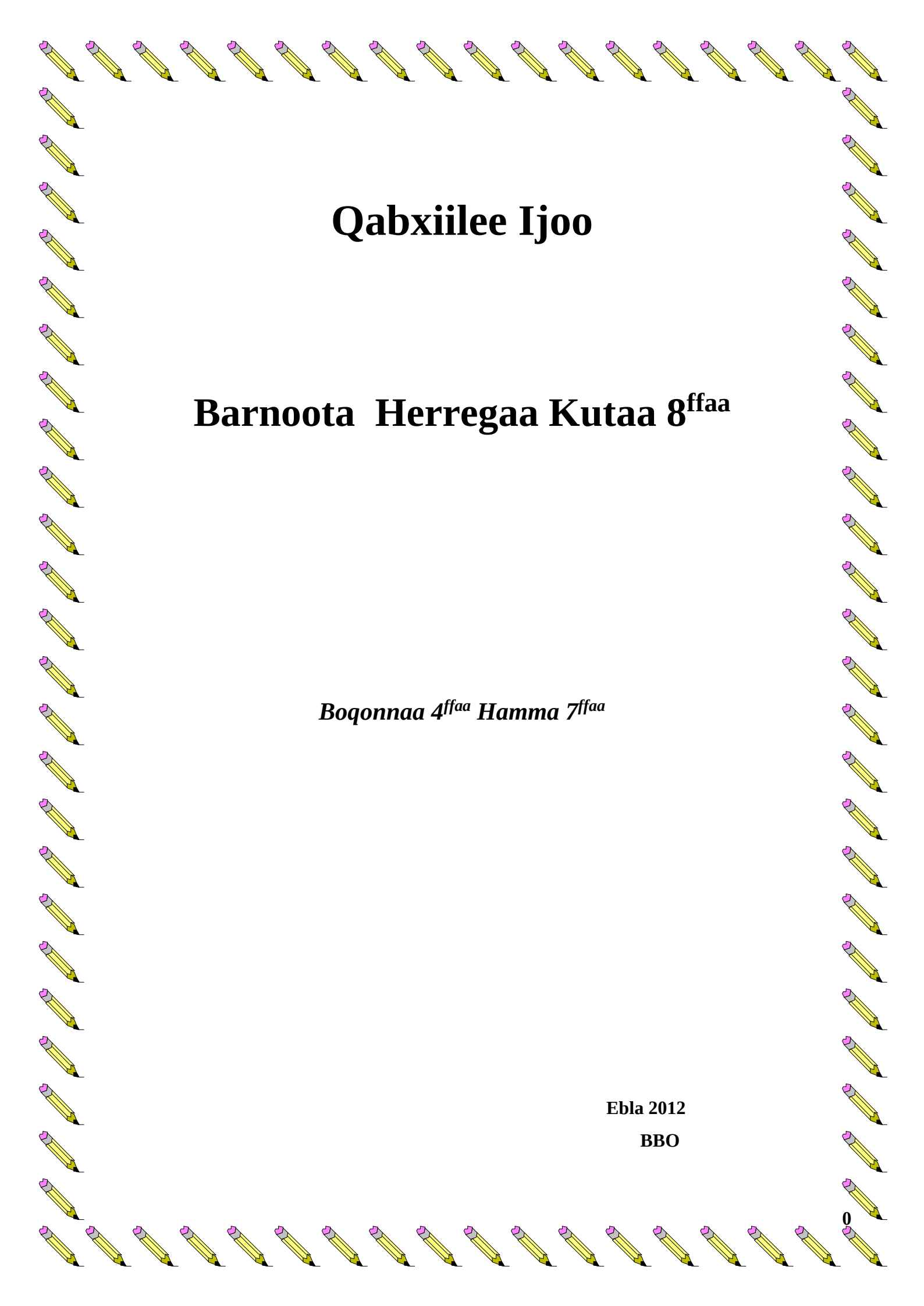




Qabxiilee Ijoo

Barnoota Herregaa Kutaa 8^{ffaa}

Boqonnaa 4^{ffaa} Hamma 7^{ffaa}

Ebla 2012

BBO

BOQONNAA 4

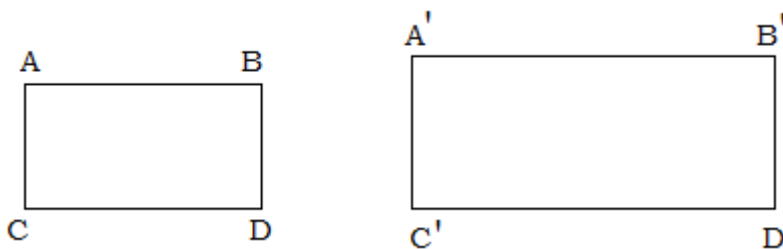
4. DANAALEE WALFAKKATOO

4.1. Danaalee Diriiroo Walfakkaatoo

Hiikkoo Danaalee Walfakkaatoo

Hiikkoo: Rog-baay'ee lama kan walfakkaatan, yoo rogoonni walitti dhufoon piroporshinaalii ta'anii fi kofoonni walitti dhufoon walitti galoo ta'anii dha.

- Rog-baay'ee A fi A' walfakkaatoo ta'an $A \sim A'$ jennee barreessina. Yoo dubbisamus A fakkaataa A' jenneeti. Yookiin A fi A' walfakkaatoo dha jenna.
- Rog afreen $ABCD$ fi $A'B'C'D'$ walfakkaatoo kan ta'an yoo

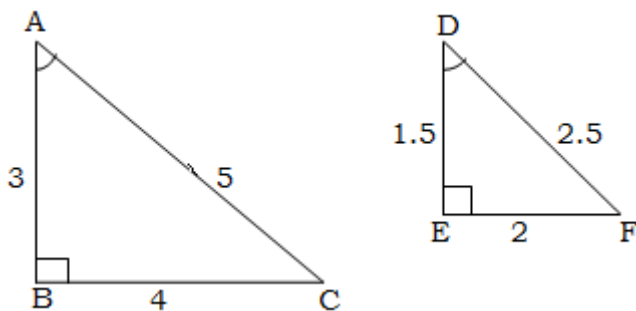


i. $\angle A \equiv \angle A'$ $\angle B \equiv \angle B'$ $\angle C \equiv \angle C'$ $\angle D \equiv \angle D'$

ii. $\frac{AB}{A'B'} = \frac{BD}{B'D'} = \frac{CD}{C'D'} = \frac{AC}{A'C'}$ ta'e dha.

Fakkeenya:

- Rog-sadee kofa sirriiwwan lamaan armaan gadii walfakkatoo ta'uu isaanii agarsiisi?



Furmaata:

Rog-sadee kofa sirrii $\triangle ABC$ fi $\triangle DEF$ wal bira qabnee madaaluu:

- Kofootni waliif gitaa walitti galoo dha.

Kunis $\angle A \equiv \angle D$ kennama

$\angle B \equiv \angle E$ kofa sirriidha

$\angle C \equiv \angle F$ (rog-sadee lama kofootni isaanii lama walitti galoo yoo ta'ee koofiti sadaffas walitti galoo ta'a).

