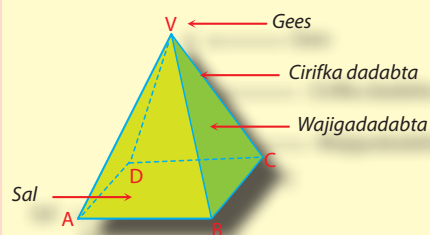# Cutubka

7^{aad}

JOOMATTARIGA IYO CABBIRAADA

UJEEDDOOYINKA CUTUBKA

Cutubkani marka uu dhamaado ardaydu waxay awoodi doonaan iney:

- ➢ fahmaan fikradaha aasaasiga ee ku saabsaan saddexagallada xaglaha quman.
- ➢ adeegsadaan kamidah aragtiyada muhimka ah ee saddexagalada xagalah quman.
- ➢ gartaan xeerarka aasaasiga ee saamiyada tirignomatariga
- ➢ gartaan noocyada kala duwan ee Bayraamidyada iyo qaybaha ay wadaagaan.

TUSMOOYINKA MUHIMKA AH

7.1   Aragtiinada ku saabsan saddexagalada xaglaha quman

7.2   Hordhaca tirigonomatariga

7.3   Shaxannada adkaha ah

Furaha Tibxaha

*Sookoobida Cutubka*

Nakhtiinka layliska

HORDHAC

Cutubkni wuxuu leeyahay saddex cutub hoosaad. Labada cutub-hoosaad ee ugu horeeya waa fikradaha iyo natiijooyinka laxiriira dhinacyadaiyo xagal aha saddexagal qummaan.Gaar ahaan, cutubhoosaadka ugu horeeya wuxuu leeyahay laba aragtiino oo caan ah "Aragtiinka Euclid iyo aragtiinka baytagoras". Kan labaadna wuxuu leeyahay saamiyaada tirigonometeriga ee saddexda ah: Sayn, Kosayn iyo taanjat ee xagasha fiiqan ee saddexagalka xagasha quman kuwaas oo ah barta ugu muhimsan ee nuxurka. Cutub-hoosaadka saddexaad waxa ku jira labo shaxanada adkaha ah Bayraamid yada iyo toobinada.Cutub-hoosaad kasta wuxuu u habaysan yahay isaga oo la raaciyay soo bandhigidda taariikhdiisa.

7.1 ARAGTIINADA SADEXAGALLADA XAGLAHA QUMAN

Masalo Furan:

Jaantuska7.1*wuxuu muujinaya gobolo dhul ah ooleh saansaan saddexagal iyo saddex laba jibbaarane dhulkaas oo ay leeyihiin afar beeralay A, B , C iyo D.*

1   *midkoodee baa leh dhulka bedkiisu ugu weyn yahay?*

2   *ma jiraan kuwa leh dhulbedkoodu is le'eg yahay?*

3   *haddii la isku daro beerta A iyo B iyo beeraha C iyo D lammaanahee baa yeelanaya bedka wayn?*
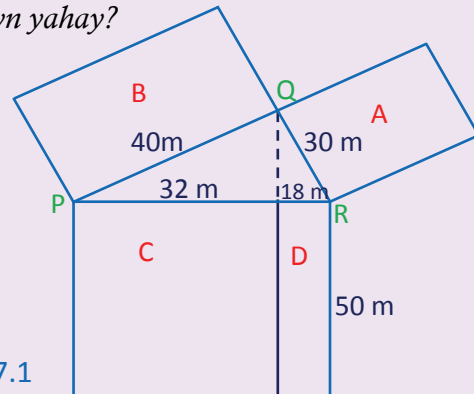
Jaantuska7.1

Masaladaa kore waxaa loo dhigayaa inay kaacaawiso inaad xusuusato baytagoraskii caanka ahaa "waa aragtiin loo isticmaalo adeegsiyo badan". Sidoo kale waxay gundhig u tahay natiijooyinka kala duwan ee la xiriira tirigonomatariga iyo bedadka.

7.1.1 Aragtiinka yuklidh iyo Weydaarkeeda

Xusuus taarikheed:
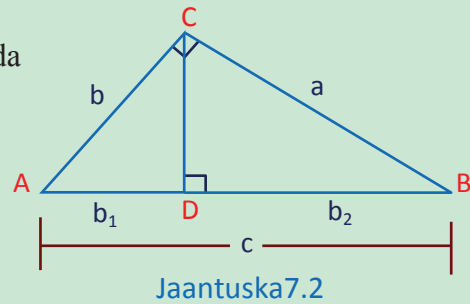
Euclid 350 B.C wuxuu ahaa xisaabiyahan Giriigah. Wuxuu qoray aasaasyo, ah 13–xidhmood oo ku saabsan xeerarka joomatariga iyo astaamaha tirooyinka.

Euclid

Hawl-galka 7.1

Sawir saddexagal xagal qumman ABC, in jeex joogga saddexagalkadhinaca shakaalkaAB sida ka muuqata Jaantuska7.2 ka dibna ka jawaab mid kasta oo kamidah su'aalaha soo socda.

Jaantuska7.2

1 Imisasaddexagal xagal qumman oo cusub ayaa samaysmay?

2 Tax saddexagallada xagal qumman?

3 Caddee xaglaha mid kasta oo kamidah saddexagallada cusub kuwaas oo isku sargo'an.

    b $\angle A$ **t** $\angle B$

4 Falanqeeya isku sargona antooda

    b $\triangle ACD \sim \triangle ABC$ **t** $\triangle CBD \sim \triangle ABC$

5 Isticmaal natiijada falanqayntii su'aasha 4 si aad u muujiso

    b $\dfrac{CB}{BD} = \dfrac{AB}{BC}$ iyo waliba$a^2 = cb_2$

    t $\dfrac{AC}{AD} = \dfrac{AB}{AC}$ iyo waliba$b^2 = cb_1$

Falanqayntii aad ku samayseenhawlgalka7.1waxay caddayn u ahayd aragtiinka Euclid. Waxayna odhanaysaa sida soo socota:

Aragtiinka 7.1 (Aragtiinka yuklidh):

Haddii joogga loo jiido dhinaca shakaalka saddexaglka xagasha qumman, markaa labajibbaarka lug kasta wuxuu le'eg yahay taranta shakaalka iyo lugta saddexagalka taas ooaan ahayn joogga sadexagalka lagu siiyay.

Sikale udhigid: ka soo qaad ΔABC inuu yahay saddaxagal xagalqumman oo $\overline{CD}$ ay tahay joogga ku qotoma shakaalka AB. *Fiiri* Jaantuska 7.3.

Marka   **i** $a^2 = cb_2$

       ii $b^2 = cb_1$

Jaantuska 7.3
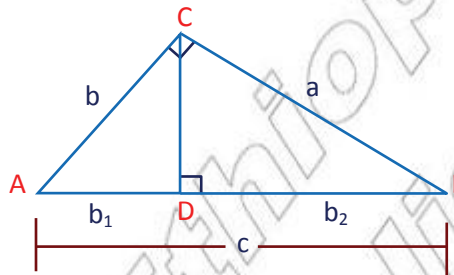
Xusuusnaw: *Marka laga eego dhinaca isu ekaanshaha ee ΔACD iyo ΔCBD. Waxaa raacaya taa: $CD^2 = b_1b_2$ tan waxaa loo yaqaana "Aragtiinka joogga".*

Tusaale 1: Ka soo qaad ΔABC inuu yahay saddaxagal xagal qumman, shakaalkiisuna yahay $\overline{AB}$ jooggiisuna $\overline{CD}$ kaas oo ku qotoma shakaalka $\overline{AB}$. Haddii AD = 3sm, BD = 12sm, Raadi dhererka mid kasta oo kamida dhinacyadan soosocda.

   b $\overline{AC}$ **t** $\overline{BC}$ **j** $\overline{DC}$
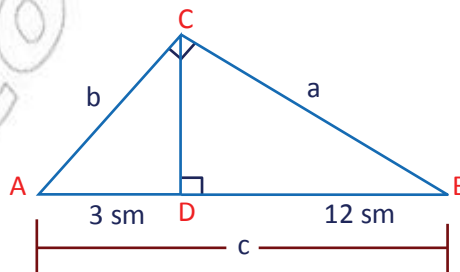
Furfuris: Talaabada ugu horaysa waa in lasawiro ΔABC. Fiiri Jaantuska 7.4

AB = 3sm + 12sm = 15sm.

b = AC, a = BC, b_1 = 3sm, b_2 = 12sm iyo c = 15sm.

Adeegsiga aragtinka Euclid wuxuu ina siinayaa,

Jaantuska 7.4

b $b^2 = cb_1$ $= 3sm \times 15sm$ $= 45sm^2$

$b = \sqrt{45}$ sm$= \sqrt{9 \times 5}$ sm $= 3\sqrt{5}$ m s

t $a^2 = cb_2$

$= 12$ sm $\times 15$ sm $= 180$ sm^2

$a = \sqrt{180}$ cm $= \sqrt{4 \times 9 \times 5}$ cm $= 2 \times 3\sqrt{5}$ cm $= 6\sqrt{5}$ cm

j $DC^2 = b_1b_2$

$= 3sm \times 12$ sm $= 36$ sm^2

$DC = \sqrt{36}$ sm $= 6$ sm

Tusaale 2: Joogg ku qotama shakaalka saddexagal xagal quman ayaa u kala qaybiyey shakaalka laba xaariijimood oo dhererkoodu yahay 1 sm iyo 8 sm. Raadi dhererada lugaha.

Furfuris: ka soo qaad $\overline{CD}$ inay tahay joogga ku qotoma shakaalka $\overline{AB}$ ee saddexaglka xagasha qumman.Fiiri Jaantuska 7.5
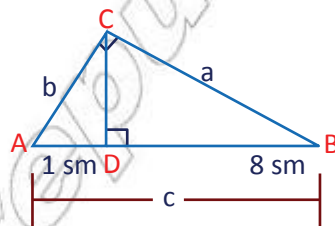
$AC^2 = AD \times AB$ $= 1$ sm $\times 9$ sm $= 9$ sm^2

$AC = 3$ sm

$BC^2 = BD \times AB$

$= 8$ sm $\times 9$ sm $= 72$ sm^2

$BC = \sqrt{72}$ sm $= 2 \times 3\sqrt{2}$ sm $= 6\sqrt{2}$ sm
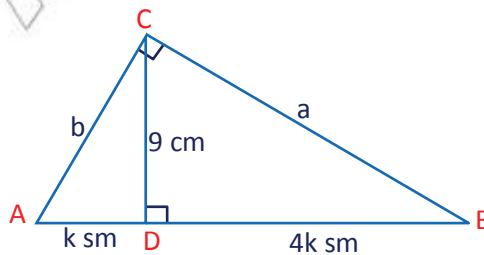

Jaantuska 7.5

Tusaale 3: Saddexagal xagal qumman dhererka joogga loo jiiday dhinaca shakaalka ayaa ah 9sm. Haddii dhererada xariijimaha shakaalka ay yihiin k smiyo4 ksm, raadi dhererda lugaha saddexagalka.

Furfuris: fiiri Jaantuska 7.6 ka dibna adeegso aragtiinka joogga:

$9^2 = k \times 4k$

$81 = 4k^2$

$k^2 = \dfrac{81}{4}$

Jaantuska7.6

Sidaa darteed, $k = \sqrt{\dfrac{81}{4}} = \dfrac{9}{2} = 4.5$ sm

$c = AB = k$sm $+ 4k$ sm $= 5k$ sm $= 5\,(4.5)$ sm $= 22.5$ sm

$a^2 = (4k) \times 5k = 4\,(4.5)\,(22.5)$ sm

$\quad = 4\,(9 \times 0.5)\,(15 \times 15 \times 0.1)$ sm^2

$\quad = 4 \times 9 \times 15^2 \times (0.05)$ sm^2

$a = \sqrt{4 \times 9 \times 15^2 \times 0.05}\ sm = 2 \times 3 \times 15 \sqrt{0.05}\ sm = 90 \sqrt{\dfrac{5}{100}}\ sm$

$\quad = 9\ \sqrt{5}\ sm$

$b^2 = (k \times 5k)$ sm$^2 = 5k^2$ sm $= (4.5)^2$ sm^2

$b = \sqrt{5 \times (4.5)^2}$ sm$^2 = 4.5\ \sqrt{5}$ sm

Shaqo-kooxeedka7.1

Jaantuska7.7 Wuxuu muujinayaa khariidadda waddada isku xidha saldhigyada A, B, C, D iyo E. Lammaaneyaasha waddooyinka, $\overline{AC}$ iyo $\overline{BC}$, $\overline{CD}$ iyo $\overline{AB}$, $\overline{DE}$ iyo $\overline{AC}$ waa kuwo isku qotoma.

AE = 6 km iyo CE = 3 km, haddii bas uu ka dhaqaaqo C una dhaqaaqo dhinaca D, ka dibna uu u dhaqaaqo dhinaca B, C, D, E, A iyo E oo ah dhammaadka raadi wadarta fogaantaa uu socon karo basku.
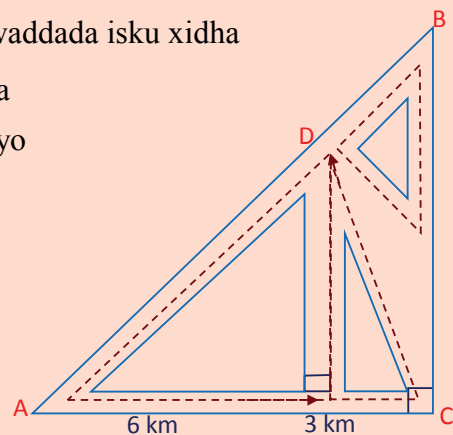
Jaantuska7.7
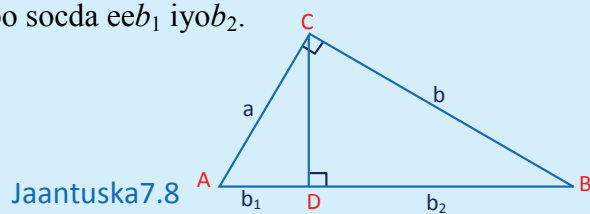
Layliska7.1

