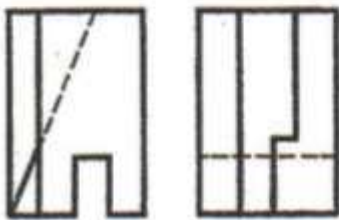
17a



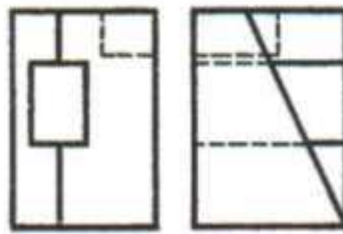
18a



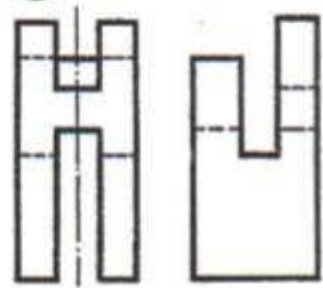
24a



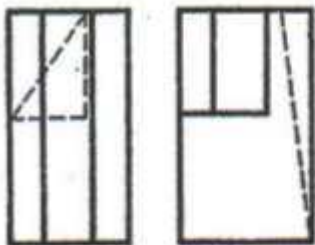
16a



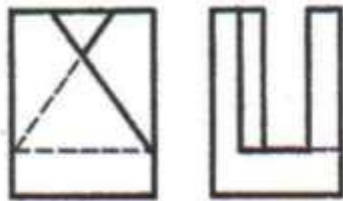
15a



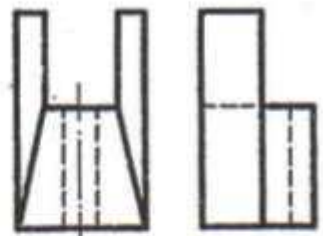
22a



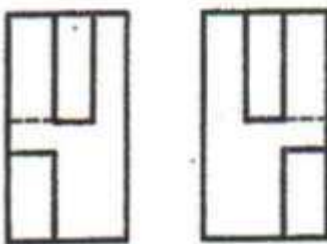
14a



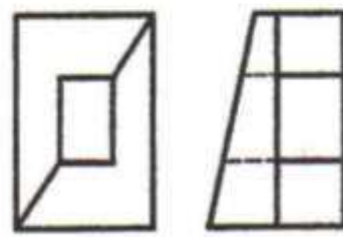
19a



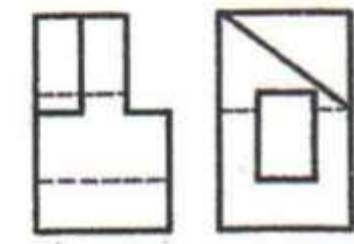
20a



21a



23a

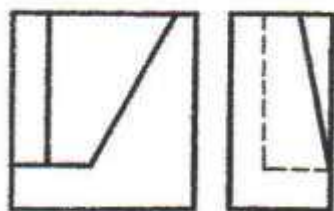


Jogaby.



# ÝUMUŞ 62

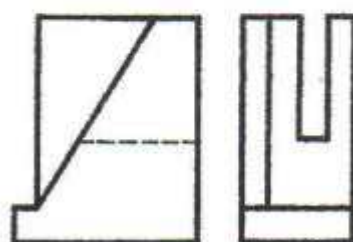
①



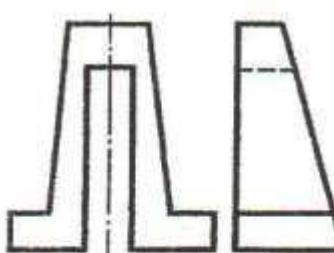
②



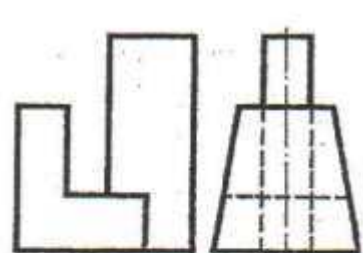
③



④



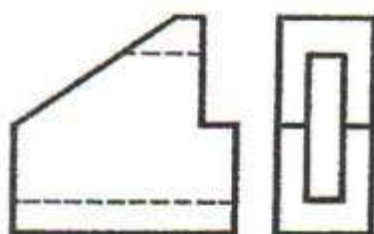
⑤



⑥



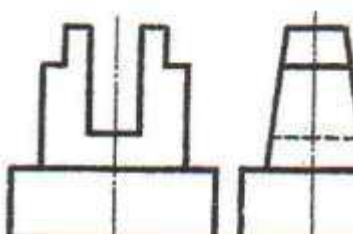
⑦



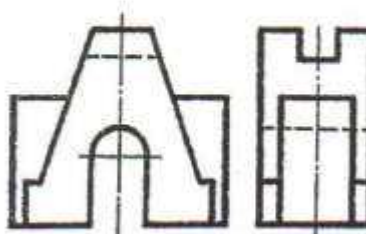
⑧



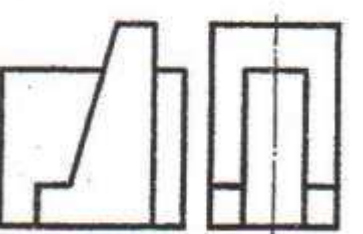
⑨



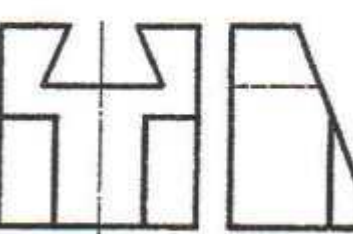
⑩



⑪



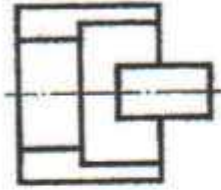
⑫



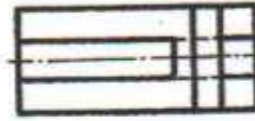
İki proyeksiya esasynda üçünjini tapmaly.

# YUMUŞ 62

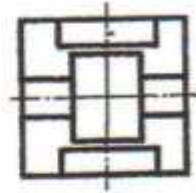
46



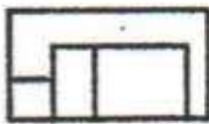
36



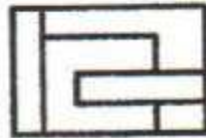
66



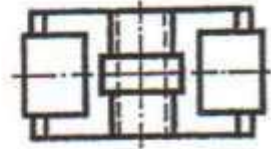
116



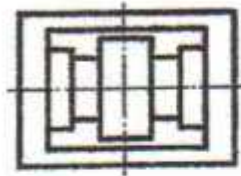
56



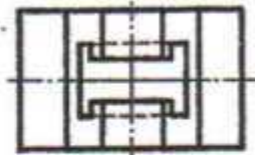
26



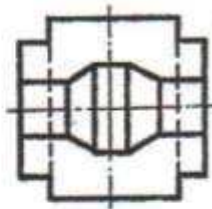
76



16



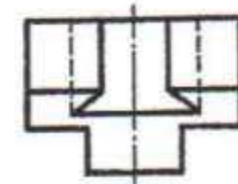
86



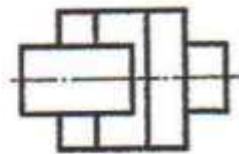
96



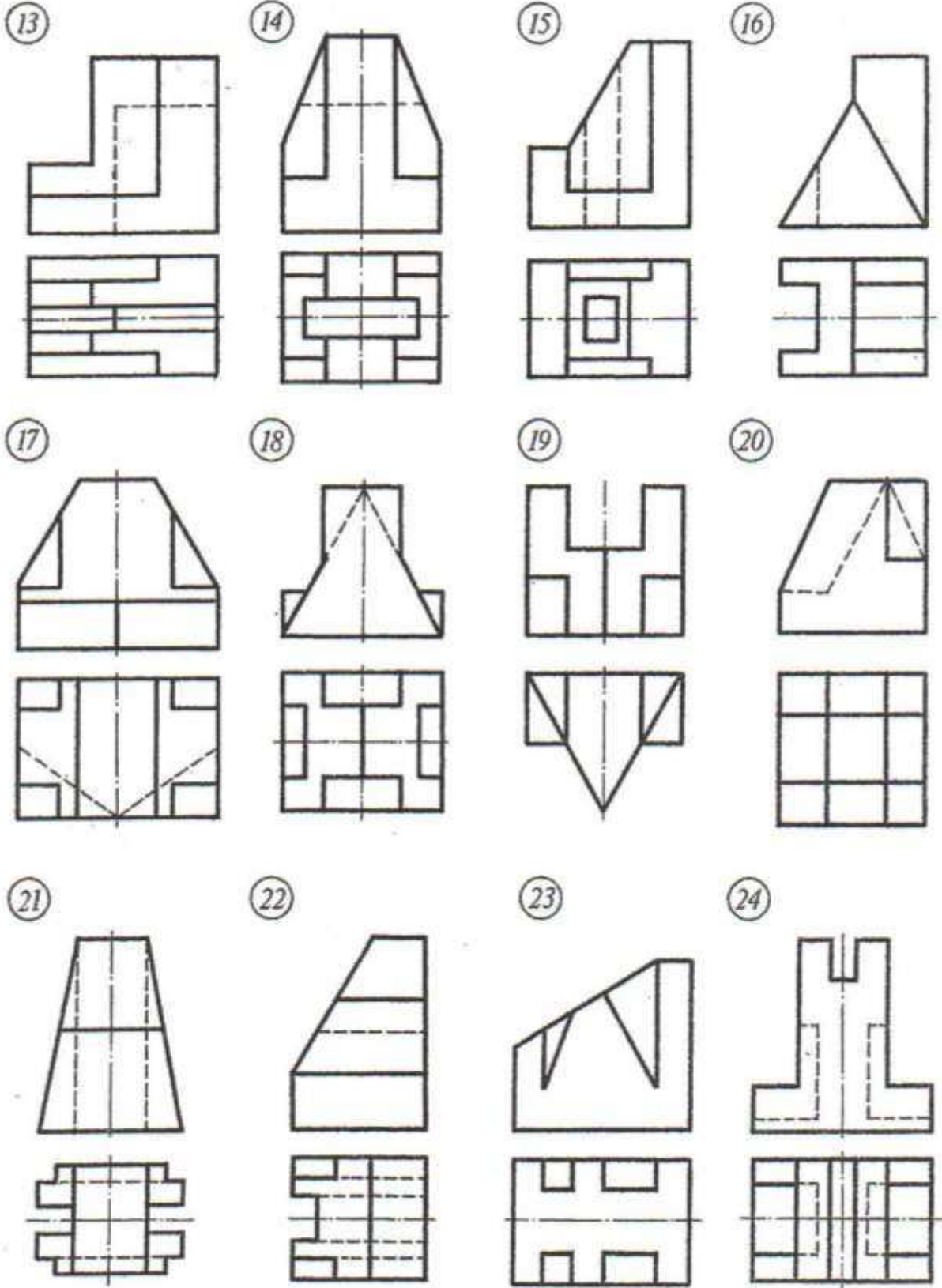
126



106



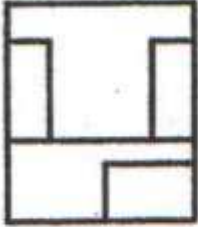
Jogaby.



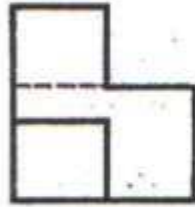
İki proyeksiya esasynda üçünjini tapmaly.



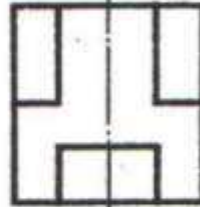
136



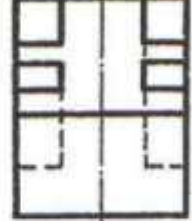
186



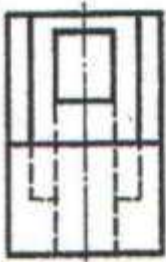
226



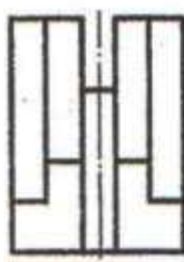
146



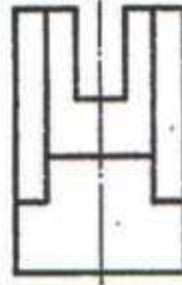
176



156



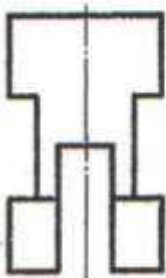
206



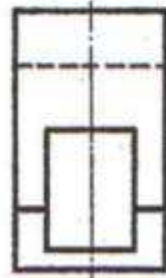
196



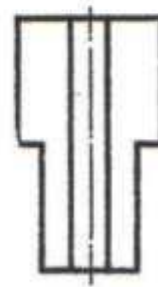
166



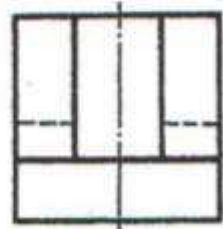
246



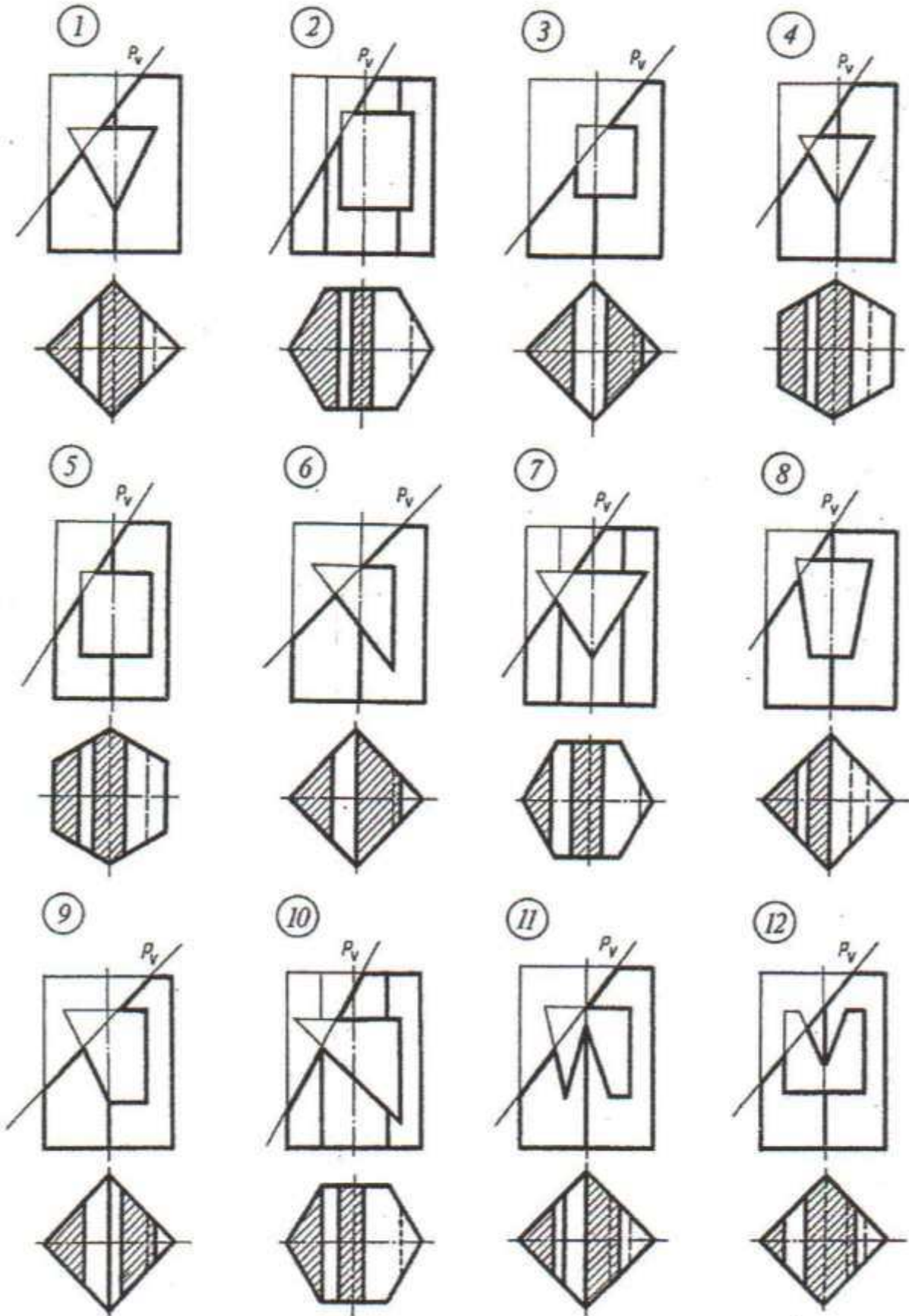
216



236

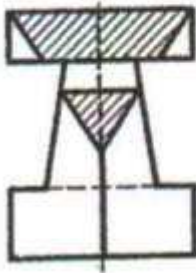


Jogaby.

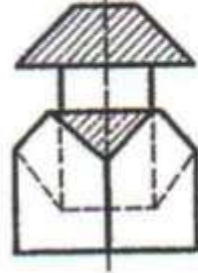


İçi boşlukly kesilen nusganyň iki proyeksiýasy esasynda üçünji proyeksiýasyny kesgitlemeli.

2e



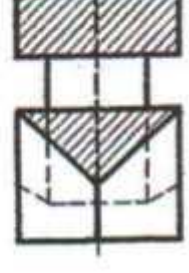
1e



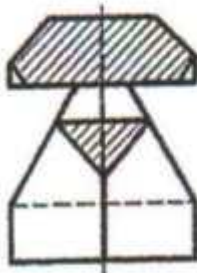
6e



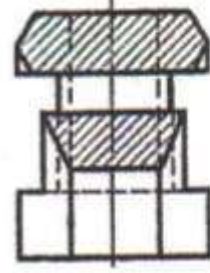
9e



7e



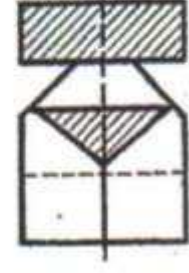
3e



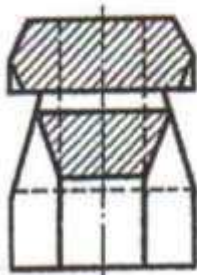
12e



4e



5e



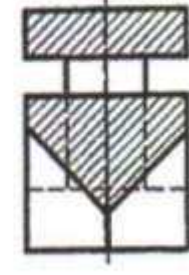
11e



10e

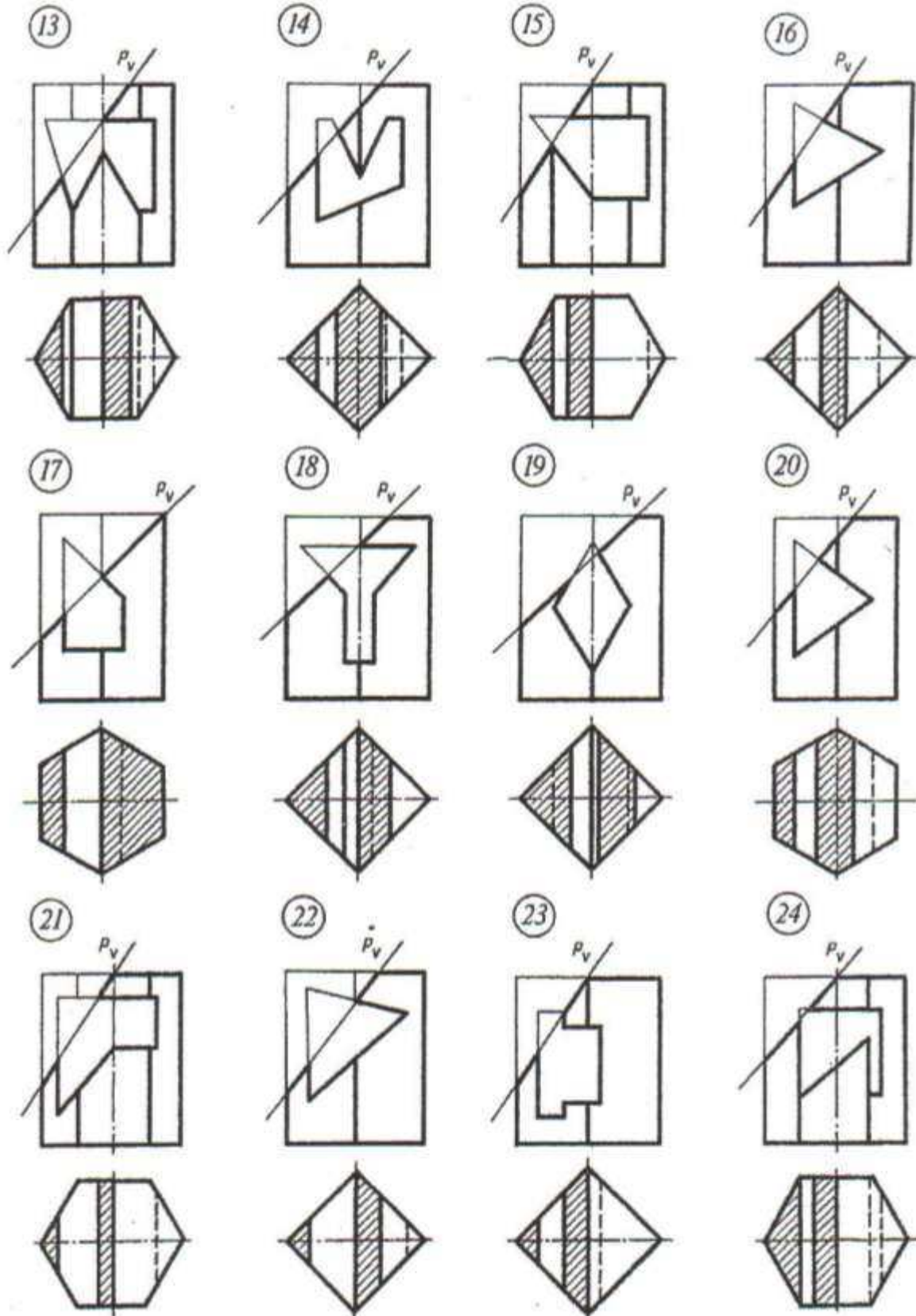


8e



Jogaby.





İç boşlukly kesilen nusganyň iki proyeksiýasy esasynda üçünji proyeksiýasyny kesgitlemeli.

# YUMUŞ 63

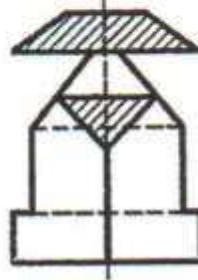
17e



13e



20e



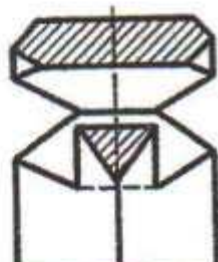
19e



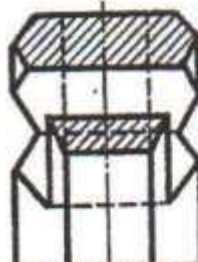
16e



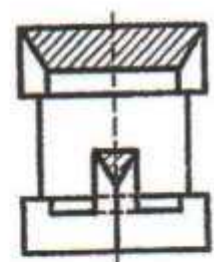
14e



18e



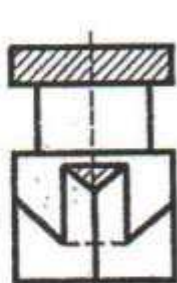
23e



21e



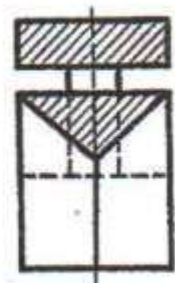
15e



22e



24e

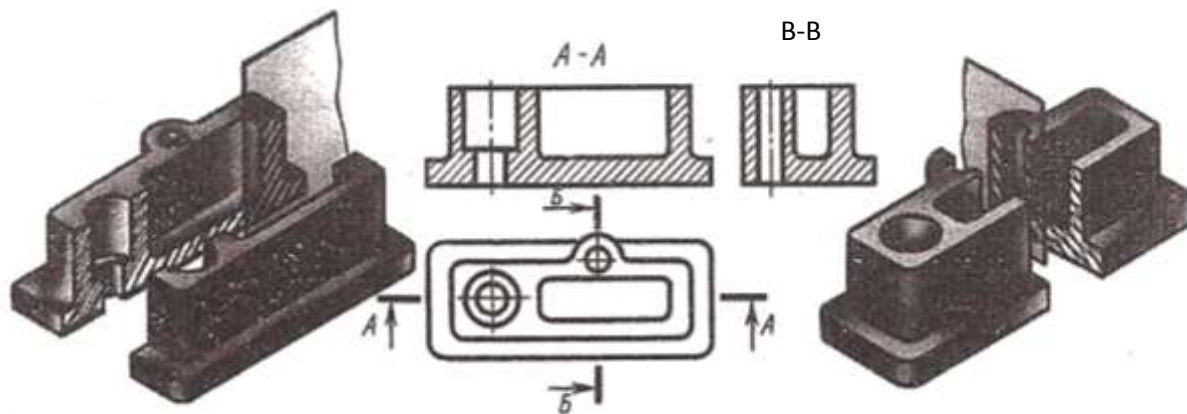


Jogaby.

## 16. Ýaryklar we kesikleri gurmak

Önümiň içki gurluşyny has aýdyň şekilini almak üçin çyzgylarda ýaryklar ulanylýar. Kesiji tekizlikleriň sanyna görä ýaryklar, ýönekeý we çylşyrymly ýaryklara bölünýär.

Ýönekeý ýaryk bir kesiji tekizlik bilen, çylşyrymly ýaryk birnäçe kesiji tekizlik bilen ýerne ýetirilýär.



69-njy surat

Kesiji tekizligiň gorizantal şekiller tekizligine ýerleşişine görä ýönekeý ýaryklar, gorizantal, wetikal we ýapgyt ýaryklara bölünýärler.

69-nji suratda iki wertikal ýaryklar ýerne ýetirlen, frontal (a-a) we profil (b-b), olaryň kesiji tekizlikleri şaýyň simmetriýa tekizligi bilen bütinleýin gabat gelmeýär. Şonuň üçin çyzgyda kesiji tekizlikleriň ýagdaýlary görkezilip şoňa laýyklykda ýaryklar bilen ýazgylar bile ýazylýar.

Kesiji tekizligiň ýagdaýy, ýapyk çyzyk her bilen ýerine ýetirlen kesigiň çyzyklary bilen görkezilýär. Ýapyk ştrihli çyzyklaryň.

Ýogynlygy S-den 1.55 çenli bolýar, bu ýerde S-esasy tutuş çyzyk; ştrihliň uzynlygy 8...20mm.

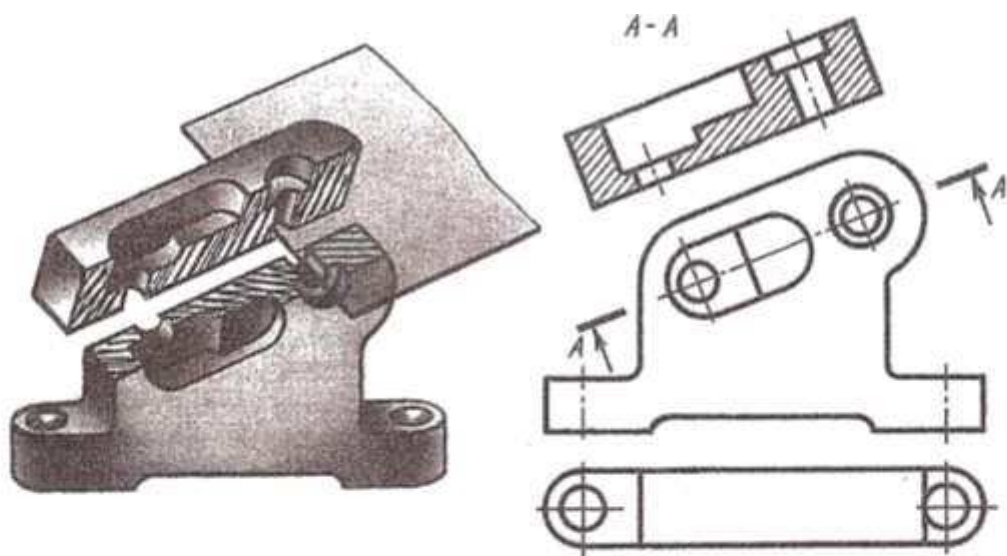
Ýapgyt ýaryk diýlip, kesiji tekizligiň gorizantal proyeksiýalar tekizligi bilen göniden tapawatlanyp burç emele getiren halyna aýdylýar.

Ýapgyt ýaryga mysal 70 suratda görkezilen. Kesiji tekizligiň ýagdaýy ugur görkeziji (strelka) kesigiň çyzygy belgilenip, görülyän, seredilýän ugra gönükdirilýär.

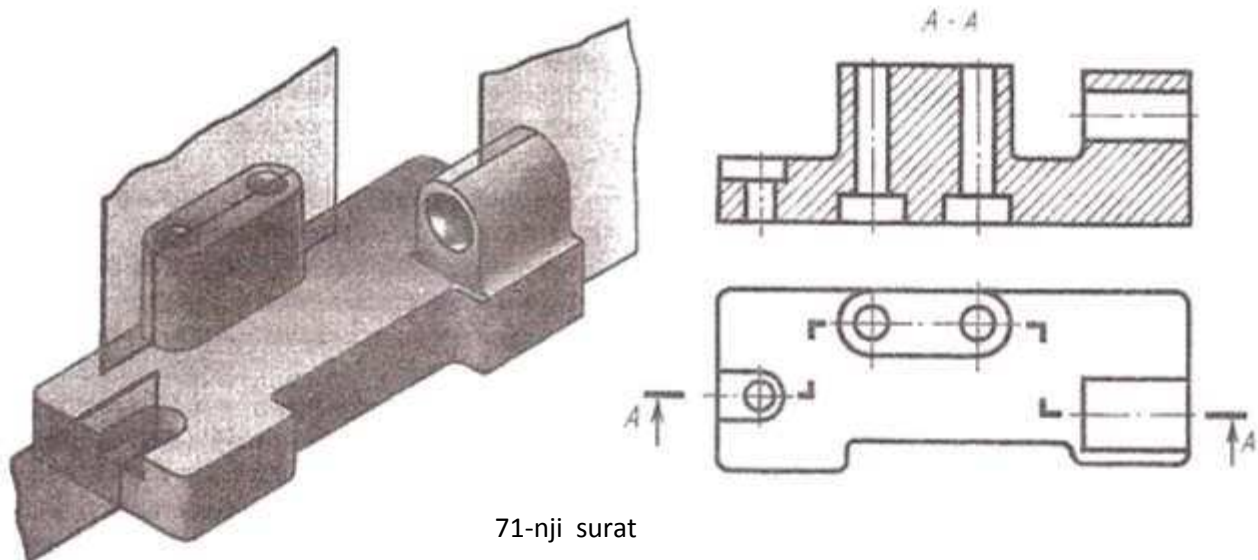
Çylşyrymly ýaryklar diýlip iki we ondanam köp kesiji tekizlikleriň kömegi bilen alnan ýaryklara aýdylýar. Olar haçanda şaýyň elementleriniň ählisi, olaryň şekilleri we ýerleşişleri ýönekeý bir kesiji tekizlikde alnan ýaryklar şekilendirilip bolman ýagdaýynda birnäçe kesiji tekizlikleri ulanmaklyk möhümligi ýüze çykarýar.

Çylşyrymly ýaryklar başgarçakly 71 surat we döwik 79 surat ýaryklar abölünýärler.