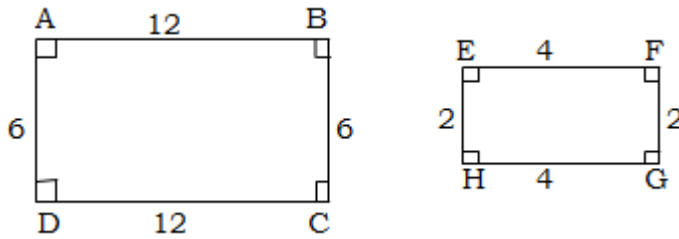
$$b. \frac{AB}{DE} = \frac{3}{1.5} = 2, \frac{BC}{EF} = \frac{4}{2} = 2 \text{ fi } \frac{AC}{DF} = \frac{5}{2.5} = 2$$

$$\text{Kunis } \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = 2$$

$\Rightarrow$ Rogootni waliif gitaa rog-sadoota lamaanii piroporshinaalii dha.

Kanaafuu, akkaataa hiikoo walfakkaatoo rog-baay'eetiin $\triangle ABC \sim \triangle DEF$

2. Rektaangiloota cimdii armaan gadiitti kennaman walfakkaatoo ta'u agarsiisi.



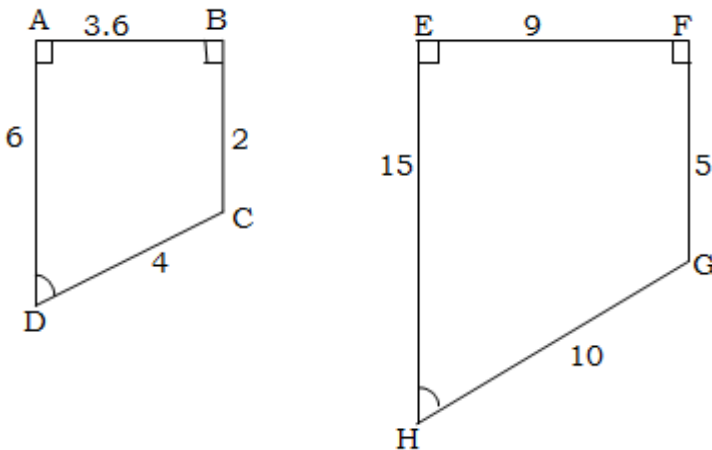
Furmaata:

a. Kofootni waliif gitaa walitti galoo dha. Sababni kofootni rektaangilii hundi kofa sirrii waan ta'eef.

$$b. \frac{AB}{EF} = \frac{12}{4} = 3, \frac{BC}{FG} = \frac{6}{2} = 3, \frac{CD}{GH} = \frac{12}{4} = 3, \frac{AD}{EH} = \frac{6}{2} = 3$$

$$\text{Kunis, } \frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{AD}{EH} = 3$$

$\Rightarrow$ Rogootni waliif gitaa rektaangiloota lamaanii piroporshinaalii dha. Kanaafuu, $ABCD \sim EFGH$.



3. Rog-baay'ee armaan gaditti kennaman lamaan walfakkaatoo ta'u isaanii agarsiisi.

Furmaata:

$$a. \left. \begin{array}{l} \angle A \equiv \angle E \\ \angle B \equiv \angle F \end{array} \right\} \text{Kennama(kofa sirrii)}$$

$\angle D \equiv \angle H$ kennama

Akkasumas $\angle C \equiv \angle G$, rog-afree lamaa kofootni walitti dhufoo sadii walitti galoo yoo ta'e kofootni afraaffaan hafe walitti galoo waan ta'eef

Kanaaf, rog-afree ABCD fi EFGH kofootni waliif gitaa walitti galoodha.

$$b. \frac{AB}{EF} = \frac{3.6}{9} = 0.4 \quad \frac{BC}{FG} = \frac{2}{5} = 0.4$$

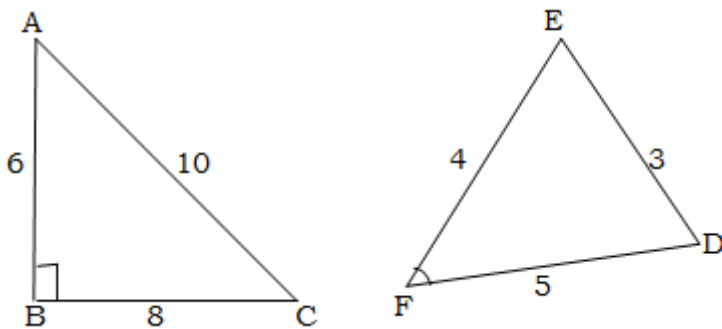
$$\frac{CD}{GH} = \frac{4}{10} = 0.4 \quad \frac{AD}{EH} = \frac{6}{15} = 0.4$$

$$\text{Kunis } \frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{AD}{EH} = 0.4$$

Rogootni waliif gitaa rog-afree lamaanii piropporshinaalii dha.

Kanaafuu rog-afree ABCD fi rog-afree EFGH walfakkaatoo dha.

4. Rog-sadee lamaan armaan gadii walfakkaatoo ta'uu fi dhabuu mirkaneessi?



Furmaata:

$$a. \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{FD} = 2$$

Yoommuu dheerina rogoota wal-gitaa, rog-sadee lamaan ilaali piropporshinaalii dha.

b. Kofootni waliif gitaa $\triangle ABC$ fi $\triangle DEF$ walitti galoo miti. Sababni $\triangle ABC$ 'n rog-sadee kofa sirriidha. $\triangle DEF$ 'n rog-sadee kofa sirrii miti.

Kanaafuu, haala hiikoo walfakka'atootiin, $\triangle ABC$ fi $\triangle DEF$ wafakkaatoo miti.

5. Kan armaan gadii keessaa kan yeroo hundaa walfakkatan isaan kami?

- Geengoo lama
- Rogsadee rog-waqixaa lamaa qaban lamaan
- Iskuweerii lama
- Rektaangilii lama
- Rog-afree lamaa
- Iskuweerii fi reektaangilii
- Iskuweerii fi roombasii

Furmaata:

- Geengooleen kamiyyuu lama walfakkaatoo dha.
- Rog-sadeen roga walqixaa lama kamiyyuu walfakkaatoo dha. Sababni isaas rogootni walitti dhufuun piroporshinaalii fi kofootni walitti dhufaan walitti galoodha.
- Iskuweerotni lama walfakkaatoodha. Sababni isaas rogootni walitti dhufuun piroporshinaalii fi kofootni walitti dhufuun walitti galoodha.
- Rektangilootni kamiyyuu lama walfakkaatoo miti. Sababni isaas kofootni walitti dhufuun walitti galoodha garuu rogootni walitti dhufuun piroporshinaalii miti.
- Rog-afreen kamiyyuu lama walfakkaatoo miti. Sababni isaas rogootni walitti dhufuun piroporshinaalii ta'uu dhiisuu ni danda'u. Akkasumas kofootni walitti dhufuun walitti galoo ta'uu dhiisuu ni danda'u.
- Iskuweerii fi rektaangiliin walfakkaatoo miti. Sababni isaas kofootni walitti dhufuun walitti galoodha. Garuu rogootni walitti dhufuun piroporshinaalii ta'uu dhiisuu ni danda'u.
- Iskuweerii fi roombasiin walfakkaatoo miti. Kofootni walitti dhufuun walitti galoo ta'uu dhiisuu danda'a.

4.2. Rog-sadoota Walfakkaatan**A. Seensa rog-sadoota wal-fakkaatanii**

Rog-sadeen lama walfakkaatoo dha kan jedhaman yoo:

- Kofootni waliif gitaa walitti galoo ta'anii fi
- Rogootni waliif gitaa piroporshinaalii ta'ani dha.

Fakkeenya: $\triangle ABC \sim \triangle DEF$ jechuun, kanneen armaan gadii hundi dhugaa ta'a jechuudha.