1 Jaantuska7.8, ΔABC waa saddexagal xagal qumman shakaalkiisuna yahay $\overline{AB}$, $\overline{CD}$ waa joogga ku qotoma shakaalka $\overline{AB}$. Raadi qiimayaasha$a$iyo $b$mid kasta oo kamida qiimayaasha soo socda eeb_1 iyob_2.
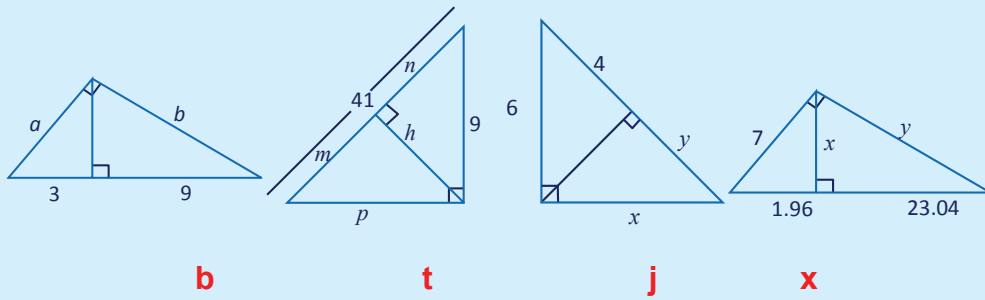
b $b_1 = 2$; $b_2 = 6$

t $b_1 = 3$; $b_2 = 6$

Jaantuska7.8

j $b_1 = 1.5$;$b_2 = 2.5$ **x** $b_1 = \sqrt{2}$; $b_2 = 2\sqrt{2}$

2 Raadi dhererka dhinaca maqan mid kasta oo kamida saddexagalada xagllaha qumman ee soo socda.
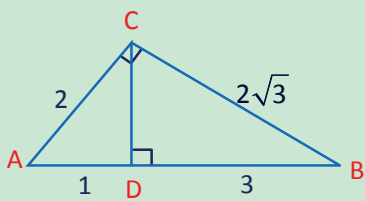

b   **t**   **j**   **x**
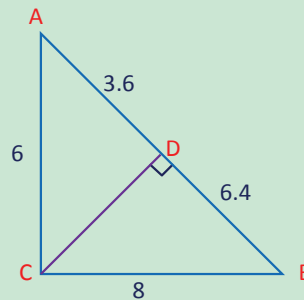
Jaantuska7.9

Weydaarka aragtiinka yuklidh

Hawl-galka 7.2

Jaantuska 7.10, $\overline{CD}$ waa joogga ku qotoma dhinaca $\overline{AB}$ ee ΔABC. Waxaad go'aamisaa ΔABC inuu yahay saddexagal xagal qumman iyo in uusan ahayn.
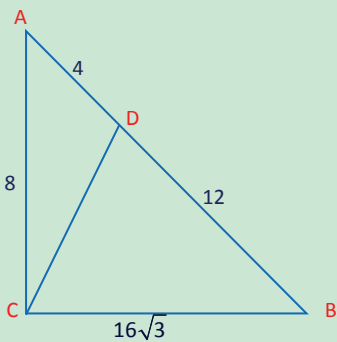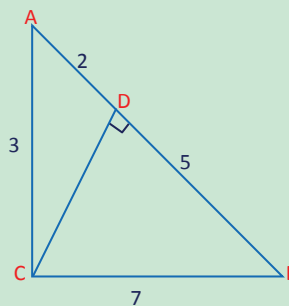
1

2

3

4

Jaantuska 7.10

Waxaad ku soo aragtay Hawlgalka 7.2 saddexagallada raali galiya aragtiinka Euclid inay yihiin saddexagallada xaglaha qumman. Saddexagallada aan raaligalinin aragtiinka yukliidh maaha saddexagallada xaglaha qumman iyada oo lagu salaynayo xaqiiqdan weydaarka aragtiinka Euclid waa sidan hoos ku qoran.
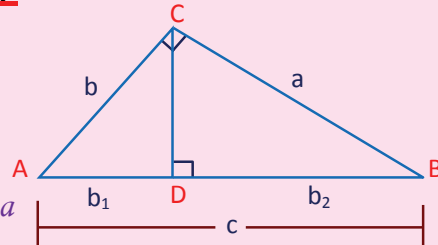
Aragtiinka 7.2 (weydaarka aragtiinka yuklidh):

$\overline{CD}$ *inuu yahay joogga ku qotoma dhinaca*
$\overline{AB}$ *ee ΔABC.*
Fiiri Jaantuska7.11. *Haddii* $a^2 = cb_2$ *iyo*
$b^2 = cb_1$, *markaa ΔABC waa sadexagal xagasha qummani aytahay barta C.*

Jaantuska7.11

Tusaale5: Jaantuska7.12, wuxuu muujinayaa ΔABC inuu yahay saddexagal xagal qumman.

Furfuris: Sida cad $AB = \dfrac{25}{13} + \dfrac{144}{13} = 13$

$$AD \times AB = \dfrac{25}{13} \times 13 = 25 = 5^2 = AC^2$$

$$BD \times AB = \dfrac{144}{13} \times 13 = 144 = 12^2 = BC^2$$
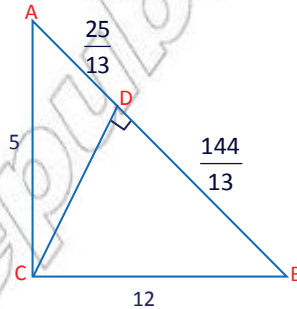
Jaantuska7.12

Tani waxay cadaynaysaa inΔABC uu yahay saddexagal xagal qumman, iyada oo loo maray weydaarkaaragtiinka Euclid.

Tusaale 6: Jaantuska7.13, wuxuu caddaynayaaΔABC

Inuusan ahayn saddexagal xagal qumman.

Furfuris: AB = 12

AD × AB = 3 × 12 = 36 = 6^2 = AC

BD × AB = 9 × 12 = 108

Laakiin $BC^2 = 64$

Jaantuska 7.13

    Tani waxay caddaynaysaa $BC^2 \neq BD \times AB$

Waxaa raacayaa in ΔABC uusan ahayn saddexagal xagal qumman haddii ΔABC uu ahaan lahaa saddexagal xagal qumman, BC^2 waxay le'ekaan lahayd BD × AB.
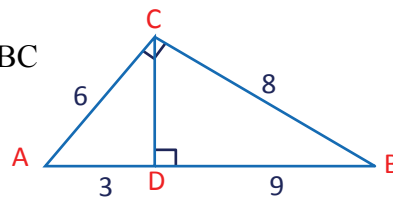
7.1.2 Aragtiinka Baytagoras iyo Weydaarkeeda

Qaybtii hore waxaad kusoo baratay aragtiinka Euclid ee saddexagal xagal qumman, Halkan waxaad isticmaali, doontaa xiriirkan si aad u baadhid aragtiinka caanka ah ee Pythagoras.

Xusuus taarikheed:

Pythagoras wuxuu ahaa xisaabyahan Giriig ah, wuxuuna noolaa qarnigii shanaad dhalashadii Ciise ka hor (B.C). Paytagorasiyo saaxiibbadii ayaa markii ugu horaysay aqoonsaday tirooyinka aan lakabka ahayn. Sidookale qarnigii shanaad dhalashadii Ciise ka hor (B.C). Paytagoras iyo ardaydii dhiganeysay iskuulkiisa ayaa waxay darseen 3-4-5saddexagal.

Pythagoras

Hawl-galka 7.3

*Ujeeddada:*Baadhista aragtiinka baytagorasiyada oo lacabbirayo lugaha iyo shakaalka saddexagal xagal qumman.

*Saabaan:*Warqad laba jibbaaran, mastarad mitir ku salaysan, iyo kalkuleetar.

Jidmarin:

1 b Cabbir dhererka (dh)¸ ballaca (b) iyo xaglo-gooyaha d mid kasta oo ka mida walxaha laydiyeed ee soo socda adiga oo qaadanaya.

    i Buuga xisaabta ardayga ee fasalka 8

    ii Sagxadda dhulka ee fasalkaaga.

    iii Sabuurada fasalkaaga.

  t ku guuri Shaxda 7.1 kadibna gali natiijooyinka su'aasha 1b.

	Buuga xisaabta ardayga	Sagxadda qolka	sabuurada
ℓ			
w			
d			
$l^2 + w^2$			
d^2			

Shaxda 7.1

j   Isticmaal natiijada Shaxda 7.1 waxaadna raadisaa xidhiidhka ka dhexeeya wadarta $\ell^2 + w^2$ iyo d^2. Qor hawraarta qeexaysa xidhiidhke ka dhexeeya.
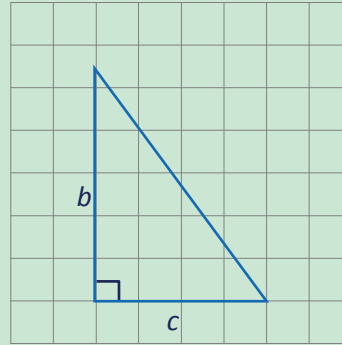
2   **b**   Ku sawir saddexagallo xaglo qumman warqada labajibbaaran dusheeda oo leh dhererada lugahalagu siiyey sida uu muujinayo Jaantuska 7.14.

     i $a = 3$cm ; $b = 4$ sm

     ii $a = 5$cm ; $b = 12$ sm

     iii $a = 2$cm ; $b = 3$ sm

     iv $a = 1.5$cm ; $b = 14.75$ sm

Jaantuska 7.14

t   Cabbir dhererkaJ ee shakaalka mid kasta oo kamida sadexagallada su'aasha 2b adiga oo qaadanaya cabbirka milimitir ee ugu dhow.

j   Ku guuri Shaxda 7.2 waxaadna galisaa natiijooyinka su'aasha 2t.

|	**a**	**b**	**c**	**a² + b²**	**c²**
i	3	4			
ii	5	12			
iii	2	3			
iv	1.5	14.75			

Shaxda 7.2

x   Isticmaal natijada shaxda 7.2siaad u raadiso xiriirka ka dhexeeya wadarta $a^2 + b^2$iyo c^2.

kh   Waxaad qortaa hawraarta sharxaysa xiriirkooda.

In badan waxaad soo baadhay aragtiinka pythagoras. Haddawaxaad baran doontaa caddaynta aragtiinka.

U fiirso saddexagalkan xagsha qumman ABC oo leh joogga ah $\overline{CD}$ kaas oo ku qotoma shakaalka $\overline{AB}$. (*Eeg* Jaantuska 7.15)
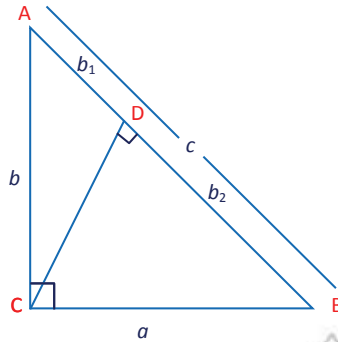
Jaantuska 7.15

Marka laga eego dhanka aragtiinka Euclid, waxaad taqaanaa $a^2 = cb_2$ iyo $b^2 = cb_1$ taas oo ah wadarta laba jibbaarrada,

$$a^2 + b^2 = cb_2 + cb_1 = (b_2 + b_1)\, c = c \times c = c^2$$

Tani waa caddaynta aragtiinka baytagoras, taas oo odhanaysa sida hoos ku qoran.

Aragtiinka Baytagoras:

> *Wadarta labajibbaarada dhererada lugaha saddexagalka xagasha qumman waxay le'eg tahay laba jibbaarka dhererka shakaalka.*

Aragtiinka Pythagoras wuxuu qabaa,

$$a^2 + b^2 = c^2$$
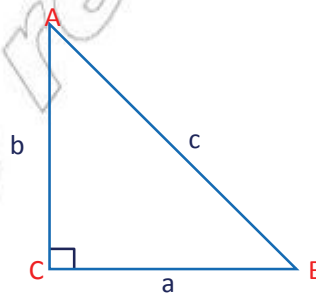
Jaantuska 7.16

Tusaale1: Raadi dhererka shakaalka saddexagalka xagasha qumman kaas oo dhererka lugahiisu ay yihin 3 sm iyo 4 sm.

Furfuirs: iyada oo lagu badalayo a = 3 iyo b = 4 hilinka $a^2 + b^2 = c^2$ waxaad helaysaa

$$c^2 = 3^2 + 4^2 = 25$$

Sidaa darted $c = 5$

Dhererka shakaalku waa 5 sm.

Tusaale 2: Haddii dhererka shakaalka saddexagal xagal qumman yahay 13 sm, isla markaana hal dhinac oo kamidah lugahiisu tahay 5 sm, raadi dhererka lugta kale.

A
5 sm
13sm
C
a
B

Jaantuska 7.17

Furfuris: Fiiri Jaantuska 7.17.
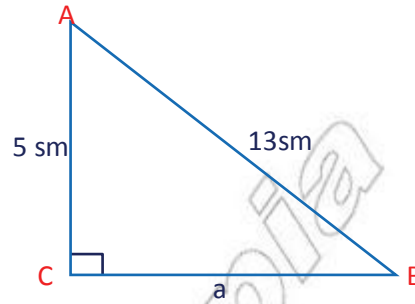
Si cad, $a^2 + 5^2 = 13^2$

$a^2 = 169 - 25 = 144$

$a = \sqrt{144} = 12$

Tusaale 3: Raadi dhererka xaglo-gooyaha ee laydi addimihiisu kala yihiin 9sm iyo 40 sm.

Solution: Ka soo qaad ABCD inuu yahay laydi dhererkiisuyahay AB = 40 sm ballaciisuna yahay BC = 9 sm. Markaa ΔABCwaa saddexagal xagal qumman.

D
C
9 cm
A
40 cm
B
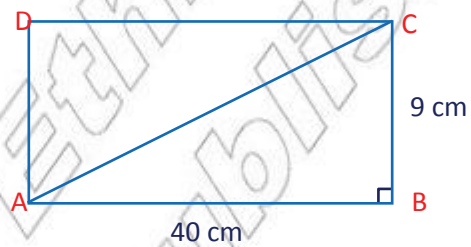
Jaantuska 7.18

Fiiri jaantuska7.18

$AC^2 = AB^2 + BC^2 = 40^2 + 9^2 = 1681$

$AC = \sqrt{1681} = 41$

Dhererka xagla-gooyahu waa 41 sm.

Tusaale4: Salaan 6 m ah ayaa lagu tiiriyay darbi ku fadhiya dhul siman. Haddi cagta sallaanku 4sm ay ka fog tahay salka darbigaJoog intee dhan ayuu gaadhikaraa sallaanku?

h
6 m
4 m
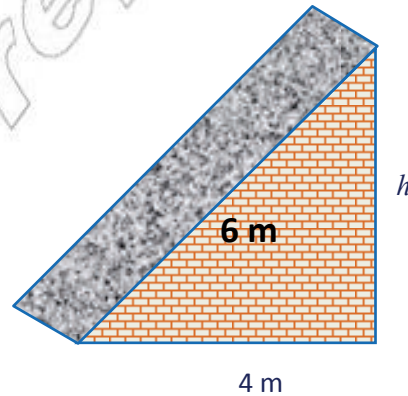
Jaantuska 7.19

Furfuirs: u qaado h joogga darbiga ee sallanku gaadhay.

Fiiri Jaantuska 7.19 kadibna $h^2 + 4^2 = 6^2$

$h^2 = 20 \Rightarrow h = \sqrt{20}$

Sidaa darteed h = $2\sqrt{5}$ m ≈ 4.47   m

Tusaale 5: Jaantuska 7.20 wuxuu muujinayaa saqafka guri. Dhererka tiirka jiifa waa 8m.Tiirasha AC iyo BC waa isle'eg yihiin.Haddii joogga saqafkuuu yahay 1.5m, maxay noqon karaan dhererka tiirasha AC iyo BC?

Jaantuska 7.20

Furfuris: Sida aan ku naqaano astaamaha saddexagal labaale, CD waa kala badhe ku qotoma AB.