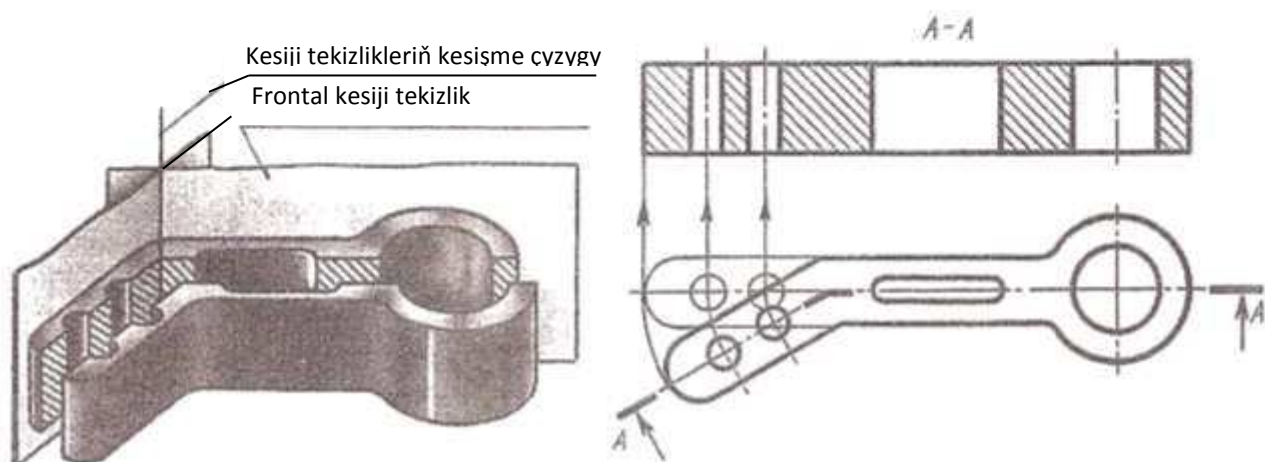




70-nji surat



71-nji surat



72-nji surat

71-nji suratda frantal basgaçakly ýarygyň ýerine ýetirilşiniň mysaly berlen, ol üç parallel kesiji tekizliklerden emele gelen.

Dowük ýaryk diýip haýsyda bolsa bir zady parallel bolmadyk tekizlikleriň kesişmesinden alynýan ýaryga aýdylýar 72 surat .

Çyzgyda kesiji tekizlikleri özara kesişme çyzygynyň ýanyndan şertli aýlap haýsyda bolsa esasy tekizlikleriň birine parallel bolýança ornyny üýtgedýärler, şonuň üçin hem frantal , gorizantal ýa-da profil döwür ýaryklar bolup bilerler.

Ýumuş 64 dört sany meseleden ybarat bolup, olaryň çözgüdi dürli ýaryklary ýerine ýetirmegiň düzgünlerine degişli bolan umumy maglumatlary bekidýär.

73 suratda dört meseläniň şertleri we olaryň çözgidiniň mysaly berilen.

Berlen şaýlaryň ähli çyzgylarynyň her wariandynyň biriji meselesinde kesiji tekizlik şaýyň simmetriýa tekizligi bilen doly gabat gelýär, şonuň üçin çyzgyda kesiji tekizlik görkezilmeýär, ýaryk bosa ýazgy bilen utgaşdyrylyp ýazylmaýar (1-nji mesele).

Şeýle meseleler işlenende ähli wariantlarda ýarygyň bölegi bilen görnişiniň bölegini birleşdirmek mümkinçiligi göz önünde tutulýar.

Bu ýagdaýda TDS2\*305-68 laýyklykda şaýyň görnüşi çyzylýan böleginde görünmeýän sudur ştryhly çyzyklar bilen şekilendirmek rugsat edilmeýär.

2...4 meselelerde şaýyň görkezilen bir şekilinde , beýlekisinde onuň şekili gurulmaly.

Mysal üçin 73a suratda (2-nji mesele) meseläniň şerti berlen, emma 73b suratda onuň çözgidi: ýokardan görniş ýapgyt ýaryk bilen çalşyrlan, alnan şekilde ölçegler goýlan.

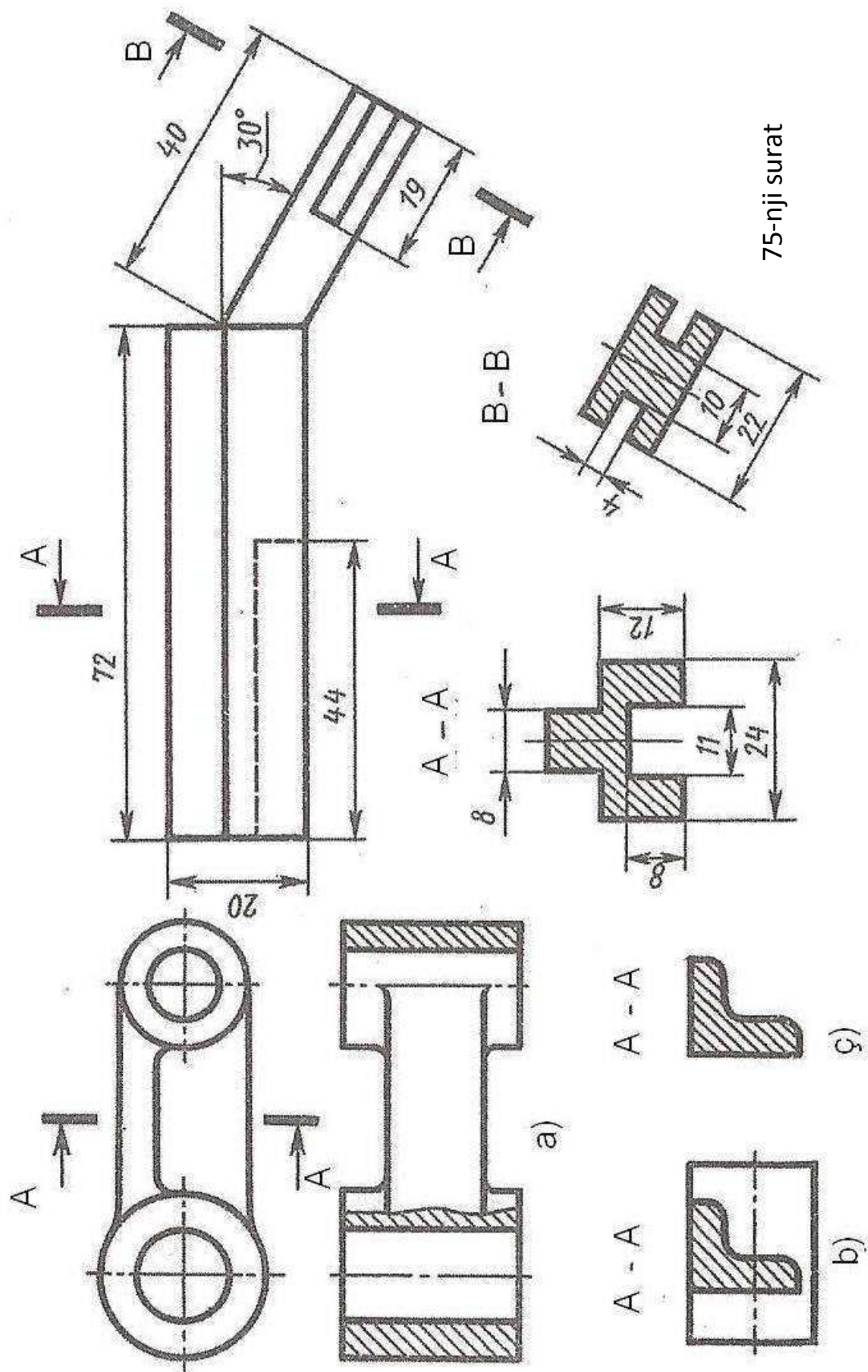
Kesik diýip figuranyň (zadyň) tekizlik bilen hyýaly kesilmesinden alnan şekile aýdylýar kesik ýerine ýetirlende diňe kesiji tekizlikde ýerleşeni görkezilýär.

74 б b suratlarda kesigiň şekili Г harpyna meňzeş (ol ştrihlenen).

Ýarykdan tapawytlylykda 74b suratda kesikde diňe kesiji tekizlikdäki ýerleşenleri görkezilýär, ondan aňyrdaky ýerleşenleri şekillendirilmeýär 74b suratda.

Ýumuş 65 şaýyň görkezlen aýdyň şekli we esasy görnişi boýunça, şaýyň esasy görnüşiniň we şertinde görkezilşi ýaly kesiginiň çyzgysyny gurma talap edilýär.

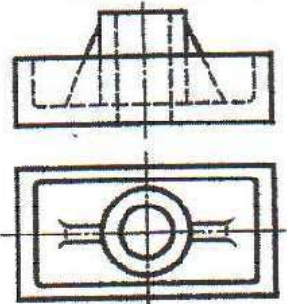
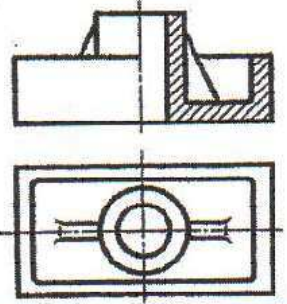
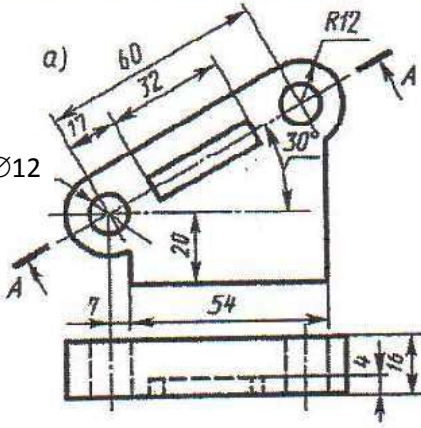
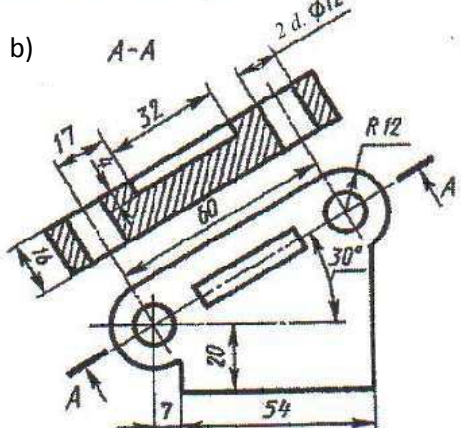
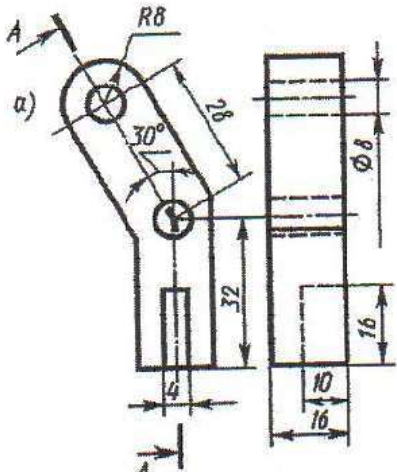
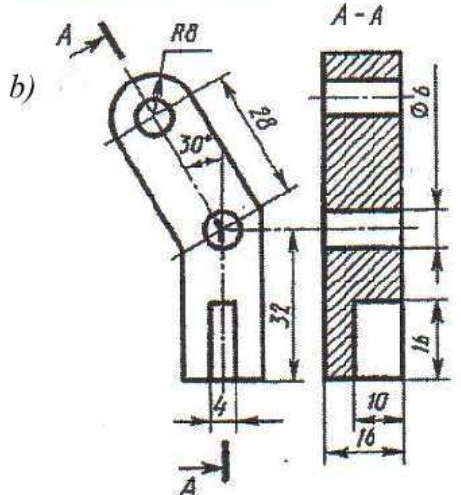
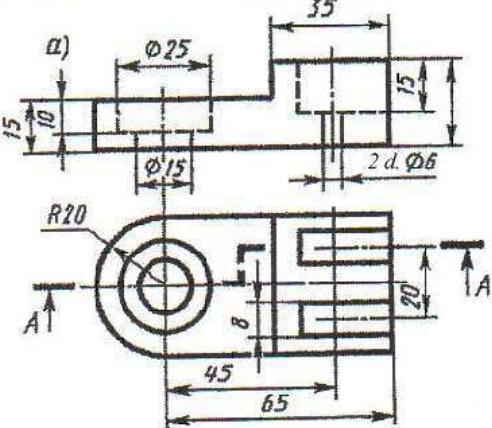
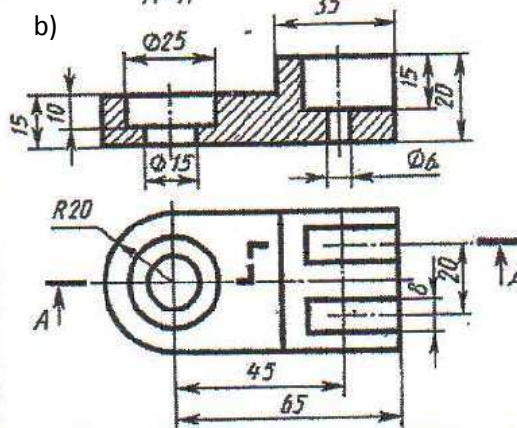
75 suratda şeýle meseläniň ýerine ýetirilşiniň mysaly görkezlen: ölçeglerni goýmak bilen şekili gurmaklyk, şaýyň keşbi barda doly düşünje berilýär.



75-nji surat

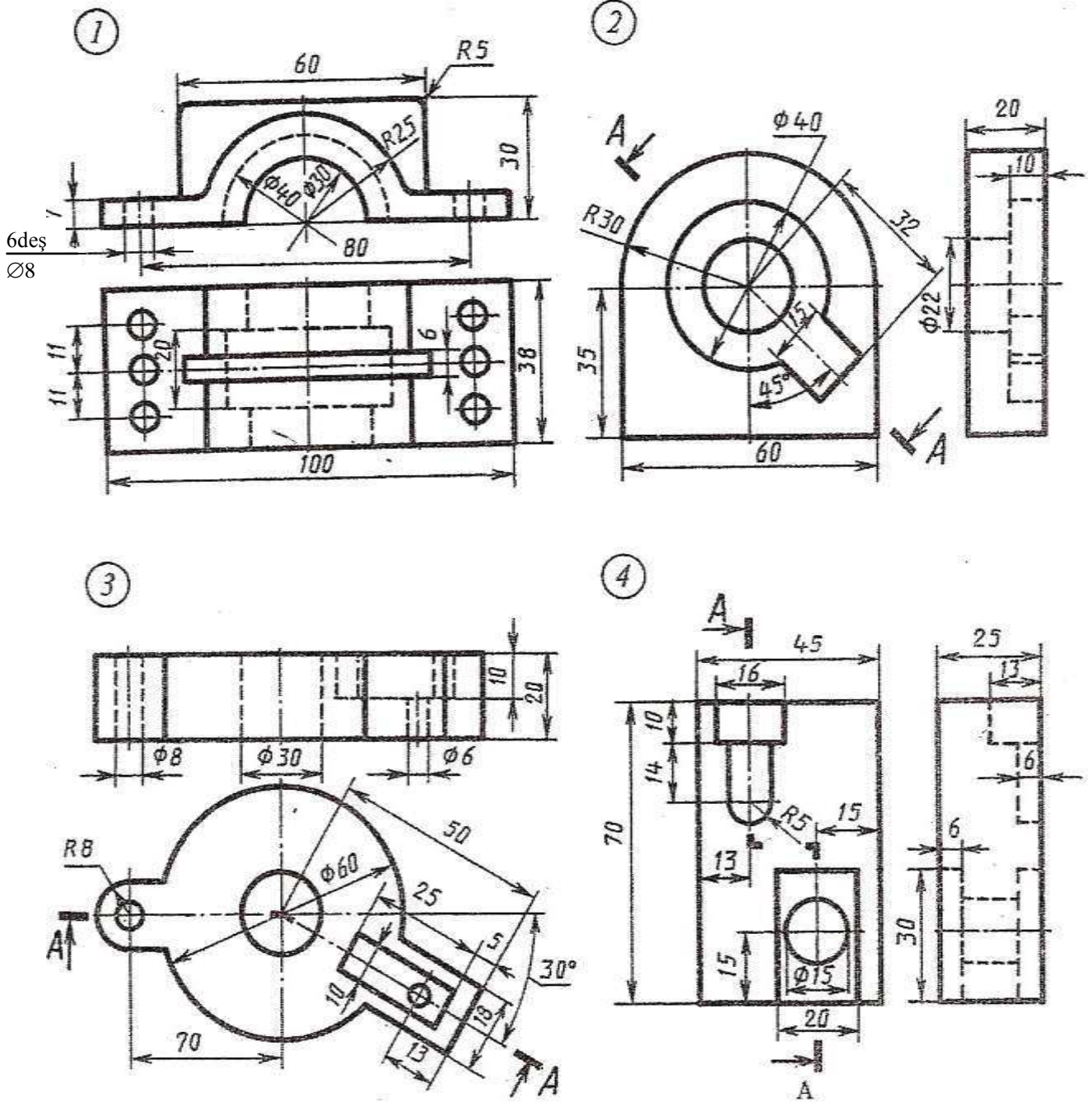
74-nji surat



№	Meselăniñ şerti.	Çözüwi
1	<p>a)</p> 	<p>b)</p> 
2	<p>a)</p>  <p>2 d. Ø12</p>	<p>b)</p> 
	<p>a)</p> 	<p>b)</p> 
4	<p>a)</p> 	<p>b)</p> 

# ÝUMUŞ 64

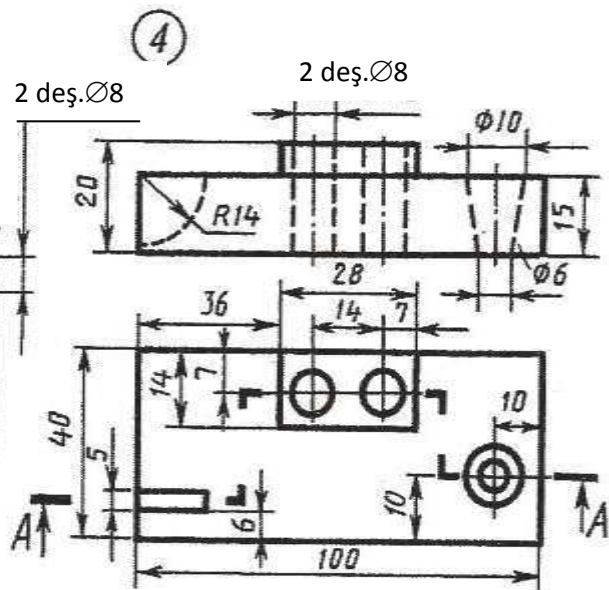
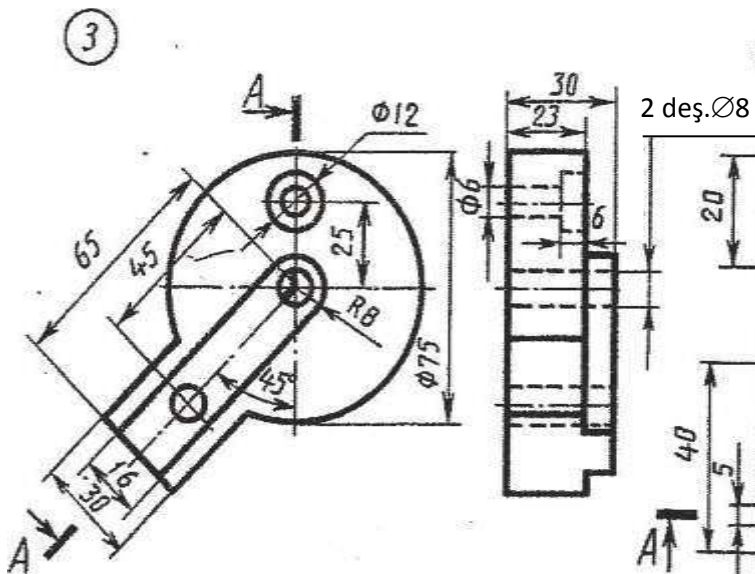
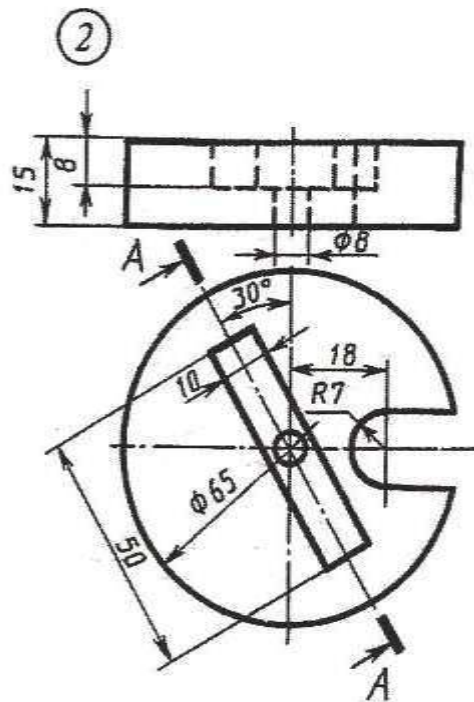
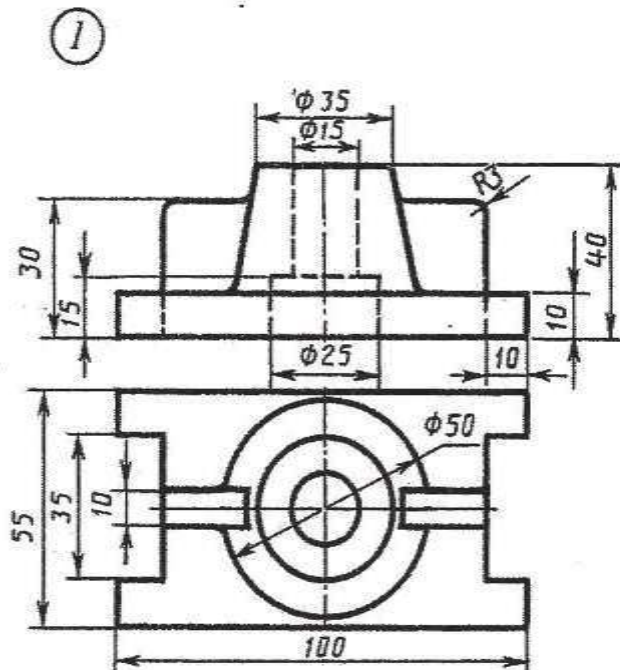
Wariant 1



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.



## Variant 2

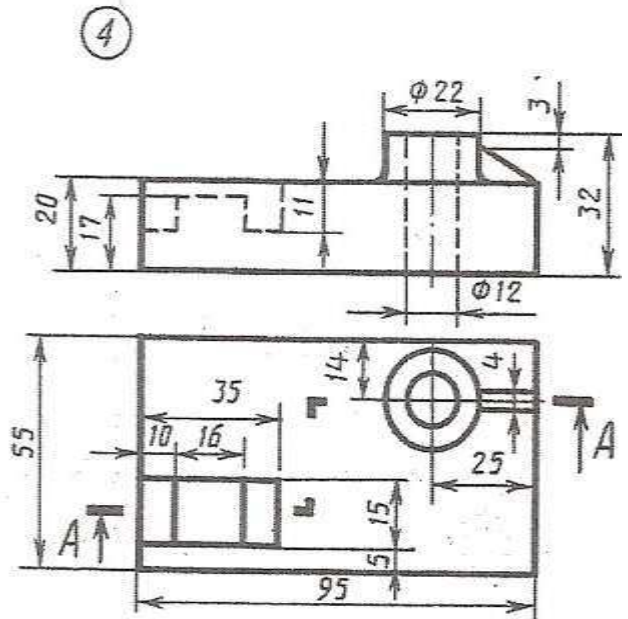
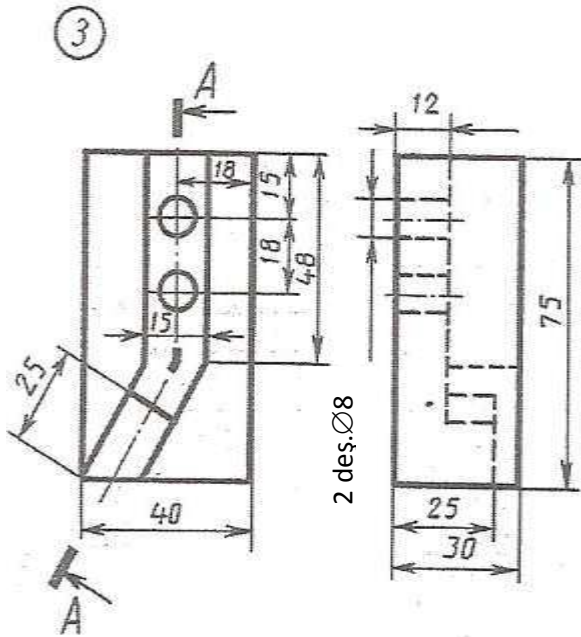
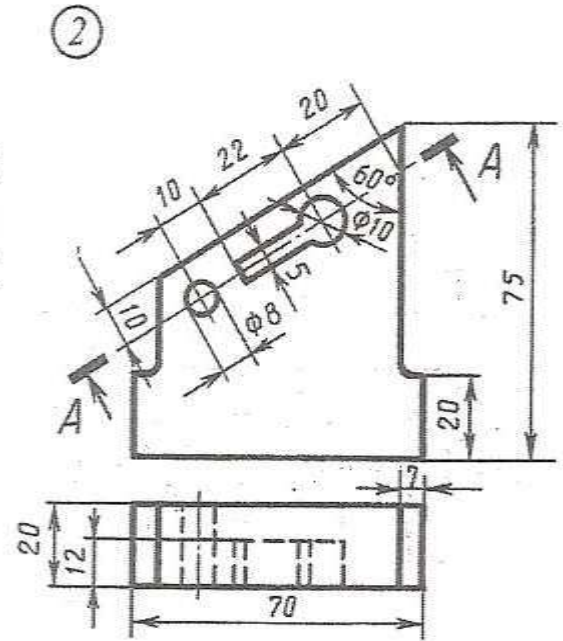
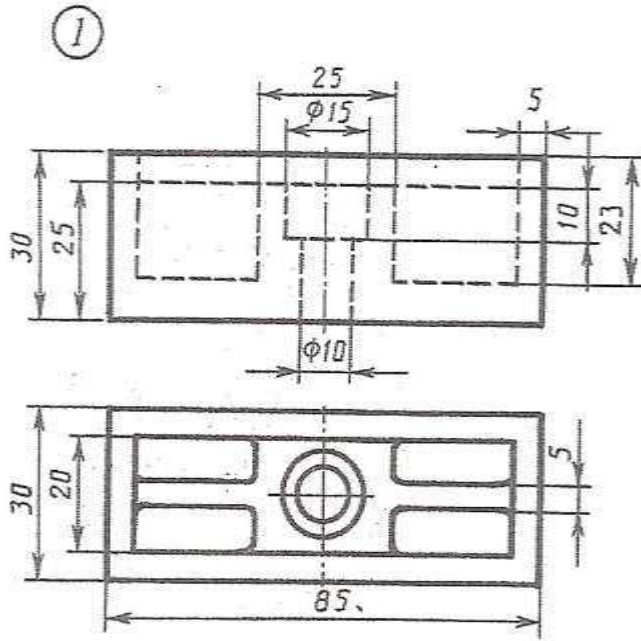


1. Öñünden görnüşini ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öñünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.



# ÝUMUŞ 64

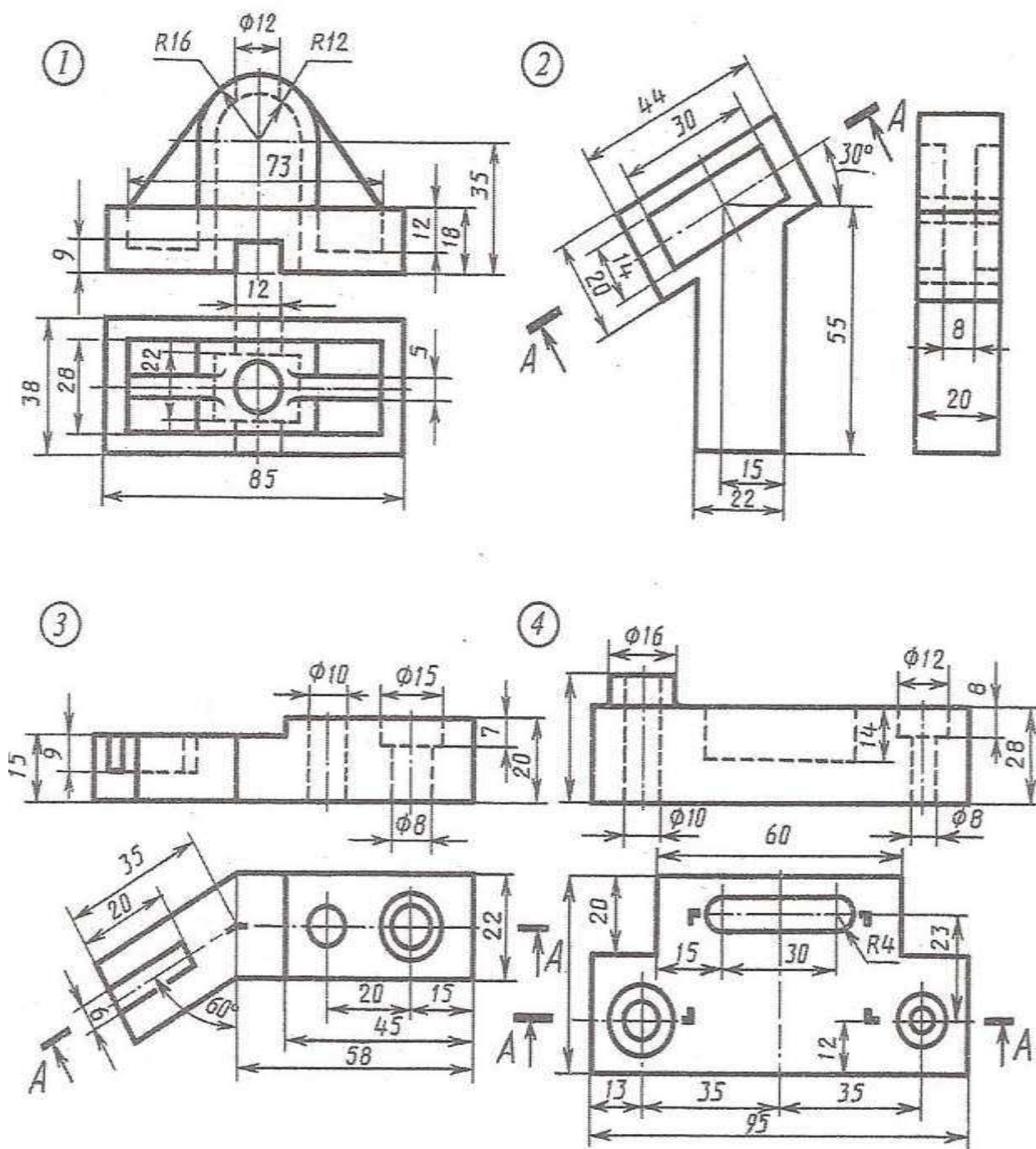
Wariant 3



1. Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.