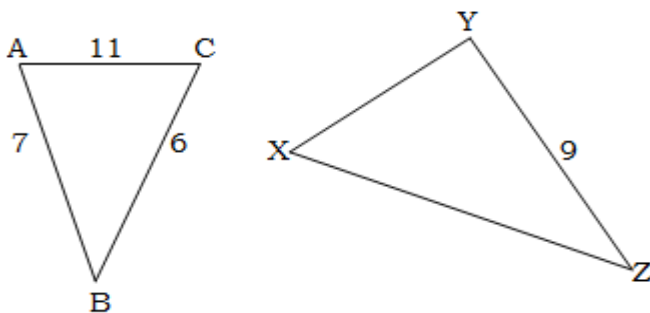
Kunis, $\angle A \equiv \angle D$, $\angle B \equiv \angle E$ $\angle C \equiv \angle F$ fi

$$\frac{AB}{DE} = \frac{BC}{FE} = \frac{AC}{DF} \text{ ta'u qaba.}$$

Hubadhu: Reeshoon rogoota walitti dhufuun rog-sadoota "dhaab-giteessapiroporshinaalummaa" jedhama.

Fakkeenya:

- Danaa armaan gadii keessatti $\triangle ABC \sim \triangle XYZ$ yoo ta'an, dheerina XZ fi XY barbaadi.

**Furmaata:**

Hiikoo rog-sadee walfakkaattoo irraa

$$\frac{AB}{XY} = \frac{BC}{YZ} = \frac{AC}{XZ} = K$$

(k-dhaab-giteessa piropporshinaalummaati)

Isa $\frac{BC}{YZ} = \frac{AC}{XZ}$ jedhutti gargaaramuun

$$\frac{6}{9} = \frac{11}{x_z}$$

$$XZ = \frac{11 \times 9}{6} = \frac{99}{6} = 16.5$$

$$XZ = 16.5$$

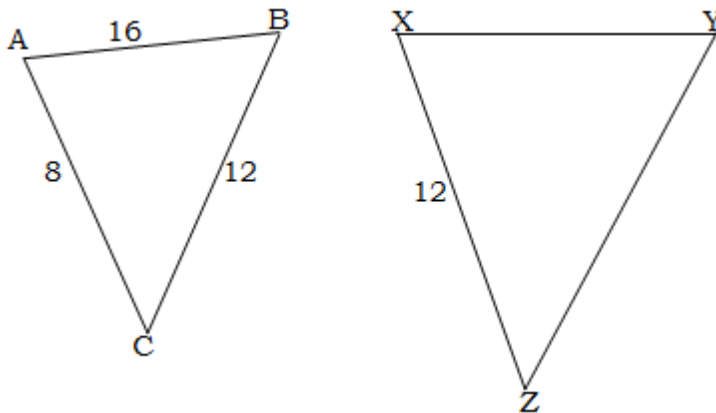
Ammas isa $\frac{AB}{XY} = \frac{BC}{YZ}$ jedhutti gargaaramuun.

$$\frac{7}{xy} = \frac{6}{9}$$

$$XY = \frac{9 \times 7}{6} = \frac{63}{6} = 10.5$$

$$XY = 10.5$$

2. Danaa armaan gadii keessatti $\triangle ABC \sim \triangle XYZ$ yoo ta'e, XY fi YZ barbaadi.



Furmaata:

Rog-sadootni kennaman waan walfakkaatniif, hiikoo walfakkaatinaa rog-sadootaan,

$$\frac{AB}{XY} = \frac{BC}{YZ} = \frac{AC}{XZ} = k \text{ (k'n lakkoofsa)}$$

kanaafuu,

$$\frac{AB}{XY} = \frac{AC}{XZ}$$

$$\frac{16}{XY} = \frac{8}{12}$$

$$XY = \frac{16 \times 12}{8}$$

$$XY = 24$$

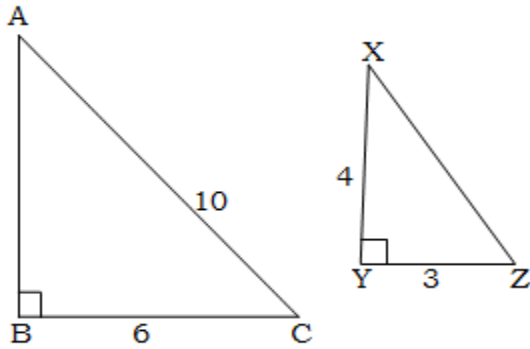
$$\frac{BC}{YZ} = \frac{AC}{XZ}$$

$$\frac{12}{YZ} = \frac{8}{12}$$

$$YZ = \frac{12 \times 12}{8}$$

$$YZ = 18$$

3. Rog-sadootni kofa sirrii armaan gadii $\triangle ABC \sim \triangle XYZ$ yoo ta'e, AB fi XZ barbaadi.

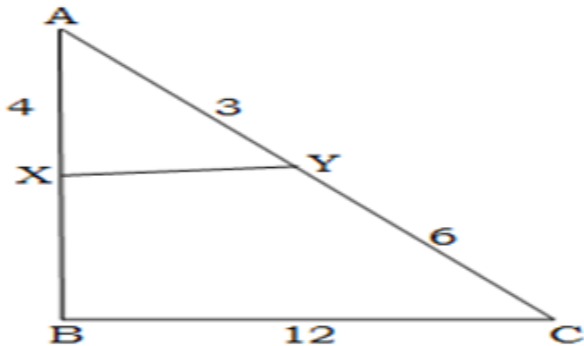


Furmaata:

$$\frac{AB}{XY} = \frac{AC}{XZ} = \frac{BC}{YZ}$$

4. Danaa armaan irratti, $\triangle ABC \sim \triangle AXY$, AY=3, YC= 6, AX=4 fi BC=12.

i. Dheerina XB barbaadi. ii. Dheerina XY barbaadi.



$$\frac{AB}{XY} = \frac{BC}{YZ}$$

$$\frac{AB}{4} = \frac{6}{3}$$

$$AB = \frac{4 \times 6}{3} = \frac{24}{3}$$

$$AB = 8$$

$$\frac{AC}{XZ} = \frac{BC}{YZ}$$

$$\frac{10}{XY} = \frac{6}{3}$$

$$XZ = \frac{10 \times 3}{6}$$

$$XZ = 5$$

Furmaata:

Rog-sadee AXY fi ABC

walfakkaattoo yoo ta'an. ($\triangle ABC \sim \triangle AXY$)

$$\frac{AX}{AB} = \frac{XY}{BC} = \frac{AY}{AC} = k \text{ (} k - \text{lakkoofsa)}$$

$$i. \frac{AX}{AB} = \frac{AY}{AC}$$

$$\frac{AX}{AX + XB} = \frac{AY}{AY + YC}$$

$$\frac{4}{4 + XB} = \frac{3}{3 + 6}$$

$$\frac{4}{4 + XB} = \frac{3}{9}$$

$$3XB + 12 = 36$$

$$XB = 8$$

$$ii. \frac{XY}{BC} = \frac{AY}{AC}$$

$$\frac{XY}{BC} = \frac{AY}{AY + YC}$$

$$\frac{XY}{12} = \frac{3}{3 + 6}$$

$$\frac{XY}{12} = \frac{3}{9}$$

$$XY = \frac{12 \times 3}{9} = 4$$

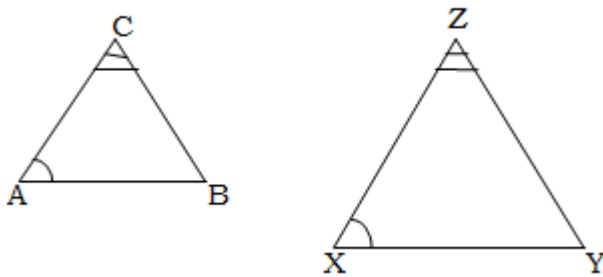
$$XY = 4$$

B. Tiyooramoota Wal-Fakkaatina Rog-sadootaa

Rog-sadeen lama walfakkaatoo kan ta'an, yoo rogoonni walitti dhufan piroporshinaalii ta'anni fi kofoonni walitti dhufan walitti galoo ta'ani dha. Garuu rog-sadeen lama walfakkaatoo ta'u isaanii mirkaneessuuf kanneen keessaa muraasa qofa waldorgoomsisuun gahaadha. Kana sirriitti hubachuudhaaf tiyooramoota walfakkaatina armaan gadii haa ilaallu.