Sidaas darteed AD = BD = 4m

$BC^2 = DB^2 + DC^2 = (4^2 + 1.5^2)\ m^2 = 18.25m^2$

$BC = \sqrt{18.25}\ m \approx 4.272\ m$

Tusaale6: Qofayaa u lugeeyay 4km dhinaca bari, ka dibna 5km ayuu u lugeeyay dhinaca koonfu-Fogaan intee le'eg ayuu u jiraa bartii uu kadhaqaaqay?
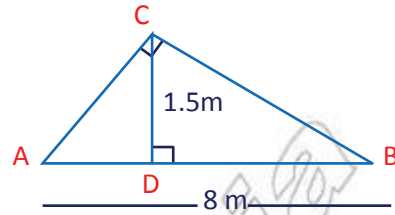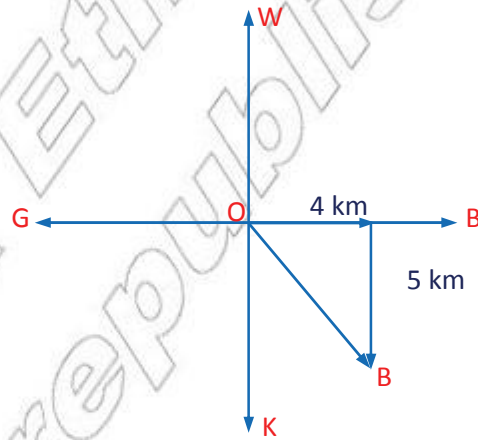
Furfuris: Fiiri Jaantuska 7.21.

Adiga oo isticmaalaya aragtiinka Pythagoras waxaad helaysaa

$OB^2 = OA^2 + AB^2 = 4^2 + 5^2 = 41$

$OB = \sqrt{41} \approx 6.403\ km$

OB = 6.403 km ayuu u jiraa bartii uu kadhaqaaqay.

Jaantuska 7.21

Tusaale 7: Jaantuska 7.22 waxaa uu soo bandhigayaa xeelad lagu cabbiro ugu dhawaanshaha ballaca haro. Soo saar ugu dhawaan cabbirka ballaca harta?
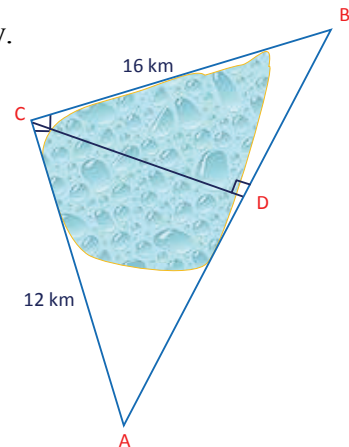
Furfuris: CD waxay tahay ugu dhawaan cabbirka ballaca harta.

Marka dib loo eego Aragtida joogga waa:-

$CD^2 = AD \times BD$

Maadaama $AB^2 = (12km)^2 + (16km)^2$

$= 144\ km^2 + 256km^2 = 400\ km^2$

Jaantuska 7.22

AB = 20 km

$(16 \text{ km})^2 = BD \times (20 \text{ km})$

$CB^2 = BD \times AB$

$(16 \text{ km}^2) = BD \times (20 \text{ km})^2$

$256 \text{ km}^2 = BD^2 \times 400 \text{ km}^2$

$BD = \sqrt{\dfrac{256 \text{km}^2}{400 \text{km}^2}}$

BD = 12.8 km

AD = AB − BD

AD = 20 km − 12.8 km

AD = 7.2 km

$CD^2 = AD \times BD$

$CD = \sqrt{7.2 \text{ km} \times 12.8 \text{ km}}$

CD = 9.6 km

Weydaarka Aragtiinka Baytagoras

Waxaad soo aragtay saddexagalka dhererka dhinacyadiisuay yihin 3, 4 iyo 5 halbeegyo inuu yahay saddexagal xagal qumman.Tirooyinkaana waxaa la yiraahdaa in ay yihiin saddexleyda Pythagorean.

Qaybtan waxaad ku arki doontaa haddii x, y iyo $z$ay yihiin dhererada dhinacyda saddexagal isla markaana $x^2 + y^2 = z^2$, kolkaa saddexagalku waa saddexagal xagal qumman.

Shaqo-kooxeedka 7.2

Ujeeddo: Si loo darsa weydaarkaaragtiinka Pythagoras iyada oo la sawirayo (ama la dhisayo) saddexagallo lana cabbirayo xaglaha.

Saabaan: mastarad mitir ah, ulo daraf toosan, jiheeye xagalbeeg.

Uidmarin:

1   Diyaari ulo dhereradoodu yihiin sida soo socota.

    b   5sm, 12sm, 13sm   **t**   30sm, 40sm, 50sm   **j**   6sm, 8sm, 10sm

2   Dhis saddexagallo adiga oo isticmaalaya ulaha su'aasha, 1b, t, iyo j.

3   Cabbir xagasha ka soo horjeeda dhinaca ugu dheer ee saddexagal kasta.

4   Adigo oo isticmaalaya natiijooyinka aad ka heshay su'aasha 3, qor hawraar qeexaysa xidhiidhka ka dhexeeya saddexleyda Baytagoras iyo saddexagalka.

Aragtiinka 7.4 (Weydaarka Aragtiinka Baytagoras)

Haddii wadarta laba jibbaarada laba dhinac ee saddexagal ay le'ekaato laba jibbaarka dhinaca saddexaad, markaa saddexagalku waa saddexagal xagal qumman.
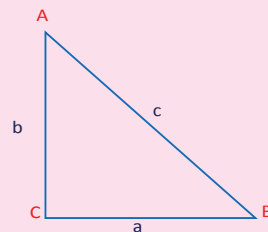
Si kale u dhihid. Haddii $a^2 + b^2 = c^2$, markaa m ($\angle C$) = 90°.

Jaantuska 7.23

Tusaale 1: Go'aami mid kasta oo ka mid ah kuwa soo socda in uu yahay iyo in kale saddex layada Pythagorean.

b 2, 3, 4 **t** 10, 24, 26 **j** $2\sqrt{2}$, 1, 3

Furfuris:

b $2^2 + 3^2 = 13$ laakiin $4^2 = 16$

2, 3, 4 ma-ahasaddexleyda Pythagoras.

Saddexagalka dhererka dhinacyadiisu yihiin 2, 3 iyo 4 halbeegyo

ma-aha saddexagal xagal qumman.

t $10^2 + 24^2 = 100 + 576 = 676$

sidoo kale, $26^2 = 676$. Middani waxay muujinaysaa 10, 24, 26 inay tahaysaddexleydabaytagoras.

j $(2\sqrt{2})^2 + 1^2 = 8 + 1 = 9$ sidoo kale $3^2 = 9$.

$2\sqrt{2}$, 1, 3 waa saddexleyda Pythagoras.

Tusaale 2: Haddii 3 sm, x sm iyo 4 sm ay yihiin dhererada dhinacyada saddexagal xagal qumman, raadi qiimaha x.

Furfuris: waxaa ku jira masaladan laba xaaladooda oo suurta gal ah. Shakaalku in uu yahay 4 sm ama x sm. Taasina waxay noqon kartaa x > 4 ama $x < 4$.

Haddii x ay le'eg tahay 3 ama 4 markaa ma noqonayo saddexagal xagal qumman.

Xaaladda koowaad,   *xaaladda labaad.*

$3^2 + x^2 = 4^2$ $x^2 = 3^2 + 4^2 = 25$

$x^2 = 16 - 9 = 7$ $x = 5$

$x = \sqrt{7}$

Sidaas darteed, x waa $\sqrt{7}$ sm ama 5 sm.

Layliska 7.2

1 Isticmaal aragtiinka Pythagoras si aad u hesho dhererka aan laaqoon ee midkasta oo ka mida saddexagallada xaglaha qumman ee soo socda.

b
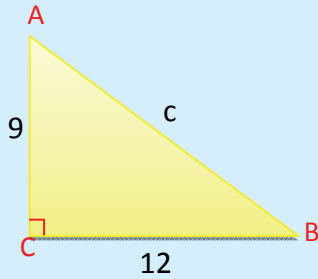
t
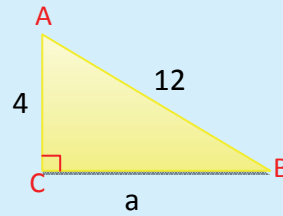
j
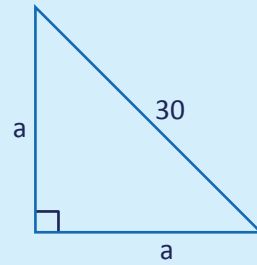
x
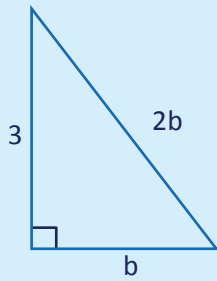
kh
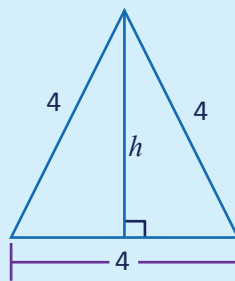
d
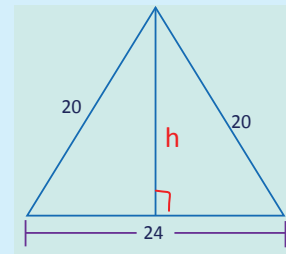
r
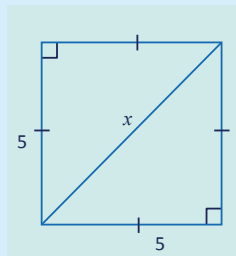
s
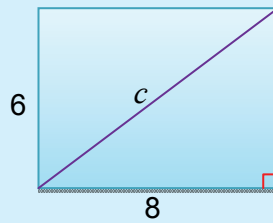
sh
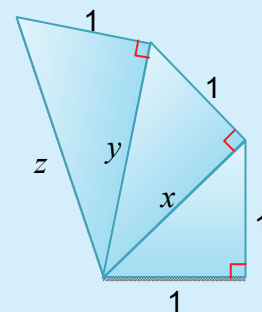
Jaantuska 7.24

2 Caddee saddexagallada soo socda ee dhererka dhinacyadooda lagu siiyay inay yihiin saddexagallo xaglo qumman iyo in kale.

b   8sm, 15sm, 17sm   **t**   6sm, 9sm, 12sm

j   14sm, 16sm, 18sm   **x**   3sm, $2\sqrt{10}$ sm, 7sm

kh   21 sm, 4sm, 25sm   **d**   2sm, 3.75sm, 4.25sm

3 Raaddi dhererka loo baahanyahay.

b Intee in le'eg ayuu gaadhayaa joogga sallaanka?

t Waa intee dhererka dhinac kasta?

b

t

13m

5m

3 cm

4 cm

STOP
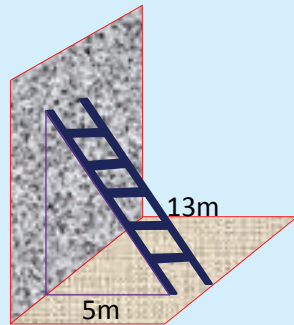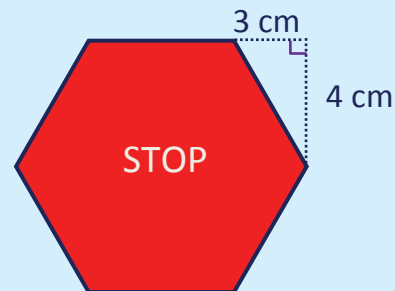
Jaantuska 7.25

4 Raadi dhererka xaglo-gooyaha laydi dhererka dhinacyadiisu ay yihiin $\sqrt{7}$ sm iyo 3sm? Jantus 7.26?

5 ABCD waa koor labaale dhinacyadeeda barbarada ahina ay yihiin $\overline{AB}$ iyo $\overline{CD}$. Haddii AB = 16 sm, CD = 8 sm iyo AD = 5 sm.

Raadii joogga barbaroolaha.

6 Tiro kasta oo tirsiimo k, caddee in 3k, 4k, 5k ay tahey saddexleyda baytagoras.

7 Jaantuska 7.27 ΔABC waa saddexagal xagal qumman.Raadi qiimayaasha x iyo y.

A

D

5sm

x

y

C

E

B

12 sm
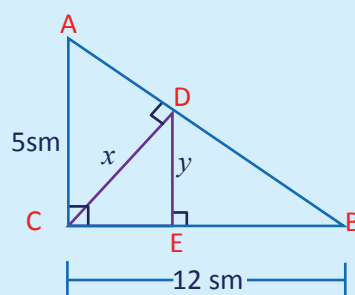
Jaantuska 7.27

7.2 HORDHACA TIRIGONOMETERI

Waxaad ku soo baratay shaxanada isu.eg iyo xaglaha aragtiinka Pythagoras iyo xarrijimaha aan sitoosan loogu cabbiri karin fogaanada aan lahelikarin sida joogga fiinta dhagax-weyn, geedka weyn iwm iyada oo la isticmaalayo xaglaha iyo xariijimaha ayaa si toos ah loo cabbirikaraa.

Cutub-hoosaadkan, waxaad ku baran doontaa hab dheeraad ah oo lagu heli karo xaglaha iyo xarriijimaha si aan toos ahayn.

7.2.1   Saamiyada tirigonometeri

Hawl-galka 7.4

Tixaac Jaantuska 7.28 ka jawaab midkasta oo kamida su'aalaha ku saabsan ∆ABC.

1   Dhinacee ayaa ah shakaal?

2   Dhinacee ayaa kasoo horjeeda∠B?

3   Dhinacee ayaa kasoo horjeeda∠A?
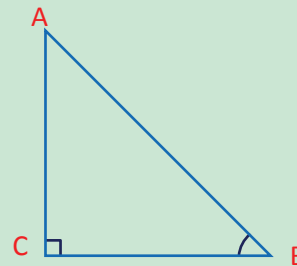
Jaantuska 7.28

Dhinaca dariska la ah xagasha fiiqan ee saddexagal xagal qumman waa dhinaca xagasha aan laxiriirin shakaalka.

4   Waa kee dhinaca dariska la ah∠B?

5   Waa kee dhinaca dariska laah∠A?

Hawlgalka 7.4 wuxuu kaa caawinayaa inaad kala cadayso dhinaca dariska iyo dhinaca kasoo horjeeda ∠B sidaku cad Jaantuska 7.29.

$\overline{AB}$ waa shakaal.

$\overline{AC}$ waa ka soo horjeedaha ∠B.

$\overline{BC}$ waa dhinaca dariska la ah ∠B.
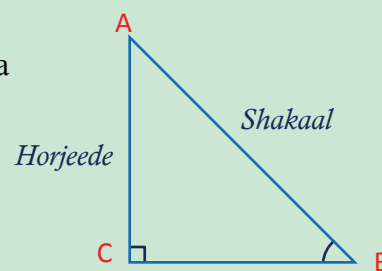
Jaantuska 7.29

Halkan waxaad ku baran doontaa nidhiidhks ka dhexeeya dhinacyada lagu magacaabo shakaal, horjeeda iyo daris kuwaas oo la nidhiidha xagasha fiiqan ee saddexagal xagal qumman.

Xusuustaariikheed

Shaqo-kooxeedka 7.3

Ujeeddo: Si loo soo saarosayn, kosayn iyo taanjant kuwaas oo la xiriira xagasha fiiqan ee saddexagal xagal qumman iyada oo la cabbirayo dhererada dhinacyada.

Saabaan: Mastarad ku salaysanmitir, xaglo-beeg, jiheeye, kalkuleetar iyo warqad laba jibbaarane.