# ÝUMUŞ 64

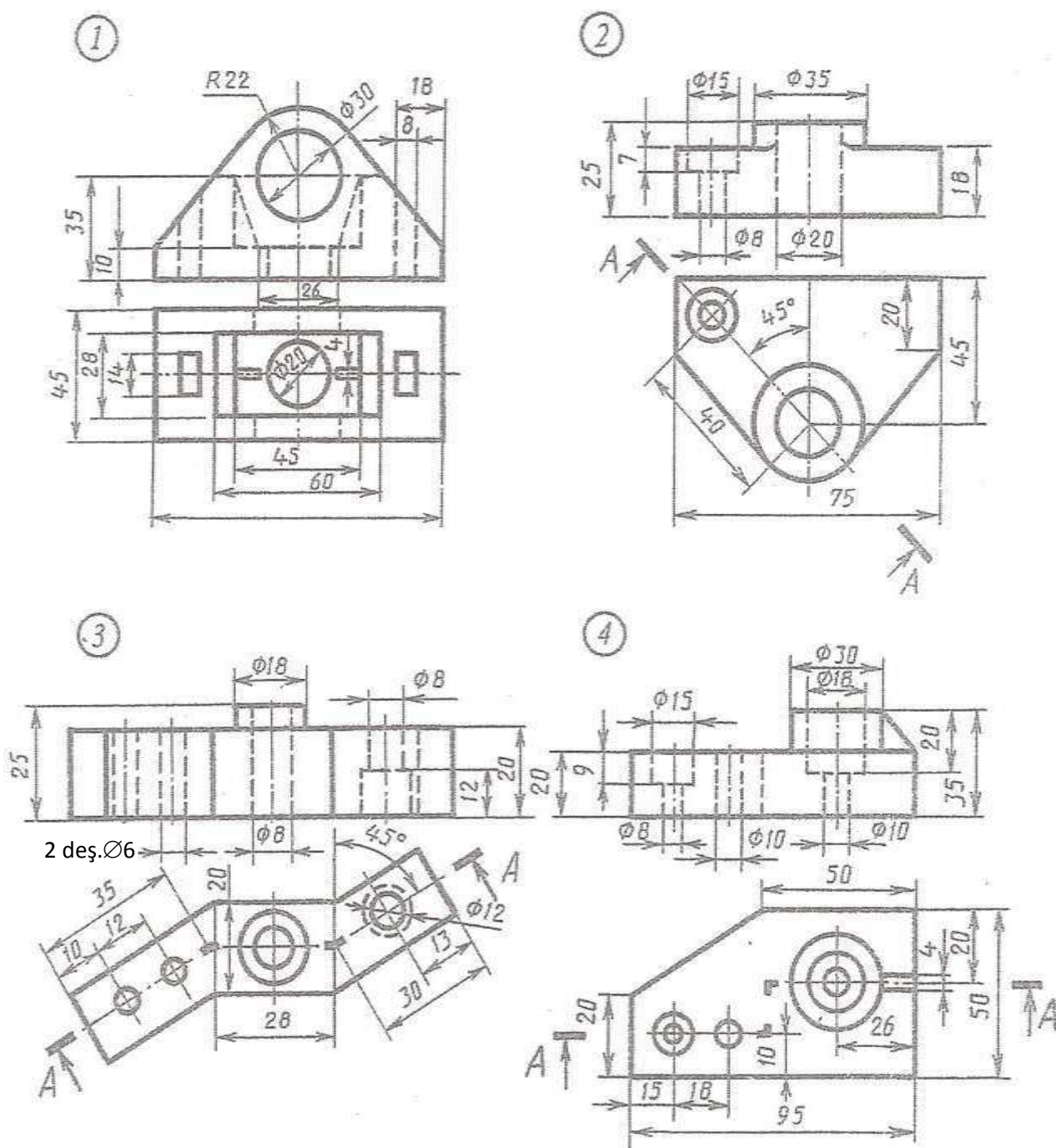
Wariant 4



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

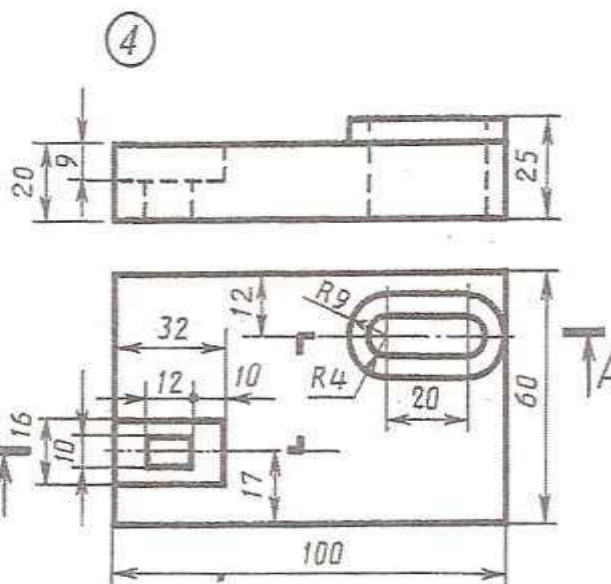
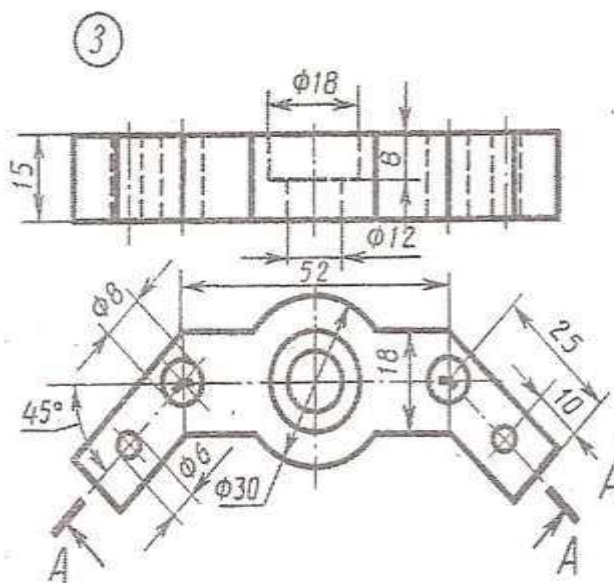
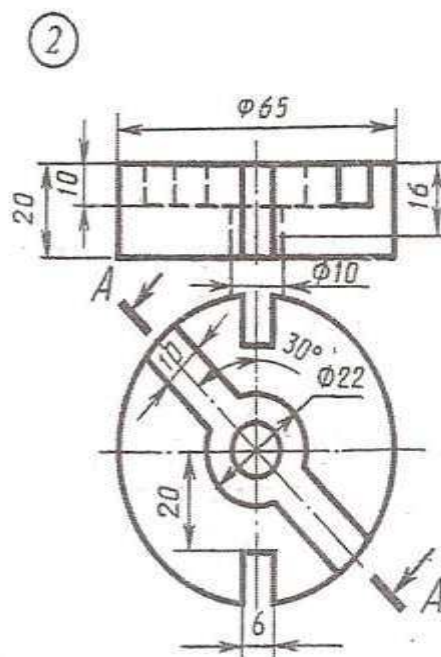
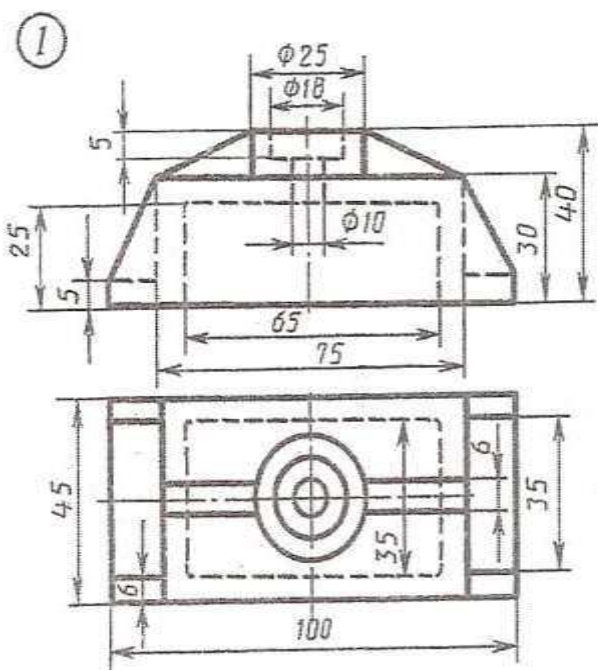
# ÝUMUŞ 64

Wariant 5



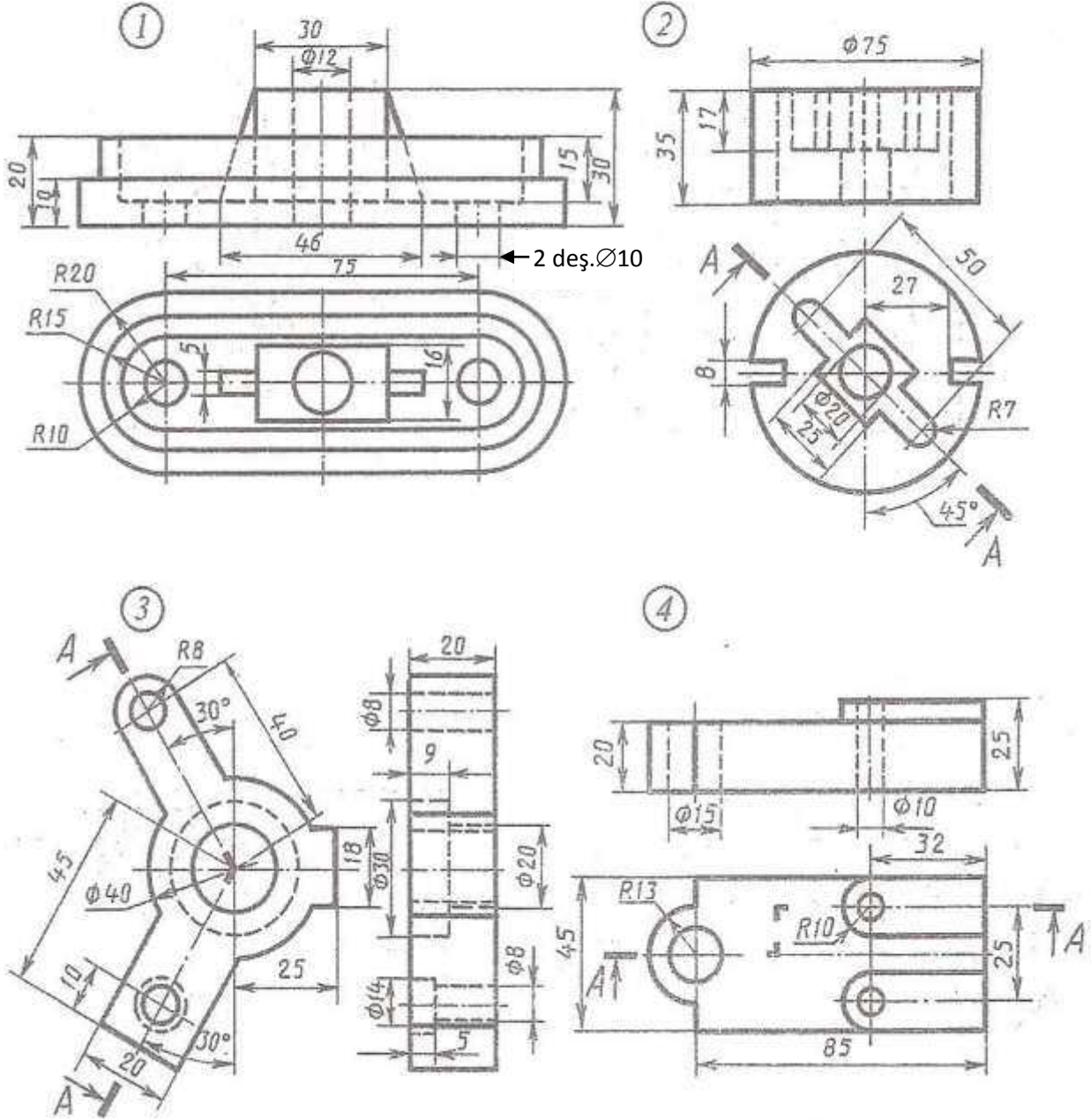
1. Önünden görünüşin ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görünüş A-A ýaryk bilen çalyşmaly.
3. Önünden görünüş A-A ýaryk bilen çalyşmaly.
4. Çepden görünüş A-A ýaryk bilen çalyşmaly.
5. Ýokardan görünüş A-A ýaryk bilen çalyşmaly.





1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

Wariant 7



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.

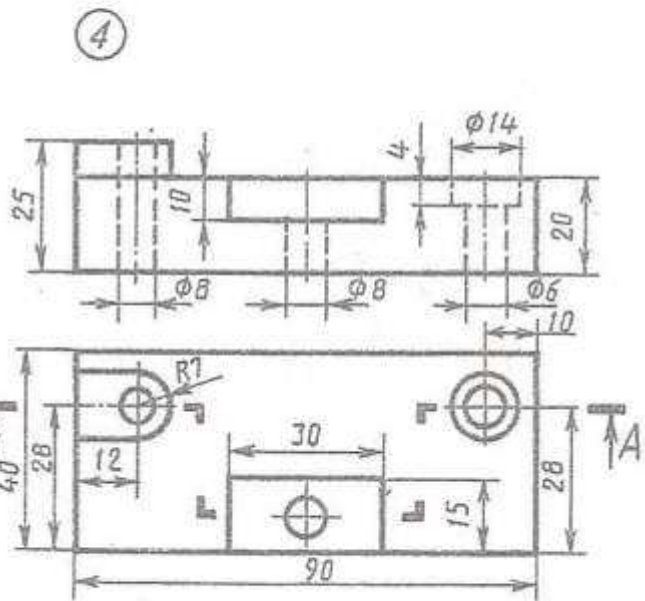
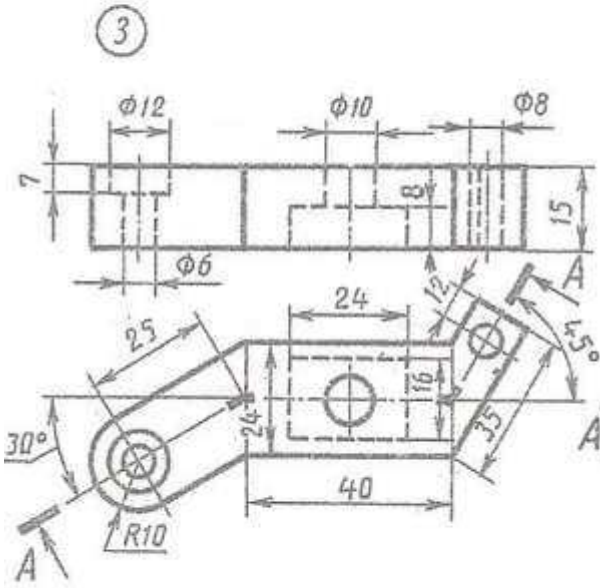
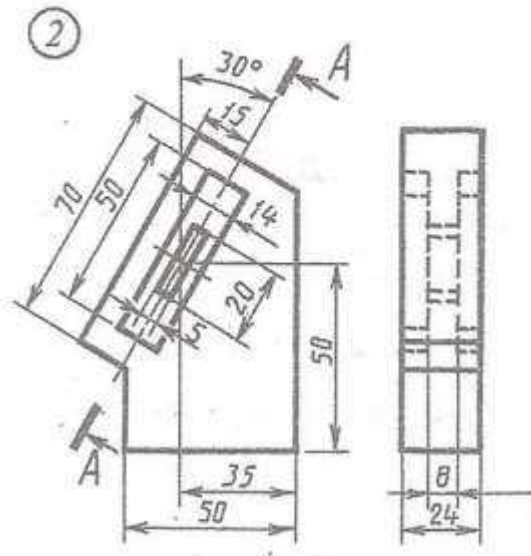
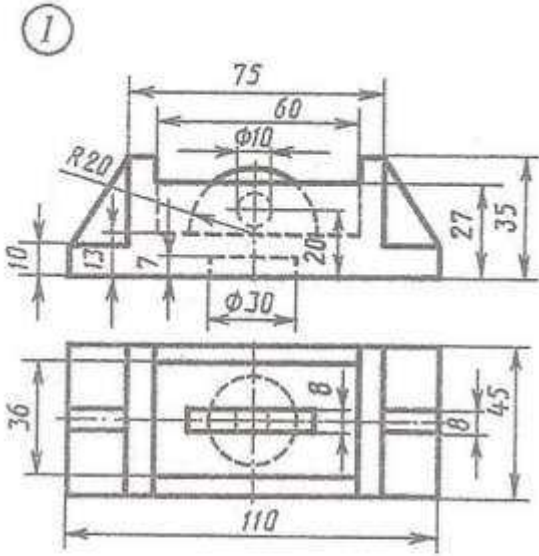
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.

3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.

4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.

5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

Wariant 8

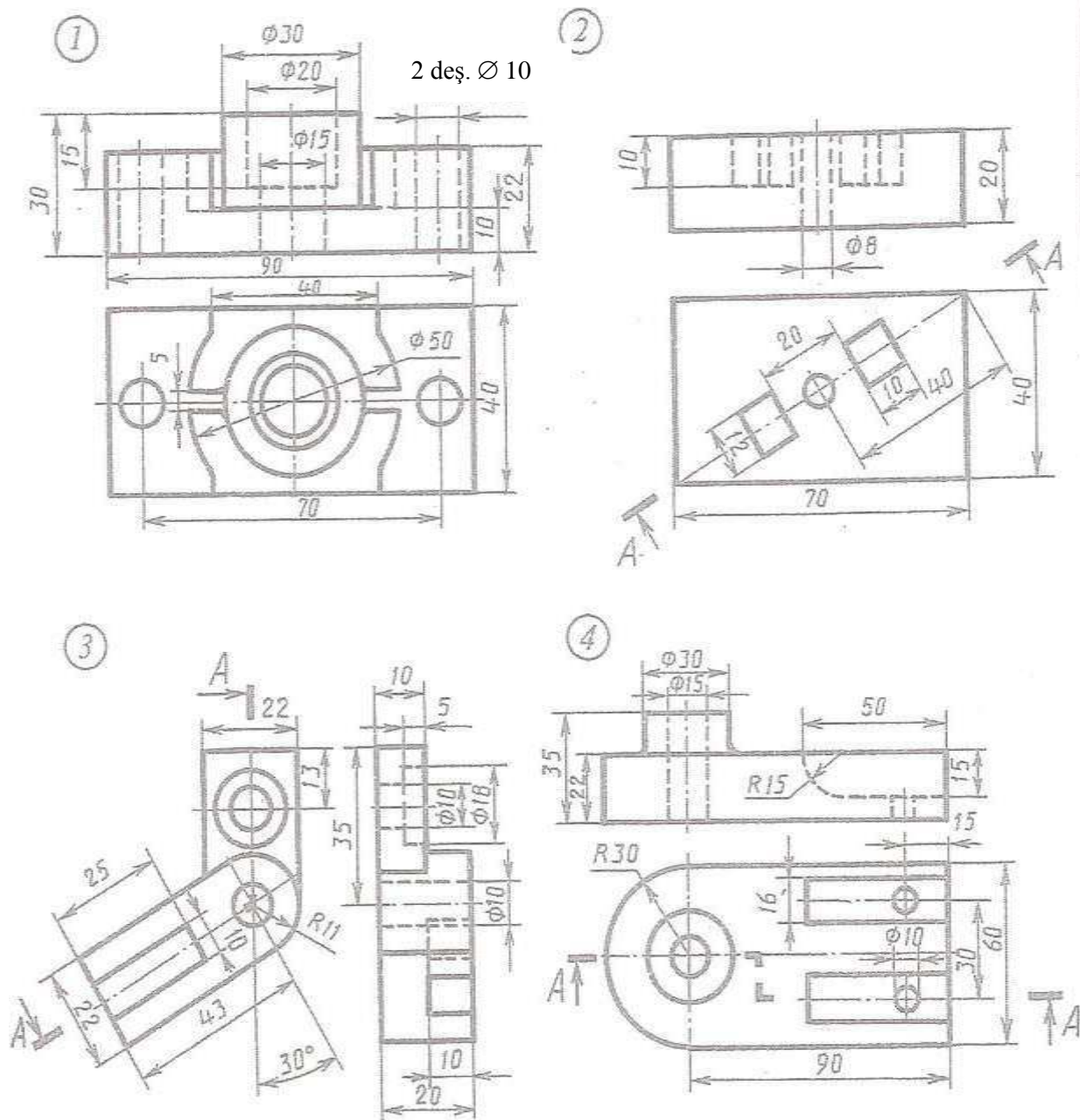


- 1.Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
- 2.Çepden görnüşi A-A ýaryk bilen çalyşmaly.
- 3.Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
- 4.Çepden görnüşi A-A ýaryk bilen çalyşmaly.
- 5.Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.

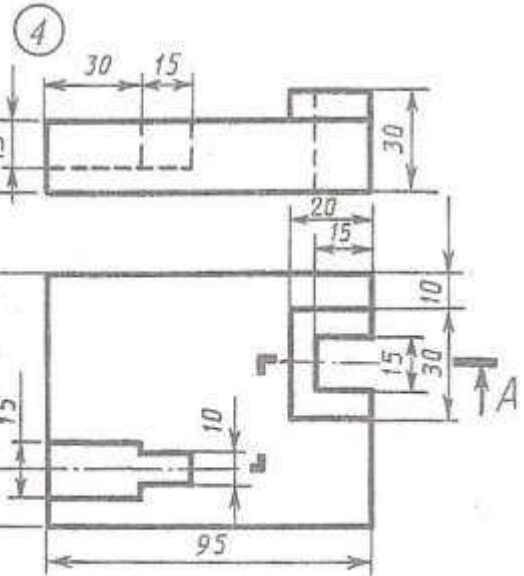
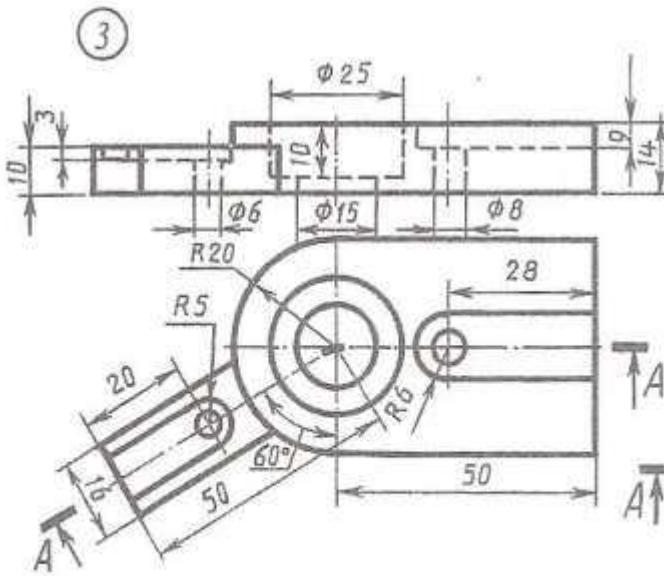
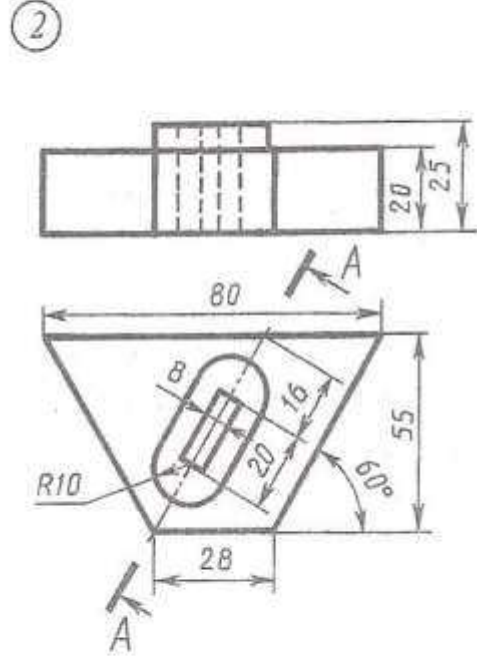
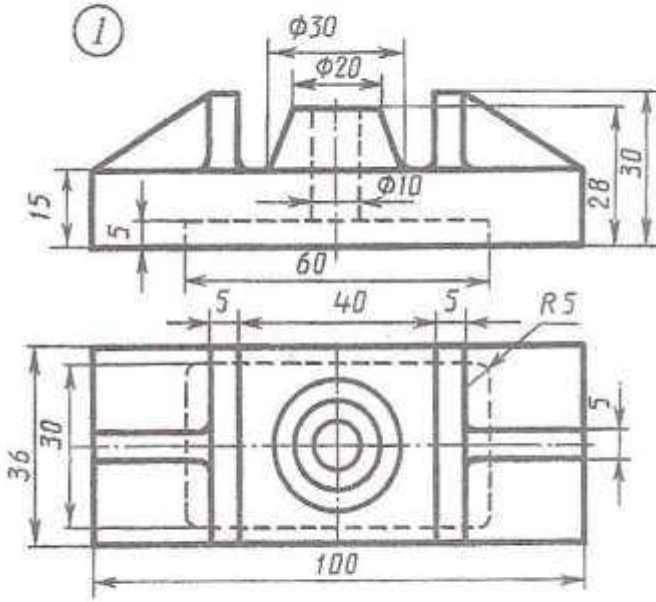


# ÝUMUŞ 64

Wariant 9



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.



1.Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.

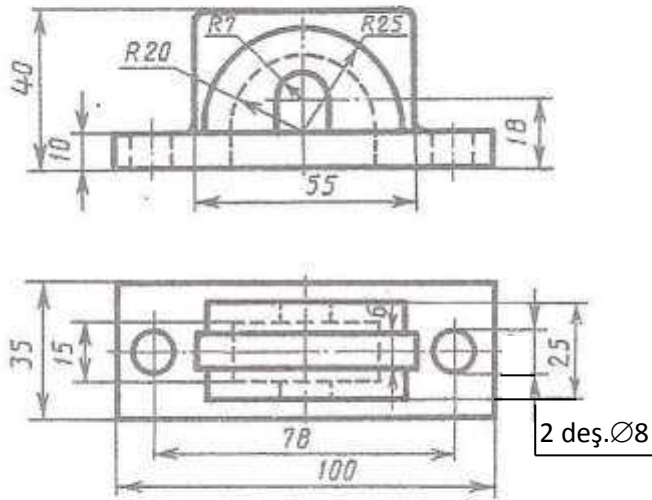
2.Çepden görnüşi A-A ýaryk bilen çalyşmaly.

3.Öňünden görnüşi A-A ýaryk bilen çalyşmaly.

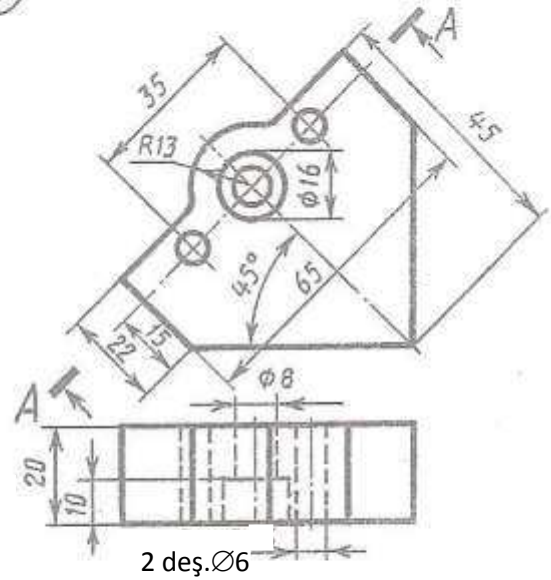
4.Çepden görnüşi A-A ýaryk bilen çalyşmaly.

5.Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.

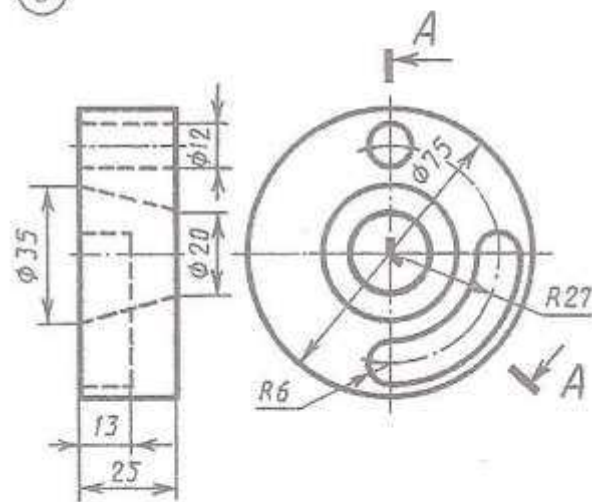
1



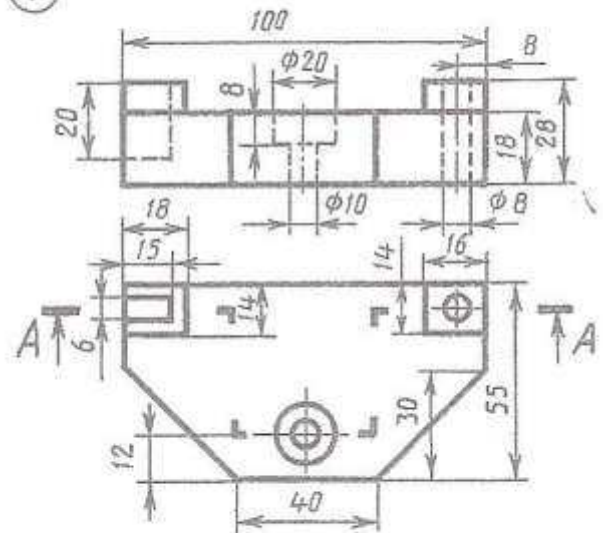
2



3



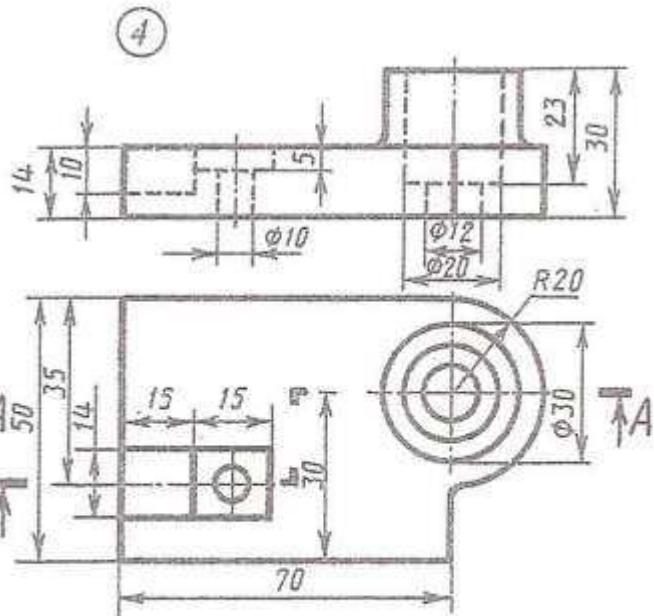
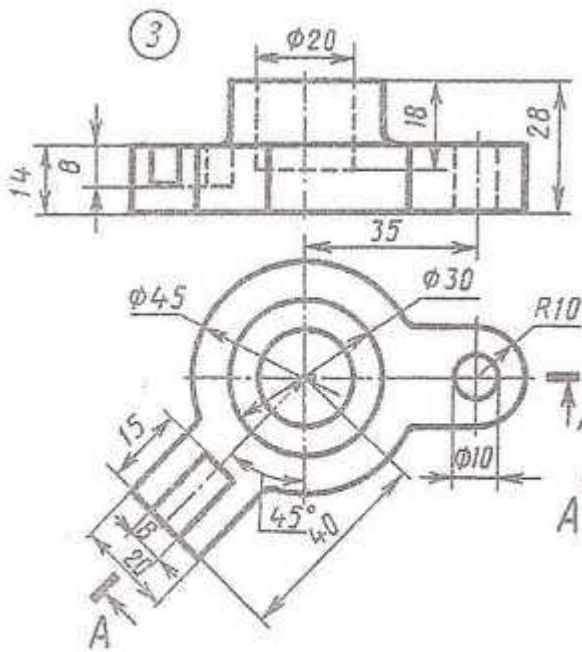
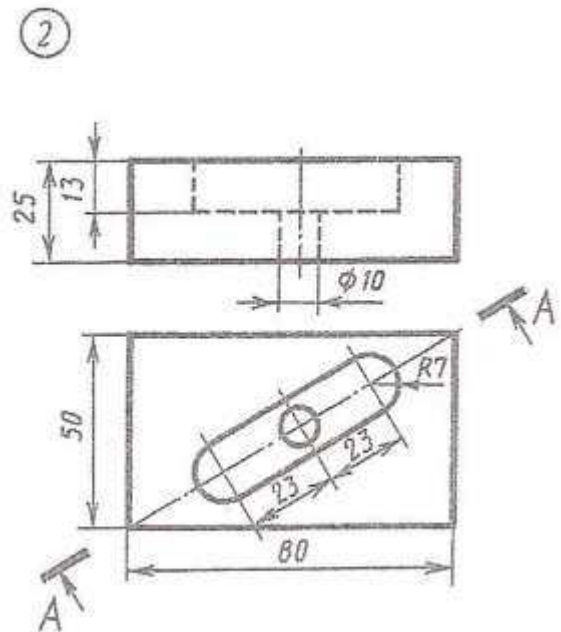
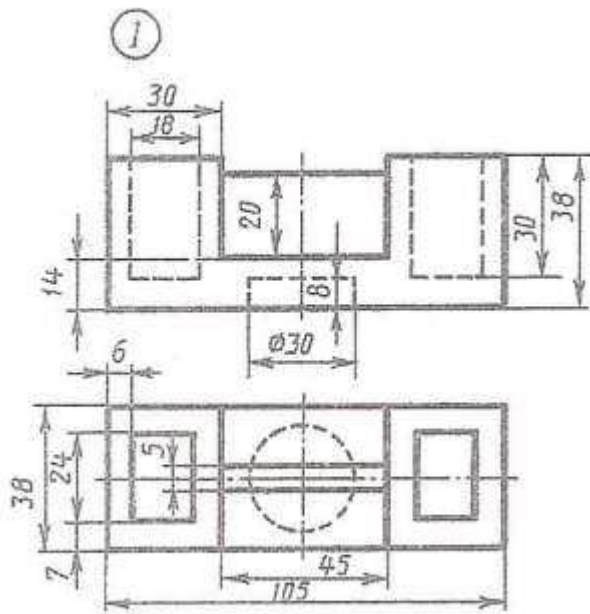
4