1. Tiyooramii Walfakkaatina k.k (kofa-kofa)

Rog-sadoota lama keessatti, kofoonni lama kan isaa tokkoo kofoota walitti dhufoo lamaan kan isa biraa waajjiin walitti galoo yoo ta'an rog-sadeen lamaan walfakkaatoo dha.

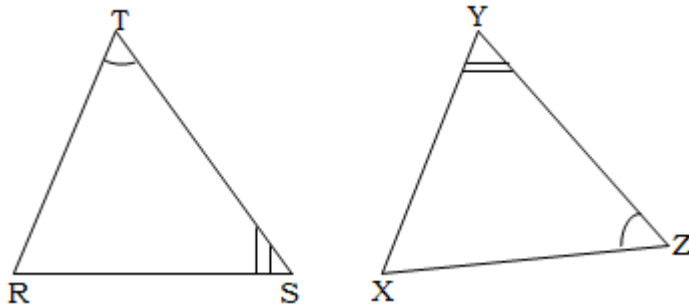


Kunis $\angle A \cong \angle X$ fi $\angle C \cong \angle Z$, yoo ta'an

$\triangle ABC \sim \triangle XYZ$ ta'an jechuudha. Sababnis Tiyooramii k.k.

Fakkeenya: Rog-sadoota RST fi XYZ keessatti,

$\angle T \cong \angle Z$, $\angle S \cong \angle Y$, $RS = 4\text{cm}$, $RT = 6\text{cm}$, $XZ = 4.5\text{cm}$ yoo ta'an dheerina YX barbaadi.



Furmaata: Tiyooramii walfakkaatina K.K dha

$\triangle RST \sim \triangle XYZ$ dha.

Kanaaf, $\frac{YX}{RS} = \frac{XZ}{RT}$

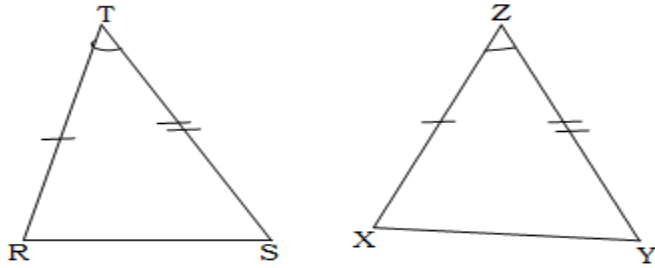
$$\frac{YX}{4\text{cm}} = \frac{4.5\text{cm}}{6\text{cm}}$$

$$YX = \frac{4\text{cm} \times 4.5\text{cm}}{6\text{cm}} = 3\text{cm}$$

YX=3cm

2. Tiyooramii Walfakkaatina RKR (Roga-kofa-roga)

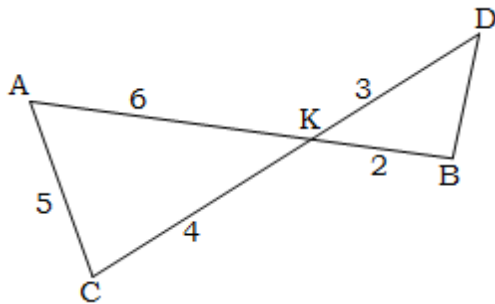
Rog-sadoota lama keessatti, cimdoolin rogoota walitti dhufoo lama piroporshinaalii fi kofoonni hammataman walitti galoo yoo ta'an rog-sadeen lamaan walfakkaatoo dha.



Kunis, $\frac{RT}{XZ} = \frac{TS}{ZY}$ fi $\angle RTS \equiv \angle XZY$ yoo ta'e

$\triangle RST \sim \triangle XYZ$ ta'e jechuudha.

Fakkeenya: Danaa armaan gadii irratti $\overline{BD}$, barbaadi.



Furmaata:

a. $\angle AKC \equiv \angle BKD$kofoota waliin duubaa.

b. $\frac{KD}{AK} = \frac{KB}{KC} = \frac{1}{2}$

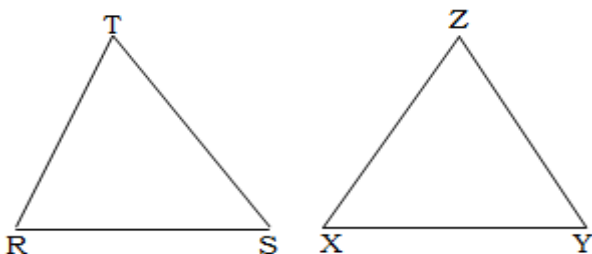
c. $\triangle BKD \sim \triangle CKA$... walfakkaatina RKRtiin

d. $\frac{BK}{CK} = \frac{KD}{KA} = \frac{BD}{CA}$

$$\frac{2}{4} = \frac{3}{6} = \frac{BD}{5} \Rightarrow \frac{BD}{5} = \frac{1}{2} \Rightarrow BD = 2.5$$

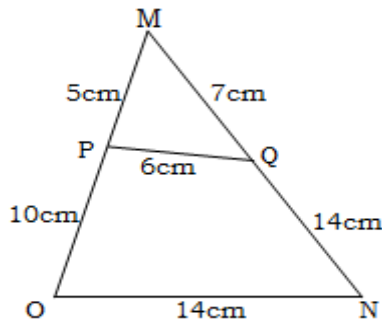
3. Tiyooramii Walfakkaatina RRR(Roga-Roga-Roga)

Rogoonni walitti dhufoon sadan rog-sadeen lama yoo piroporshinaalii ta'an rog-sadeen lamaan walfakkaatoo dha.



Kunis $\frac{RS}{XY} = \frac{ST}{YZ} = \frac{RT}{XZ}$ yoo ta'e, $\Delta RST \sim \Delta XYZ$ ta'a jechuudha.

Fakkeenya: Rog-sadee MPQ fi rog-sadee MON walfakkaatodha.



Kunis, $\frac{MP}{MO} = \frac{PQ}{ON} = \frac{MQ}{MN}$

$$\Rightarrow \frac{MP}{MO} = \frac{MP}{MP + PO} = \frac{5}{5 + 10} = \frac{5}{15} = \frac{1}{3}$$

$$\Rightarrow \frac{PQ}{ON} = \frac{6}{14} = \frac{3}{7}$$

$$\Rightarrow \frac{MQ}{MN} = \frac{MQ}{MQ + QN} = \frac{7}{7 + 14} = \frac{7}{21} = \frac{1}{3}$$

Kanaaf Tiryooramii RRR tiin $\Delta MPQ \sim \Delta MON$.

C. Naannawaa fi Bal'ina Rog-sadoota Walfakkaatoo

Hiikoo: Rog-sadootni lama walfakkaatoo yoo ta'anii fi reeshoon rogoota waliif gitaa k yoo ta'e

i. Reeshoon naannawa isaanii k ta'a.

ii. Reeshoo bal'ina isaanii ammo k^2 ta'a.