Jidmarin:

1 Ku guuriJaantuska 7.30warqada labajibbaaran kadibna koox ahaan uga shaqeeya.

2 Adiga oo isticmaalaya mastarad, cabbir dhererrada shakaalada, dhinacyada kasoo horjeeda iyo dhinacyadda dariska la ah ∠O ee∆AOP, ∆BOQiyo∆COR adiga oo qaadanaya cabbirka ugu dhaw ee milimitirka.
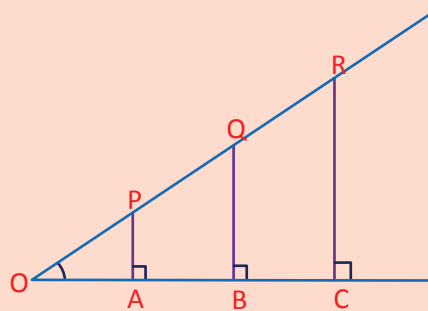
Jaantuska 7.30

Ku guuri tusaha 7.3, isla markaana gali natijooyinka.

Dhinac	Dhererrada ∆AOP	Dhererrada ∆BOQ	Dhererrada ∆COR
Shakaal			
Horjeede			
Daris			

Tusaha 7.3

3 Adiga oo isticmaalaya dhererada iyo kalkuleetar raadi mid kasta oo kamida saamiyada soo socda ee∠O. Ku guuri tusaha 7.4 kadibna gali natiijooyinka.

Saami	Kusaabsan ΔAOP	Kusaabsan ΔBOQ	Kusaabsan ΔCOR
$\dfrac{\text{Horjeeda}}{\text{Shakaal}}$			
$\dfrac{\text{Daris}}{\text{Shakaal}}$			
$\dfrac{\text{Horjeedo}}{\text{Daris}}$			

Tusaha 7.4

4   Waa maxay xiriirada ka dhexeeya natiijooyinka tusaha 7.4. Qor hawraarqeexaysa xiriiradaas.

5   Caddee adiga oo isticmalaya xaqiiqda inΔAOP, ΔBOQ iyo ΔCOR ay yihiin saddexagallo isku jaad ah (isu – eg).

Shaqo-kooxeedka 7.3 dhererka saamiyada ee $\dfrac{\text{Horjeede}}{\text{Shakaal}}$, saamiga dherer $\dfrac{\text{Daris}}{\text{Shakaal}}$ iyo saamiga dhere $\dfrac{\text{Horjeede}}{\text{Daris}}$ waxaaloo yaqaanaa saamiyada tirignomatariga ee saddexagal xagal qumman. heerkan, waxaad ku haysataa qeexida saamiyada tirigonomatariga ee saddexda ah kuwas oo kala ah: sayn, kosayn, iyo tangant kuwaas xagasha fiiqan ee saddexagal xagal qumman.

Qeexid 7.1 *U tixgali saddexagal xagal qumman ABC.Fiiri* Jaantuska 7.31.

i   *Saynka ∠A, waxaa loosoo gaabiyaa "sin A" waxaana loo qeexaa sidan:*

$$\sin A = \frac{\text{dhererka dhinaca ka soo horjeeda } \angle A}{\text{dhererka shakaalka}} = \frac{a}{c}$$

ii   *Kosaynka ∠A, waxaa loo soo gaabiyaa "kosayn A" waxaanaloo qeexaasidan:*

$$\cos A = \frac{\text{dhererka dhinaca dariska la ah} \angle A}{\text{dhererka shakaal ka}} = \frac{b}{c}$$
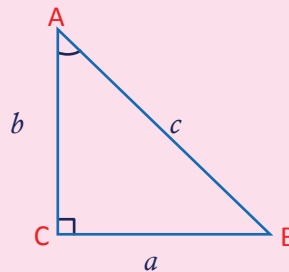
Jaantuska 7.31

iii Taanjantiga $\angle A$, waxaa loo soo gaabiyaa "tan A" waxaa loo qeexaa sidan:

$$\tan A = \frac{dheerarka\ dhinaca\ ka\ soo\ horjeeda\ \angle A}{dherarka\ dhinaca\ dariska\ la\ ah\ \angle A} = \frac{a}{b}$$

F.G **1** Sin A, cosA iyo tan A, waxaa loola jeedaa cabbirka xagasha $\angle A$.

2 xagal kasta oo fiiqan θ, maadaama shakaalkuinuu yahay dhinaca ugudheer, $0 < \sin\theta < 1$ iyo $0 < \cos\theta < 1$.

Qormo: Dhererrada dhinacahorjeedaha, dhinaca dariska iyo shakkalka waxaa loo soo gaabiyaa lior, darj,shak.,sida ay u kala horeeyaan..Fiiri Jaantuska 7.32.

Saamiyada tirigonometariga seddexda ah la xiriira xagasha $\angle A$

Si fudud waxaa loo muujin karaa sidan:

$$\sin A = \frac{horj}{shak}$$

$$\cos A = \frac{dar}{shak}$$

$$\tan A = \frac{horj}{dar}$$
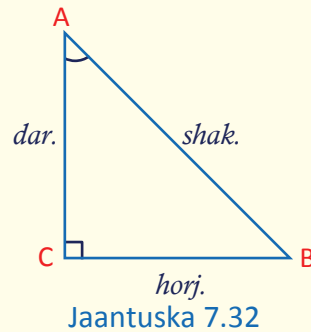
Jaantuska 7.32

Tusaalaha 1: Jaantuska 7.33, ΔABC waa saddexagal xagal qumman cabbirka xagashiisu $(\angle C) = 90^o$, AC = 4 sm iyo BC = 3 sm.

Raadi **b** sin A, cos Aiyo tan A.

t sin B, cos B iyo tan B

Jaantuska 7.33

Furfuris: Sicad oo badhax laAB = 5 sm

b $\sin A = \dfrac{4}{5}$ **t** $\sin B = \dfrac{3}{5}$

$\cos A = \dfrac{3}{5}$ $\cos B = \dfrac{4}{5}$

$\tan A = \dfrac{4}{3}$ $\tan B = \dfrac{3}{4}$
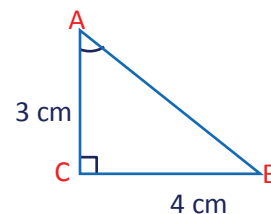
Tusaalaha 2: Haddii A iyo B ay yihiin xaglo is-dhammaystiro, ma runbaa

$$\sin A = \cos B, \cos A = \sin B \text{ iyo } \tan A = \frac{1}{\tan B}?$$

Furfuris: Eeg ΔABC ee ka muuqda Jaantuska 7.34

$$\sin A = \frac{a}{c} = \cos B, \cos A = \frac{b}{c} = \sin A \text{ iyo } \tan A = \frac{a}{b} = \frac{1}{\left(\dfrac{b}{a}\right)} = \frac{1}{\tan B}$$

Tusaalaha 3: Raadi saamiyada tirigonomatarigaee saddexda ah ee laxiriira xagasha fiiqan θ sida ku cad Jaantuska 7.35 hoose
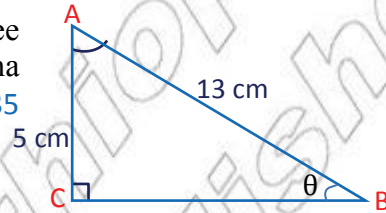
Jaantuska 7.35

Furfuris: BC = 12 marka loo eego aragtiinka Pythagoras

$$\text{sayn } \theta = \frac{5}{13}, \text{ kosayn } \theta = \frac{12}{13} \text{ iyo } \tan \theta = \frac{5}{12}.$$

Tusaalaha 4: Saddexagalka ΔABC, caabirka$(\angle C) = 90^{o}$ iyo $\sin A = \frac{40}{41}$. Raadi

a sayn B   **b** kosayn B   **c** taan B

Matahay suurtagal in la helo dherarka shakaalka? Sharax

Furfuris: Sawir saddexagalka ΔABC, cabbirka xagasha m$(\angle C)$ iyo $\frac{BC}{AB} = \frac{40}{41}$

Halka saddexagal ee suurtagalka ah waa midka kamuuqda Jaantuska 7.36. Adigo oo isticmaalaya aragtiinka Pythagoras waxaad helaysaa

$$AC^2 + 40^2 = 41^2$$
$$AC^2 = 41^2 - 40^2$$
$$AC^2 = 1681 - 1600$$
$$AC = \sqrt{81}$$
$$AC = 9$$

Jaantuska 7.36

Tan waxaad ka helaysaa,

b sayn B = $\frac{9}{41}$ **t** kosayn B = $\frac{40}{41}$ **j** tan B = $\frac{9}{40}$
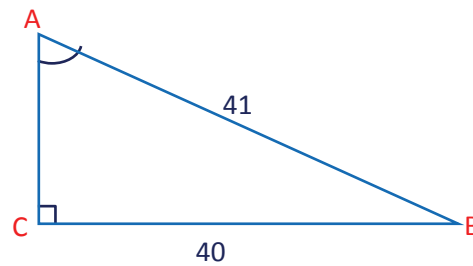
F.G: *Haddii aad ku dhufato dhererrada dhinac kata eeΔ ABC* Jaantuska 7.36, *tiro togan sida* 2×9, 2×40, 2×41*mar labaad waxay ku siin saddexagal xagal qumman kaas oo dherarrada dhinacyadiisu yihiin*18, 80, 82.

Ama haddii aad ku dhufato $\dfrac{1}{2}$, *dherada dhinacyadu waxay noqonayaan*4.5, 20, 20.5; *saddexagalku wali waxaa uu ahaan saddexagal xagal qumman.*

Sidoo kale saamiyada tirigonomatariga isma bedelayaan.

Matalan, sin B = $\dfrac{18}{82} = \dfrac{9}{41}$, $\sin B = \dfrac{4.5}{20.5} = \dfrac{9}{41}$. Laakiin baaxadda saddexagalka ayaa is badelaysa. Sidaa darteed dherarka shakaalka way is badasha saddexagal ilaa saddaxagal.

Tusaalha 5: Jaantuskan 7.37 wuxuu muujinayaa in ay jiraan laba saddexagal xaglo qumman. Raadi sine, cosine iyo tangent ee xaglaha cabbirkoodu yahay α, β iyo θ sida muuqata.
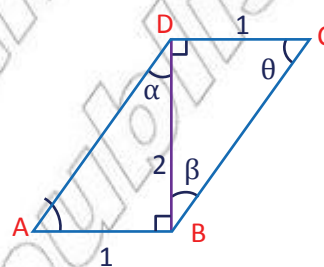
Jaantuska 7.37

Furfuris: Marka ugu horraysa waxaad raadisaa dhererada AD iyo BC adiga oo isticmaalaya aragtiinka baytagoras.

$$AD^2 = AB^2 + BD^2 \qquad\qquad BC^2 = BD^2 + DC^2$$
$$AD^2 = 1^2 + 2^2 \qquad\qquad BC^2 = 2^2 + 1^2$$
$$AD^2 = 5 \qquad\qquad\qquad BC^2 = 5$$
$$AD = \sqrt{5} \qquad\qquad\qquad BC = \sqrt{5}$$

i $\quad \sin \alpha = \dfrac{AB}{AD}$

$\qquad \sin \alpha = \dfrac{1}{\sqrt{5}} = \dfrac{\sqrt{5}}{5}$

$\qquad \sin \beta = \dfrac{DC}{BC}$

$\qquad \sin \beta = \dfrac{1}{\sqrt{5}} = \dfrac{\sqrt{5}}{5}$

ii $\quad \cos\alpha = \dfrac{BD}{AD}$

$\qquad \cos\alpha = \dfrac{2}{\sqrt{5}} = \dfrac{2\sqrt{5}}{5}$

$\qquad \cos\beta = \dfrac{BD}{BC}$

$\qquad \cos\beta = \dfrac{2}{\sqrt{5}} = \dfrac{2\sqrt{5}}{5}$

$$\sin \theta = \frac{BD}{BC} \qquad\qquad \cos \theta = \frac{DC}{BC}$$

$$\sin \theta = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5} \qquad\qquad \cos \theta = \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}$$

iii $\tan \alpha = \dfrac{AB}{BD} \qquad\qquad \tan \beta = \dfrac{BC}{BD} \qquad\qquad \tan \theta = \dfrac{BC}{DC}$

$\tan \alpha = \dfrac{1}{2} \qquad\qquad\quad \tan \beta = \dfrac{1}{2} \qquad\qquad\quad \tan \theta = 2$

Layliska 7.3

1 Raadi saynka, kosaynka, iyo tangantiga xagasha calaamadaysan ee Jaantuska 7.38.
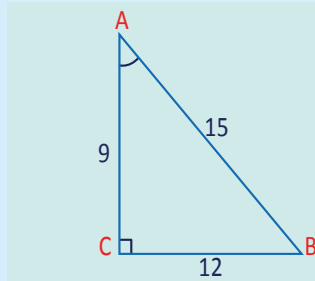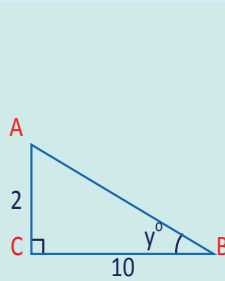
b **t** **j**
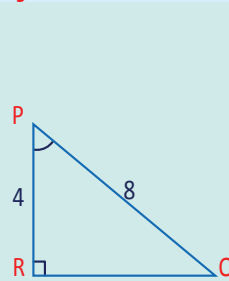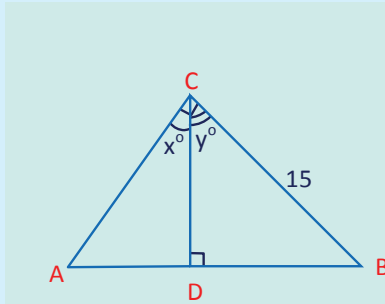
x **kh**
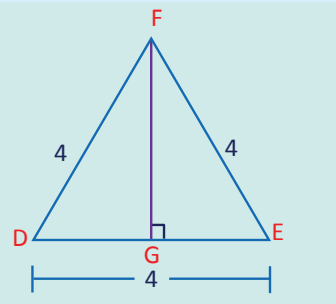
Jaantuska 7.38

2 Geed jooggiisu yahay 15m ayaa hadh 10m ah ku sameeyey dhulka. Raadi xagasha taanjentiga ee uu geedku kaga samaysay fallaadhaha cadceedda?

3 Raadi saynka xagasha ka samaysantay dhinaca labajibbaaran iyo xaglo-gooyaha.

4 Sallaan 9 mitirah ayaa lagu tiiriyay darbiqotoma. Haddii tanjantiga xagasha kasamaysantay sallanka iyo dhulka ay tahay 0.35, joog intee dhan ayuu sallanku ka gaarayaa darbiga?

7.2.2 Qiimayaasha saynka, kosaynka iyo taanjentiga ee xaglaha 45°, 30° iyo 60°

Xaglaha gaarka ah ee cabbirkoodu yahay 30°, 45° iyo 60° waxaa loo isticmaalaa adeegsiyada laxiriira tirigonomatariga. Sidaa darteed, saamiyada tirigonomatariga ee sadexda ah ee laxiriira xaglahaas waxaa lagu lafa guri qaybtan.