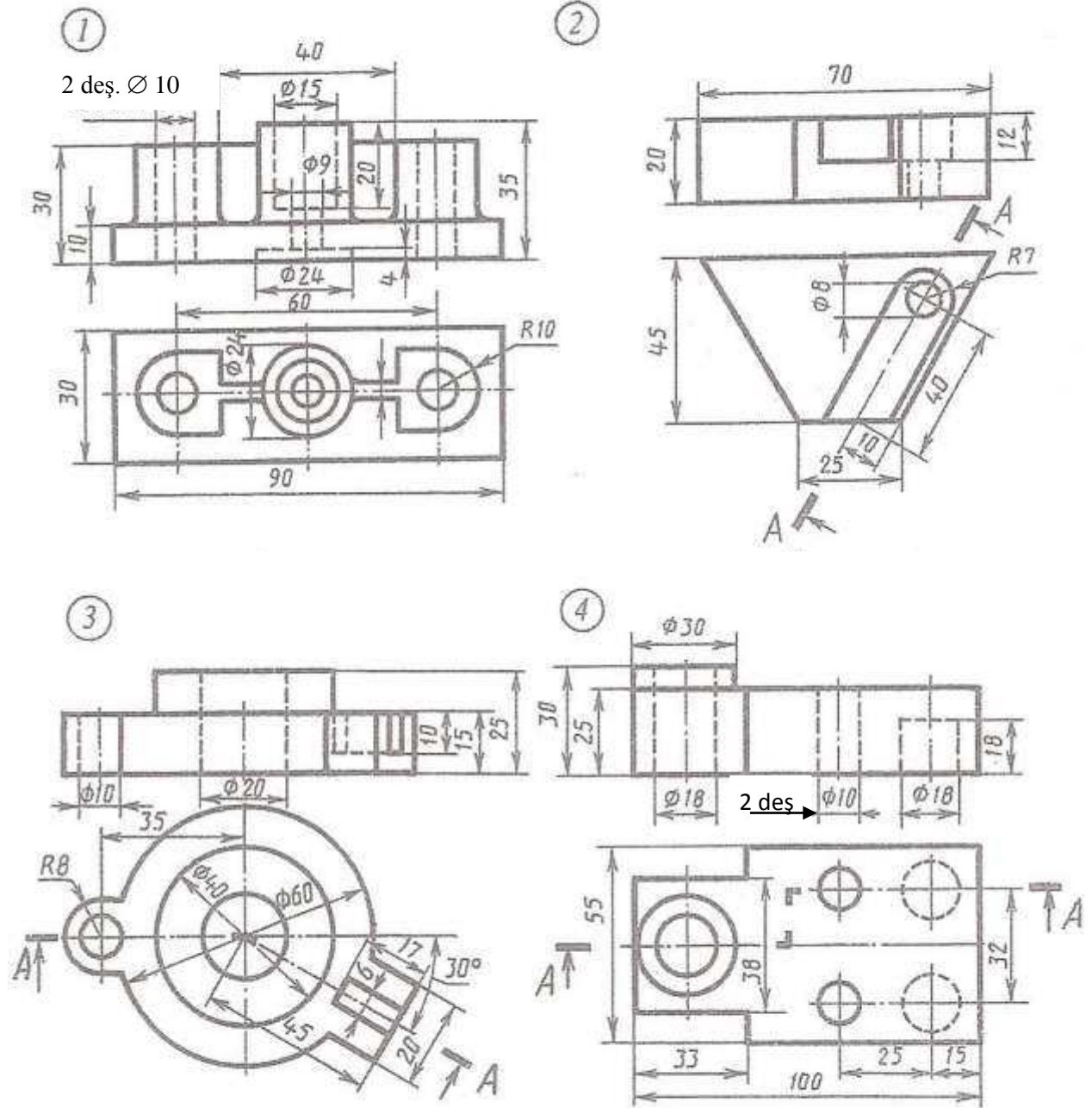
1. Öňünden görnüşini ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.



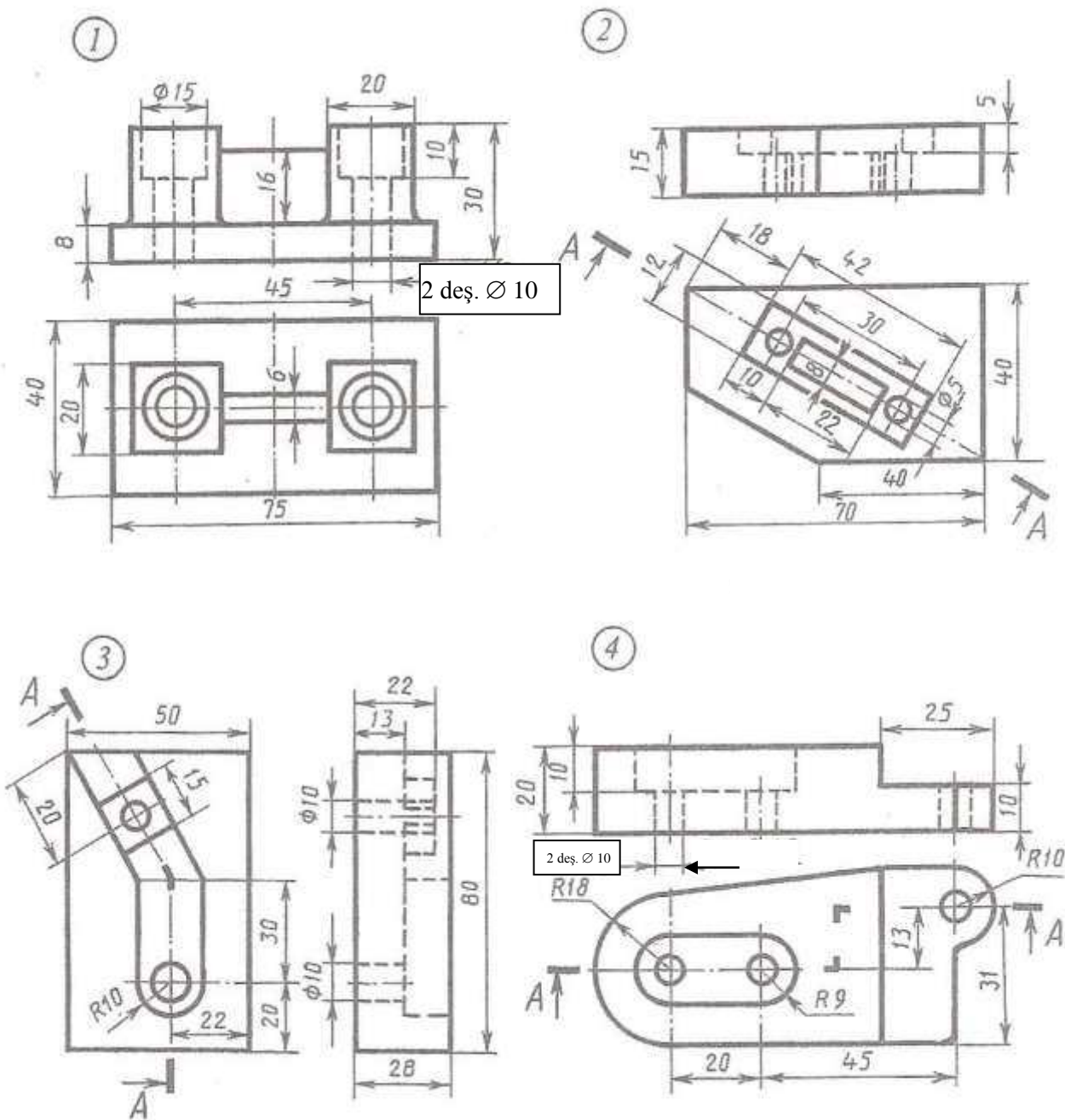
Wariant 12



1. Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

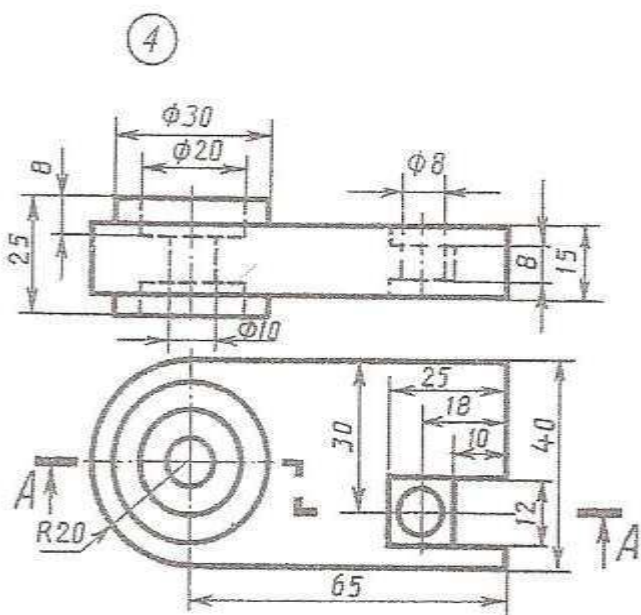
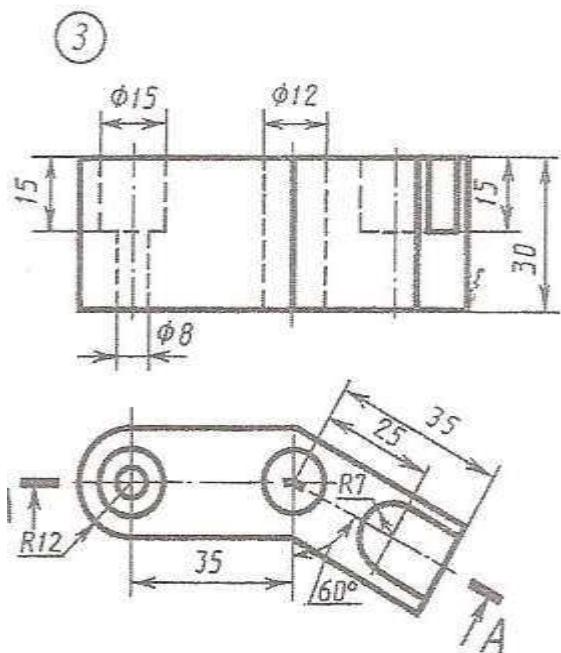
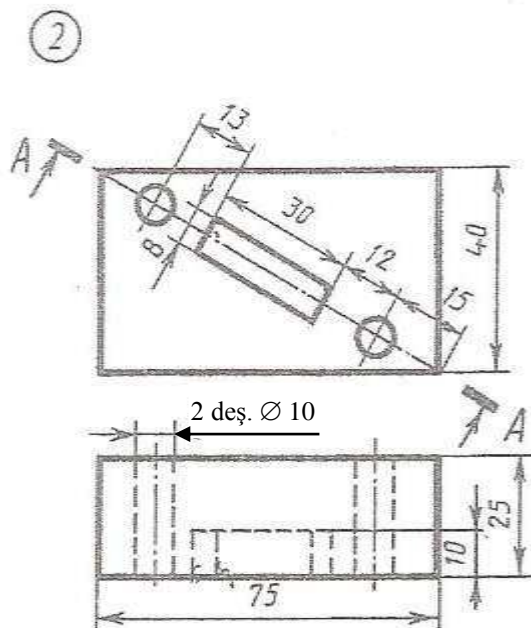
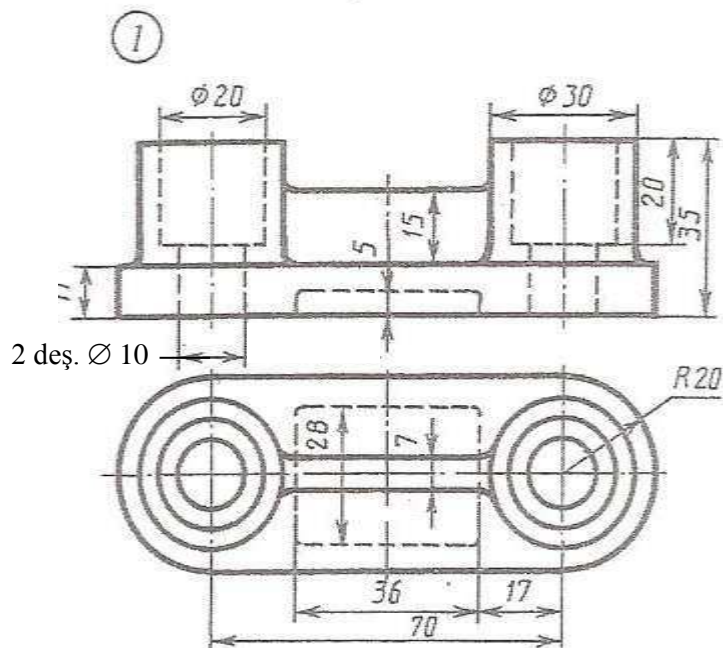


- 1.Öñünden görnüşini ýaryny frontal ýarygyň ýary bilen birikdirmeli
- 2.Çepden görnüşini A-A ýaryk bilen çalyşmaly.
- 3.Öñünden görnüşini A-A ýaryk bilen çalyşmaly.
- 4.Çepden görnüşini A-A ýaryk bilen çalyşmaly.
- 5.Yokardan görnüşini A-A ýaryk bilen çalyşmaly.

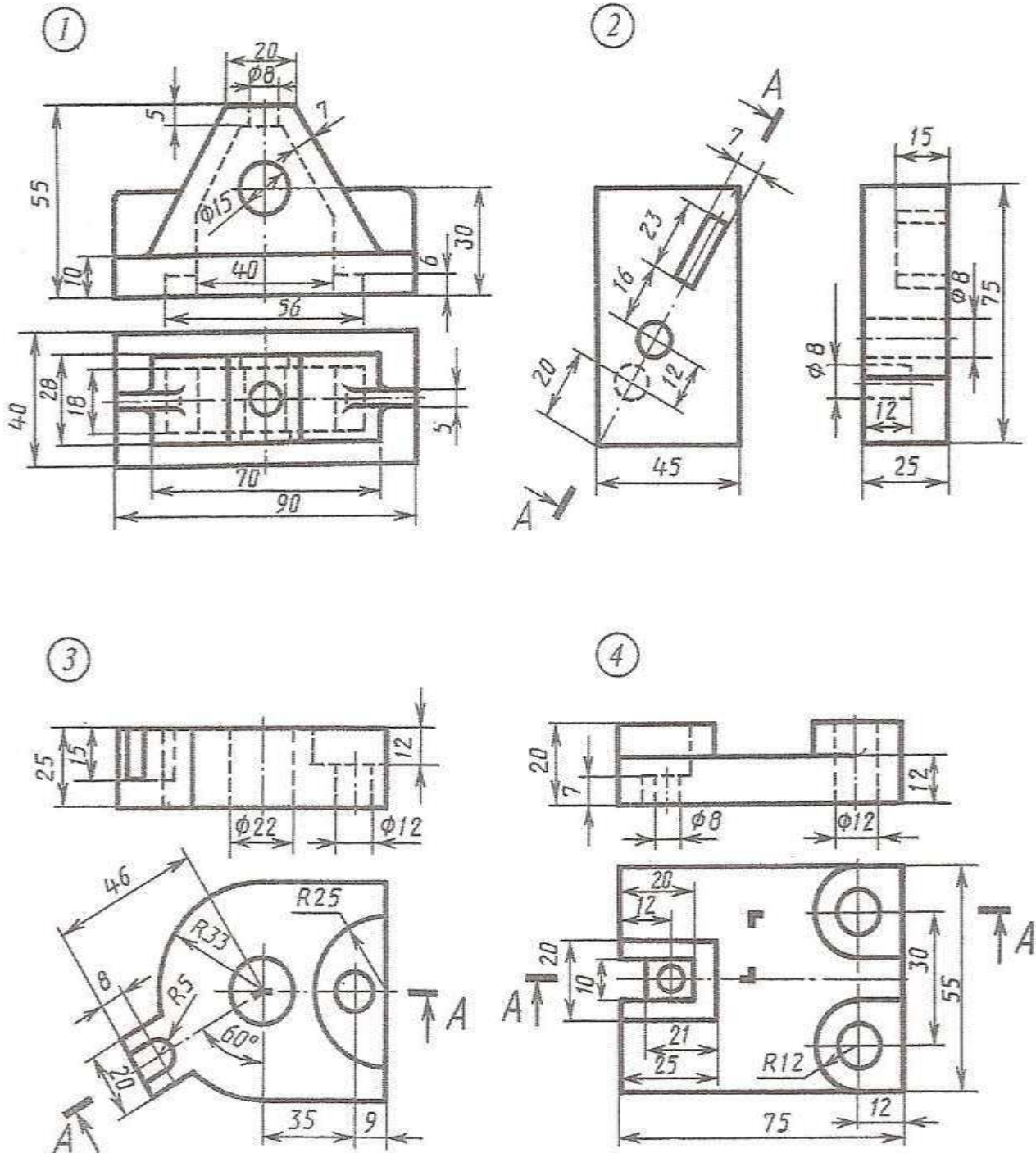


# ÝUMUŞ 64

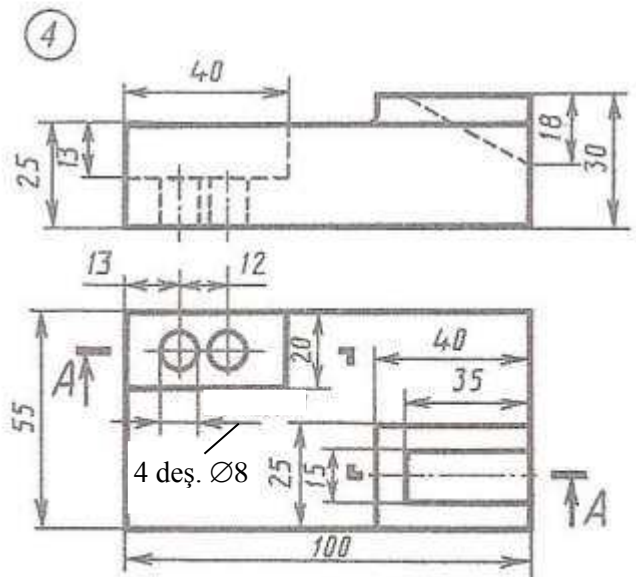
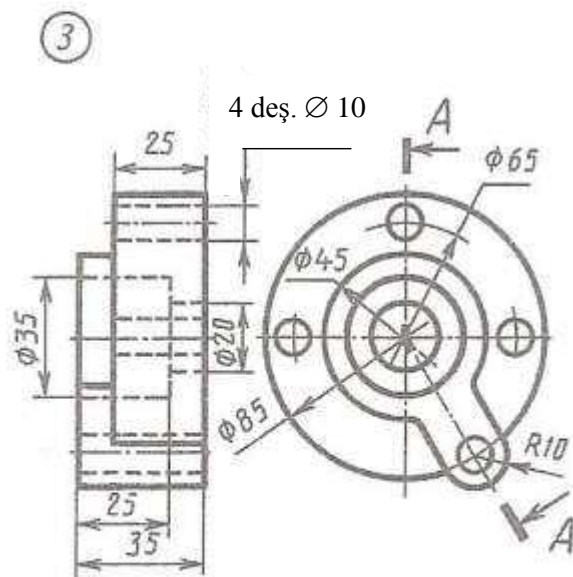
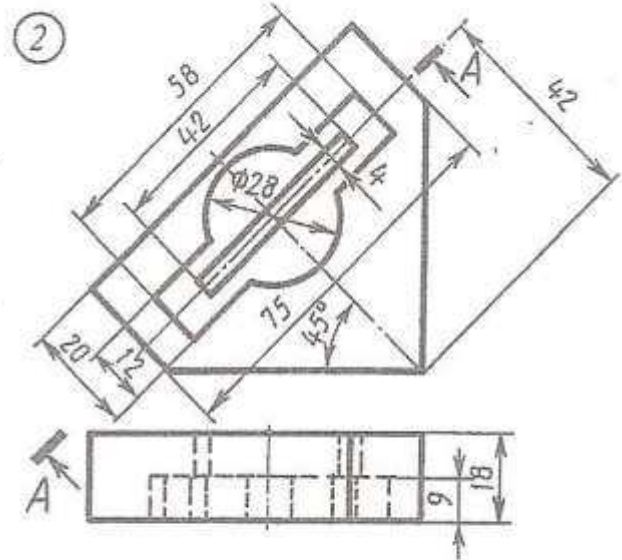
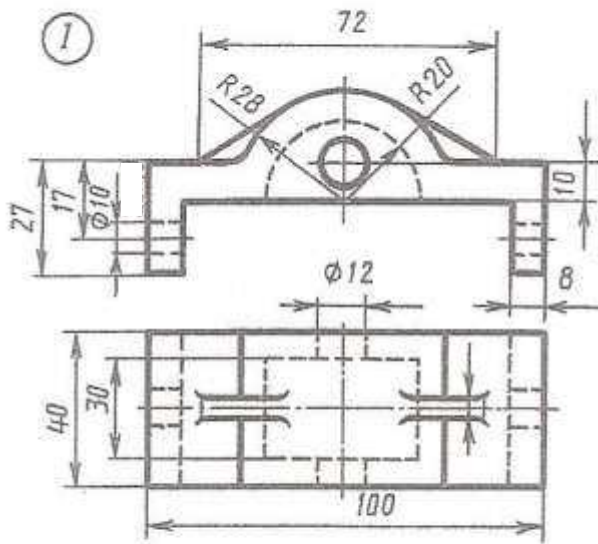
Wariant 15



1. Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.

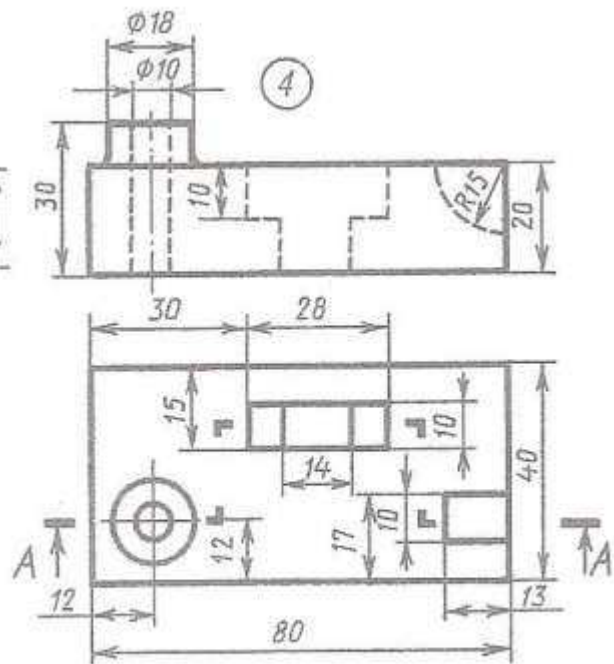
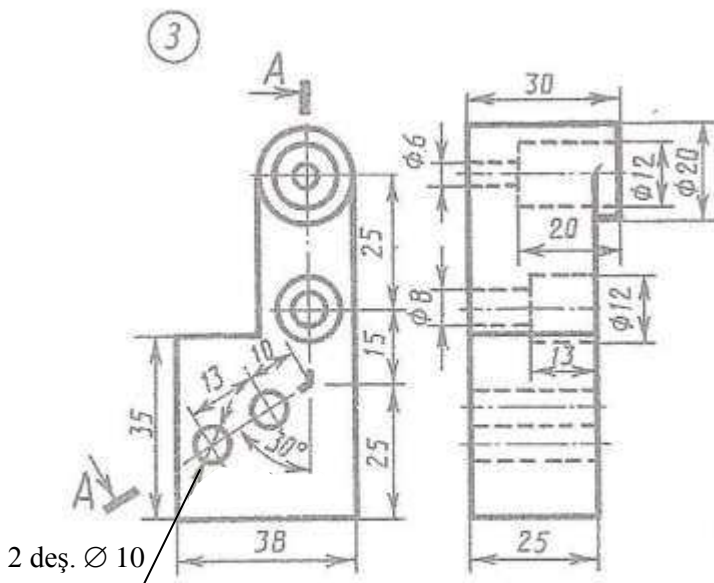
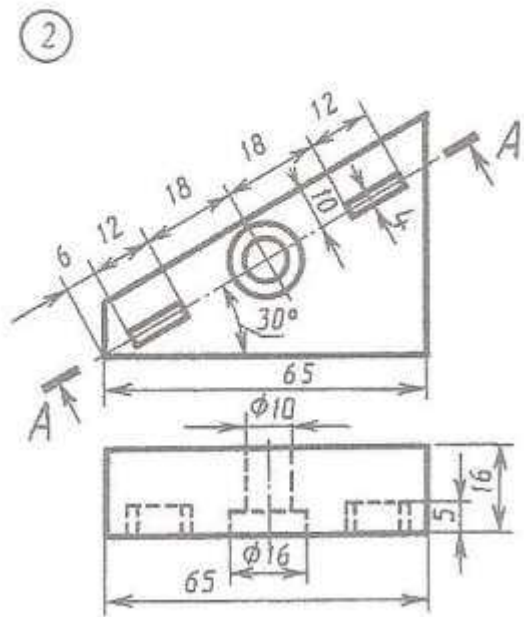
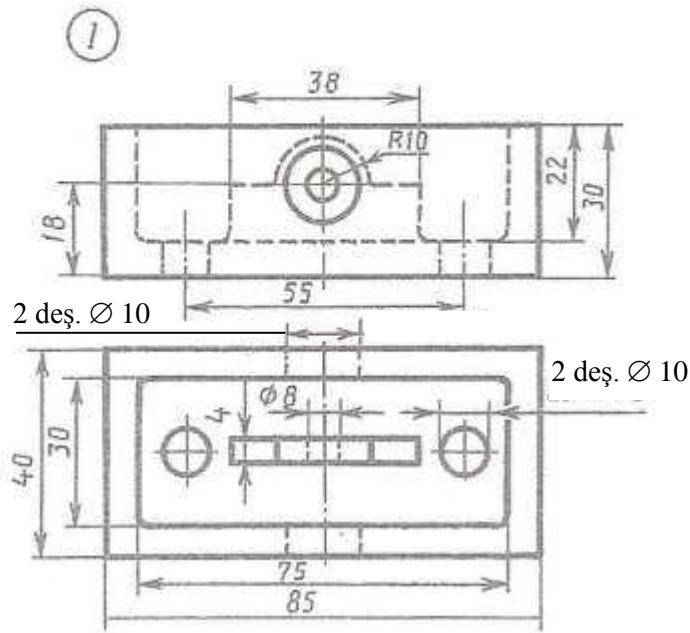


1. Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

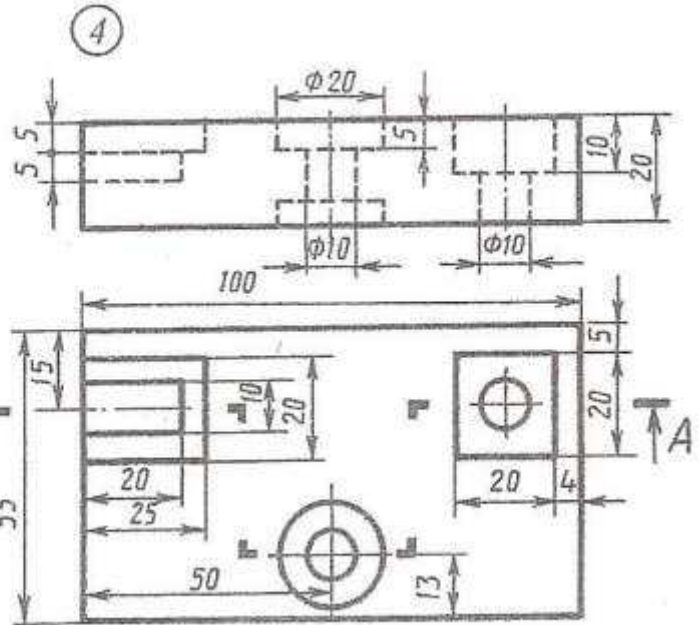
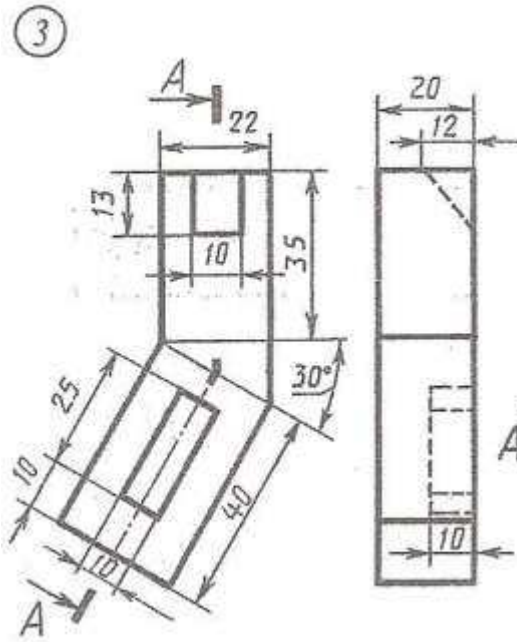
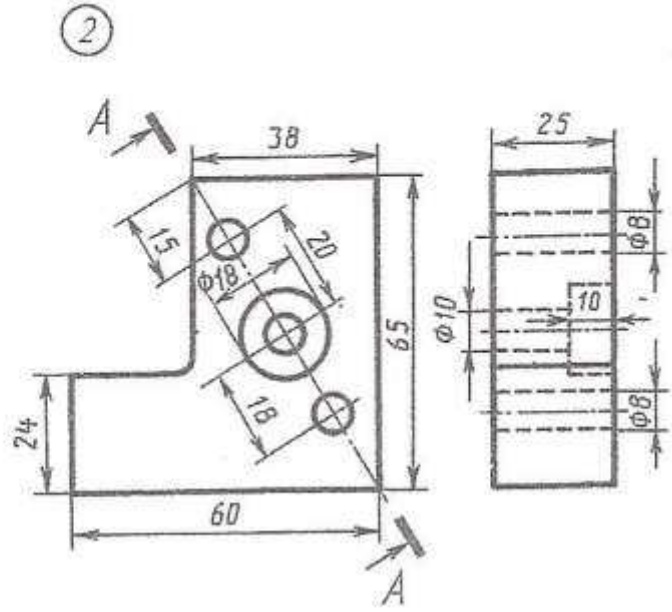
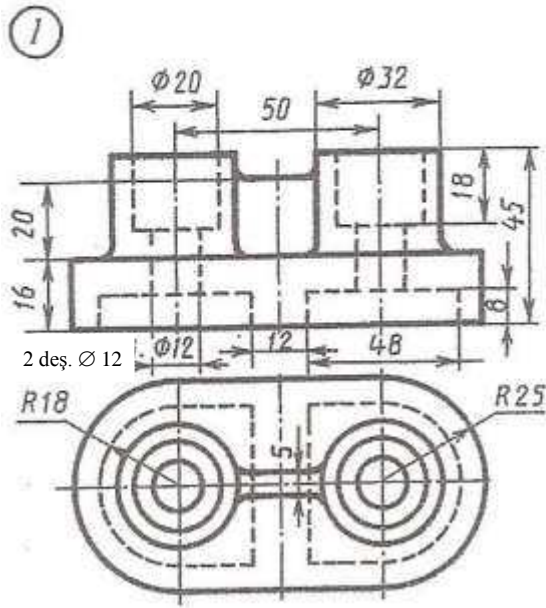




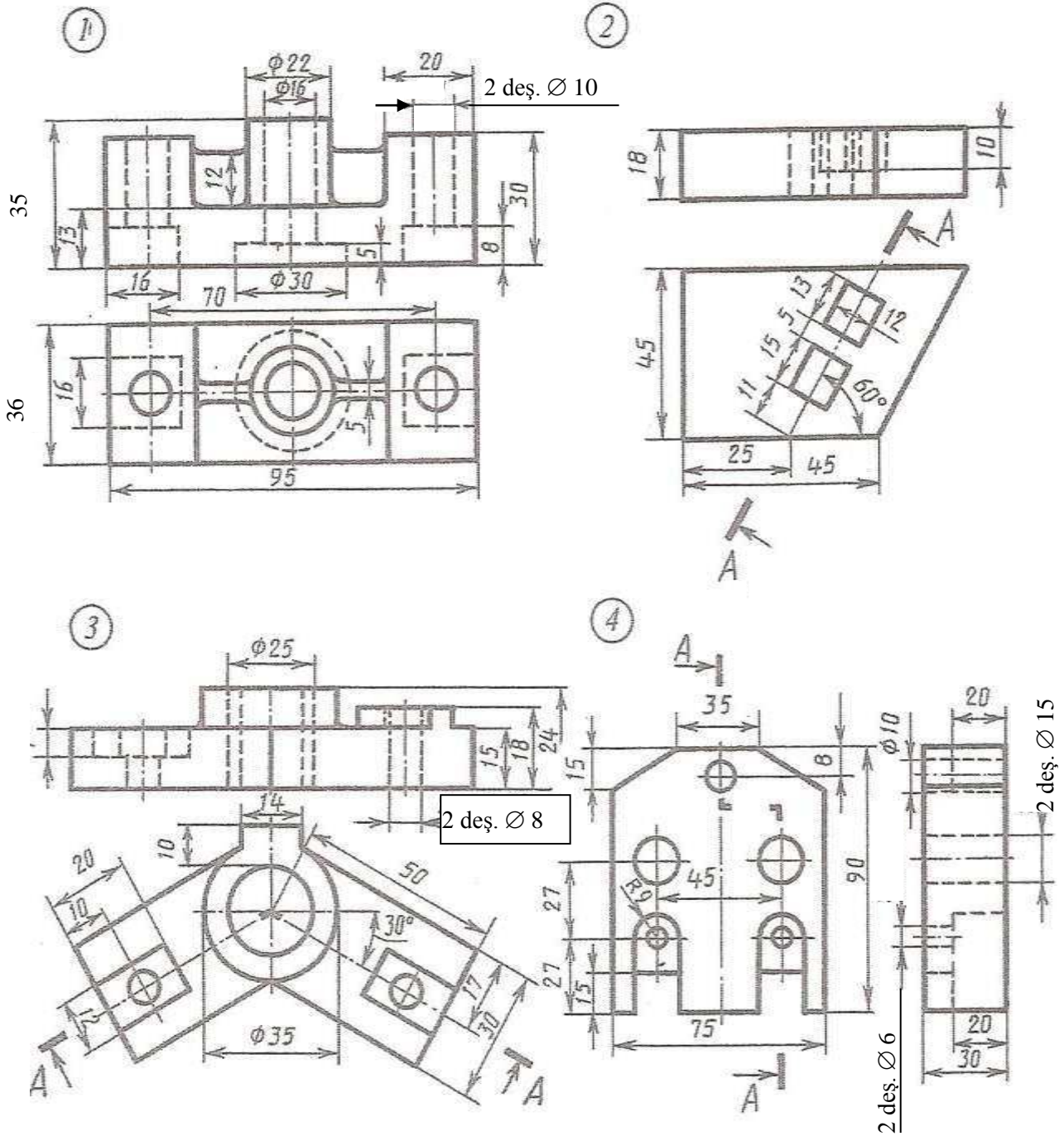
1. Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.