Fakkeenya:

1. Rogsadootni lama ΔABC fi ΔXYZ walfakkaatoodha.

Rogootni waliif gitaa $AB=5\text{cm}$ fi $XY=15\text{cm}$ yoo ta'an,

a. Reeshoon Naannawa ΔABC fi ΔXYZ barbaadi.

b. Reeshoo bal'ina ΔABC fi ΔXYZ barbaadi.

Furmaata:

a. $\frac{AB}{XY} = \frac{5\text{cm}}{15\text{cm}} = \frac{1}{3}$

Hiikoo armaan oliin

$$\frac{\text{Naannawa}\Delta ABC}{\text{Naannawa}\Delta XYZ} = \frac{AB}{XY} = \frac{1}{3}$$

Kanaafuu reeshoon naannawa ΔABC fi ΔXYZ , $\frac{1}{3}$ ta'a.

b. Hiikoo armaan oliin, $\frac{\text{Bal'ina } \triangle ABC}{\text{Bal'ina } \triangle XYZ} = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$

Kanaafuu reeshoon bal'ina $\triangle ABC$ fi $\triangle XYZ$ $\frac{1}{9}$ ta'a.

2. $\triangle ABC \sim \triangle DEF$, $BC=24\text{cm}$, $EF=36\text{cm}$ fi bal'inni $\triangle ABC=270\text{cm}^2$,

yoo ta'an bal'ina $\triangle ABC$ barbaadi.

Furmaata:

$$\frac{BC}{EF} = \frac{24\text{cm}}{36\text{cm}} = \frac{2}{3}$$

$\triangle ABC \sim \triangle DEF$, (kennama)

$$\frac{\text{Bal'inni } \triangle ABC}{\text{Bal'inni } \triangle DEF} = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$$

$$\frac{\text{Bal'inni } \triangle ABC}{270\text{cm}^2} = \frac{4}{9}$$

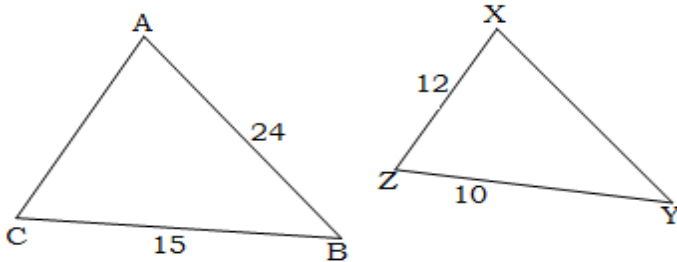
$$\Rightarrow \text{Bal'inni } \triangle ABC = \frac{270\text{cm}^2 \times 4}{9} = 120\text{cm}^2$$

Kanaafuu, bal'inni $\triangle ABC=120\text{cm}^2$

Gilgaala Boqonnaa 4

1. Yoo $\triangle ABC \sim \triangle DEF$ ta'e, akkasumas $AC=12\text{cm}$, $AB=8\text{cm}$ fi $DE=6\text{cm}$ ta'an dheerina DF barbaadi.

2. Danaaleen armaan gadii kana irratti $\triangle ABC \sim \triangle XYZ$ yoo ta'an XY fi AC barbaadi.

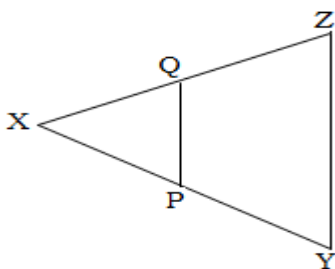


3. Danaa armaan gatii keessatti $\triangle XYZ \sim \triangle XPQ$, $XP=6\text{cm}$, $XQ=9\text{cm}$, $YZ=15\text{cm}$ fi $XY=18\text{cm}$ yoo

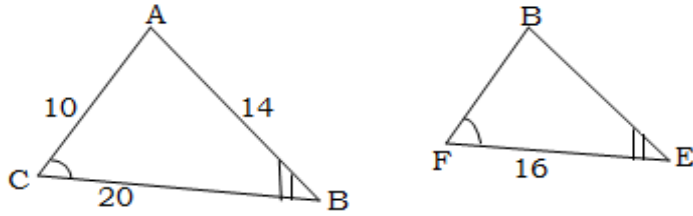
ta'e,

a. XZ meeqa?

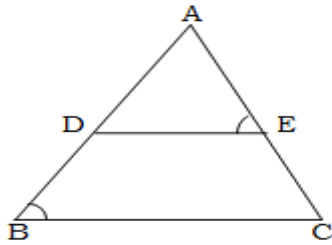
b. PQ meeqa?



4. Danaa armaan gadii irratti dheerina rogoota DE fi DF barbaadi.



5. Danaa armaan gadii irratti D'n AB irratti E'n AC irratti fi $s(\angle AED) = 60^\circ$, $s(\angle ABC) = 60^\circ$, AE=5cm, AD=6cm fi DB=4cm yoo ta'e, EC barbaadi.



6. $\triangle ABC \sim \triangle DEF$, BC=20cm, EF=15cm fi bal'inni $\triangle DEF = 180 \text{ cm}^2$, yoo ta'an bal'ina $\triangle ABC$ barbaadi.

7. Rog-sadootni wal fakkaatoon lama, yoo bal'inni rog-sadee jalqabaa 100 cm^2 fi bal'inni rog-sadee lammaffaa 121 cm^2 ta'e, reeshoo rogoota waliif gitaa barbaadi.

8. $\triangle ABC \sim \triangle XYZ$. AB=14cm, XY=17cm fi naannawni $\triangle ABC = 56 \text{ cm}^2$ dha. Naannawa $\triangle XYZ$ barbaadi.

9. $\triangle RST \sim \triangle XYZ$. Bal'inni rog-sadee $\triangle RST = 27 \text{ cm}^2$ bal'inni $\triangle XYZ = 243 \text{ cm}^2$ yoo ta'e fi RS=7cm yoo ta'e dheerina XY barbaadi.

10. $\odot ABC$ fi $\odot XYZ$ 'n walfakkaatoo yoo ta'anii fi Bal'inni $\triangle ABC = 144 \text{ cm}^2$ fi Bal'inni $\triangle XYZ = 100 \text{ cm}^2$, yoo ta'e reeshoon naannawa $\triangle ABC$ gara naannawa $\triangle XYZ$ barbaadi.

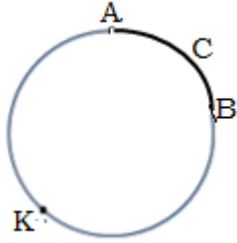
BOQONNAA 5

5 GEENGOO

5.1. Waa'ee Geengoo Bal'inaan

A. Golboo goddaa fi golboo Xiqqaa geengoo

Hiikoo: Tuutni tuqaalee, tuqaalee lamaan geengoo tokkicha irra jiran gidduu jiru **golboo** jedhama.

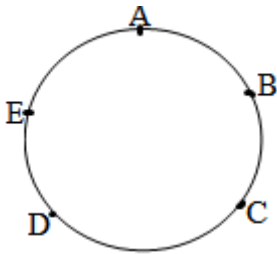


Qaamni geengoo armaan olii kan guraacha'e golboo dha.

Mallattoo: ACB'n golboo $\widehat{ACB}$ jedhamee dubbifama.

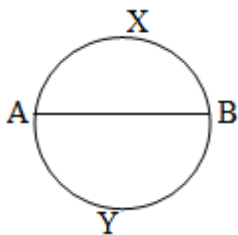
Golboo tokko sirriitti adda baafachuuf qubeewwan sadii ykn sadii olitti fayyadamna.