Hawl-galka7.5

Ujeedo: In lahelo saynka, kosaynka, iyo taanjantiga ee xagasha 45°

Saabaanka: Mastarad kusalaysan mitir iyo, xaglo-beeg.Sawir sadexgal, xagal qumman ΔABC kaa soo m(∠C) = 90°, AC = BC = 10 sm.

Jidmarin:

1 Raadi dhererka shakaalka.

2 Raadi cabbirka xaglaha∠A iyo ∠B.

3 Raadi qimeyaashe sayn kosayn iyo taanjenti ee xaglaha∠A iyo ∠B.

4 Qor bayaan qeexaya natiijooyinka su'aasha 3.

Hawlgalka 4, waxaad ku soo baratay saynka, kosaynka iyo taanjentiga xaglaha fiiqan ee sadexagal labaalaha, xagasha quman marka dhererka lugihiisa lagu sargooyo 10 sm.

Bal hadda aynu eegno sadexagal labaalaha xagasha qumman ΔABC kaas oo $m(\angle C) = 90^o$ iyo AC = BC = $x$halka$x$tahay tiro togan oo maangala. *Fiiri* Jaantuska 7.39.

$$AB^2 = AC^2 + BC^2$$
$$= x^2 + x^2$$
$$= 2x^2$$
$$AB = \sqrt{2x^2}$$
$$= x\sqrt{2}$$
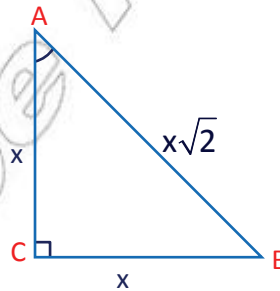
Jaantuska 7.39

Sida muuqata $m(\angle A) = m(\angle B) = 45^o$.

Sidaas darteed qiimayaasha∠Aiyo∠B waa isku mid.

$$\sin A = \frac{BC}{AB} = \frac{x}{x\sqrt{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

Sidoo kale, $\cos A = \dfrac{AC}{AB} = \dfrac{x}{x\sqrt{2}} = \dfrac{\sqrt{2}}{2}$

$\tan A = \dfrac{BC}{AC} = \dfrac{x}{x} = 1$

Si loo fududeeyo xisaabintan qaado $x = 1$, marka AB = $\sqrt{2}$.

Waxaana lagu soo koobay sidan:

i $\quad \sin 45^\circ = \dfrac{\sqrt{2}}{2}$ **ii** $\quad \cos 45^\circ = \dfrac{\sqrt{2}}{2}$ **iii** $\quad \tan 45^\circ = 1$

Tusaalaha1: Raadi dhererada maqan ee Jaantuska 7.41 adiga oo isticmaalayasaamiyada tirigonometariga.
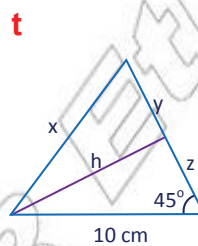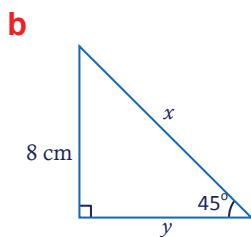
Jaantuska 7.40

Furfuris:

b $\tan 45^\circ = \dfrac{8\text{ cm}}{y}$

$\quad 1 = \dfrac{8\text{ cm}}{y}$

$\quad y = 8\text{cm}$

$\sin 45^\circ = \dfrac{8\text{ cm}}{x}$

$\dfrac{1}{\sqrt{2}} = \dfrac{8\text{ cm}}{x}$

$x = 8\sqrt{2}\text{ cm}$

t $\sin 45^\circ = \dfrac{h}{10\text{ cm}}$

$\dfrac{\sqrt{2}}{2} = \dfrac{h}{10\text{ cm}}$

$h = 10\left(\dfrac{\sqrt{2}}{2}\right)\text{cm}$

$\quad = 5\sqrt{2}\text{ cm}$

$\tan 45^\circ = \dfrac{h}{z} = 1 = \dfrac{5\sqrt{2}}{z}$

$z = 5\sqrt{2}\text{ cm}$

$\tan 45^\circ = \dfrac{x}{10\text{ cm}}$

$1 = \dfrac{x}{10\text{ cm}}$

$x = 10\text{cm}$

Tusaalahe 2: Sallaan lagu tiiriyay darbi ayaa la sameeyay xagal 45° ah dhulka. Cagta sallaanka 4m ayay ka fogayd salka cirifka darbiga. Adiga oo isticmaalaya saamiyada tirigonomatariga ka jawaab mid kasta oo kamida su'aalaha soo socda.

b Joog intee dhan ayuu sallaanku ka gaadhi karaa darbiga:

t Raadi dhererka sallaanka?

Furfuris: Siloo furfuro meseladan tallaabada ugu horraysa waa in la sawiro jaantus muujinaya sallaanka iyo cirifka darbiga. Fiiri Jaantuska 7.41.

Jaantuska 7.41

b $\tan 45^o = \dfrac{BC}{AC}$

$$\dfrac{\sqrt{2}}{2} = \dfrac{BC}{4}$$

$$BC = 2\sqrt{2} \text{ m}$$

t $\cos 45^o = \dfrac{AC}{AB}$

$$\dfrac{\sqrt{2}}{2} = \dfrac{4}{AB}$$

Sidoo kale, $\dfrac{1}{\sqrt{2}} = \dfrac{4}{AB}$

$$AB = 4\sqrt{2} \text{ m}$$
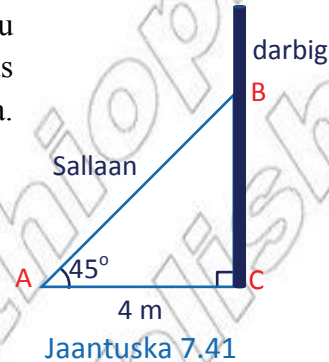
Qiimeyaasha sayn, kosayn iyo taanjentiga ee xaglaha 30° iyo 60°

Hawl-galka7.6

Ujeedo: Si loo helo sayn, kosayn iyo taanjantiga xaglaha 30° iyo 60°.

Saabaan: Mastarad ku salaysan mitir, jiheeye iyo xaglo-beeg.

Jidmarin:

1 **b** Sawir goobo gacankeedu yahay 4 sm xudunkeedu yahay barta A, islamarkaana u qaado "t" inay yihiin baro kasta oo ka midah goobada dusheeda.

t Sawir goobo gacankeedu yahay 4 sm xudunkeeduna yahay barta Bku calaamadee barta ay iska gooynayaan goobooyinka in ay tahay c. Eeg Jaantuska 7.42.
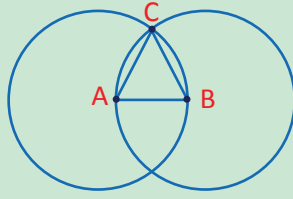
Jaantuska 7.42

j   Cabbir dhinacyada iyo xaglaha ΔABC. Waa noocee saddexagalka ΔABC?

2   Dib ugu sawirΔABC warqad gaar ah islamarkaana sawir joogga $\overline{CD}$ ee ku qotoma $\overline{AB}$ sida ka muuqata Jaantuska 7.43.

b   Raadi dhererka $\overline{CD}$.

t   Waa maxay cabbirka xagasha∠ACD?

j   Raadi qiimayaasha sayn, kosayn iyo taanjent ee cabbirada xaglaha∠A iyo∠ACD.

Jaantuska 7.43

3   Qor hawraar qeexaysa sayn, kosayn iyo taanjent ee cabbirada xagalaha ∠B iyo ∠BCD.
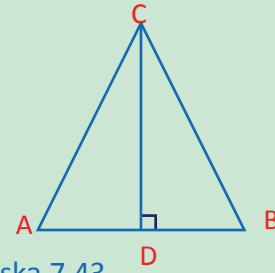
Hawlgalka7.6 wuxuukaa caawinayaa inaad hesho qiimayaasha sayn, kosayn iyo taanjent ee xaglaha 30° iyo 60°.Soo qaado saddexagal labaalaha ABC iyo joogga AD ee ku qotoma BC. *Fiiri* Jaantuska 7.44.

U qaado dhererka dhinac kasta eeΔABC *x*.

Markaa CD = $\dfrac{x}{2}$.

U qaado AD = *h*. Markaa $h^2 + \left(\dfrac{x}{2}\right)^2 = x^2$

$$h^2 = x^2 - \frac{x^2}{4} \quad = \frac{3}{4}x^2$$

$$h = \sqrt{\frac{3}{4}x^2} = \frac{x\sqrt{3}}{2}$$

Jaantuska 7.44

Hadda $\sin C = \dfrac{h}{x} = \dfrac{\dfrac{x\sqrt{3}}{2}}{x} = \dfrac{x\sqrt{3}}{2x} = \dfrac{\sqrt{3}}{2}$,
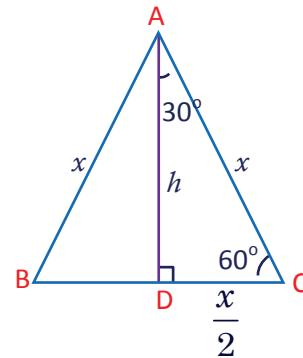
$$\cos C = \frac{\left(\dfrac{x}{2}\right)}{x} = \frac{x}{2x} = \frac{1}{2}$$

$$\tan C = \frac{h}{\left(\dfrac{x}{2}\right)} = \frac{\left(\dfrac{x\sqrt{3}}{2}\right)}{\left(\dfrac{x}{2}\right)} = \frac{x\sqrt{3}}{2} \times \frac{2}{3} = \sqrt{3}$$

Si loo fududeeyo xisaabinta, u qaado $x = 2$. Markaa $\dfrac{x}{2} = 1$.

Natijooyinka sare waxaan ku soo koobaynaa sidan:

i $\sin 60^o = \dfrac{\sqrt{3}}{2}$ **ii** $\sin 30^o = \dfrac{1}{2}$

        $\cos 60^o = \dfrac{1}{2}$ $\cos 30^o = \dfrac{\sqrt{3}}{2}$

        $\tan 60^o = \sqrt{3}$ $\tan 30^o = \dfrac{1}{\sqrt{3}} = \dfrac{\sqrt{3}}{3}$

Xusuusnow xaglaha is-dhammaystira sida 60° iyo 30°, qimeyaasha taanjaantiyada waa rogaallada midba midka kaleQiimaha saynka ee xaglaha midkood wuxuu le'eg yahay qiimaha kosaynka ee xagasha kale.

Farsemada fudud:

Raadi qiimayeesha saynka, kosaynka iyo taanjaantahe xaglaha 30°, 45° iyo 60° adiga oo isticmaaleya kal kuleetar sayntifig.

Tusaale 3:   Raadi qiimayaasha x iyo y ee saddexagalada xaglaha qumman ee Jaantuska 7.45.
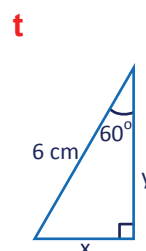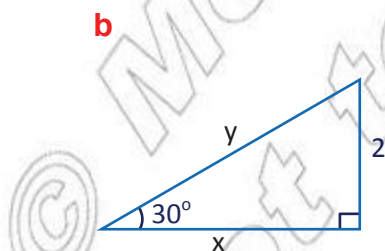
Jaantuska 7.45

Furfuris: Adeegsiga saamiyada tirigonomeetariga waxay ku siinaysaa sidan:

b $\sin 30^o = \dfrac{2\ cm}{y}$ $\dfrac{1}{2} = \dfrac{2\,cm}{y}$ $y = 4cm$	$\tan 30^o = \dfrac{2}{x}$ $\dfrac{\sqrt{3}}{3} = \dfrac{2}{x}$ $x = \dfrac{6\sqrt{3}}{3} = 2\sqrt{3}\ cm$
t $\sin 60^o = \dfrac{x}{6\ cm}$ $\dfrac{\sqrt{3}}{2} = \dfrac{x}{6\,cm}$ $\dfrac{6\sqrt{3}}{2}\,cm = x$ $x = 3\sqrt{3}\ cm$	$\cos 60^o = \dfrac{y}{6\ cm}$ $\dfrac{1}{2} = \dfrac{y}{6\,cm}$ $y = \dfrac{1}{2}(6cm)$ $\qquad = 3cm$

Tusaale 4:   ku qeex dhererada lugaha saddexagalka 30° iyo 60° adiga oo ku tibaaxaya dhererka shakaalka C.

Furfuris: U qaado ΔABC inuu yahay saddexagal xagal qumman cabbirka

$m(\angle A) = 30^o$, $m(\angle B) = 60^o$ iyo $AB = c$.

Fiiri Jaantuska 7.46

Jaantuska 7.46

$\sin 30^o = \dfrac{BC}{AB}$ $\dfrac{1}{2} = \dfrac{BC}{c}$ $BC = \dfrac{c}{2}$	$\sin 60^o = \dfrac{AC}{AB}$ $\dfrac{\sqrt{3}}{2} = \dfrac{AC}{c}$ $AC = \dfrac{c\sqrt{3}}{2}$

Sidaas darteed 30° iyo 60° ee saddexagalka dhererada dhinacyadiisu waa $\dfrac{c}{2}$, $\dfrac{c\sqrt{3}}{2}$ iyo c.

Tusaale 5: Birta calanka ayaa bixisay hoos dhererkiisu yahay 4m dhulsiman dushiisa. Haddi xagasha ay ku sameeyeen dhamaadka hooska dhulka iyo iftiinka fallaaraha ka imanaya cadceeda ay tahay 30°, raadi joogga birta calanka adiga oo qaadanaya cabbirka sintimitirka ugu dhaw.

Furfuris: Fiiri Jaantuska 7.47.

$$\tan 30^o = \frac{h}{4m}$$

$$\frac{\sqrt{3}}{3} = \frac{h}{4m}$$

$$h = \frac{4\sqrt{3}}{3}\, m$$

$$h \approx 2.31\text{m}$$
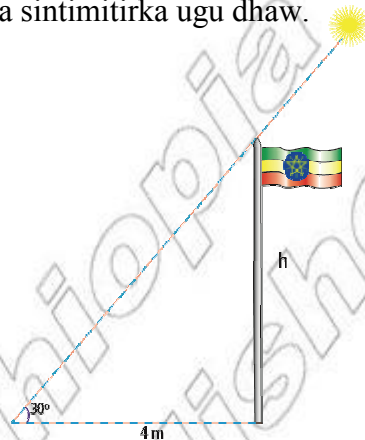
Jaantuska 7.47

Tusaale 6: ka soo qaad shimbir duulaysa ayaa degtay meel 100m ka fog xagal 30° ah marka loo eego sinaanta dhulka. Joog intee dhan ayey shimbirtu kasarraysaa dhulka

Furfuris: Uqaado h joogga ay shimbirtu kor u duushay sida kamuuqata Jaantuska 7.48

$$\sin 30^o = \frac{h}{100\, m} \Rightarrow \frac{1}{2} = \frac{h}{10\, m} \Rightarrow h = 50\, m$$
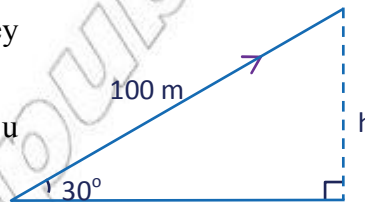
Jaantuska 7.48

Shimbirtu waxay ka sarraysaa dhulkc 50 m.