# ÝUMUŞ 64

Wariant 19



1. Öňünden görnüşini ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

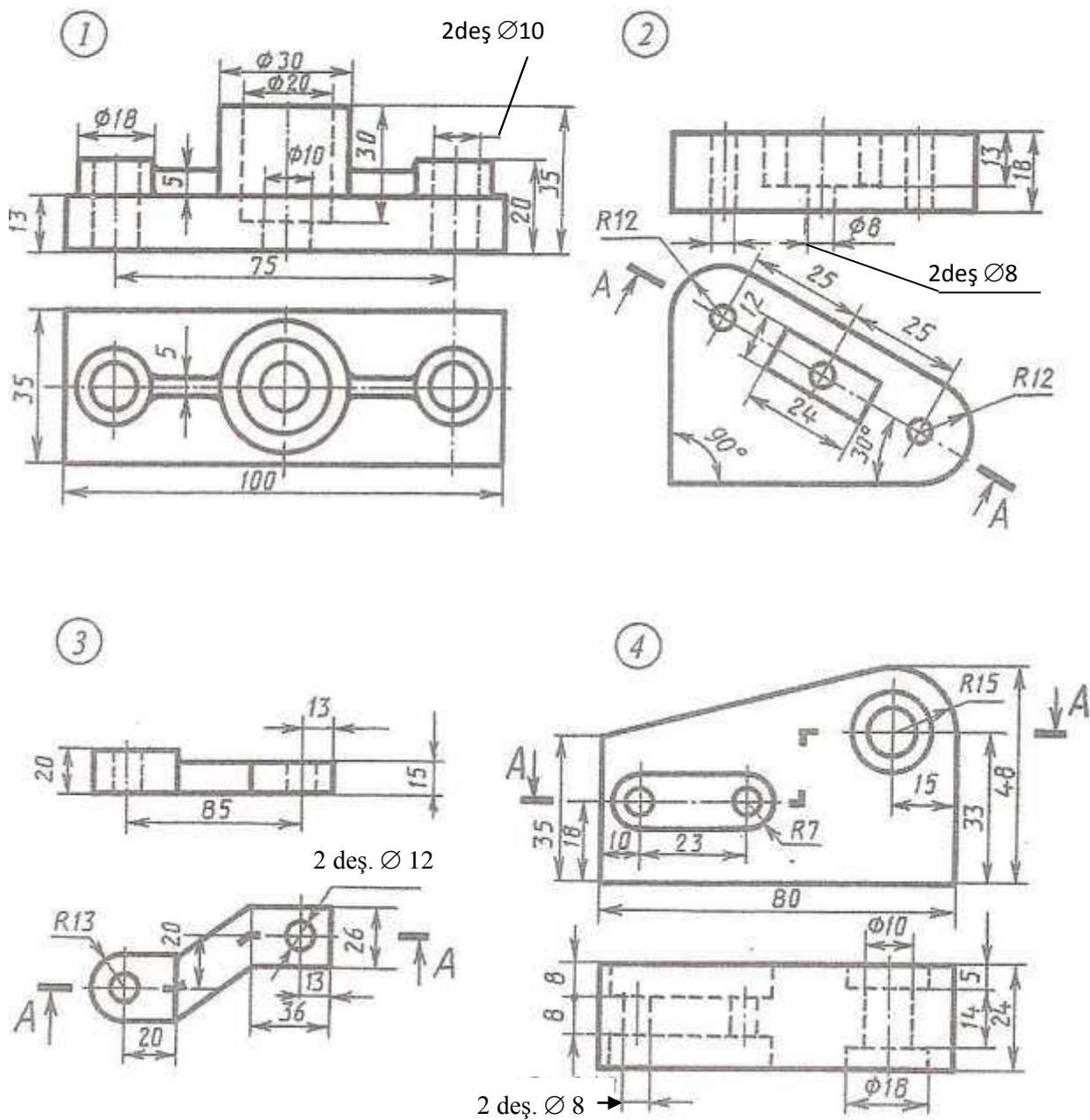


- 1.Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
- 2.Çepden görnüşi A-A ýaryk bilen çalyşmaly.
- 3.Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
- 4.Çepden görnüşi A-A ýaryk bilen çalyşmaly.
- 5.Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.



# ÝUMUŞ 64

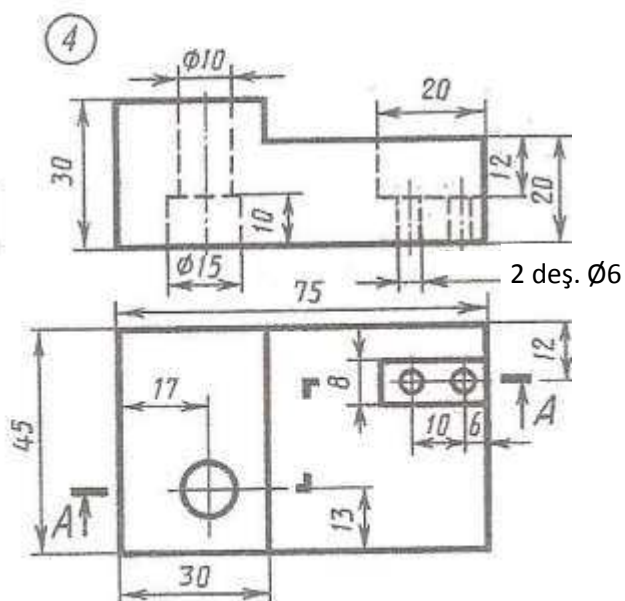
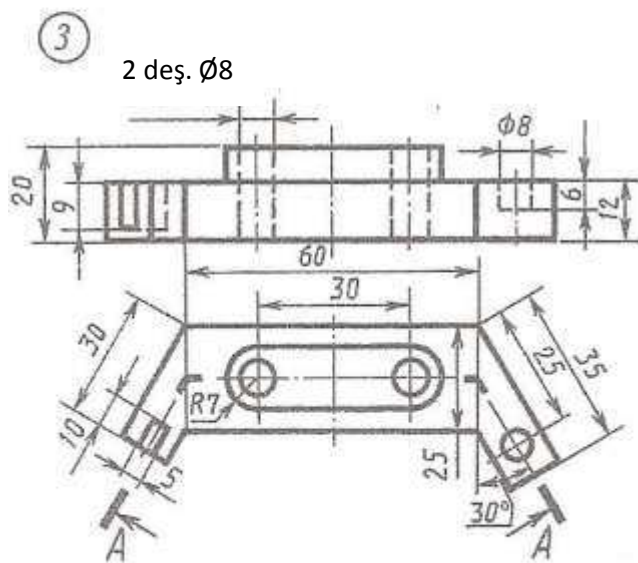
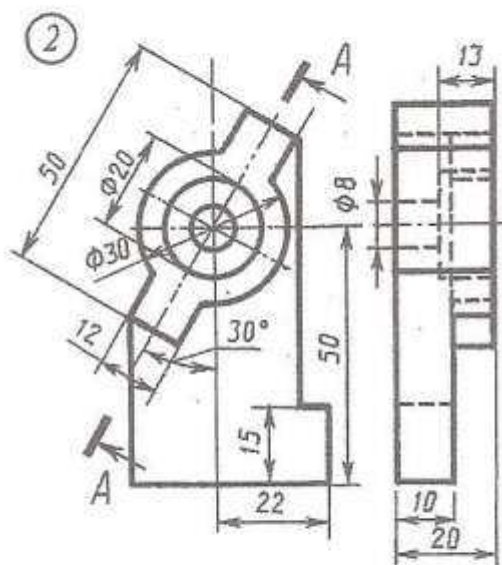
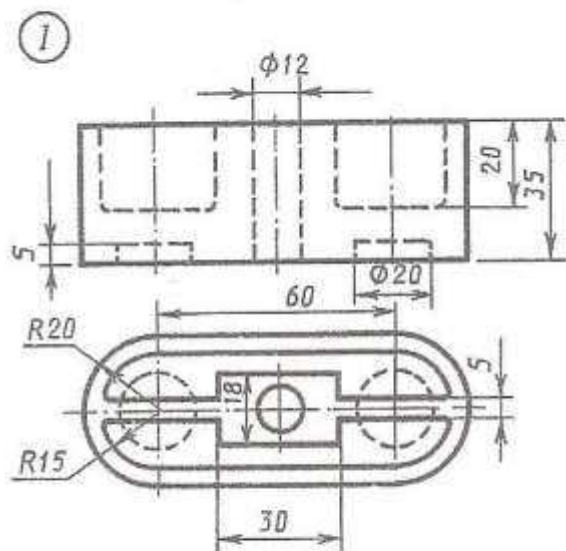
Wariant 21



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

# ÝUMUŞ 64

Wariant 22



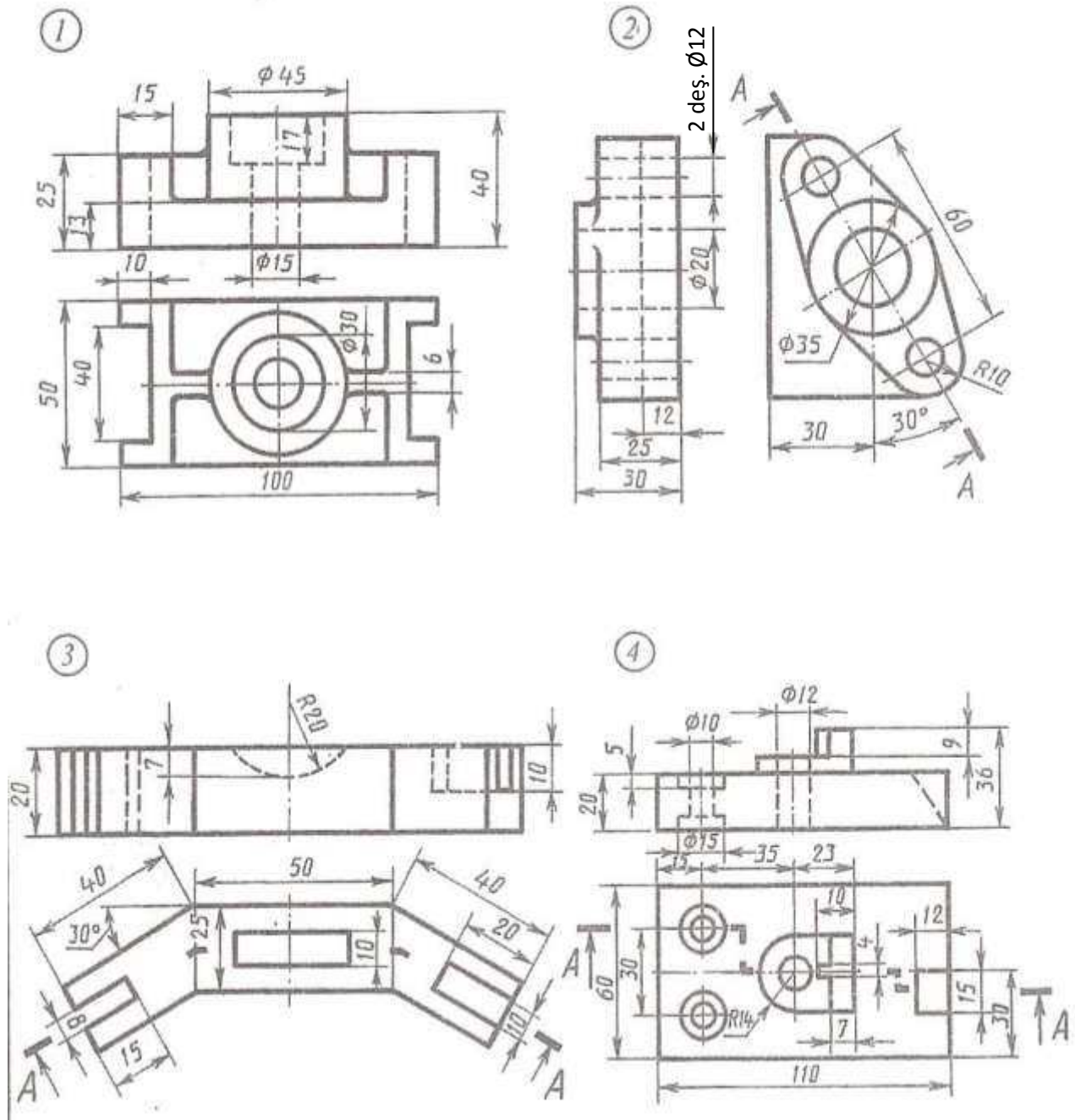
1.Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.

2.Çepden görnüşi A-A ýaryk bilen çalyşmaly.

3.Öňünden görnüşi A-A ýaryk bilen çalyşmaly.

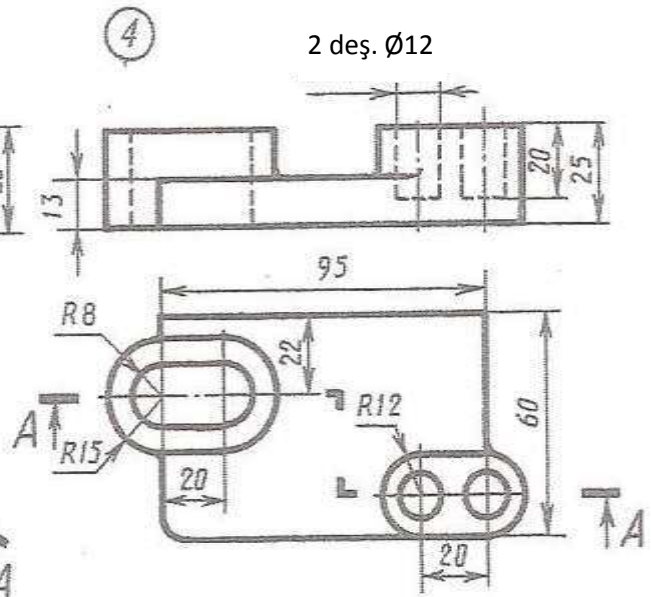
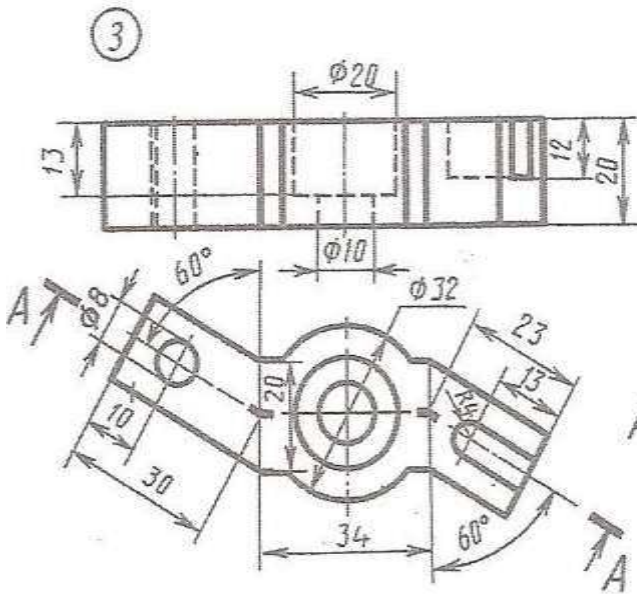
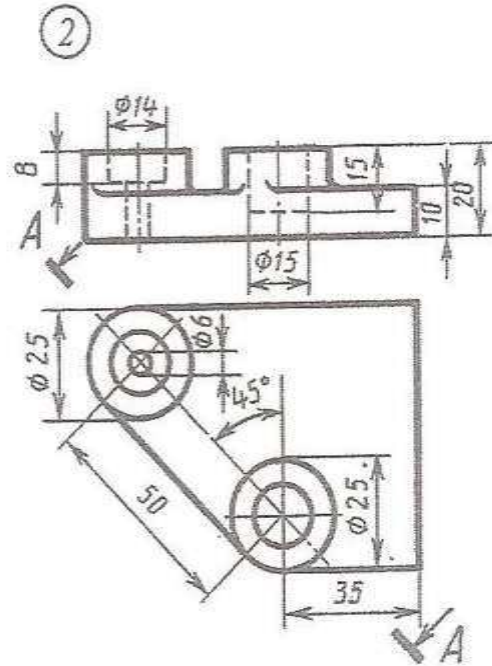
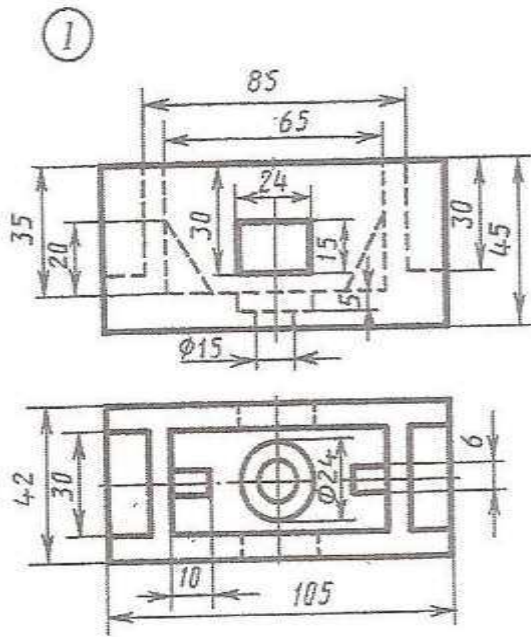
4.Çepden görnüşi A-A ýaryk bilen çalyşmaly.

5.Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

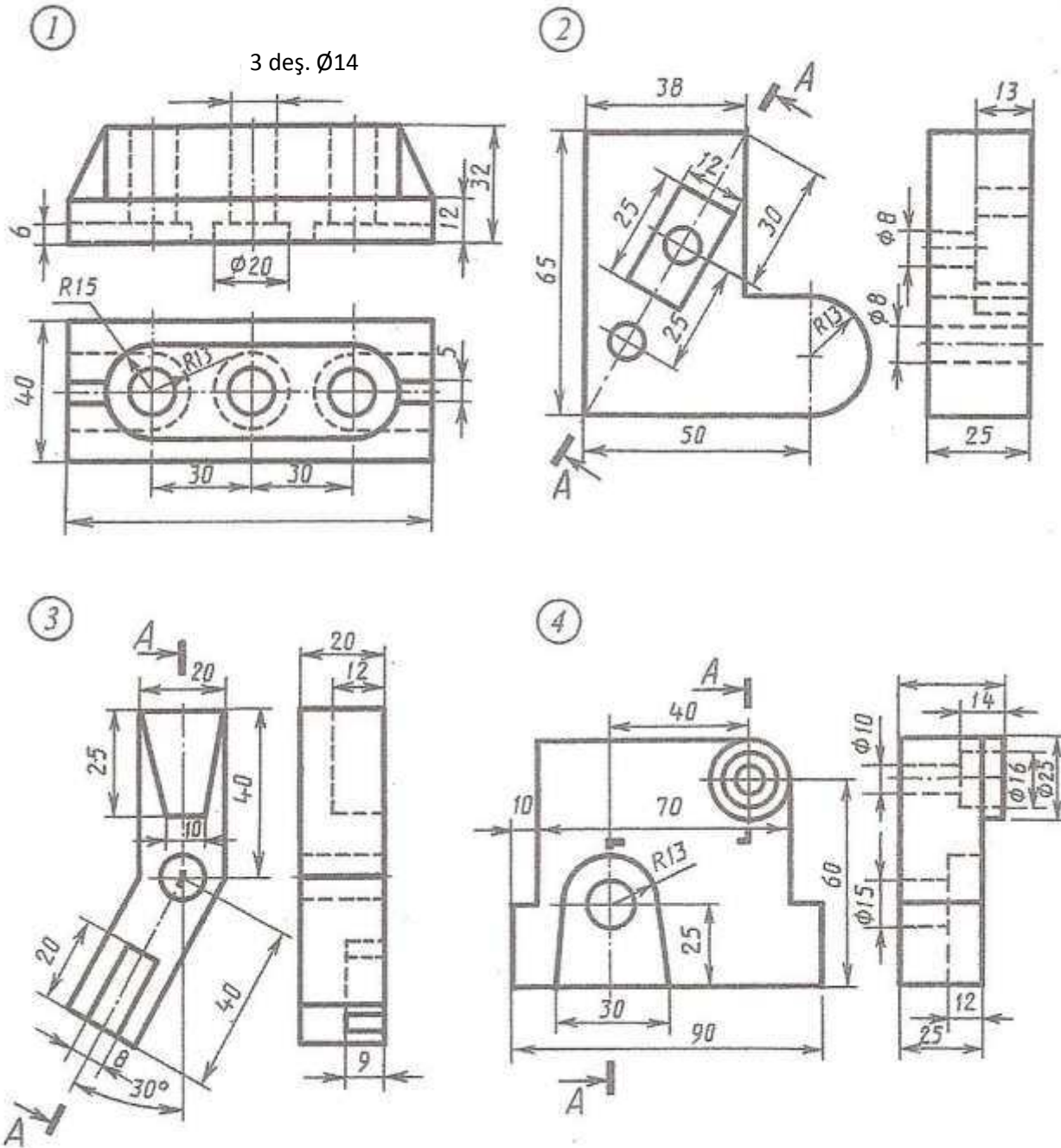




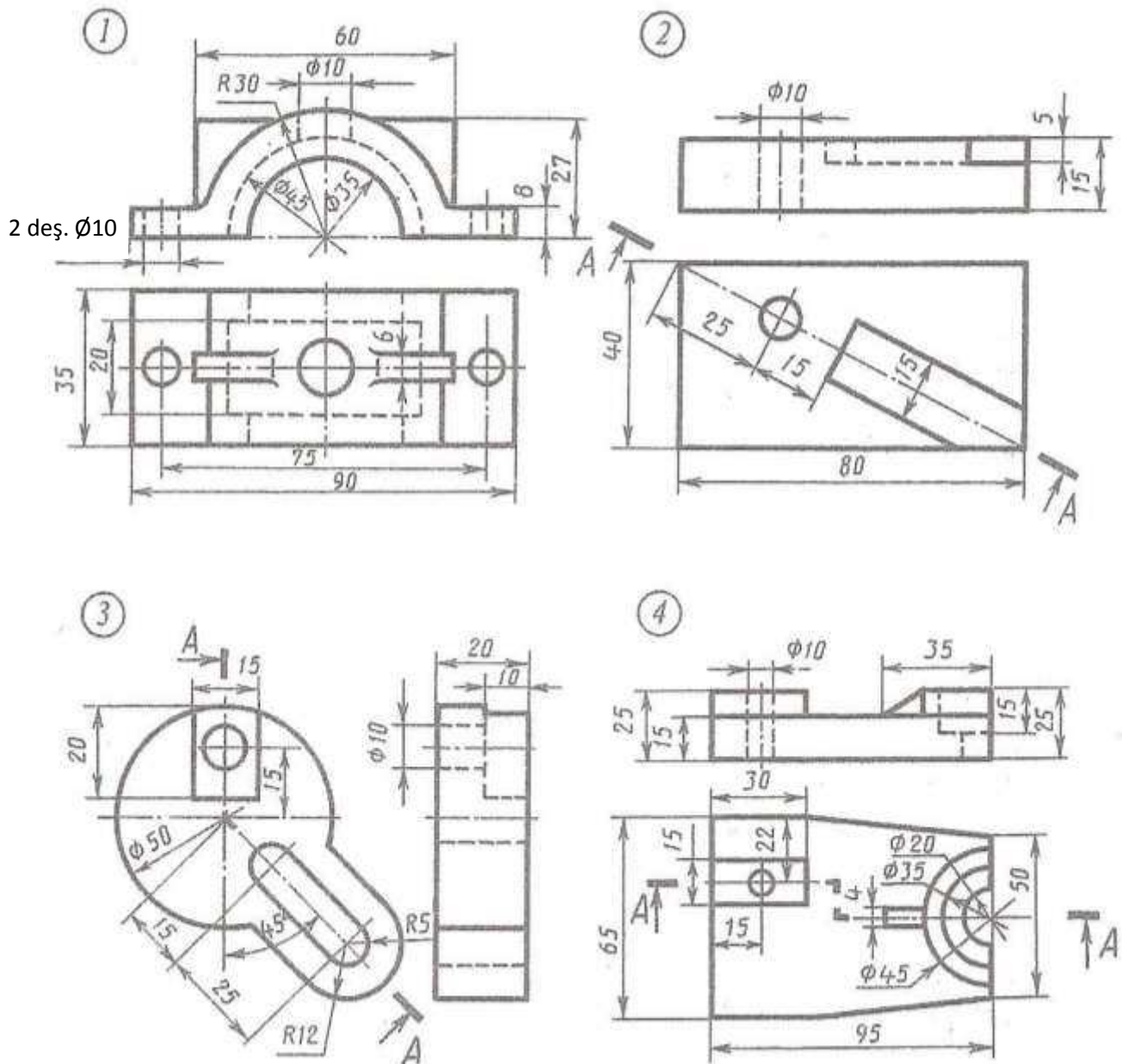
1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

# ÝUMUŞ 64

Wariant 25



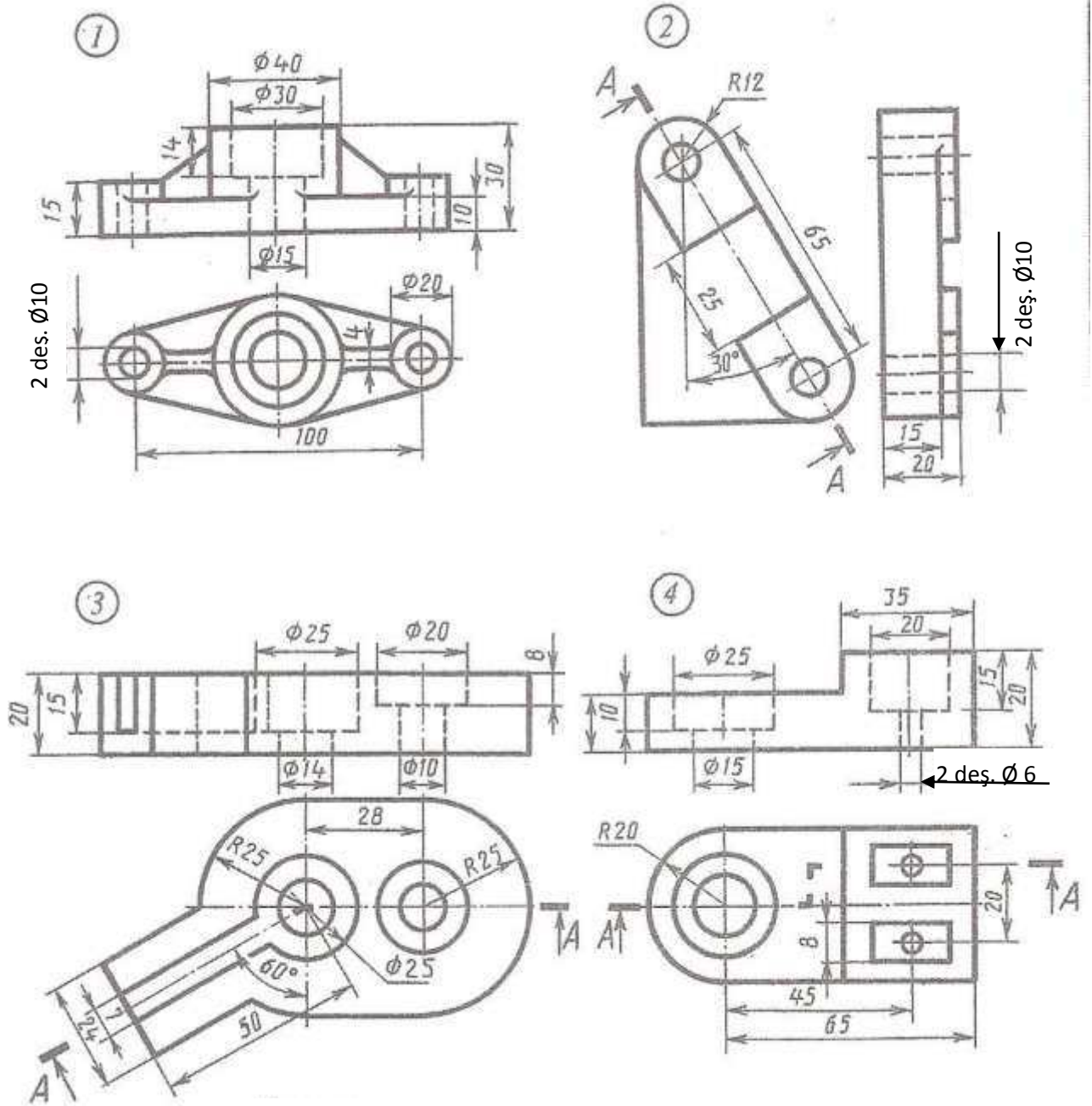
1. Öňünden görnüşiň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşi A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşi A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşi A-A ýaryk bilen çalyşmaly.