Fakkeenya:



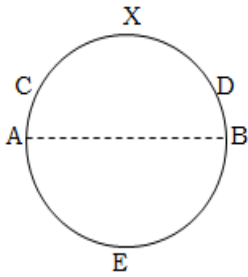
Danaa armaan olii keessatti $\widehat{AD}$ yoo jennu, golboon kun isa bita A ykn mirga A irra jiru ta'uu isaa adda baasuu hin dandeenyu. Garuu $\widehat{AED}$ yoo jenne isa bita A jiru ta'uu isaa hubanna. Golboo isa karaa mirga A jiru waamuu yoo barbaadhe: ABCD ykn $\widehat{ACD}$ jechuu ni dandeenya.

Hiikoo: Golboon fiixeen isaa fiixee diyaameetirii ta'e walakkaa geengoo jedhama.



$\overline{AB}$ 'n diyaameetirii yoo ta'uwalakkaa geengooti.

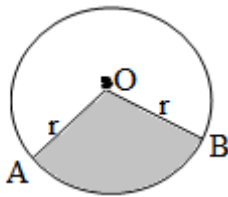
Hiikoo: Golboon dheerinni isaa walakkaa geengootii gadi ta'e golboo xiqqaa, kan walakkaa geengootii ol ta'e ammo golboo guddaa jedhama.



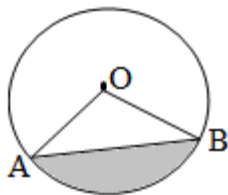
Danaa armaan olii keessatti $\overline{AB}$ 'n yoo diyaameetirii ta'e, $\widehat{CXD}$ 'n golboo xiqqaa, $\widehat{CED}$ 'n ammo golboo guddaa dha.

B. Sektarii fi Segmentoota Geengoo

Hiikoo: Sektarii geengoo, kutaa geengoo kan raadiyesota lamaa fi geengootiin marsamedha.



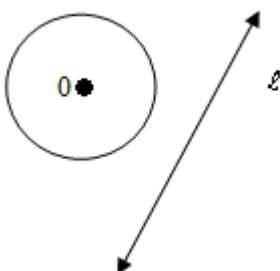
Hiikoo: Segimentiin geengoo, kutaa geengoo kan koordii fi golboo geengootiin marfameedha.



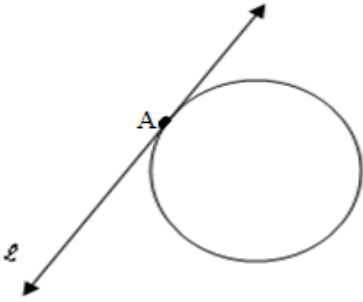
C. Hariiroo geengoo fi Sararoota Qajeeloo

Sarara qajeelaa fi geengoo diriiroo tokkicha irra yoo jiraatan hariiroo armaan gadii qabaachuu danda'u.

1. Sararri qajeelaan tokko geengoo kenname wajjin osoo wal hin tuqiin darbuu ni danda'a. Haala kanaanis geengoo fi sararichituqaa waliinii hin qaban jechuudha.

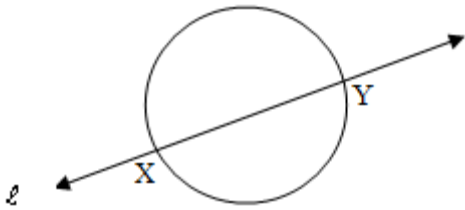


2. Sararri qajeelaan tokko geengoo kenname tokko tuqaa(bakka tokkichatti qaxxaamuree) darbuu ni danda'a. Haala kanaan, **tuqaa waliin tokko** qabu jechuu dha.



Yeroo kana, sararichi sarara **taanjenti** jedhama. Tuqaan waliinii kun ammo tuqaa **taanjentummaa** jedhama. Danaa armaan olii keessatti ℓ 'n sararaa **taanjantiiti**. A 'n ammoo tuqaa taanjantummaati.

3. Sararri qajeelaan tokko geengoo kenname bakka lamatti tuqee darbuu ni dandaa'a. Haala kanaan sararii fi geengoon tuqaa waliini lama qabu jechuu dha.



Sararri akkasii kun **seekaantii** jedhama. Danaa armaan olii keessatti **sarara seekaantii** jedhama.

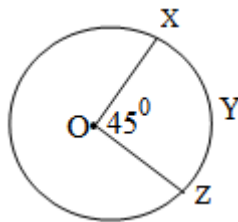
5.2. Kofoota Geengoo Keessaa

5.2.1. Kofa Handhuuraa fi Kofa itti Marfammoo

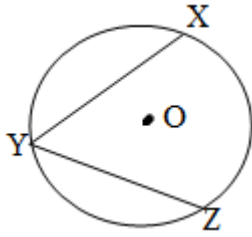
Hiikoo: Kofti handhuuraa, kofa verteeksiin isaa hundhuura geengoo irra ta'ee rogoonni isaa ammo raadiyesota geengoo ta'anii dha.

Geengoo kana irratti $\angle XOZ$ 'n golboo XYZ **hammate** jenna karaa biraa ammo golboo XYZ , $\angle XOZ$ **aguuge** jenna. Yemmuu $\angle XOZ$ 'n kofa handhuuraa ta'e, safarri kofa ($\angle XOZ$) safara golboo XYZ wajjin tokko (walqixa dha) kana jechuunis $S(\angle XOZ) = S(\widehat{XYZ})$

Fakkeenya: Geengoo armaan gadii irratti O 'n handhuura yoo ta'ee fi $s(\angle XOZ) = 45^\circ$ ta'e, $S(\widehat{XYZ}) = 45^\circ$ ta'a.

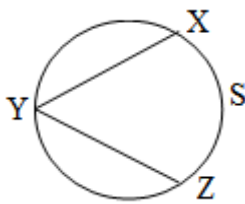


Hiikoo: Kofti varteksiin isaa geengoo irra ta'ee golboo geengichaatiin aguugame, **kofa itti marfamaa** jedhama.



O'n hundhuura geengichaa ta'ee, X, Y fi Z'n tuqaalee geengichaa yoo ta'an $\angle XYZ$ **kofa itti marfamaa** jedhama

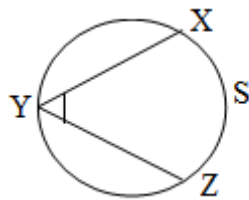
Hiikoo: Kofti varteksiin isaa geengoo irra ta'ee golboo geengichaatiin aguugame, **kofa itti marfamaa** jedhama.



Kunis; $(\angle XYZ) = \frac{1}{2} s(\widehat{XSZ})$

Fakkeenya:

1. Danaa armaan gadii keessatti yoo $S(\widehat{XSZ}) = 100^\circ$ ta'e, $S(\angle XYZ)$ barbaadi.



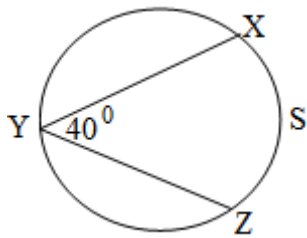
Furmaata:

$S(\widehat{XSZ}) = 100^\circ$ kan kenname

$S(\angle XYZ) = \frac{1}{2} S(\widehat{XSZ})$ hiikoo armaan oliitiin

$S(\angle XYZ) = \frac{1}{2} (100^\circ) = 50^\circ$

2. Danaa armaan gadii irratti yoo $S(\angle XYZ) = 40^\circ$ ta'e, $S(\widehat{XSZ})$ meeqa ta'a?



$$S(\angle XYZ) = 40^\circ \text{ (kan kenname)}$$

$$S(\angle XYZ) = \frac{1}{2} s(\widehat{XSZ}) \text{ Hiikoo armaan oliitiin}$$

$$40^\circ = \frac{1}{2} S(\widehat{XSZ})$$

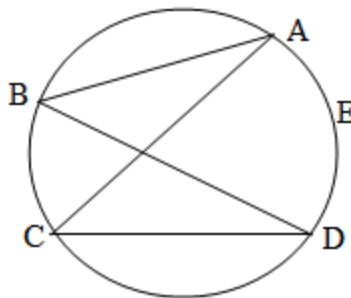
$$s(\widehat{XSZ}) = 2(40^\circ) = 80^\circ$$

Hubadhu: Geengoo tokko keessatti, kofootni itti marfamoo ta'an yoo golboo tokkichaana aguugaman safari isaanii walqixa.