Tusaale 7: Wiish ayaa kor looga qaaday xagal 60° si uu ugaaro dhalada sare ee dhismaha dugsi. (Fiiri Jaantuska 7.49) Haddii salka wish ku uu 15m ka fogyahay cagta dhismaha dugsiga, raadi joogga dhismaha dugsiga iyo dhererka kor loo qaaday wiishka.
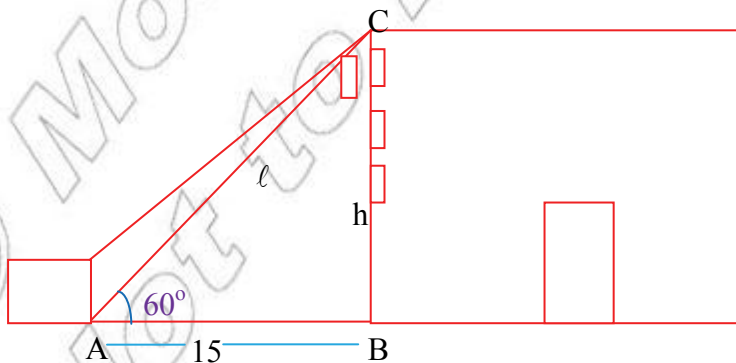
Jaantuska 7.49

Furfuris: Uqaado jooggadhismaha dugsiga, in u yahay halbeeg h ah iyo joogga uu wiishka sare u kacay tahay l mitir Jaantuska 7.49 waxaad kuatki kartaa in.

$$\tan 60^o = \frac{h}{15\,m}$$

$$\sqrt{3} = \frac{h}{15\,m}$$

$$h = 15\sqrt{3}\,m$$

$$\cos 60^o = \frac{15\,m}{\ell}$$

$$\frac{1}{2} = \frac{15\,m}{\ell}$$

$$\ell = 30m$$

Joogga dugsiga waa $15\sqrt{3}$ m.   30 m ayaa wiishka kor loo qaaday.

Layliska7.4

1 Ka jawaab mid kasta oo kamida su'aalaha soo socda ee ka muuqda Jaantuska 7.50 - 7.54.

b Waa intee dhererka geedku?
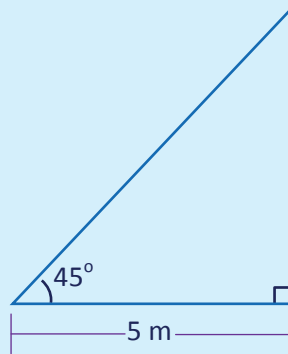
Jaantuska 7.50

t Waa intee dhererka hoosku?
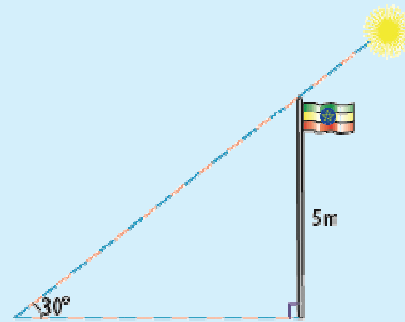
Jaantuska7.51

j Waa imisa dhererka sallaanka?
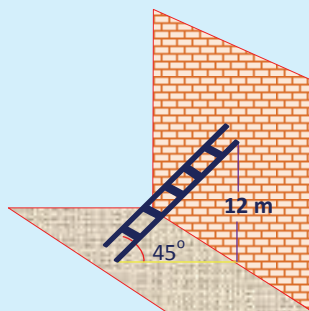
Jaantuska 7.52

x Wa intee ballaca wabiga?
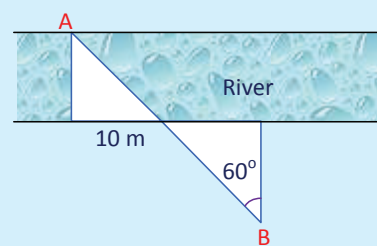
Jaantuska 7.53

kh Waa imisa ballaca Harta?

Jaantuska 7.54

2 Jaantusyada 7.55, raadi dhererada lagu calaamadeeyay*x* iyo*y*.
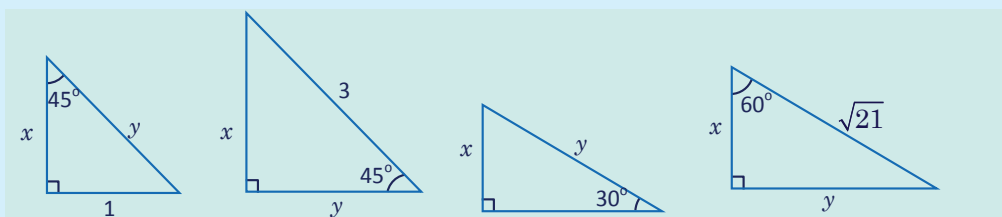
b	t	j	x

Jaantuska 7.55

3 Jaantuska 7.56, m ($\angle$B) = 90°, BC = 4cm, iyo $\angle$BAC $\cong\angle$CAD $\cong\angle$ADB. Raadi qiimayaasha*x*, *y* iyo θ.
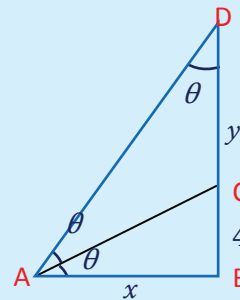
Jaantuska 7.56

4 Waddo ayaa xagal janjeedha 30°samaysay marka loo eego xarriiq toosan. Raadi fogaanta ay tahay inaad waddada kor ugu lugayso siaad ugu kordhiso jooggaaga 100m.

5 Sallaan dhererkiisu yahay 12m ayaa lagu tiiriyay darbi wuxuuna gaadhay joog 6m ka sarreeya dhulka. Raadi xagasha uu sallaanku la sameeyay dhulka.

6 Haddii aad si toos ah u lugayso 173 m islamarkaanaaad gaadhid fikta sare ee buur dheererkeedu yahay 150 m. Raadi janjeedhka (xagasha) buurta (isticmaal shaxda qiimaha)

7.3 SHAXANNADA ADKAHA

Cutubka 5 ee xisaabta fasalka 7 waxaad ku soo baratay shaxannada adkaha sida gumburaha biriisim iyo dhululubooyinka.Cutub-hoosaadkan waxaad ku baran doontaa laba nooc oo kale oo ka mida shaxannada adkaha sida Gumburada bayramidhka iyo toobinada.Gumburada bayraamidhka iyo toobinadu waa adkayaasha caanka ka ah dunidan.Tusaale gumburada bayraamidhka ee masaarida, gumburada bayraamidh ka ee silsilada raashinka.

Waxaad kufalanqayn doontaan gumburada bayramidhka iyo toobinada laba qaybood ahaan.

7.3.1 Gumburada bayraamidhka

Shaqo-kooxeedka 7.4

Ujeedo: In laga sameeyo gunburada bayraamidha warqad la'laalaabay.

Saabaan: Mastarad ku salaysan mitir, manqasyo, iyo warqadadag. Guuri Jaantuska 7.57. Laalaab oo fidi saddex-xagalka adiga oo raacaya tilmaamaha geesaha A, B C iyo D. PQRS waa labajibbaarane dhererka dhinaciisu yahay 6 sm.

Saddexagalladu waa ay isku sargo'an yihiin.

Jidmarin:

1   Waa noocee jaantuska adkaha ah ee aad aragto?

2   Sawir adkaha adiga oo ilaalinaya in uusan isbedel ku dhicin salka PQRS. Salku waa wajiga fidsan ee adkuhuuu ku fadhiyo.
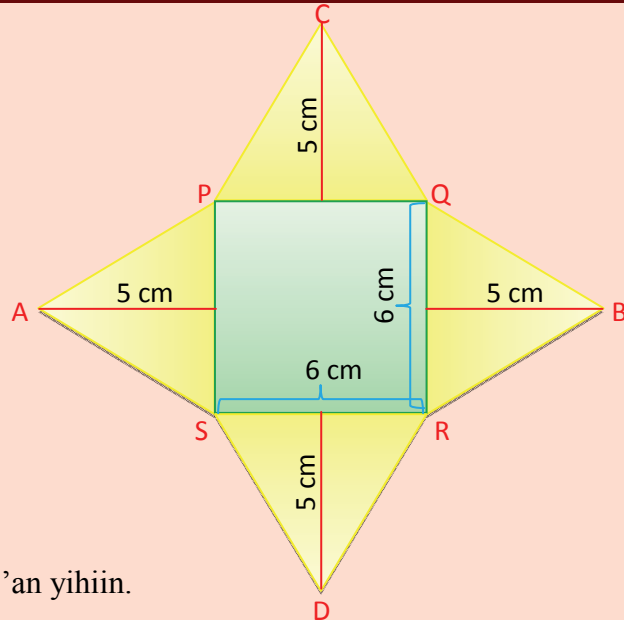
Jaantuska 7.57

Shaxanka adkaha ee hawlgal kooxeedka 7.4 wuxuu tusaale u yahay gumbur bayraamidh salkiisu yahay labajibbarane.Hawlgalkan soo socda waxaad ku arki doontaa gumbur bayraamidh salkiisu yahay geesoole.

Hawl-galka 7.7

Fiiri gunburada baraamidhyada ka muuqda Jaantuska 7.58.

b   **t**   **j**
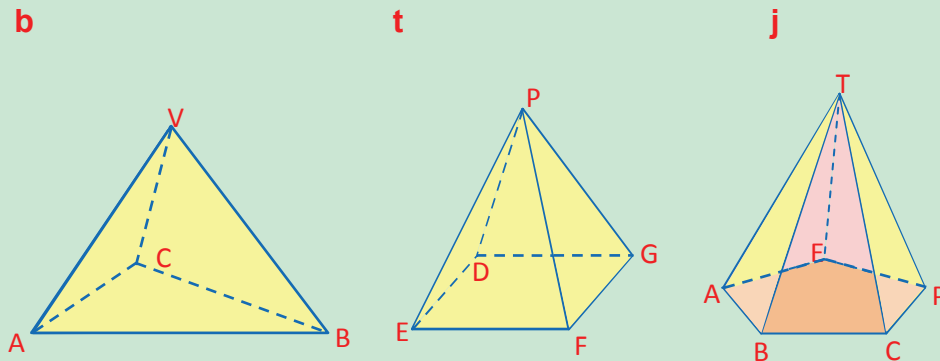
Jaantuska 7.58

1   Qor tirada wajiyada ee gumbur kasta uu leeyahay.

2   muuji salka gumburkasta.

3   Qor hawraar qeexaysa geesaha V, P iyo T.

4   Fatanqee sida loo qeexo waxa uu yahay gumbur.

Hawlgalka7.7, waxaad ku soo aragtay gumbur inuu yahay adke salkiisu yahay geesoole wajiyadiisa kalena ay yihiin saddexagallo.

Guudahaan gumbur waxaa loo qeexaa sidan soo socota.

Qeexid 7.2   *Gumbur waa adke ka samaysma isku xiridda geesaha geesoole.Bedka geesoolaha waxaa loogu yeeraa salka gumburka.*
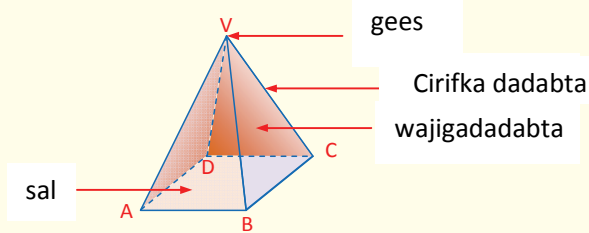
Jaantuska 7.59

+   *ABCD waa salka gumburka.*

+   *V waa gees.*

+   *Wajiyada saddexagal ee gumburka sida ΔBVC, ΔCVD waxaa lagu magacaabaa wajiyada dadabta.*

> ♦ *Dhinacyada wajiyada dadabta kuwaas aan ahayn dhinacyada salalka sida VA, VB, VC, VD waxaa loo yaqaanaa cirifyada dadabta.*
>
> ♦ *Salka gumburtu waxaa noqon kara geesoole kasta laakiinse wajiyadeeda dadabta had iyo jeer waa saddexagalo sidaas awgeed, gumbur waxaa loogu magac bixiyaa hadba qabka (ama nooca) uu yahay salalkeeda.*

Gumbur, haddii ay salalkoodu yihiin, saddex xagal, afargeesle, shan geesle, lixgeesle, siddey u kale horeeyaan (Fiiri Jaantuska 7.61).
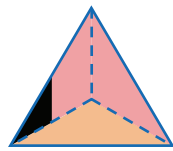
| *Gumbur Saddex xagaleed* | *Gumbur Afar-geelse* | *Gumbur shangeesle* | *Gumbur lixgeesle* |
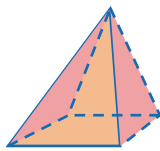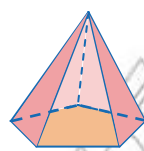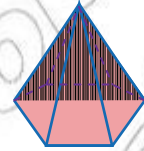
Jaantuska 7.60

7.3.2 Toobin

Waxaa jira walxo dhabah oo leh qaabka toobinka, tusaale ahaan saqafka mundulka, geesaha lo'da, jallaatada, koofiyada lagashado maalinta dhalashada, la xusayo Kuwaas aan kor kusoo xusnay waa qaar kamida walxaha leh qaabka toobinka.Qaybtan waxaad kubaran doontaa qaybaha kala duwan ee toobinka.

Shaqo-kooxeedka7.5

Ujeedo: Samayntatoobin iyada oo la laalaabayo lana duubayo warqad.

Qalabka loo baahan yahay: Mastarad cabbiran qalabka lagu cabbiro goobada, xagal beege manqas, warqad adag.

Habka laraacayo:

1 Falanqee noocajoomatariga ee ay walaxdu noqoto marka salka gumburku isubedelo qaab gabal goobeed.

2 Sawir 3 goobo oo gacankoodu yahay 10 sm oo u kala googoo
   i Goobobadh
   ii Rubuc goobo
   iii Goobo gabal xagalshiisu tahay 120°.
   iv Goobo gabal xagashiisu tahay 270°.

3 Kor duub gabalkasta oo su'aashaha 2 oo gacanada cabbir.

4 U soo bandhig fasalka muunadda aad ka soo samaysay weydiinta 3^{aad}.

5 Qor weedh qeexaysa muunadaasi.

Muunadahaaad ku sameeysay Shaqo-kooxeedka 7.5 waa tusaaleyaasha adkeyaasha ee looyaqaano: toobino goobeedyo qumman.