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.



Wariant 27

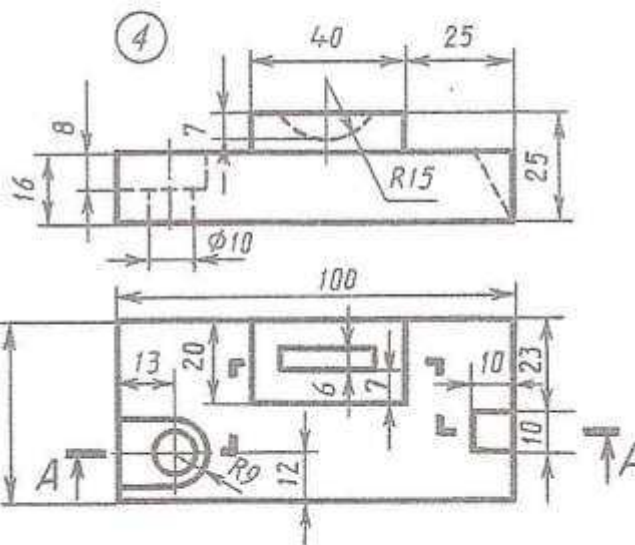
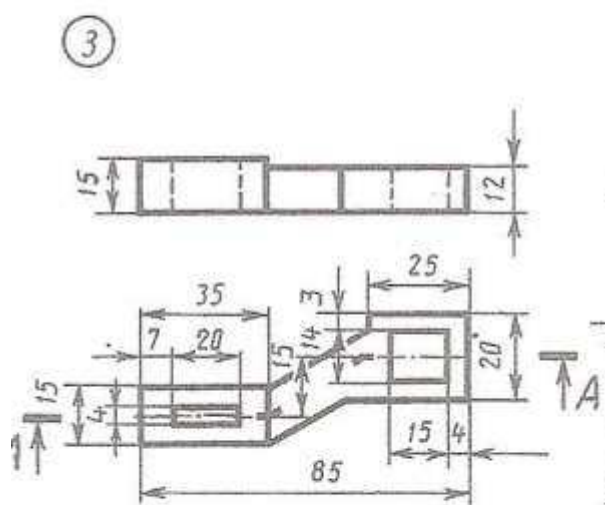
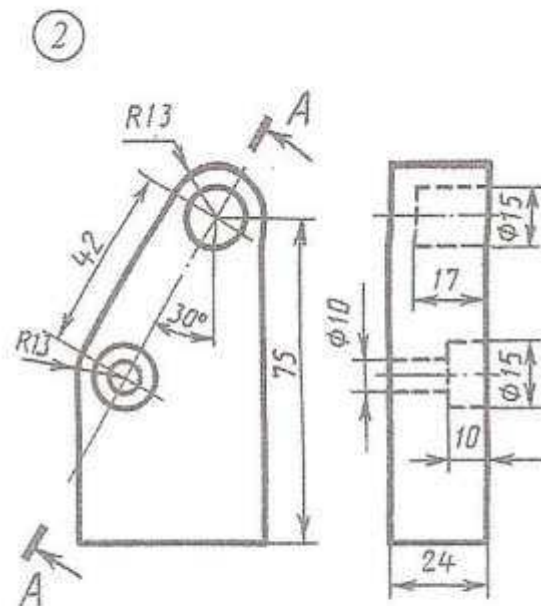
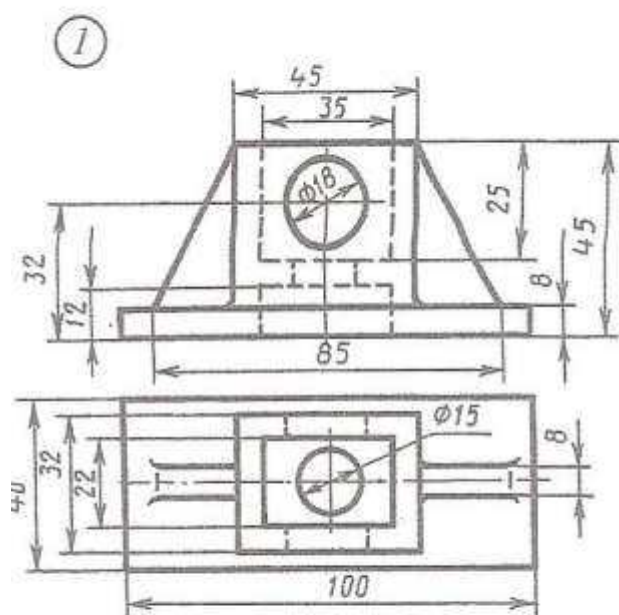


1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.



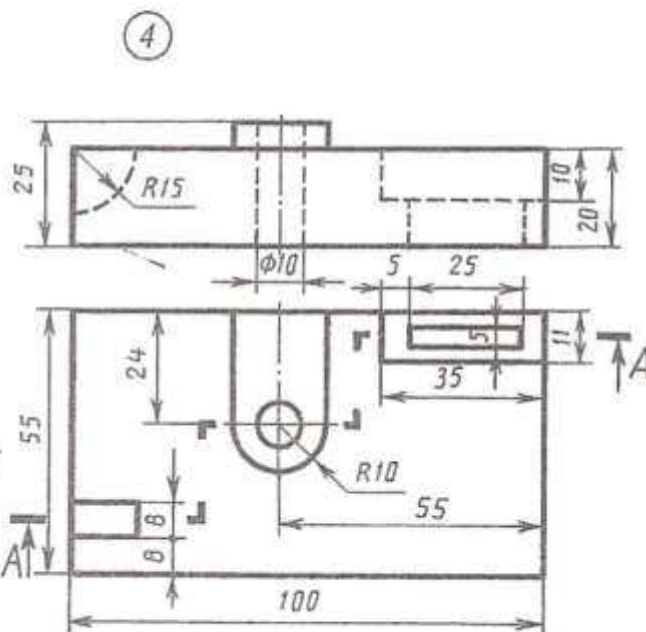
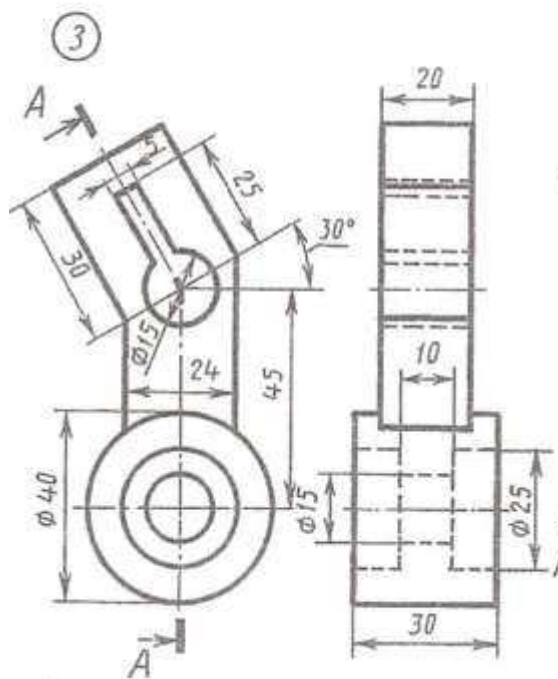
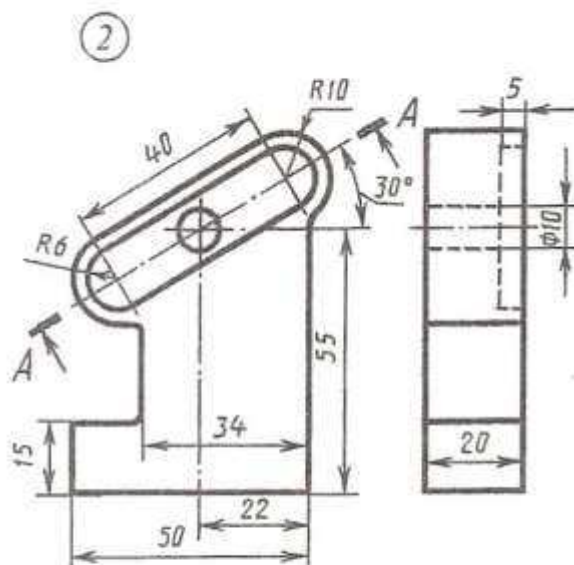
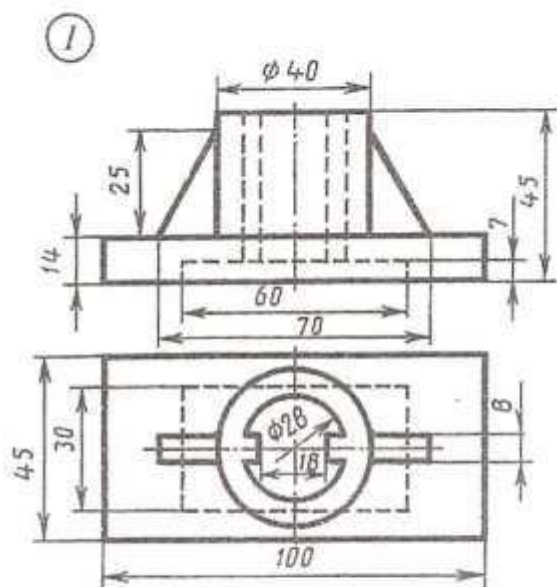
# ÝUMUŞ 64

Wariant 29



1. Öňünden görnüşiniň ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öňünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

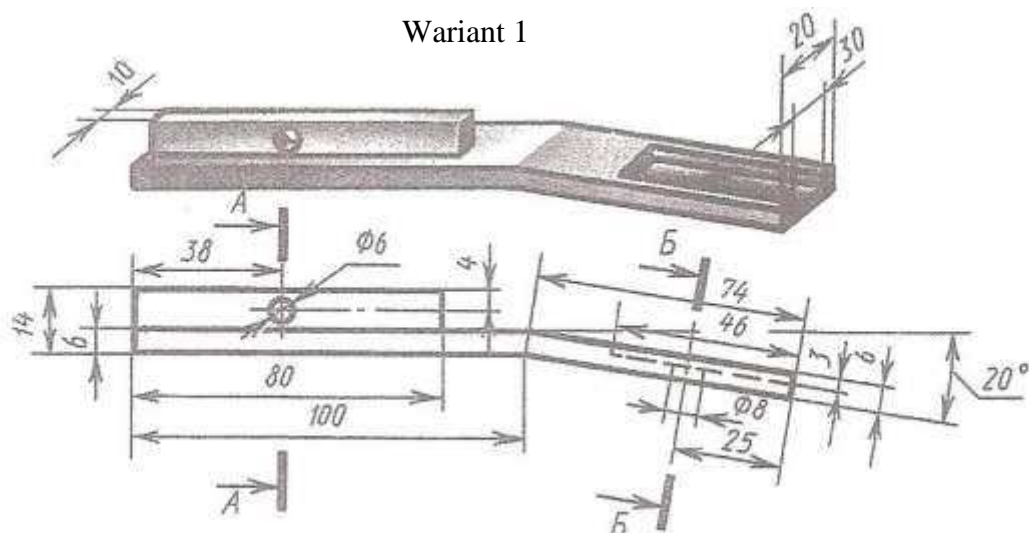




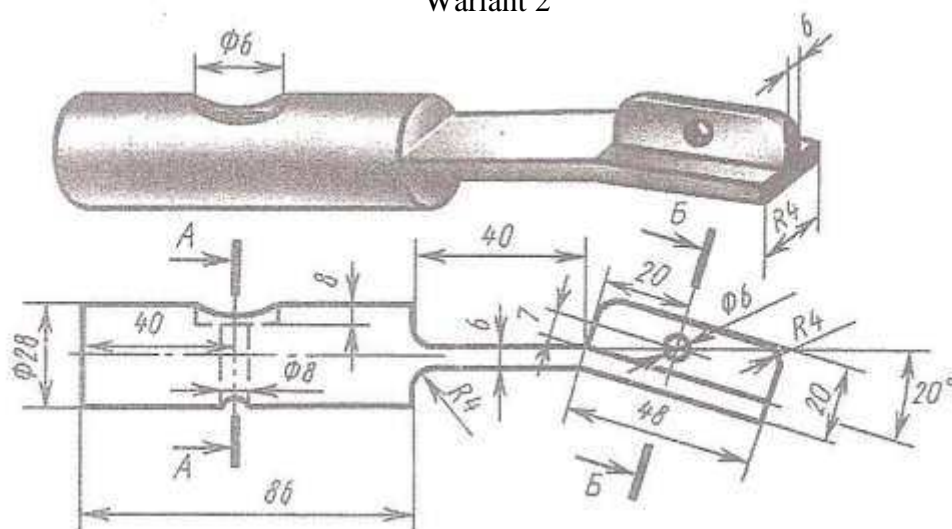
1. Öñünden görnüşini ýaryny frontal ýarygyň ýary bilen birikdirmeli.
2. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
3. Öñünden görnüşini A-A ýaryk bilen çalyşmaly.
4. Çepden görnüşini A-A ýaryk bilen çalyşmaly.
5. Ýokardan görnüşini A-A ýaryk bilen çalyşmaly.

## YUMUŞ 65

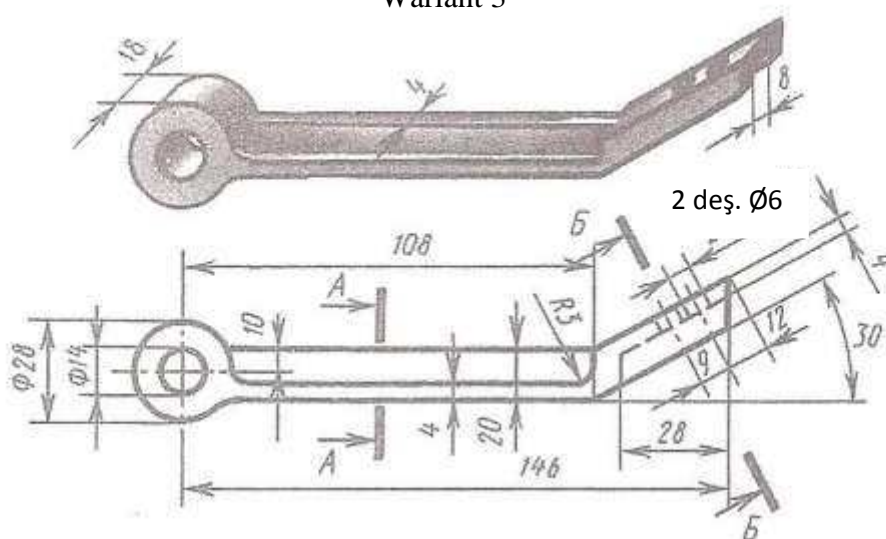
### Wariant 1



## Variant 2



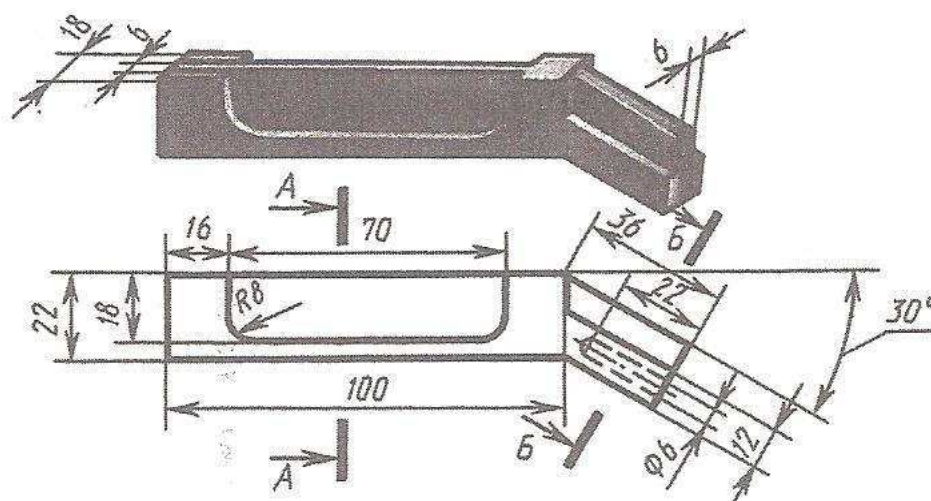
### Wariant 3



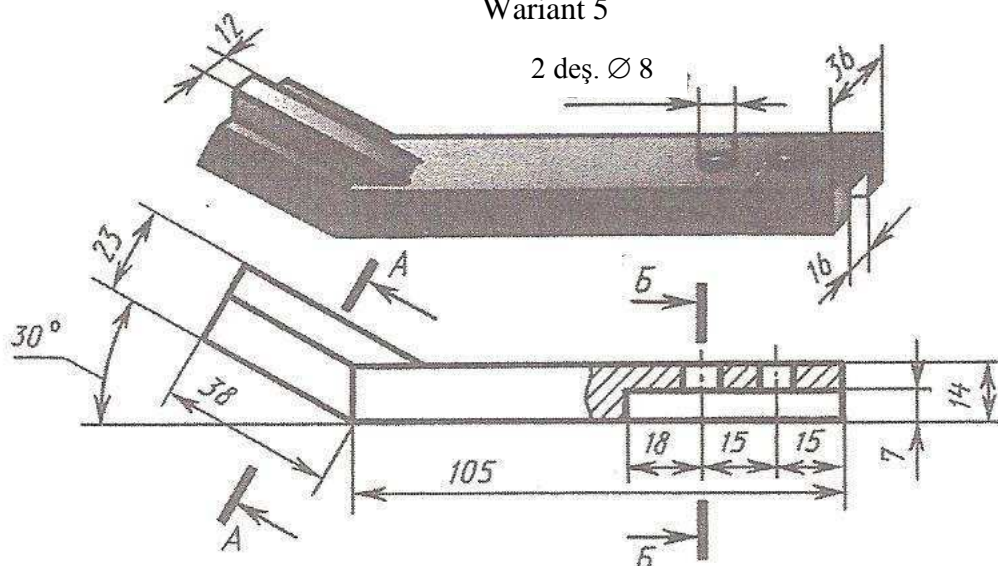
Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

# ЎМУШ 65

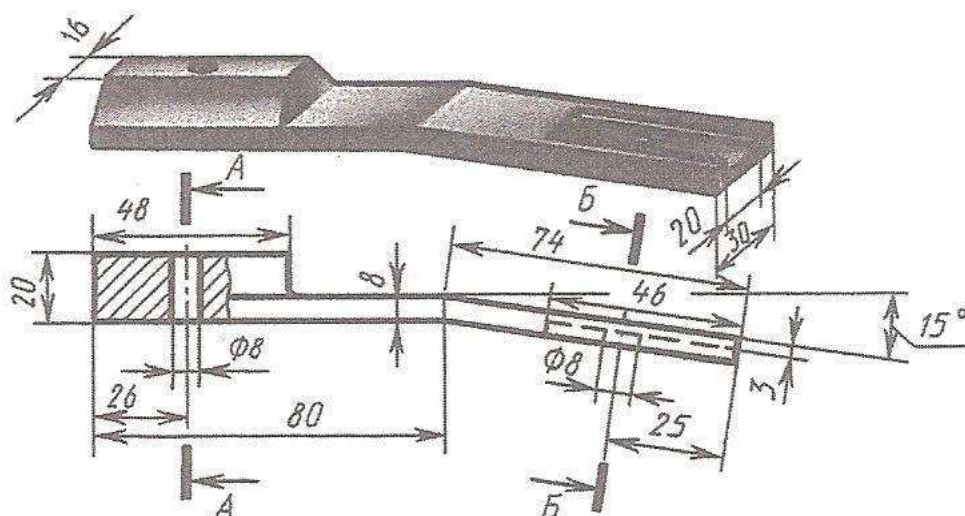
## Wariant 4



## Wariant 5



## Wariant 6

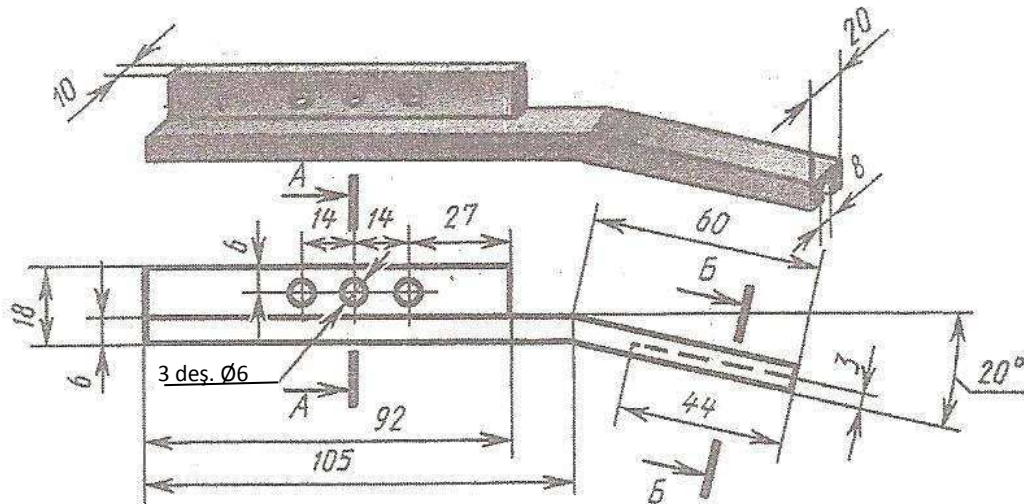


Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

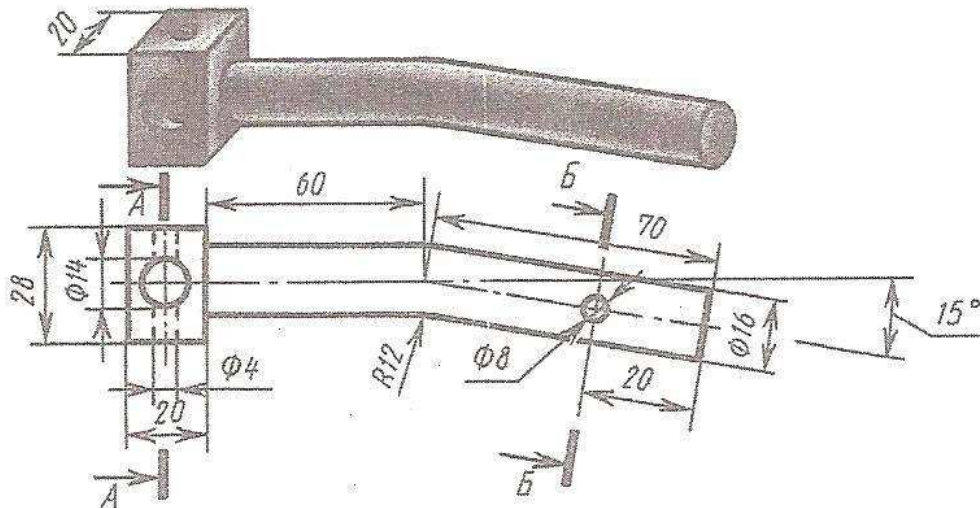


# ЎУМУШ 65

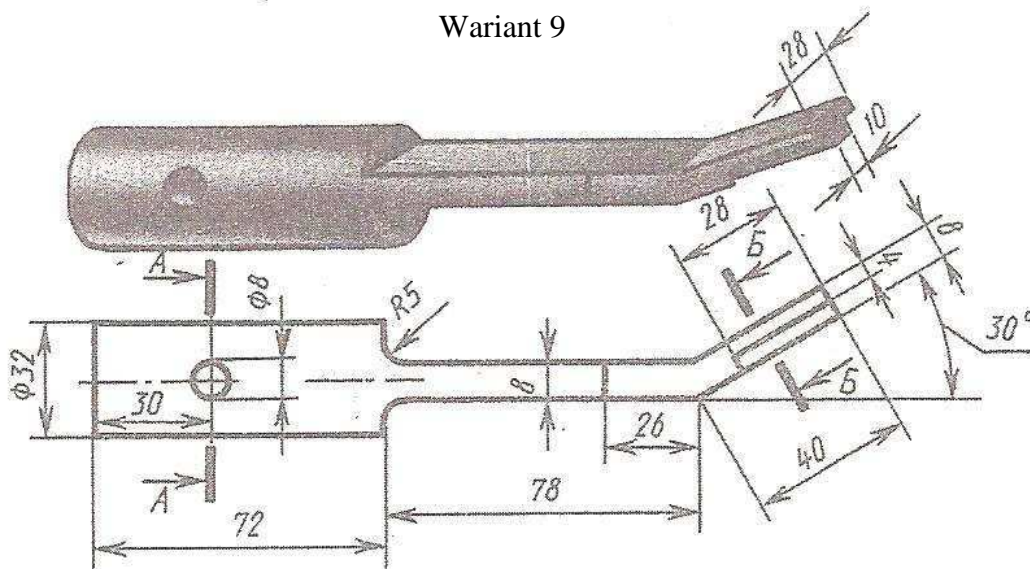
Wariant 7



Wariant 8



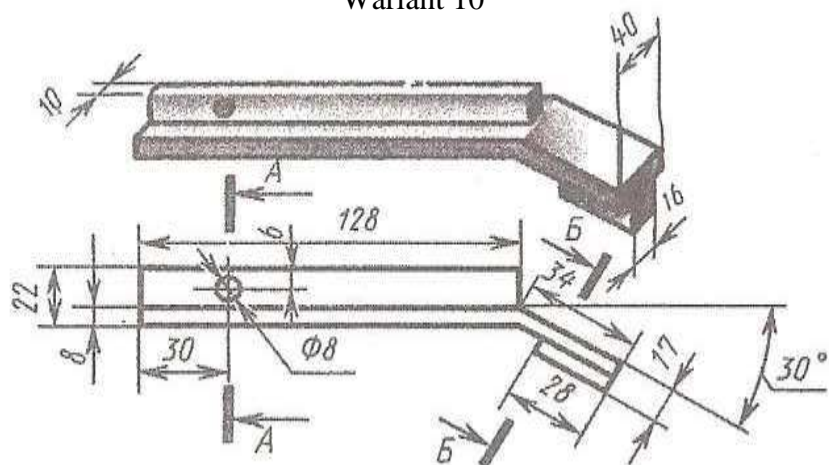
Wariant 9



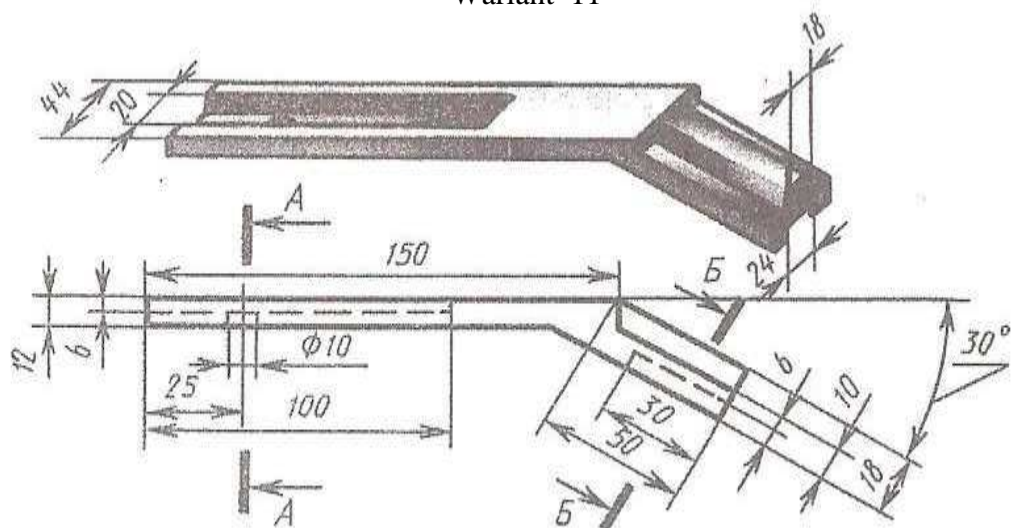
Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