Fakkeenya:

Danaa armaan gadii irratti

$s(\angle ABD) = 55^\circ$ yoo ta'e, safara($\widehat{AED}$) fi $s(\angle ACD)$ barbaadi.



Furmaata:

Kan kenname $s(\angle ABD) = 55^\circ$

$$s(\angle ABD) = \frac{1}{2} s(\widehat{AED}) \text{ Hiikoo}$$

$$55^\circ = \frac{1}{2} s(\widehat{AED})$$

$$s(\widehat{AED}) = 2(55^\circ)$$

$$s(\widehat{AED}) = 110^\circ$$

$$\text{Akkasumas } s(\angle ACD) = \frac{1}{2} s(\widehat{AED})$$

$$s(\angle ACD) = \frac{1}{2}(110^\circ) \text{ kan arganneerra.}$$

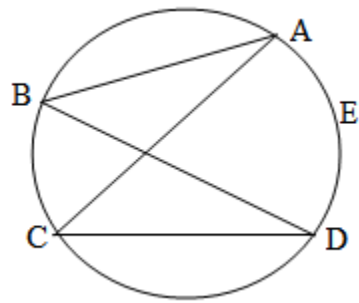
$$s(\angle ACD) = 55^\circ$$

kanarraa ka'uun $s(\angle ABD) = s(\angle ACD)$.

Sababni isaa golboo tokkichaana $(\widehat{AED})$ 'n aguugaman.

5.2.2. Kofoota Koordota Wal-qaxxaamuran Lamaan Uumaman

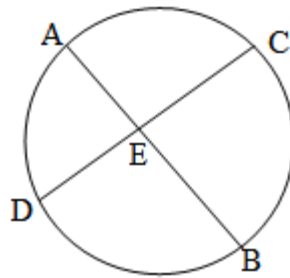
Hiikoo: Safarri kofoota koordotni lama geengoo keessatti wal qaxxaamuruun uumamu walakkaa ida'ama safara golboo gamaa gamanaan hammatamaniiti.



$$s(\angle AED) = \frac{1}{2}((\widehat{AD}) + (\widehat{CB}))$$

Fakkeenya:

- Geengoo armaan gadii keessatti yoo $s(\widehat{AC}) = 65^\circ$ fi $s(\widehat{DB}) = 75^\circ$ ta'e $s(\angle AEC)$ barbaadi.



Furmaata:

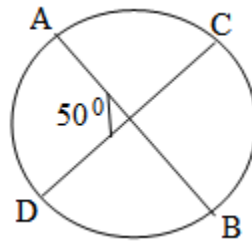
$$s(\angle AEC) = \frac{1}{2}(s(\widehat{AC}) + s(\widehat{DB}))$$

$$s(\angle AEC) = \frac{1}{2}(65^\circ + 75^\circ)$$

$$s(\angle AEC) = \frac{1}{2}(140^\circ)$$

$$s(\angle AEC) = 70^\circ$$

- Geengoo armaan gadii keessatti yoo $s(\widehat{CB}) = 58^\circ$ fi $s(\angle AED) = 50^\circ$ ta'e, $s(\widehat{AD})$ barbaadi.



Furmaata:

$$S(\angle AED) = \frac{1}{2} (s(\widehat{AD}) + s(\widehat{CB}))$$

$$50^\circ = \frac{1}{2} (s(\widehat{AD}) + 58^\circ)$$

$$50^\circ = \frac{1}{2} s(\widehat{AD}) + 29^\circ$$

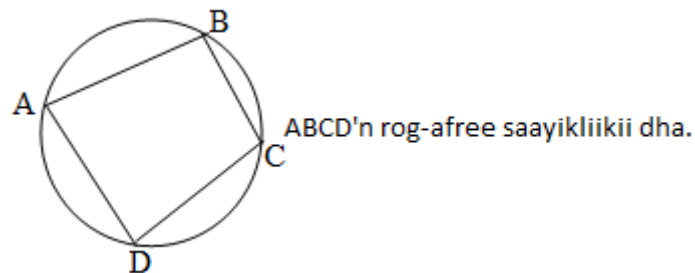
$$\frac{1}{2} s(\widehat{AD}) = 50^\circ - 29^\circ$$

$$\frac{1}{2} s(\widehat{AD}) = 21^\circ$$

$$s(\widehat{AD}) = 42^\circ$$

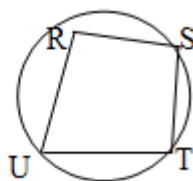
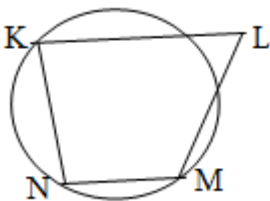
Rog- afree Saayikiliikii

Hiikoo: Rog-afreen tokko saayikiliikii kan jedhamu yoo rog-afree verteeksotni isaa hundi geengoo tokko irratti argamani dha.

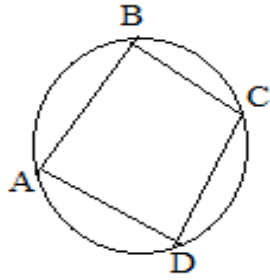


ABCD'n rog-afree saayikliikii dha.

Hubadhu: Rog-afree KLMN fi RSTU armaan gadii saayikiliikii miti.



Hiikoo: Rog-afreen tokko yoo saayikiliikii ta'e, kofootni fuullee waliif **hirkoo** dha.

Fakkeenya:

Rog-afree saayikiliikii ABCD kana irratti $\angle ABC$ fi $\angle ADC$ akkasumas $\angle BAD$ fi $\angle BCD$ hiirkoo walii ta'uu.

Mirkaneessuu:

i. Safarri kofa itti marfamaa walakkaa safara golboo isa agugeeti.

ii. Safarri geengoo guutuu 360° .

Rog-afree saayikiliikii ABCD armaan olii irra $\angle BAD$ fi $\angle BCD$ hirkoo walii ta'uu agarsiisuu ni danda'ama.

$$\text{Kunis: } s(\angle BAD) = \frac{1}{2} s(\widehat{BCD})$$

$$s(\angle BCD) = \frac{1}{2} s(\widehat{BAD})$$

$$s(\angle BAD) + s(\angle BCD) = \frac{1}{2} s(\widehat{BCD}) + \frac{1}{2} s(\widehat{BAD})$$

$$s(\angle BAD) + s(\angle BCD) = \frac{1}{2} s(\widehat{BCD}) + \frac{1}{2} s(\widehat{BAD})$$

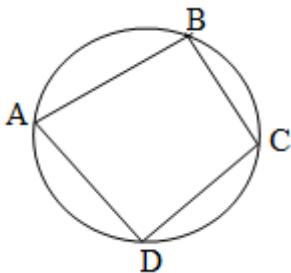
$$s(\angle BAD) + s(\angle BCD) = \frac{1}{2} (360^\circ) \text{ safara geengoo guutuu. } s(\angle BAD) + s(\angle BCD) = 180^\circ$$

Kanaafuu $\angle BAD$ fi $\angle BCD$ hirkoo walitti.