Hadaba guud ahaan toobin goobeedka qumman (toobinka fudud) wuxuu inooga muuqdaa Jaantuska 7.61.
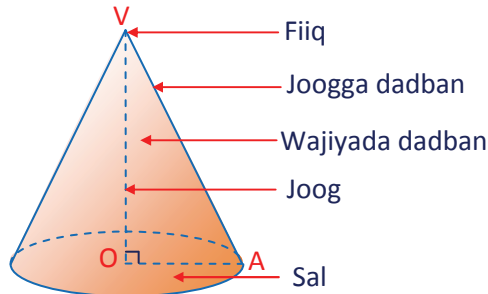
Toobin goobeed quman
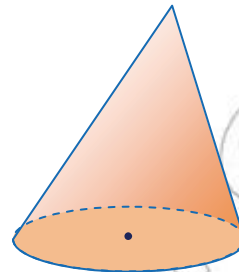
Jaantuska 7.62

Toobin janjeedha

Jaantuska 7.63

Toobin goobeed qumman

> Xusuus: *Toobin waa shaxan adke ah oo ka kooban sal, kaas oo ah gobal goobeed ee dusha sallaxah iyo fiiqa sallaxa kale,*
>
> - *salku waa wajigo fidsan uu toobinku kufadhiyo salku waa gabal goobeed.*
>
> - *wajiga dadbani waa wajigaxoodan ee toobinka*
>
> - *jooggu waa xariijinta ku qotonta taasoo katimaada fiiqa ilaa xudunta (badhtanka) salka.*

Haddii VO aynaahayn qotonka OA markaa toobinka waxaa layidhaahdaa: toobinka janjeedha sida kamuuqatatoobinka (Jaantuska 7.64)

Layliska 7.5

1 Sawir toobin gacankiisu yahay 4 sm muuji salkiisa, wajiyada dadban, fiiqa, Joogga iyo joogga janjeedha.

2 Ku qor magacyada, salka,fiiqa, geftinada dadban iyo wajiyada dadban, ee gumburka, marka salkiisu yahay.

b qardhaas   **t** 8 - geesoole

3 Waa imisa tirada ugu yare ee wajiyogumbur yeelan karo?

4 Waa noocee saddexaagallada ay noqonayaan wajiyada dadban ee gumburka caadiga ah?

🔑 Furaha Tibxaha 🔑

- Fiiqa
- Gumburka
- Aragtinka yuklidh
- Geftinada dadban
- Addin (lug)
- Shaxan adke ah

- Barta ugu saraysa
- Salka
- Rogaalka
- Aragtiinka baytagoros
- Taabtaha
- Toobin

- Kosayn
- Shakaalka
- Wajiyada dadban
- Sayn
- Tirigonometri
- Taanjeentiga

Sookoobida Cutubka

1 Aragtiinka yuklidh

U qaado ΔABC yahay saddexagal xagal qummanoo ay $\overline{CD}$ tahay joogga ku qotoma fiiqa, C ilaa shakaalka $\overline{AB}$ marka.

i $AC^2 = AD \times AB$

ii $BC^2 = BDAB$
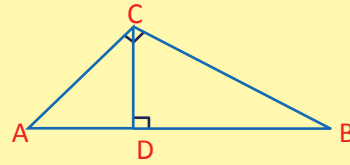
2 Rogaalka aragtiin yuklidh

Sida ΔABC haddii, $\overline{CD}$ ay tahay joogga C ilaa AB sidaas darteed $AC^2 = AD \times AB$ iyo $BC^2 = BD \times AB$, markaa ΔABC waa saddexagal xagal qumman oo leh $m(<C) = 90°$.
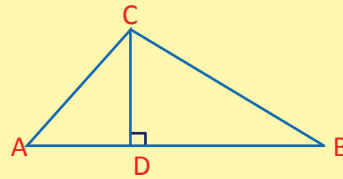
3 Aragtiinka baytagoras

Saddexagal xagalqumman, ay addimuhu le'eg yihiin laba jibaaka $a^2 + b^2 = c^2$ shakaalka.
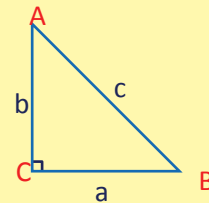
4 Rogaalka aragtiinka baytagoras

Hadii wadarta labajibaarka dhererada labada dhinac, le'egtahaylabajibaarkadhinaca saddexaad markaa saddexaglku waa saddexagalxagal qumman.
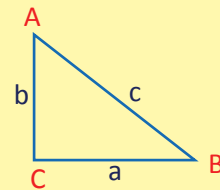
5 *Haddii ΔABC uu yahay saddexagal xagal qumman ee xagasha qumman $(<C) = 90°$,*

sayn $A = \dfrac{a}{c}$; kosayn $A = \dfrac{b}{c}$; tan $A = \dfrac{a}{b}$
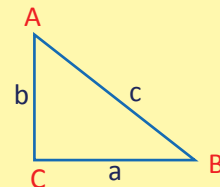
Haddii A iyo B ay yihiin xaglaha fiiqan ee saddexagalxagalqumman markaa A iyo B waa xaglo isbuuxsha isla markaana:

i *Sayn A = kosayn B*

ii *kos A = sayn B*

6 Saynka, koska, iyo tanjentiga ee xoglaha 30°, 45° iyo 60°:

i $sayn\ 45° = kosay\ 45° = \dfrac{\sqrt{2}}{2}\ ;\quad tan\ 45° = 1$

ii $sayn\ 30° = \dfrac{1}{2}\ ;\ kosay\ 30° = \dfrac{\sqrt{3}}{2}\ ;\ tan\ 30° = \dfrac{\sqrt{3}}{3}$

iii $sayn\ 60° = \dfrac{\sqrt{3}}{2}\ ;\ kosay\ 60° = \dfrac{1}{2}\ ;\ tan\ 60° = \sqrt{3}$

7 Shaxannada adkaha

i *Gumburka*

Gumburka waxaa loogu magacdaraa qaabka salkiisa, sida::

✓ *gumbur sadex- xagaleed*

✓ *gumbur afar- geesle*

✓ *gumbur shan-geesle*

✓ *gumbur lix-geesle*

Fiiqa
Geftinkadadaban
Wajiyada dadban
salka

ii *Toobin*

Fiiqa
Joogga
Wajiyada dadban
Joogga
Salka
Gacanka salka
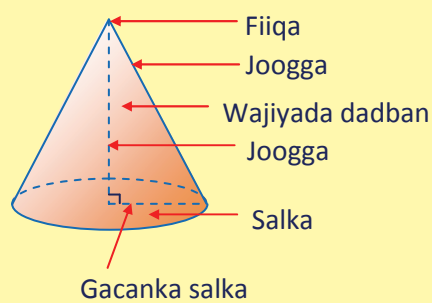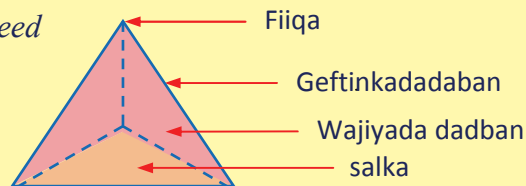
Nakhtiinka laylis cutubka 7^{aad}

1   Raadi mid kasta dhererka dhinaca maqan ee saddexagal xagal qumman ee soo socda.

b

1
c
2

t

a
37
12

j

x
$3\sqrt{3}$
$2\sqrt{3}$

x

a
c
45°
4

kh

1
1.25
b

d

$\sqrt{3}$
c
5

r

3   4
4   3
x

s

a
10
30°
b
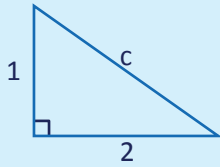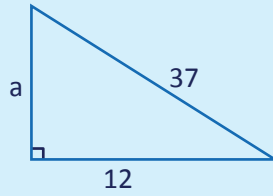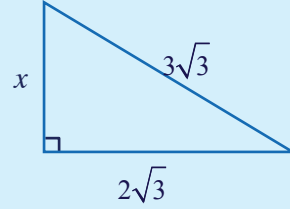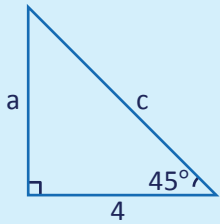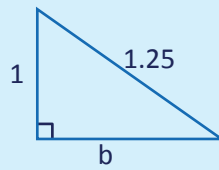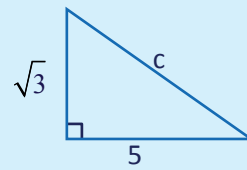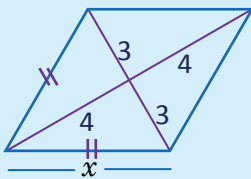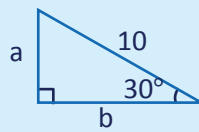
Jaantuska 7.65

2   Raadi dhererka dhinaca maqan ee saddexagal xagal qumman ee soo socda.

b

1
x
h
3

t

y   4   z
x   10

j

3   h   4
x   y

x

24   h   7
x   y
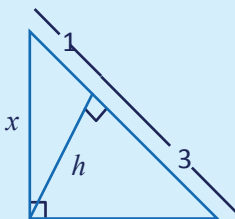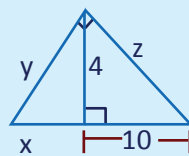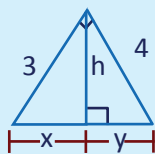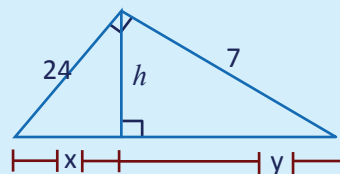
Jaantuska 7.66

3 Haddii dhererka dhinackasta oo laba jibaarane yahay 5 sm. Raadi dhererka xaglo gooye kasta.

4 Haddii xaglo gooyaha laba jibaarane yahay 12sm, raadi dhererka dhinac kasta.

5 Haddii dhinacyada laydi ay kala yihiin 3 sm iyo 7 sm. Waa intee dhererka xaglo gooyaha mid ka mida ahi?

6 Sallaan dhererkiisu yahay 10 m, ayaa kutiirsan, gidaar ka soo horjeeda oo qoton ah. Haddii cagta sallaanka uu u jiro salku gidaarka ay tahay 3m, joog intee le'eg ayuu ku gaadhayaa gidaarka?

7 Dhererada xaglo-gooyayaasha qardhaas ayaa kala ah 8 sm iyo 6 sm. Raadi wareegga qardhaasta.

8 Haddii shakaalka saddex-agal xagal qumman uu dheer yahay 4 addinka ugu yar addinkiisa ugu weyna yahay 8 sm. Raadi wareegga saddexagalka.

9 Raadi dhererka harta (warta) soo socota.
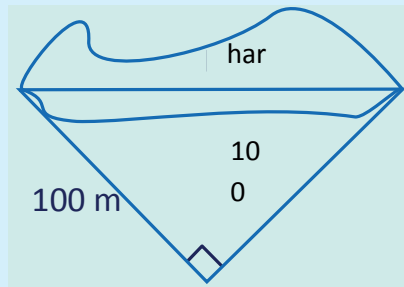
Jaantuska 7.67

Shaqo mashruuca:

10 Adigoo isticmaalaya cabbiraad aan toos aheyn. Raadi ballaca buuxa ee ballli ama har (warta) ee agagaarkiina kutaala.

11 Adigoo isticmaalaya $30^o – 60^o$qalabka labajibbaaran iyo $45^o – 45^o$ee qalabka labajibbaaran cabbir joogga geedka, iyo cidhifyada dhismaha ee aad heli kartid adigoo iskaga beegaya meelku haboon sida ka muuqata (Jaantaska 7.68)
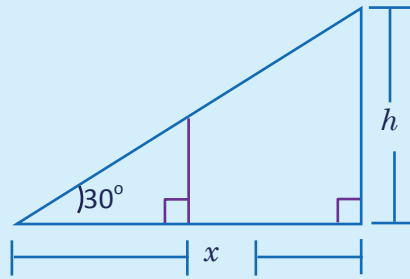
Jaantaska 7.68

12 Imisa waji dadban ayuu yeelan karaa gumburka haddii ay salalkiisu yihiin

   b   9-dhinac   **t**   20-dhinac   **j** n-dhinacyo

13 Muuji wajiyada dadban ee gumburka caadiga'ah inayisku sargo'an yihiin saddexagal ka labaalahaah.

14 Haddii salka gumburka uu isubadalo gabal goobeed, markaa adke noocee ah baynu heleynaa?

Shaxada Xidid $y = \sqrt{x}$

	0	1	2	3	4	5	6	7	8	9
1.0	1.000	1.005	1.010	1.015	1.020	1.025	1.030	1.034	1.039	1.044
1.1	1.049	1.054	1.058	1.063	1.068	1.072	1.077	1.082	1.086	1.091
1.2	1.095	1.100	1.105	1.109	1.114	1.118	1.122	1.127	1.131	1.136
1.3	1.140	1.145	1.149	1.153	1.158	1.162	1.166	1.170	1.175	1.179
1.4	1.183	1.187	1.192	1.196	1.200	1.204	1.208	1.212	1.217	1.221
1.5	1.225	1.229	1.233	1.237	1.241	1.245	1.249	1.253	1.257	1.261
1.6	1.265	1.269	1.273	1.277	1.281	1.285	1.288	1.292	1.296	1.300
1.7	1.304	1.308	1.311	1.315	1.319	1.323	1.327	1.330	1.334	1.338
1.8	1.342	1.345	1.349	1.353	1.356	1.360	1.364	1.367	1.371	1.375
1.9	1.378	1.382	1.386	1.389	1.393	1.396	1.400	1.404	1.407	1.411
2.0	1.414	1.418	1.421	1.425	1.428	1.432	1.435	1.439	1.442	1.446
2.1	1.449	1.453	1.456	1.459	1.463	1.466	1.470	1.473	1.476	1.480
2.2	1.483	1.487	1.490	1.493	1.497	1.500	1.503	1.507	1.510	1.513
2.3	1.517	1.520	1.523	1.526	1.530	1.533	1.536	1.539	1.543	1.546
2.4	1.549	1.552	1.556	1.559	1.562	1.565	1.568	1.572	1.575	1.578
2.5	1.581	1.584	1.587	1.591	1.594	1.597	1.600	1.603	1.606	1.609
2.6	1.612	1.616	1.619	1.622	1.625	1.628	1.631	1.634	1.637	1.640
2.7	1.643	1.646	1.649	1.652	1.655	1.658	1.661	1.664	1.667	1.670
2.8	1.673	1.676	1.679	1.682	1.685	1.688	1.691	1.694	1.697	1.700
2.9	1.703	1.706	1.709	1.712	1.715	1.718	1.720	1.723	1.726	1.729
3.0	1.732	1.735	1.738	1.741	1.744	1.746	1.749	1.752	1.755	1.758
3.1	1.761	1.764	1.766	1.769	1.772	1.775	1.778	1.780	1.78	1.786
3.2	1.789	1.792	1.794	1.797	1.800	1.803	1.806	1.808	1.811	1.814
3.3	1.817	1.819	1.822	1.825	1.828	1.830	1.833	1.836	1.838	1.841
3.4	1.844	1.847	1.849	1.852	1.855	1.857	1.860	1.863	1.865	1.868
3.5	1.871	1.873	1.876	1.879	1.881	1.884	1.887	1.889	1.892	1.895
3.6	1.897	1.900	1.903	1.905	1.908	1.910	1.913	1.916	1.918	1.921
3.7	1.924	1.926	1.929	1.931	1.934	1.936	1.939	1.942	1.944	1.947
3.8	1.949	1.952	1.954	1.957	1.960	1.962	1.965	1.967	1.970	1.972
3.9	1.975	1.977	1.980	1.982	1.985	1.987	1.990	1.992	1.995	1.997
4.0	2.000	2.002	2.005	2.007	2.010	2.012	2.015	2.017	2.020	2.022
4.1	2.025	2.027	2.030	2.032	2.035	2.037	2.040	2.042	2.045	2.047
4.2	2.049	2.052	2.054	2.057	2.059	2.062	2.064	2.066	2.069	2.071
4.3	2.074	2.076	2.078	2.081	2.083	2.086	2.088	2.090	2.093	2.095
4.4	2.098	2.100	2.102	2.105	2.107	2.110	2.112	2.114	2.117	2.119
4.5	2.121	2.124	2.126	2.128	2.131	2.133	2.135	2.138	2.140	2.142
4.6	2.145	2.147	2.149	2.152	2.154	2.156	2.159	2.161	2.163	2.166
4.7	2.168	2.170	2.173	2.175	2.177	2.179	2.182	2.184	2.186	2.189
4.8	2.191	2.193	2.195	2.198	2.200	2.202	2.205	2.207	2.209	2.211
4.9	2.214	2.216	2.218	2.220	2.223	2.225	2.227	2.229	2.232	2.234
5.0	2.236	2.238	2.241	2.243	2.245	2.247	2.249	2.252	2.254	2.256
5.1	2.258	2.261	2.263	2.265	2.267	2.269	2.272	2.274	2.276	2.278
5.2	2.280	2.283	2.285	2.287	2.289	2.291	2.293	2.296	2.298	2.300
5.3	2.302	2.304	2.307	2.309	2.311	2.313	2.315	2.317	2.319	2.322
5.4	2.324	2.326	2.328	2.330	2.332	2.335	2.337	2.339	2.341	2.343