# ЎМУШ 65

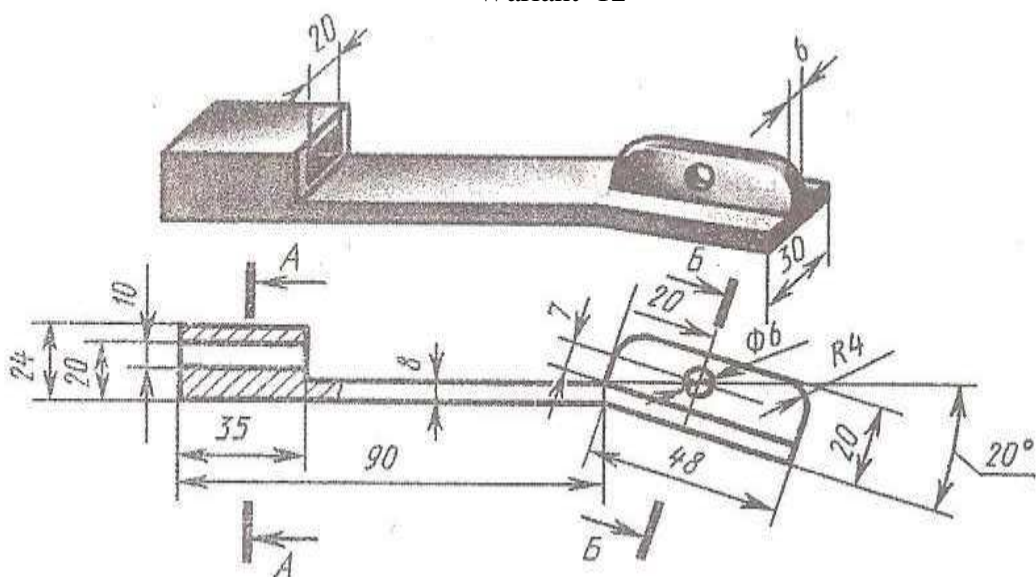
Wariant 10



Wariant 11



Wariant 12

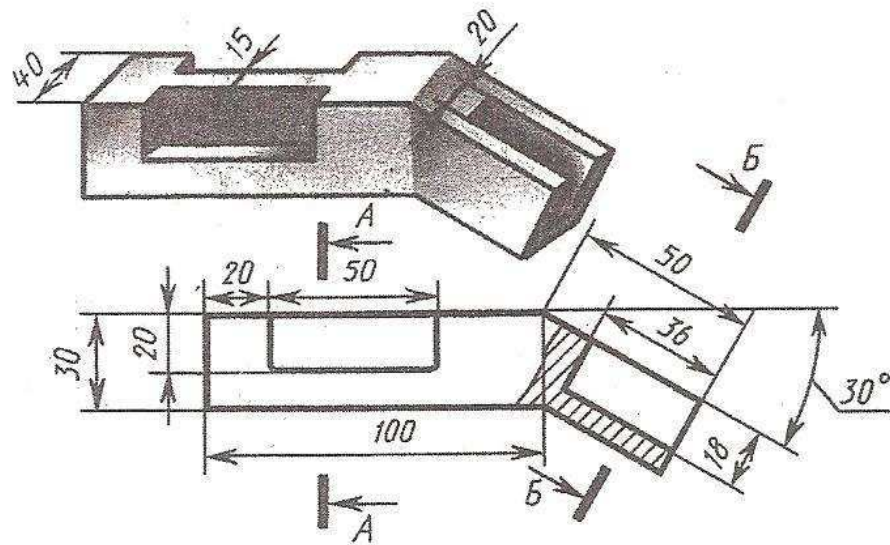


Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

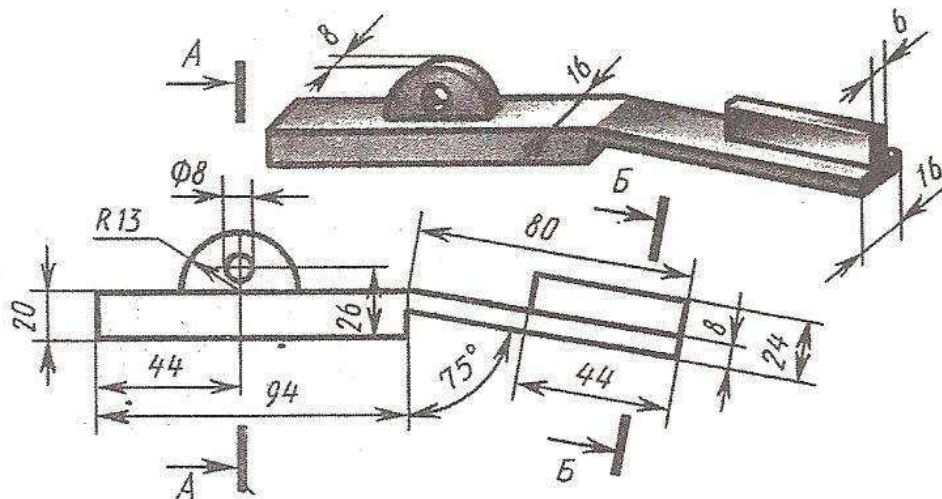


# ЎУМУШ 65

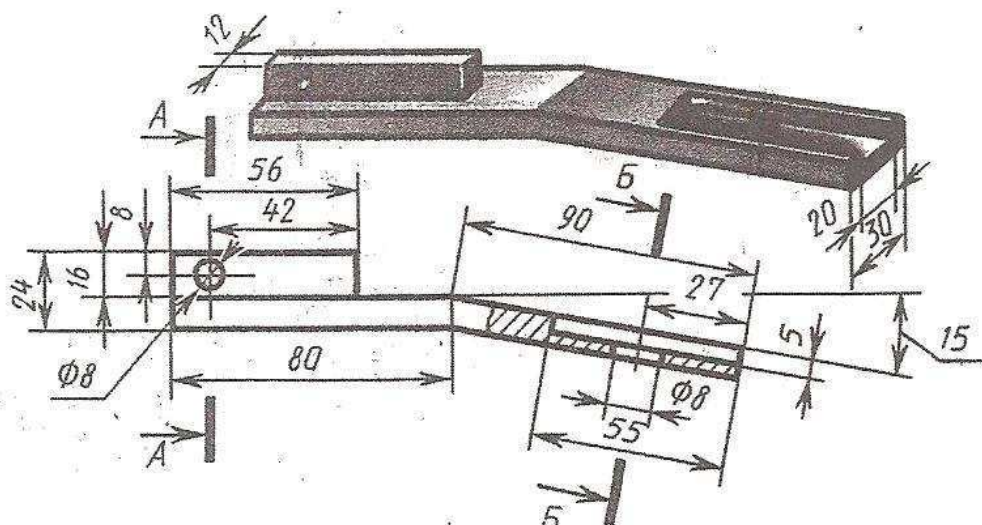
Wariant 13



Wariant 14



Wariant 15

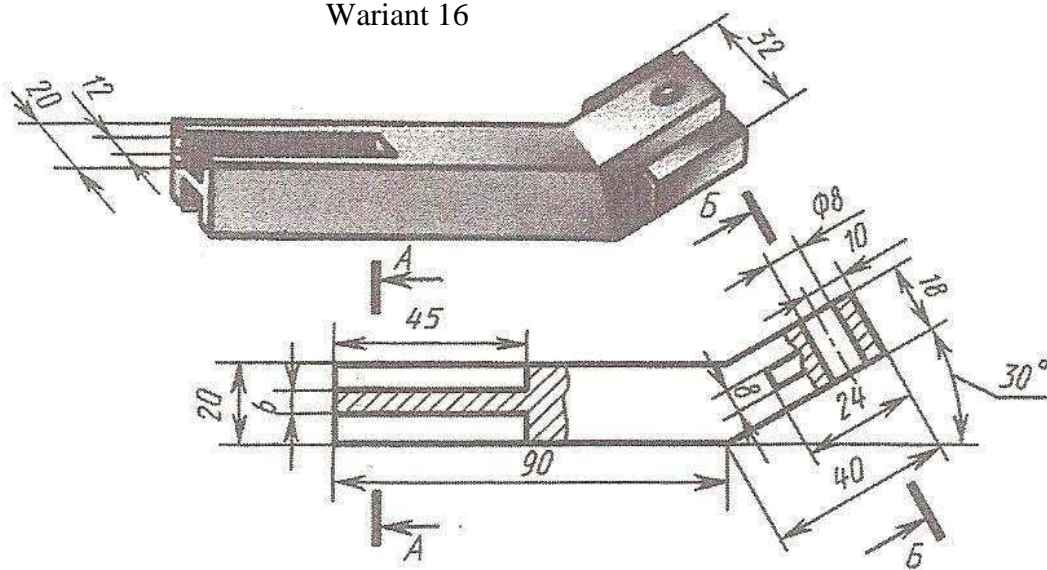


Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

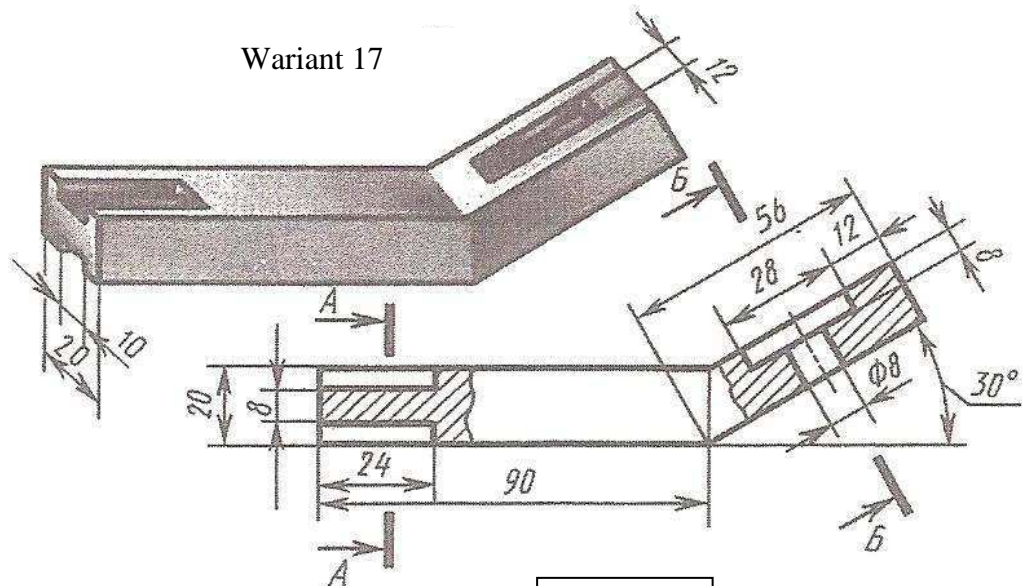


# ÝUMUŞ 65

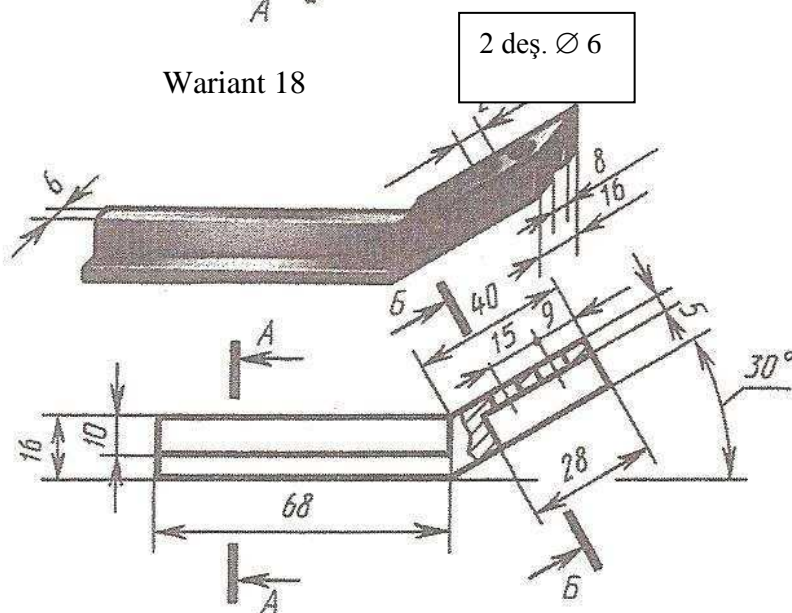
Wariant 16



Wariant 17



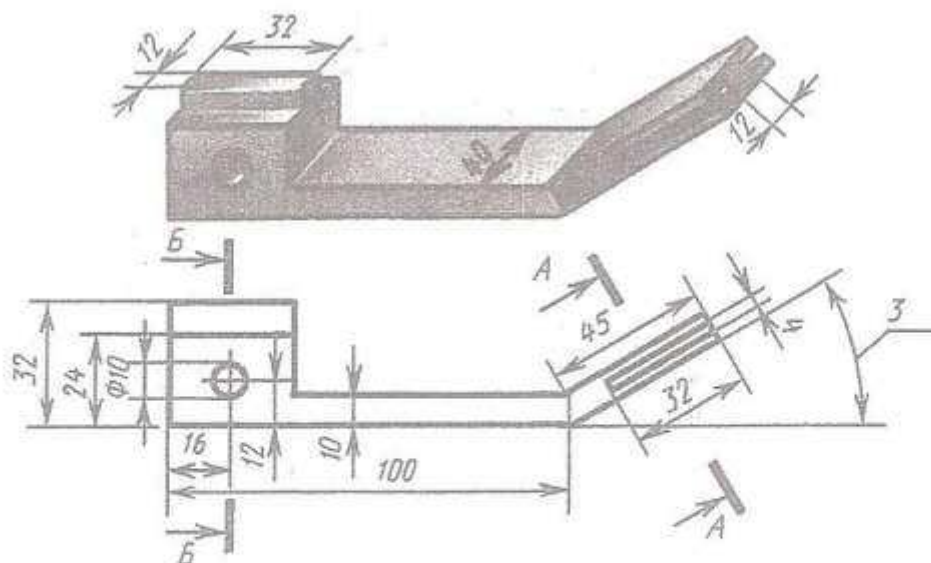
Wariant 18



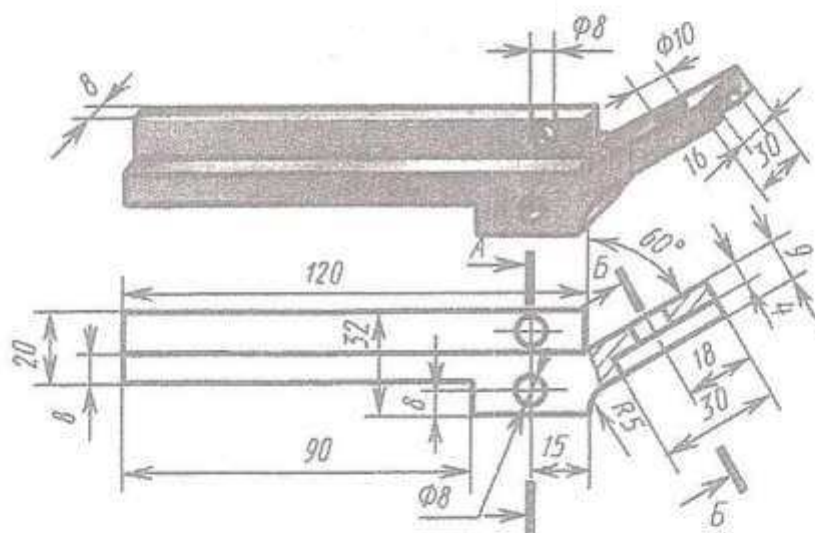
Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

# ЎМУШ 65

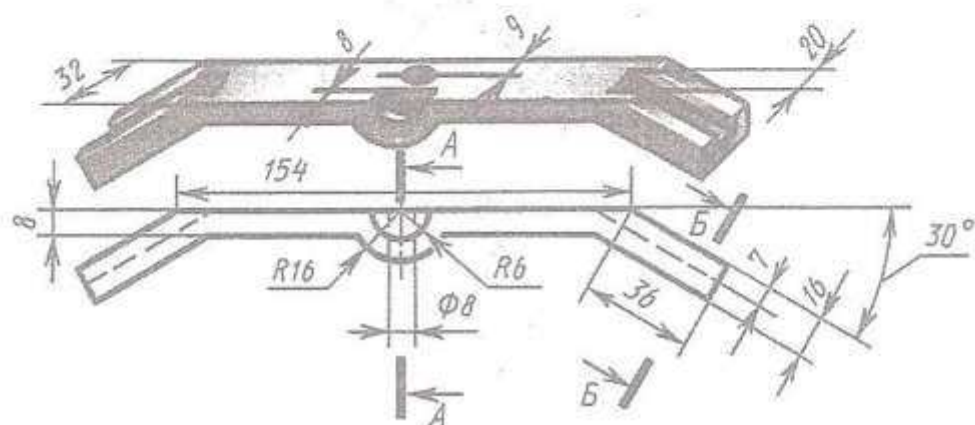
Wariant 19



Wariant 20



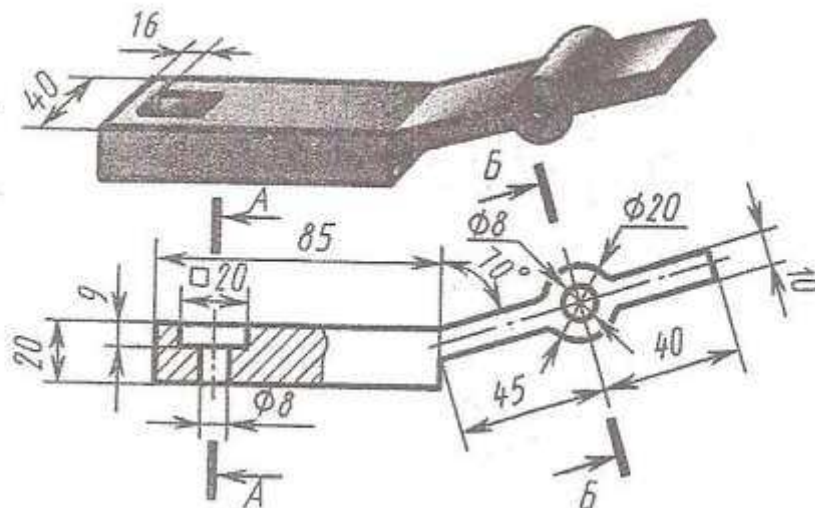
Wariant 21



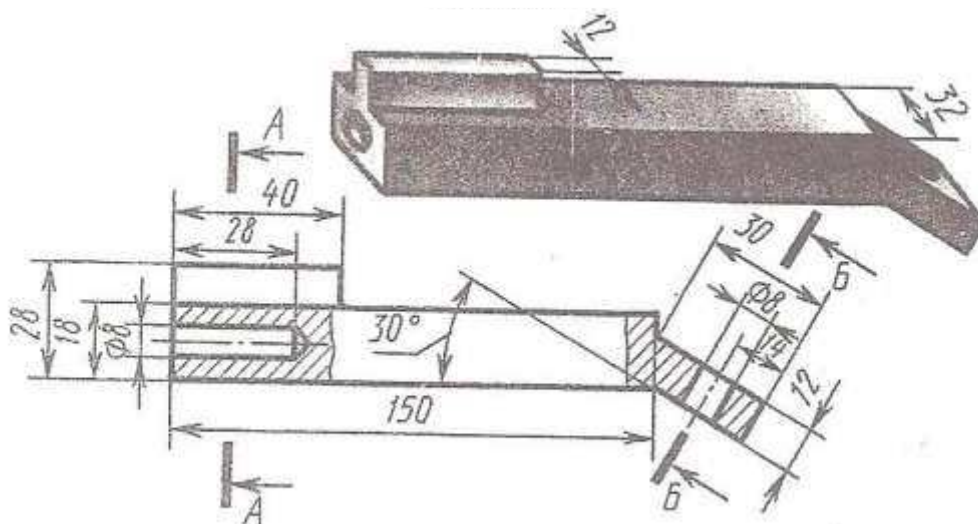
Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

## YUMUŞ 65

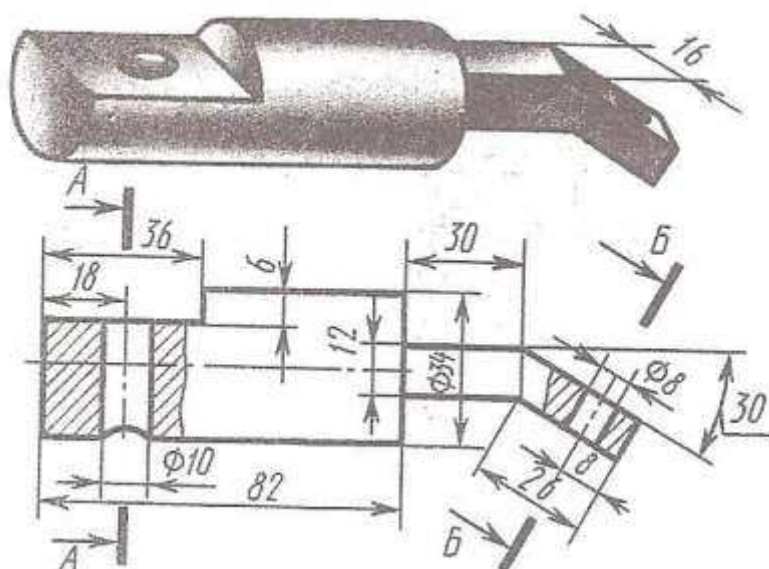
## Wariant 22



### Wariant 23



### Wariant 24

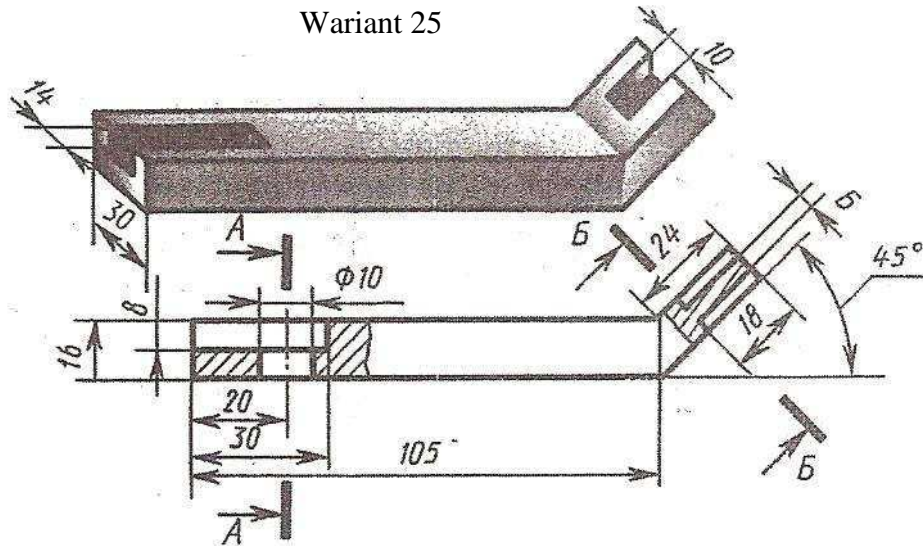


Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).

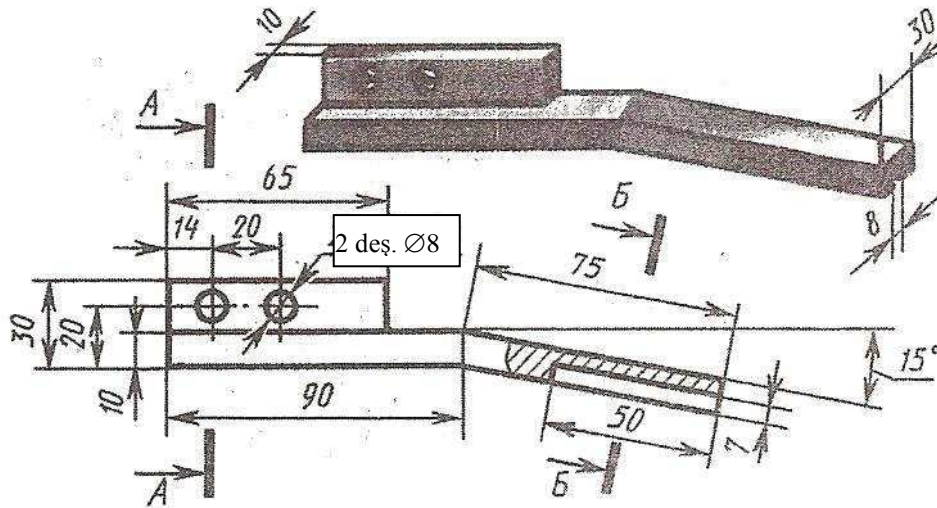


## YUMUŞ 65

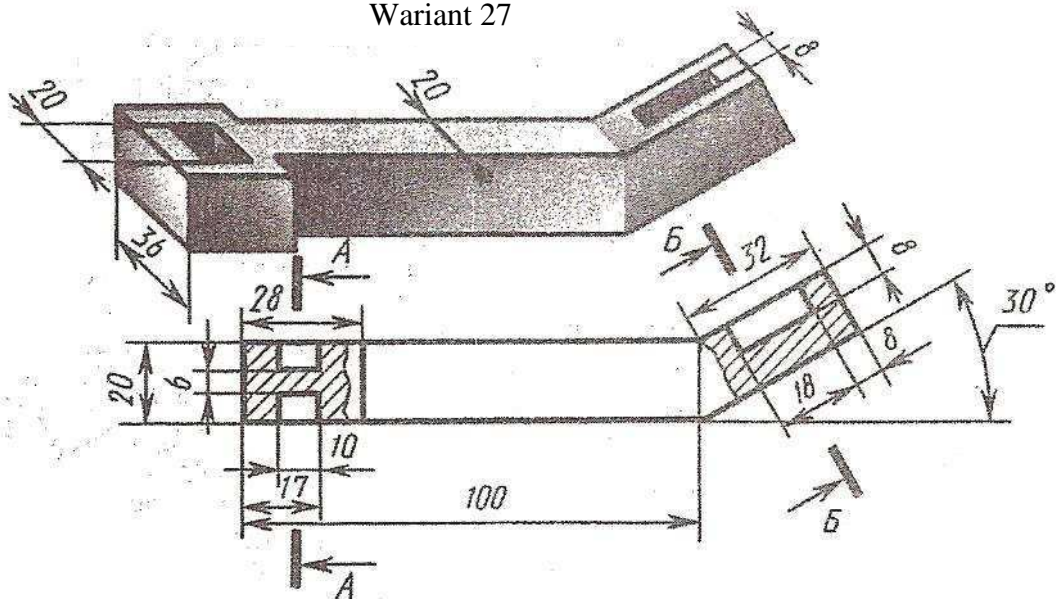
### Wariant 25



### Wariant 26



### Warient 27



Şaýyň esasy görnüşini we görkezilen kesigini ýerine ýetirmeli. Gurulan şekilde ölçegleri goýmaly (ölçegleriň bir topary şaýyň aýdyň şekilinde görkezilen).



## 17.Shemalar we olaryň ýerine ýetirilişi

Shemalar hakynda umumy düşünje. Häzirki zaman giňden ýaýran tehnikalaryň maşynlaryň, enjamlaryň we gurluşlaryň işleýişleri mehaniki, pnevmatiki, gidrawliki we elektrik gurluşlaryň jeminiň täsirinde kesgitleýär.

Çyzgy boýunça şeýle gurluşlaryň hereketleriniň esaslaryny we yzygiderligini öwrenmek juda kyn.Şol sebäpden çyzgydan başgada gurluşyň ol ýa-da beýleki bölekleriniň hereketleriniň esaslaryna we yzygiderligine baş çykarmaga has tiz mümkinçilik berýän ýörite shemalar düzülip bilner.

Shema diýlip konstruktorçylyk resminasyna aýdylýar. Shemada önümi düzüji bölekler ýa-da gurluşlar we olaryň arasyndaky baglanyşyk şertli grafiki şekillerde berilýär.

Shemalaryň hilleri,görnüşleri we olary resmileşdirmekligiň umumy talaplary TDS 2.701-84 (CTCƏB 651-77) görkezilen.

TDS 2.701-84 talaplaryna laýyklykda önümleriň düzümine girýän böleklere baglylykda shemalar aşakdaky görnüşlere bölünýärler:elektrik, gidrowlik, pnevmatik, gaz, kinematik, wakuum, optiki, energetiki, bölüji, kombinirlenen.

Esasy niýetlenen işine baglylykda shemalar aşakdaky hillere bölünýärler:

**Umumy shemalar**-toplumy düzüji böleklerini we ulanylýan ýerinde özara birleşdirilişini kesgitleýär.

**Ýerleşiş shemalary** – önümi düzüji bölekleriň, şeýle hem simleriň işilen simleriň, gömmesimleriň, trubageçirijileriň we ş.m. birek – birege görä ýerleşişlerini kesgitleýär.

**Birleşdirilen** – bir önüm üçin çykarylan iki we ondanam köp hili shemalardan düzülen konstruktorçylyk resminamadyr.

Eger-de önümiň düzümine dürli görnüşli elementler (bölekler) girýän bolsa, onda oňa birnäçe bir hilli laýyk gelyän görnüşli shemalar işlenip taýýarlanylýarlar. (Mysal üçin prinsipial elektrik we prinsipialpnewmo shemasy) ýa – da kombinirlenen shema (mysal üçin prinsipial elektropnewmo shemasy). Kähalatlarda bir görnüşdäki shemada başga görnüşdäki shemanyň elementini (bölegini) çyzmak rugsat edilýär, eger-de şol berlen shemanyň işleýişini täsir edýän bolsa, ýa-da önüme degişli bolmadyk emma şol önümiň işleýiş prinsipini düşündirmäge zerur bolan elementleri hem şekillendirmek bolar. Bu elementler shemada ştrih punktirli çyzyklar bilen saýlanylýarlar, çyzyklaryň ýogynlygy baglanyşyk çyzygy ýalydyr we olaryň ýanynda gerekli maglumatlar ýerleşdirilýär (mysal üçin şol elementleriň ýerleşýän ýerini habar berýän).

Pudaklardaky standartlaryň kesgitleän nomenklaturalaryna laýyklykda utgaşdyrylan (biri-birine gabat gelyän) shemalary taýýarlamak rugsat edilýär, ýagny bir hili shemada başga hili shema mahsus häsýetli maglumatlary



ýerleşdirmek (mysal üçin önümi sepleme, gurnama shemada daşky birikdirmäni görkezmeklik). TDS 2.701-84 tarapyndan görkezilmedik ýöne pudaklaýyn standartlar tarapyndan tassyklanan shemalaryň görnüşlerini we hilini işläp taýýarlamak rugsat edilýär. Shemanyň adyny onuň görnüşini we hilini kesgitleýär. Kombinirlenen shemanyň ady shemanyň görnüşiniň we shemanyň hilini sazlaşmagyna baglylykda kesgitlenýär (mysal üçin gidropnewmo prinsipial shemasy). Bilelikdäki shemalaryň atlary shemanyň görnüşleriniň we shemanyň hilleriniň sazlaşygy esasynda kesgitlenýär (mysal üçin elektrik birleşdirme we birikdirme shemasy).

Shemalara harplar we sanlar arkaly kod (şertli bellikler ) dakylýar. Harplar shemanyň görnüşini kesgitleýär, sanlar bilen shemanyň hili aňladylýar.

Shemalaryň görnüşleri aşakdaky harplar bilen bildirilýär: E(Э) – elektriki; G(Γ) – gidrawliki; P (Π) – pneumo; H(X) – gazly; K – kinematiki; W(B) – waakumly; L(Л) – optiki; P – energetiki; Ýe.(Е) – önümi düzüji böleklere bölmek, S(C) – kombinirlenen.

Shemalaryň hilleri sanlar bilen aňladylýarlar:

1. Struktura gurluş (düzüm).
2. Funksional (baglanyşykly).
3. Prinsipial (doly).
4. Birleşdirme (montaž).
5. Birikdirme.
6. Umumy.
7. Ýerleşdirme.
8. O – bilelikdäki.

Shemalaryň kodlarynyň aňladylyşynyň mysallary: Gidrawliki birleşdirme shemasy - Γ 4 , elektrogidropnewmokinematiki prinsipial shema – C3, elektrik birleşdirme we çatma shemasy – Э0.

Shemalar standart formatlarda TDS 2.104-68 esasynda, esasy ýazgy bilen ýerine ýetirilýär.

Shemalar ýerine ýetirilende masştab berjaý edilmeýär. Önümi düzýän bölekleriň giňişlikdäki hakyky ýerleşiş ýagdaýlary shemada nazara alynmaýar, düzgüne görä shemada önümiň düzümine girýän bölekler YKRU-da standart bilen berkerar edilen şertli grafiki belgiler bilen şekillendirilýär. Shemalaryň elementleriniň arasyndaky (bölekleriň) şertli belgilenişi we baglanyşyk çyzyklarynyň ýerine ýetirilişi tablisalarda görkezilen.

Aşakdaky tablisalarda TDS tarapyndan bellenilen, umumy peýdalanylýarn (ulanylýan) şertli belgiler görkezilen.

Shemalarda döwürler we kesişme çyzyklar seýrek bolmalydyr. Shemalary aýdyňlyk üçin zeňletmek bilen, okamaga amatly bolar ýaly jaýlaşykly ýerine ýetirilýär.

Elementleri (bölekleri) aýratyn gurluşdan ybarat bolan ýagdaýynda, şol gurluşlaryň atlaryny görkezmek bilen shemalarda inçe şitrih – punktir çyzyklar arkaly tapawutlandyrmak rugsat edilýär.

## **Prinsipiýal shema.**

Okuw şertlerinde köplenç halatlarda prinsipiýal shemalar ulanylýar. Aşakdaky mysal edilip getirilen shemalarda (sur.77,78,79) olaryň ýerine ýetiriliş düzgüni şekillendirilen. Shemada şekillendirilen her bir elementiň öz şertli belgilenmesi tertip san belgisi ýa-da harp-san ýerleşiş belgilenmesi bolmalydyr. Shemanyň her bir görnüşi üçin şeýle belgilenmäniň düzgünnamasay kesgitlenendir. Gidrawliki, pnevmatiki we elektrik shemalarda bu belgilemeler elementleriň sanawynda tablissa görnüşinde ýokardan aşak ýazyp doldurylýar. Elementleriň sanawy düzgün boýunça esasy ýazgydan ýokarda ýerleşdirilýär. Ähli sanaw üçin esasy ýazgynyň ýokarsynda ýer tapylman ýagdaýynda galan bölegini esasy ýazgynyň çep gapdalynda ýazmak rugsat edilýär. 76-njy suratda çyzgyda sanawyň ýerleşdiriliş ölçegleri görkezilen. Setirleriň h beýikligi 8mm-den az bolmaly däl, ýazgynyň göwrümine görä setiriň beýikligini beýgeltmek bolar. Elementleriň sanawynyň doldurylyş düzgüni shemanyň görnüşleri boýunça kesgitlenýär. “Atlary” diýlen sütünde elementiň ady we haýsy resminama esaslanyp element ulanylýan bolsa şol resminamanyň (TDS-iň we ş.m.) belgisi ýazylýar. “Sany” diýlen sütünde önümdäki ulanylýan elementleriň sany goýulýar. “Bellik” diýen sütünde elementleriň atlarynda görkezilmedik tehniki maglumatlar berilip bilner. “Belgisi” diýlen sütünde esasy konstruktorçylyk resminamasynda şol elementiň shema bilen aňladylşy ýazylýar.