Shaxada Xidid Labajibaarka $y = \sqrt{x}$

	0	1	2	3	4	5	6	7	8	9
5.5	2.345	2.347	2.349	2.352	2.354	2.356	2.358	2.360	2.362	2.364
5.6	2.366	2.369	2.371	2.373	2.375	2.377	2.379	2.381	2.383	2.385
5.7	2.387	2.390	2.392	2.394	2.396	2.398	2.400	2.402	2.404	2.406
5.8	2.408	2.410	2.412	2.415	2.417	2.419	2.421	2.423	2.425	2.427
5.9	2.429	2.431	2.433	2.435	2.437	2.439	2.441	2.443	2.445	2.447
6.0	2.449	2.452	2.454	2.456	2.458	2.460	2.462	2.464	2.466	2.468
6.1	2.470	2.472	2.474	2.476	2.478	2.480	2.482	2.484	2.486	2.488
6.2	2.490	2.492	2.494	2.496	2.498	2.500	2.502	2.504	2.506	2.508
6.3	2.510	2.512	2.514	2.516	2.518	2.520	2.522	2.524	2.526	2.528
6.4	2.530	2.532	2.534	2.536	2.538	2.540	2.542	2.544	2.546	2.548
6.5	2.550	2.551	2.553	2.555	2.557	2.559	2.561	2.563	2.565	2.567
6.6	2.569	2.571	2.573	2.575	2.577	2.579	2.581	2.583	2.585	2.587
6.7	2.588	2.590	2.592	2.594	2.596	2.598	2.600	2.602	2.604	2.606
6.8	2.608	2.610	2.612	2.613	2.615	2.617	2.619	2.621	2.623	2.625
6.9	2.627	2.629	2.631	2.632	2.634	2.636	2.638	2.640	2.642	2.644
7.0	2.646	2.648	2.650	2.651	2.653	2.655	2.657	2.659	2.661	2.663
7.1	2.665	2.666	2.668	2.670	2.672	2.674	2.676	2.678	2.680	2.681
7.2	2.683	2.685	2.687	2.689	2.691	2.693	2.694	2.696	2.698	2.700
7.3	2.702	2.704	2.706	2.707	2.709	2.711	2.713	2.715	2.717	2.718
7.4	2.720	2.722	2.724	2.726	2.728	2.729	2.731	2.733	2.735	2.737
7.5	2.739	2.740	2.742	2.744	2.746	2.748	2.750	2.751	2.753	2.755
7.6	2.757	2.759	2.760	2.762	2.764	2.766	2.768	2.769	2.771	2.773
7.7	2.775	2.777	2.778	2.780	2.782	2.784	2.786	2.787	2.789	2.791
7.8	2.793	2.795	2.796	2.798	2.800	2.802	2.804	2.805	2.807	2.809
7.9	2.811	2.812	2.814	2.816	2.818	2.820	2.821	2.823	2.825	2.827
8.0	2.828	2.830	2.832	2.834	2.835	2.837	2.839	2.841	2.843	2.844
8.1	2.846	2.848	2.850	2.851	2.853	2.855	2.857	2.858	2.860	2.862
8.2	2.864	2.865	2.867	2.869	2.871	2.872	2.874	2.876	2.877	2.879
8.3	2.881	2.883	2.884	2.886	2.888	2.890	2.891	2.893	2.895	2.897
8.4	2.898	2.900	2.902	2.903	2.905	2.907	2.909	2.910	2.912	2.914
8.5	2.915	2.917	2.919	2.921	2.922	2.924	2.926	2.927	2.929	2.931
8.6	2.933	2.934	2.936	2.938	2.939	2.941	2.943	2.944	2.946	2.948
8.7	2.950	2.951	2.953	2.955	2.956	2.958	2.960	2.961	2.963	2.965
8.8	2.966	2.968	2.970	2.972	2.973	2.975	2.977	2.978	2.980	2.982
8.9	2.983	2.985	2.987	2.988	2.990	2.992	2.993	2.995	2.997	2.998
9.0	3.000	3.002	3.003	3.005	3.007	3.008	3.010	3.012	3.013	3.015
9.1	3.017	3.018	3.020	3.022	3.023	3.025	3.027	3.028	3.030	3.032
9.2	3.033	3.035	3.036	3.038	3.040	3.041	3.043	3.045	3.046	3.048
9.3	3.050	3.051	3.053	3.055	3.056	3.058	3.059	3.061	3.063	3.064
9.4	3.066	3.068	3.069	3.071	3.072	3.074	3.076	3.077	3.079	3.081
9.5	3.082	3.084	3.085	3.087	3.089	3.090	3.092	3.094	3.095	3.097
9.6	3.098	3.100	3.102	3.103	3.105	3.106	3.108	3.110	3.111	3.113
9.7	3.114	3.116	3.118	3.119	3.121	3.122	3.124	3.126	3.127	3.129
9.8	3.130	3.132	3.134	3.135	3.137	3.138	3.140	3.142	3.143	3.145
9.9	3.146	3.148	3.150	3.151	3.153	3.154	3.156	3.158	3.159	3.161

Shaxada Xidid Labajibaarka $y = x^2$

	1	2	3	4	5	6	7	8	9
1.0	1.020	1.040	1.061	1.082	1.103	1.124	1.145	1.166	1.188
1.1	1.232	1.254	1.277	1.300	1.323	1.346	1.369	1.392	1.416
1.2	1.464	1.488	1.513	1.538	1.563	1.588	1.613	1.638	1.664
1.3	1.716	1.742	1.769	1.796	1.823	1.850	1.877	1.904	1.932
1.4	1.988	2.016	2.045	2.074	2.103	2.132	2.161	2.190	2.220
1.5	2.280	2.310	2.341	2.372	2.403	2.434	2.465	2.496	2.528
1.6	2.592	2.624	2.657	2.690	2.723	2.756	2.789	2.822	2.856
1.7	2.924	2.958	2.993	3.028	3.063	3.098	3.133	3.168	3.204
1.8	3.276	3.312	3.349	3.386	3.423	3.460	3.497	3.534	3.572
1.9	3.648	3.686	3.725	3.764	3.803	3.842	3.881	3.920	3.960
2.0	4.040	4.080	4.121	4.162	4.203	4.244	4.285	4.326	4.368
2.1	4.452	4.494	4.537	4.580	4.623	4.666	4.709	4.752	4.796
2.2	4.884	4.928	4.973	5.018	5.063	5.108	5.153	5.198	5.244
2.3	5.336	5.382	5.429	5.476	5.523	5.570	5.617	5.664	5.712
2.4	5.808	5.856	5.905	5.954	6.003	6.052	6.101	6.150	6.200
2.5	6.300	6.350	6.401	6.452	6.503	6.554	6.605	6.656	6.708
2.6	6.812	6.864	6.917	6.970	7.023	7.076	7.129	7.182	7.236
2.7	7.344	7.398	7.453	7.508	7.563	7.618	7.673	7.728	7.784
2.8	7.896	7.952	8.009	8.066	8.123	8.180	8.237	8.294	8.352
2.9	8.468	8.526	8.585	8.644	8.703	8.762	8.821	8.880	8.940
3.0	9.060	9.120	9.181	9.242	9.303	9.364	9.425	9.486	9.548
3.1	9.672	9.734	9.797	9.860	9.923	9.986	10.049	10.112	10.176
3.2	10.304	10.368	10.433	10.498	10.563	10.628	10.693	10.758	10.824
3.3	10.956	11.022	11.089	11.156	11.223	11.290	11.357	11.424	11.492
3.4	11.628	11.696	11.765	11.834	11.903	11.972	12.041	12.110	12.180
3.5	12.320	12.390	12.461	12.532	12.603	12.674	12.745	12.816	12.888
3.6	13.032	13.104	13.177	13.250	13.323	13.396	13.469	13.542	13.616
3.7	13.764	13.838	13.913	13.988	14.063	14.138	14.213	14.288	14.364
3.8	14.516	14.592	14.669	14.746	14.823	14.900	14.977	15.054	15.132
3.9	15.288	15.366	15.445	15.524	15.603	15.682	15.761	15.840	15.920
4.0	16.080	16.160	16.241	16.322	16.403	16.484	16.565	16.646	16.728
4.1	16.892	16.974	17.057	17.140	17.223	17.306	17.389	17.472	17.556
4.2	17.724	17.808	17.893	17.978	18.063	18.148	18.233	18.318	18.404
4.3	18.576	18.662	18.749	18.836	18.923	19.010	19.097	19.184	19.272
4.4	19.448	19.536	19.625	19.714	19.803	19.892	19.981	20.070	20.160
4.5	20.340	20.430	20.521	20.612	20.703	20.794	20.885	20.976	21.068
4.6	21.252	21.344	21.437	21.530	21.623	21.716	21.809	21.902	21.996
4.7	22.184	22.278	22.373	22.468	22.563	22.658	22.753	22.848	22.944
4.8	23.136	23.232	23.329	23.426	23.523	23.620	23.717	23.814	23.912
4.9	24.108	24.206	24.305	24.404	24.503	24.602	24.701	24.800	24.900
5.0	25.100	25.200	25.301	25.402	25.503	25.604	25.705	25.806	25.908
5.1	26.112	26.214	26.317	26.420	26.523	26.626	26.729	26.832	26.936
5.2	27.144	27.248	27.353	27.458	27.563	27.668	27.773	27.878	27.984
5.3	28.196	28.302	28.409	28.516	28.623	28.730	28.837	28.944	29.052
5.4	29.268	29.376	29.485	29.594	29.703	29.812	29.921	30.030	30.140

Shaxada Xidid Labajibaarka $y = x^2$

	1	2	3	4	5	6	7	8	9
5.5	30.360	30.470	30.581	30.692	30.803	30.914	31.025	31.136	31.248
5.6	31.472	31.584	31.697	31.810	31.923	32.036	32.149	32.262	32.376
5.7	32.604	32.718	32.833	32.948	33.063	33.178	33.293	33.408	33.524
5.8	33.756	33.872	33.989	34.106	34.223	34.340	34.457	34.574	34.692
5.9	34.928	35.046	35.165	35.284	35.403	35.522	35.641	35.760	35.880
6.0	36.120	36.240	36.361	36.482	36.603	36.724	36.845	36.966	37.088
6.1	37.332	37.454	37.577	37.700	37.823	37.946	38.069	38.192	38.316
6.2	38.564	38.688	38.813	38.938	39.063	39.188	39.313	39.438	39.564
6.3	39.816	39.942	40.069	40.196	40.323	40.450	40.577	40.704	40.832
6.4	41.088	41.216	41.345	41.474	41.603	41.732	41.861	41.990	42.120
6.5	42.380	42.510	42.641	42.772	42.903	43.034	43.165	43.296	43.428
6.6	43.692	43.824	43.957	44.090	44.223	44.356	44.489	44.622	44.756
6.7	45.024	45.158	45.293	45.428	45.563	45.698	45.833	45.968	46.104
6.8	46.376	46.512	46.649	46.786	46.923	47.060	47.197	47.334	47.472
6.9	47.748	47.886	48.025	48.164	48.303	48.442	48.581	48.720	48.860
7.0	49.140	49.280	49.421	49.562	49.703	49.844	49.985	50.126	50.268
7.1	50.552	50.694	50.837	50.980	51.123	51.266	51.409	51.552	51.696
7.2	51.984	52.128	52.273	52.418	52.563	52.708	52.853	52.998	53.144
7.3	53.436	53.582	53.729	53.876	54.023	54.170	54.317	54.464	54.612
7.4	54.908	55.056	55.205	55.354	55.503	55.652	55.801	55.950	56.100
7.5	56.400	56.550	56.701	56.852	57.003	57.154	57.305	57.456	57.608
7.6	57.912	58.064	58.217	58.370	58.523	58.676	58.829	58.982	59.136
7.7	59.444	59.598	59.753	59.908	60.063	60.218	60.373	60.528	60.684
7.8	60.996	61.152	61.309	61.466	61.623	61.780	61.937	62.094	62.252
7.9	62.568	62.726	62.885	63.044	63.203	63.362	63.521	63.680	63.840
8.0	64.160	64.320	64.481	64.642	64.803	64.964	65.125	65.286	65.448
8.1	65.772	65.934	66.097	66.260	66.423	66.586	66.749	66.912	67.076
8.2	67.404	67.568	67.733	67.898	68.063	68.228	68.393	68.558	68.724
8.3	69.056	69.222	69.389	69.556	69.723	69.890	70.057	70.224	70.392
8.4	70.728	70.896	71.065	71.234	71.403	71.572	71.741	71.910	72.080
8.5	72.420	72.590	72.761	72.932	73.103	73.274	73.445	73.616	73.788
8.6	74.132	74.304	74.477	74.650	74.823	74.996	75.169	75.342	75.516
8.7	75.864	76.038	76.213	76.388	76.563	76.738	76.913	77.088	77.264
8.8	77.616	77.792	77.969	78.146	78.323	78.500	78.677	78.854	79.032
8.9	79.388	79.566	79.745	79.924	80.103	80.282	80.461	80.640	80.820
9.0	81.180	81.360	81.541	81.722	81.903	82.084	82.265	82.446	82.628
9.1	82.992	83.174	83.357	83.540	83.723	83.906	84.089	84.272	84.456
9.2	84.824	85.008	85.193	85.378	85.563	85.748	85.933	86.118	86.304
9.3	86.676	86.862	87.049	87.236	87.423	87.610	87.797	87.984	88.172
9.4	88.548	88.736	88.925	89.114	89.303	89.492	89.681	89.870	90.060
9.5	90.440	90.630	90.821	91.012	91.203	91.394	91.585	91.776	91.968
9.6	92.352	92.544	92.737	92.930	93.123	93.316	93.509	93.702	93.896
9.7	94.284	94.478	94.673	94.868	95.063	95.258	95.453	95.648	95.844
9.8	96.236	96.432	96.629	96.826	97.023	97.220	97.417	97.614	97.812
9.9	98.208	98.406	98.605	98.804	99.003	99.202	99.401	99.600	99.800