## **Kinematiki doly shema.**

Kinematiki shemalarda mehanizimleriň düzgünlerini we olaryň elementleriniň özara täsirleriniň ýagdaýy, hereketiň geçişiniň yzygiderligi görkezilýär. 77-nji suratda kompressoryň herekete getirijisiniň kinematiki doly shemasy berlen.

Shemada TDS 2.770-68 (1-nji tablisada) görkezilen maşyn we mehanizimleriň elementleriniň kinematiki şertli grafiki belgilenişi ulanylan.

Özara täsir edýän elementleriň shemada şertli aňladylşy ölçegleri olaryň elementleriniň önümdäki ölçegleriniň gatnaşyklarynyň mysaly gabat gelmelidir. Kinematiki shemalarda wallar, oklar, sterženler, şatunlar, kriwoşipler we ş.m. S galyňlykda esasy tutuş çyzyklar bilen şekillendirilýär. Şertleşikler we sadalaşdyrmalar bilen şekillendirilýän elementler  $S/2$  ýogynlykdaky tutuş çyzyklar bilen ýerine ýetirilýär. Düzgün boýunça kinematiki shemalar ýazgyn şekil görnüşinde ýerine ýetirilýär: ähli wallar we oklar bir tekizlikde ýa-da parallel tekizliklerde ýerleşen diýlip şertleşilýär. Düzgün boýunça shemada şekillendirilen her bir elemente, hereketiň çeşmesinden (başlanýan ýerinden) başlap, tertip belgi

*Düzüm görkezijiniň (spesifikasyýanyň) ölçegleri*

Diagram illustrating the dimensions and layout of a form (Düzüm görkezijiniň (spesifikasyýanyň) ölçegleri).

The form is rectangular, with overall dimensions of 297 (width) by 297 (height).

**Top Section Dimensions (Horizontal):**

- FOR: 6
- ZOL: 6
- YER: 8
- BELGISI: 70
- ATLARY: 63
- MUK: 10
- BELLIK: 22

**Top Section Dimensions (Vertical):**

- FOR: 5
- ZOL: 5
- YER: 5
- BELGISI: 15
- ATLARY: 8
- MUK: 5
- BELLIK: 5

**Bottom Section Dimensions (Horizontal):**

- FOR: 7
- ZOL: 10
- YER: 23
- BELGISI: 15
- ATLARY: 10
- MUK: 70
- BELLIK: 15
- Other: 5
- Other: 15
- Other: 15
- Other: 20

**Bottom Section Dimensions (Vertical):**

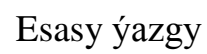
- FOR: 8 x 5 = 40
- ZOL: 5
- YER: 5
- BELGISI: 5
- ATLARY: 5
- MUK: 15
- BELLIK: 15
- Other: 15
- Other: 5
- Other: 15

76-njy surat

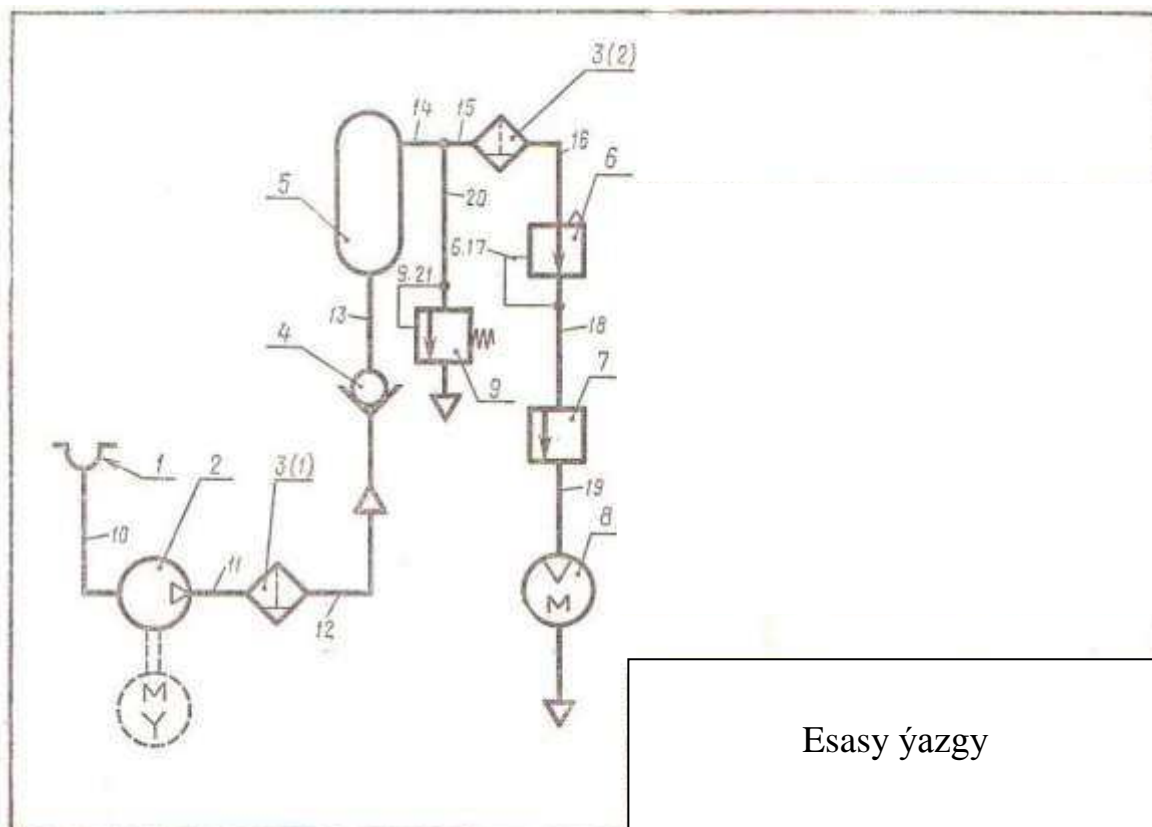




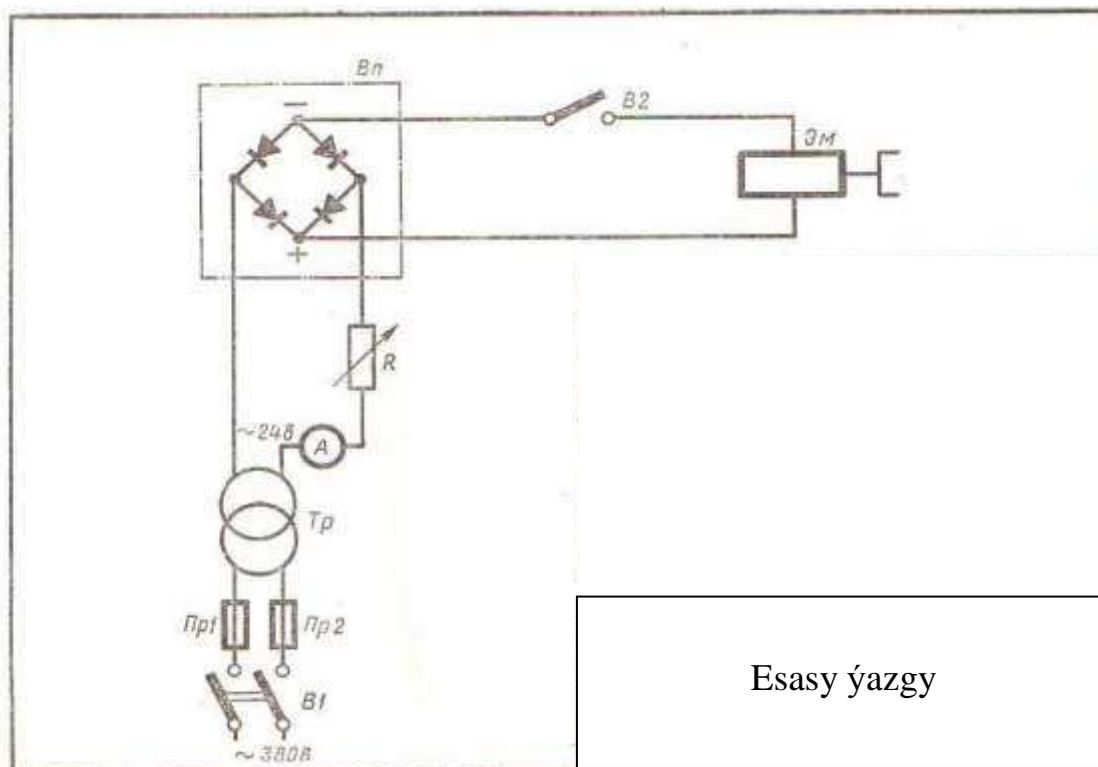
77-nji surat



78-nji surat



79-njy surat



80-nji surat

(nomer) dakylýar. Wallar rim sifrleri bilen, galam elementleri arap sifrleri bilen belgilenýär. Elementiň tertip belgisi çykaryjy çyzygyň tekjesinde goýulýar. Çykaryjy çyzygyň tekjesiniň aşagynda bolsa kinematiki elementiň esasy häsiýetleri we başga görkezijileri barada maglumatlar görkezilýär. Aşakda TDS 2.703-68 laýyklykda shemalarda görkezilmeli bolýan aýry-aýry kinematik zynjyrlar we olaryň häsiýetleriniň hem-de görkezijileriniň sanawynyň mysaly berlen:

- a) Hereket çeşmesi- ady, görnüşi, häsiýeti
- b) Çekili geçirijiniň şkiwi-şkiwiň diametri
- ç) Dişli tigr-dişiň sany, moduly, kese dişli tigr üçin bolsa-dişiň ýapgytlyk burçy we goşmaça ugry.
- d) **Gurçukly**- ok moduly, girme sany
- e) Hereketli hyr – hyryň hereketiniň çyzygy, girme sany, ýazgy „çep“ (diňe çep hyrlar üçin)

77-njy suratdaky shemany okamak üçin hereket çeşmesinden (hereketegetirijiden) başlamak gerek. I hereketegeçirijiniň I oky, çeýelik arkaly 2 maýyşgak mufta bilen reduktoryň II okuna birikdirilen. II Reduktoryň II okunda tormozyň kalodkasy oturdylan. Şol II okada III okda ýerleşen gurçukly 5 tigiri aýlaýan 4 gurçuk berkidilen, ol hem öz gezeginde goraýjy 6 muftonyň kömegi bilen 7 kompressoryň IV oky bilen birikdirilýär.

### **Gidrawliki we pnevmatiki doly shemalar.**

Gidrawliki we pnevmatiki shemalary ýerine ýetirmegiň düzgünleri TDS 2.704-68 kesgitlenýär. Bu shemalarda elementleriň şertli grafiki belgilenmesi TDS 2.780-68, 2.781-68, 2.782-68 we 2.784-70 esasynda ýerine ýetirilýär.

78,79 we 80-nji suratlarda gidrawliki, pnevmatiki,elektrik doly shemalaryň ýerine ýetirilişine mysallar berlen.

Elementler we gurluşlar düzgün boýunça birden başlap akymyň işçi gurşawynyň ugry boýunça tertip boýunça sanlar bilen belgilenýär. Birmeňzeş elementlere umumy tertip san belgisi adyň dakylmagy rugsat berilýär, şondan soňra ýaýyň içinde berlen elementiň tertip belgisi goýulýar. (Meselem, 78-nji suratyda süzgüç.). San belgilemeleri çykaryjy çyzyklaryň tekjesinde goýulýar. Elementlere san belgili at dakylandan soňra akymyň işçi gurşawynyň ugry boýunça baglaşdyryjy çyzyklara tertip san belgileri atlary dakylýar. Eger-de baglanyşyk çyzygynyň ýoly haýsyda bolsa bir elementiň içinden geçýän bolsa, onda baglanyşyk çyzygysynyň san belgili adynyň önünden nokat goýulyp, nokadyň önünden şol elementiň san belgisi goýulýar. (Meselem: 78-nji suratda goraýjy 6 klapanda 6.15 baglanyşyk çyzygy). Baglanyşyk çyzyglaryna san belgili at dakmalar çykaryjy çyzygyň golaýynda tekjesiz goýulýar.



Diagram of a mechanism with 9 links. The mechanism consists of a central vertical shaft (link 2) and a planetary gear set (links 3, 4, 5, 6, 7, 8, 9). Link 1 is a motor (M) with diameter 300. Link 2 is a vertical link with diameter 150. Link 3 is a horizontal link with diameter 300. Link 4 is a vertical link. Link 5 is a horizontal link with  $m=3$ ,  $z=14$ . Link 6 is a horizontal link with  $m=3$ ,  $z=28$ . Link 7 is a vertical link with diameter 150. Link 8 is a horizontal link. Link 9 is a vertical link. The mechanism is a planetary gear system with a central vertical shaft (link 2) and a planetary gear set (links 3, 4, 5, 6, 7, 8, 9).

Kinematiki shemalari TDS – 2.703-68 we TDS – 2.770-68, gidravliki we pnevmatiki shemalari TDS – 2.704-76, - 2.780-68, - 2.781-68, - 2.784-70, - 2.786-70, optiki shemalari TDS – 2.412-68 (TDS – 2.732-68), elektriki shemalari TDS – 2.709-72, - 2.710-75, - 2.755-74 standartlarda berkarar edilendir.

Kinematiki shemalarda ulanylýan şertli belgileri çyzgynyň masştabyny saklaman çyzýarlar. Emma bir shemada olaryň birmeňzeş ölçegleri bolmalydyr (81-nji surat). Shemada şekillendirilen her bir elemente hereketiň çeşmesinden başlap, tertip nomer berýärler.

Wallary rim sifrleri bilen, beýleki elementleri bolsa arap sifrleri bilen nomerleýärler.

Shemalar ýerine ýetirilende gysgaça ýazgylary ulanýarlar. Dişli tigrilerde moduly we dişleriň sanyny görkezýärler, şkiwleriň ýanynda olaryň diametrini we inini ýazýarlar. Elektro dwigateliň kuwwatyny we minutdaky aýlaw sanyny ýazgy bilen görkezýärler. Şol ýazgylary çykaryjy çyzygyň tekjesiniň aşagyndan ýazýarlar. Shemalary üstünlikli okamak üçin, olarda ulanylýan şertli belgileri gowy bilmeli.

Elektrik shemalarynda ulanylýan şertli belgiler üçin kesgitli ölçegler takykklanandyr. Shemada ähli elementleriň ýerleşme belgileri bolmalydyr. Her bir ýerleşme belgi, elementiň görnüşiniň harp belgisinden we birmeňzeş harp belgili elementleriň toparynyň çäginde birden başlaýan tertip nomerli belgiden ybarat bolmalydyr.

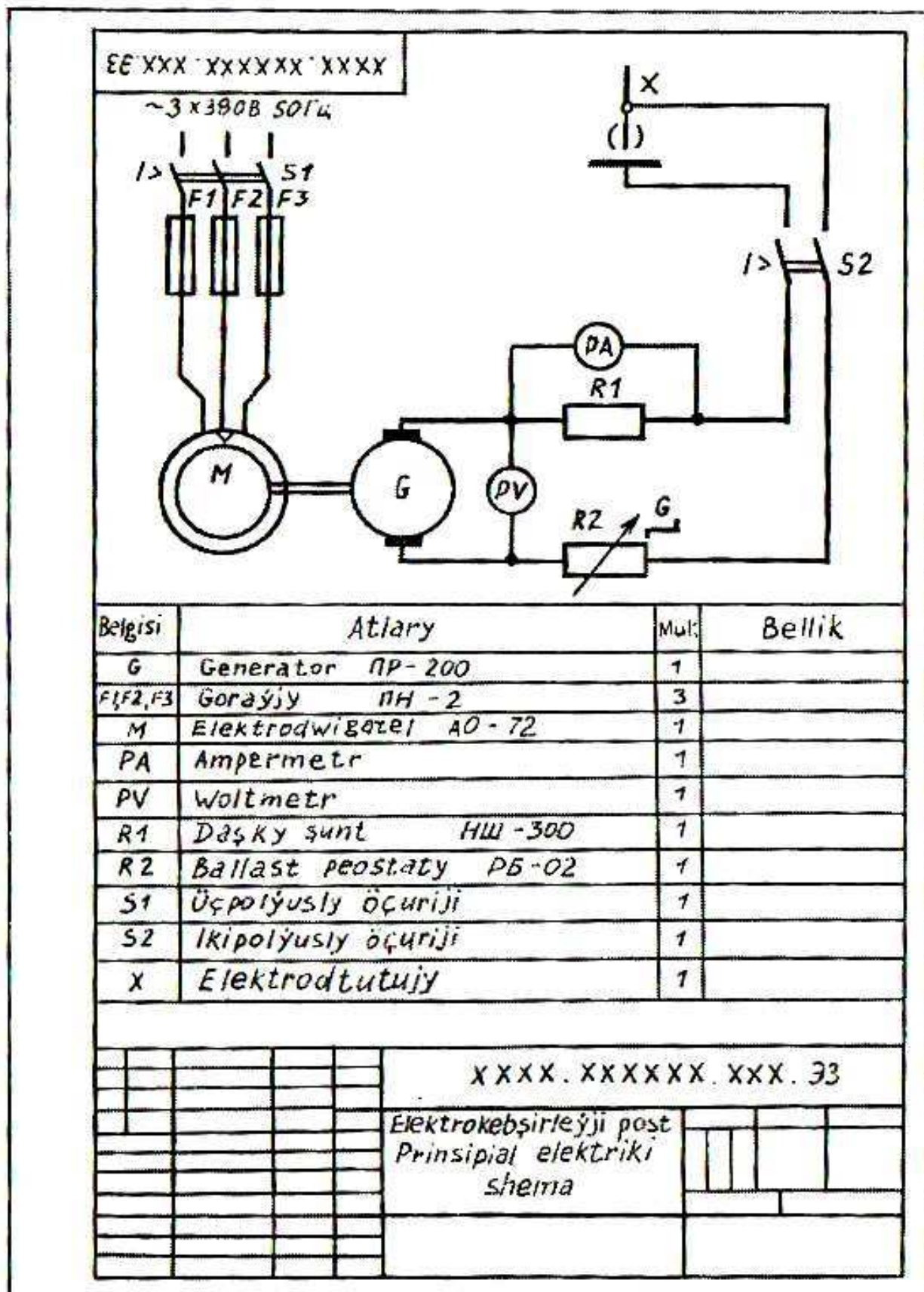
**Shemalar üçin esasy şertli belgiler.** Kinematiki shemalar üçin has ýygy-ýygydan duş gelýän şertli belgiler kitabyň ahyryndaky 1-nji jedwelinde berlendir.

Elektrik shemalar üçin has ýygy-ýygydan duş gelýän şertli grafiki belgileri we olaryň ölçegleri şol 2-nji jedwelinde berlendir. Şertli belgileri peýdalanmagy ýeňilleşdirmek üçin, her bir gurluşyk shemasyna onuň has mahsus häsiýetlerini goşýarlar.

Elektrik shemalary üçin şertli grafiki belgiler örän köpdür we olary ýatda saklamak kyndyr.

Şonuň üçin ýaşaaýyş we önümçilik jaýlaryny elektrik bilen abzallaşdyryş, telefonlaşdyryş çyzgylarynda ulanylýan belgileriň eksplikasiýasyny ýerleşdirmek kabul edilendir.

**Shemalary okamak.** Önümçilikdäki şertlerde kinematiki shema bilen tanyşmagy tehniki pasporty öwrenmekden başlamagy maslahat berilýär. Okuw döwründe mehanizmiň gurluşyny we onuň nämä gerekdigini beýan etmekden başlamaly. Pasport boýunça onuň gurluşy bilen tanyş bolmaly. Soňra shemada nähili şertli belgileriň barlygyny kesgitlemeli.



82-nji surat


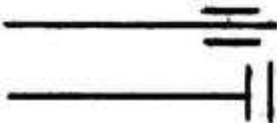
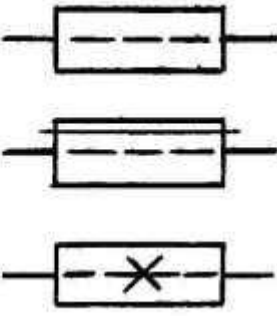


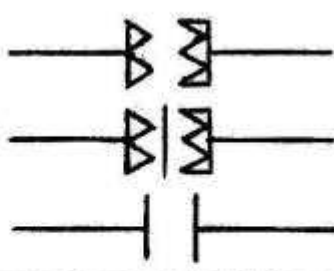
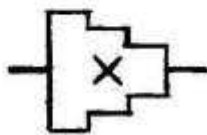

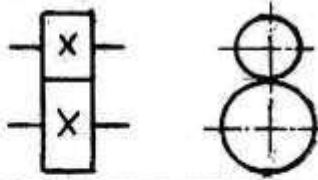
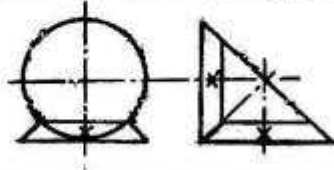
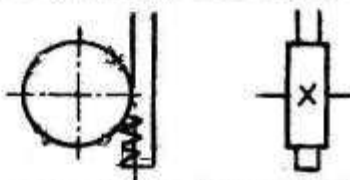

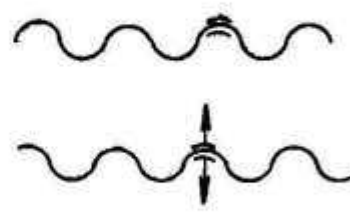
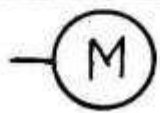
Kinematiki shemany okamagy mehanizmiň ähli esasy şaýlaryna hereket berýän dwigatelden başlamalydyr. Soňra şu hereketiň berilýän ugry boýunça yzygiderli gitmeli.

Elektrik shemalary okamagyň tertibi kinematikleriňki ýalydyr. Elektrik shemalar okalanda aşakdakyny göz önünde tutmaly (82-nji surat). Prinsipal elektrik shemalaryndaky şaýlaryň ýerleşişleri adatça önümde kabul edilenlerden tapawutlanýarlar. Şaýlary, shemalary düzmek we okamak üçin amatly ýagdaýda ýerleşdirýärler. Olaryň ýerleşişlerini (elementleriň arasyndaky baglylygy) has gysga çyzyklar bilen görkezýärler. Elektrik baglylyklary bir çyzyk bilen, mehaniki baglylygy iki çyzyk bilen görkezýärler. Önümiň elementleriniň şertli grafiki belgileriniň ýanynda olaryň harply belgilerini ýazýarlar. Harply belgiler standart tarapyndan takykklanandyr. Harply belgilerden başga shemalarda elementiň gysga adyny görkezmeklige-de ýol berilýär. Bu ady köplenç harply belginiň aşagynda drob görnüşinde görkezýärler.

### Kinematiki shemalar üçin şertli belgiler






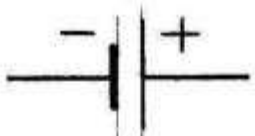
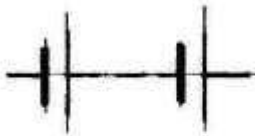

1-nji tablisa

№	Ady	Şertli belgisi
1	2	3
1	Towdar(wal), ok, towdarjagaz, we başgalar.	
2	a) Typma we yrynma podşipnikleri (tipini anyklamazdan): a) radial podşipnik b) daýanç podşipnik	
3	Şaýyň towdar bilen birikdirilişi: a) aýlananda erkin birikme b) aýlanmaýan süýşýän birikme ç) butnawsyz birikme.	

1	2	3
4	<p>İlişme utgaşdyryjylary:</p> <p>a) bir taraplaýyn ýumruly utgaşdyryjylary</p> <p>b) iki taraplaýyn ýumruly utgaşdyryjy</p> <p>c) friksion ýumruly (tipini anyklamazdan)</p>	
5	Towdarda berkidilen basgançakly şkiw	
6	Tekiz çeki arkaly açyk hereket geçirir	
7	Silindrik dişli geçiriji (tipini anyklamazdan)	
8	Konik dişli geçiriji (tipini anyklamazdan)	
9	Dişli reýkaly geçiriji (tipini anyklamazdan)	
10	Hereketi geçirýän wint	
11	<p>Hereketi geçirýän wintdäki gaýka:</p> <p>a) sökülmeýän</p> <p>b) sökülýän</p>	
12	Elektrodwigatel	

# Elektrik shemalar üçin şertli belgiler

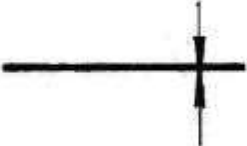
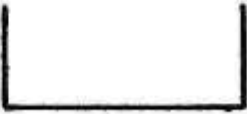


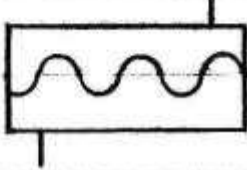

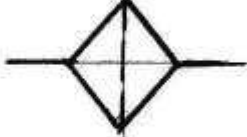

2-nji tablisa

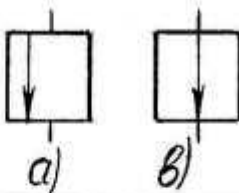
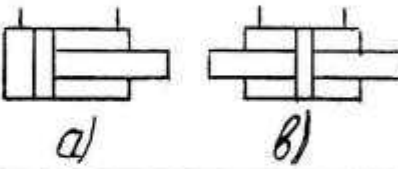
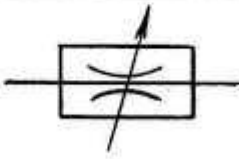

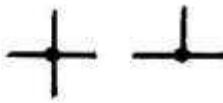
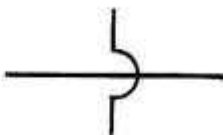



№	Ady	Şertli belgisi
1	2	3
1	Geçiriji kabel	
2	Geçirijileriň şahalanyşy	
3	Yerebirikdirme	
4	Ýarymgeçirijili diod	
5	Üç fazaly üýtgeýän toguň generatory	
6	Galwaniki elementler	
7	Elementleriň batareýasy	
8	Ampermetr	



1	2	3
9	Sazlanýan (reostat) rezistor garşylyk	
10	Ereýji goraýjy	
11	Bir polýusly ýazdyryjy	
12	Watt-sagat hasapçy	
13	Stepselli ýazdyrylýan birikme	
14	Yşyklandyryş ýa-da gyzdyryş çyrasy	
15	Sazlaýan kondensator	
16	Elektrik jaňy	
17	Uly ses çykaryan jaň (reproduktor)	
18	Induktiwlik tegegi	

3-nji tablisa

№	Ady	Şertli belgisi
1	2	3
1	Trubaly geçiriş a) Sorujy döküji	
2	Bak (gap)	
3	Hemişelik ugurly akym beriji nasos	
4	Dişli geçirijili nasos	
5	Wintli nasos	
6	Pilçeli nasos	
7	Suwuklyk ýa-da howa süzüji	
8	Suw motory	

1	2	3
9	Sazlaýjy. a) Açyk b) Ýapyk	
10	Iki taraplaýyn täsir ediji silindr a) Birtaraplaýyn b) Iki taraplaýyn	
11	Drossel	
12	Owrujy klapen	
13	Birikdirýän akym	
14	Birikdiriji akym ýok	
15	Basyş bilen berilýän suwuklyk	
16	Sistemedan suwuklygyň dökmegi	
17	Basyş bilen berilýän howa (gaz)	



## Edebiýatlar

1. Türkmenistanyň Konstitusíasy. Aşgabat, 2008.
2. Gurbanguly Berdimuhamedow. Ösüşiň täze belentliklerine tarap. Saýlanan eserler. I tom. Aşgabat, 2008.
3. Gurbanguly Berdimuhamedow. Ösüşiň täze belentliklerine tarap. Saýlanan eserler. II tom. Aşgabat, 2009.
4. Gurbanguly Berdimuhamedow. Garaşsyzlyga guwanmak, Watany, Halky söýmek bagtdyr. Aşgabat, 2007.
5. Gurbanguly Berdimuhamedow. Türkmenistan – sagdynlygyň we ruhubelentligiň ýurdy. Aşgabat, 2007.
6. Türkmenistanyň Prezidenti Gurbanguly Berdimuhamedowyň Ministrler Kabinetiniň göçme mejlisinde sözlän sözi. (2009-njy ýylyň 12-nji iýuny). Aşgabat, 2009.
7. Türkmenistanyň Prezidentiniň «Obalaryň, şäherleriň, etrapdaky şäherçeleriň we etrap merkezleriniň ilatynyň durmuş-ýaşayyş şertlerini özgertmek boýunça 2020-nji ýyla çenli döwür üçin» Milli maksatnamasy. Aşgabat, 2007.
8. «Türkmenistany ykdysady, syýasy we medeni taýdan ösdürmegiň 2020-nji ýyla çenli döwür üçin Baş ugry» Milli maksatnamasy. «Türkmenistan» gazetini, 2003-nji ýylyň, 27-nji awgusty.
9. «Türkmenistanyň nebitgaz senagatyny ösdürmegiň 2030-njy ýyla çenli döwür üçin Maksatnamasy». Aşgabat, 2006.
10. E. Annaberdiýew “Inženerçilik çyzgy” Aşgabat, 2002
11. B. Aşyrow “Çyzykly geometriýa” (nokat, göni çyzyk we tekizlik) Aşgabat, 1970
12. B. Aşyrow “Çyzykly geometriýa” (aýlamak, proeksiýalar tekizligini çalşyrmak) Aşgabat, 1970
13. S. Şadurdyýew, B. Aşyrow “Çyzuw” 6-synp, 2003ý.
14. Боголюбов С.К. «Индивидуальные задания по курсу черчения» М. 1940
15. Б. Ашыров «Рабочая тетрадь по начертательной геометрии» Ашгабат 1976г.
16. Гордон И.И., Семенцов Н.М., Огаевский М.Н. “Курс начертательной геометрии.” М. 1974
17. Лагерь А.И., Калесников Э.А. “Инженерная графика.” М. 1985
18. Годик Е.Ч., Харин А.М. “Справочное руководство по черчению.” Машиностроение. 1974
19. Вяткин Г.П. «Машиностроительное черчение» М. 1985
20. Общие правила выполнения чертежей. М. 1984

## Mazmuny

Sözbaşy .....	7
1 Çyzyklar we ýazgylar .....	9
2. Çyzgydaky şriftler .....	30
3. Çyzgy masşablary .....	38
4. Formatlar .....	39
5. Materiallaryň ýaryklarda we kesiklerde şertli grafiki belgilenişleri .....	41
6. Geometriki gurluşlar.Töweregiň deň bölekler bölünişi we çatrymlary.....	43
7. Lekal egrilerini gurmak .....	70
8.Ýapgytlyklary we konuslyklary gurmak hem-de belgilemek .....	75
9.Çyzmaly geometriýanyň esaslary.Nokat, göni çyzyk, tekizlik we projeksiýalary özgertmegiň usullary .....	80
10 . Aksonometriki projeksiýalary gurmak .....	104
11.Geometriki figuralaryň we nusgalaryň projeksiýalary .....	110
12. Figuralaryň tekizlikler bilen kesigi we olaryň üstleriniň ýazgyny .....	135
13. Nusganyň iki projeksiýasy boýunça üçünji projeksiýasyny gurmak.....	155
14. Geometriki figuralaryň üstleriniň özara kesişmesi .....	177
15.Nusganyň çyzgylaryny ýaryklary ulanmak bilen ýerine ýetirmek.....	196
16.Ýaryklary we kesikleri gurmak .....	246
17.Shemalar we olaryň ýerine ýetirilişi.....	291
18.Edebiýatlar .....	307