Haaluma kanaan $\angle ABC$ fi $\angle ADC$ hirkoo walii ta'uu agarsiisi.

Fakkeenya:

Danaa armaan gadii irratti, $s(\angle ABC) = 85^\circ$ fi $s(\angle BCD) = 80^\circ$ yoo ta'e, $s(\angle ADC)$ fi $s(\angle BAD)$ barbaadi.

Furmaata:**Furmaata:**

$$s(\angle ABC) + s(\angle ADC) = 180^\circ \text{ (kofoota waliif fullee)}$$

$$85^\circ + s(\angle ADC) = 180^\circ$$

$$s(\angle ADC) = 180^\circ - 85^\circ$$

$$s(\angle ADC) = 95^\circ$$

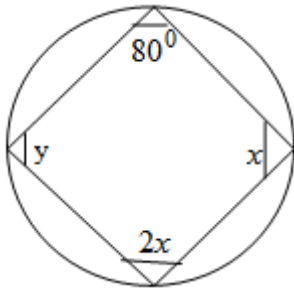
$$s(\angle BCD) + s(\angle BAD) = 180^\circ \text{ (kofoota waliif fullee)}$$

$$80^\circ + s(\angle BAD) = 180^\circ$$

$$s(\angle BAD) = 180^\circ - 80^\circ$$

$$s(\angle BAD) = 100^\circ$$

2. Danaalee armaan gadii keessatti gatii x fi y barbaadi.



Furmaata:

PQRS'n rog-afree saykiliikii waan ta'eef

$$s(\angle RPQ) + s(\angle RSQ) = 180^\circ$$

$$80^\circ + 2x = 180^\circ$$

$$2x = 180^\circ - 80^\circ$$

$$2x = 100^\circ$$

$$x = 50^\circ$$

$$s(\angle PRS) + s(\angle PQS) = 180^\circ$$

$$y + x = 180^\circ$$

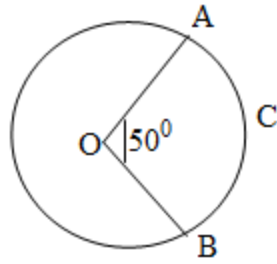
$$y + 50^\circ = 180^\circ$$

$$y = 180^\circ - 50^\circ$$

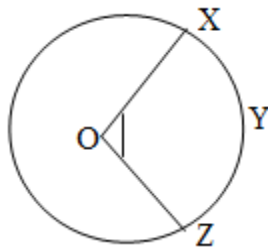
$$y = 130^\circ$$

Gilgaala Boqonnaa 5

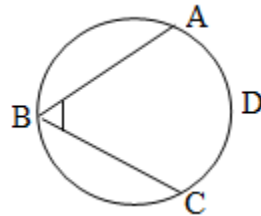
1. Geengoo armaan gadii keessatti O'n handhuura yoo ta'ee fi $s(\angle AOB) = 50^\circ$ yoo ta'e, $s(\widehat{ACB})$ barbaadi.



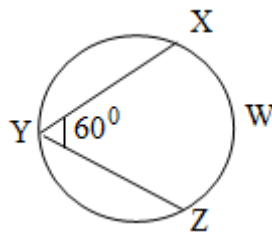
2. Geengoo armaan gadii keessatti O'n handhuura yoo ta'ee fi $s(\widehat{XYZ}) = 60^\circ$ yoo ta'e, $s(\angle XOZ)$ meeqa ta'a?



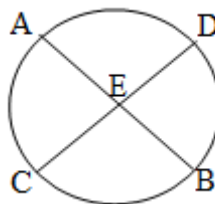
3. Geengoo armaan gadii keessatti yoo $s(\widehat{ADC}) = 110^\circ$ ta'e, $s(\angle ABC)$ barbaadi.



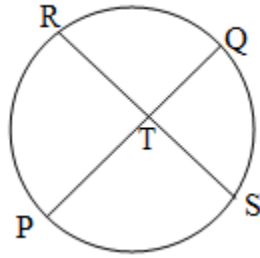
4. Geengoo armaan gadii keessatti yoo $s(\angle XYZ) = 60^\circ$ ta'e, $s(\widehat{XWZ})$ barbaadi.



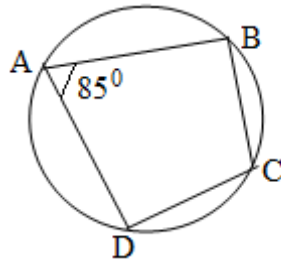
5. Geengoo armaan gadii keessatti koordotni $\overline{AB}$ fi $\overline{CD}$ tuqaa E irratti walqaxxaamuranii fi $s(\widehat{AC}) = 80^\circ$ fi $s(\widehat{BD}) = 90^\circ$ yoo ta'e, $s(\angle DEB)$ barbaadi.



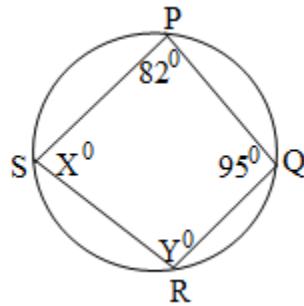
6. Geengoo armaan gadii keessatti koordotni $\overline{RS}$ fi $\overline{PQ}$ tuqaa T irratti walqaxxaamuranii fi $s(\widehat{RQ}) = 70^\circ$ fi $s(\angle PTS) = 80^\circ$ yoo ta'e, $s(\widehat{PS})$ meeqa ta'a?



7. Danaa armaan gadii keessatti, $s(\angle DAB) = 85^\circ$ yoo ta'e, $s(\angle DCB)$ meeqa ta'a?



8. Danaa armaan gadii keessatti x° fi y° barbaadi.



BOQONNAA 6

6. SEENSA CARRAA TA'UMSAA

6.1. Yaad-rimee Carraa Ta'umsaa

Jireenya hawaasummaa guyyaa, guyyaa keessatti carraan ta'umsaa ni jiraata.

Carraan ta'umsaa waanti raagame tokko ta'uu isaa fi ta'uu dhiisuu isaa, ta'ee uumamu keessatti kan ittiin madaallu dha. Kanaaf waanti raagame ni ta'a yookiin ta'uu dhiisuu ni mala.

Fakkeenya:

- Har'a ni rooba.
- Lootoriin naaf baha.
- 100% nan abdadha qormaata nan darba.
- Tolaan bara dhufu ni fuudha.

Ta'iilee muuxannoo guyyaa guyyatti qabnu irraa shakkii tokko malee ta'uu danda'anii fi ta'iilee shakkii tokko malee ta'uu hin dandeenye ni jiru.

Fakkeenya:

Gaafilee armaan gadii **dhugaa** yookiin **soba** jechuun deebisi. Deebii keetiif sababa kenni.

1. Carraan harreen dhaltuun gaangee dhalu ni dandeessi.
2. Carraan sararonni sirrii lama kan walqaxxaamuran tuqaa tokko qofa irratti.
3. Carraan Umrii Dirriibaa fi kan abbaa isaa waggaa 10'n wal caalu danda'u.
4. Carraan Torban tokko guyyota torba qabu.
5. Carraan Aduun karaa lixaatiin baati.
6. Carraan Oromiyaa fi Tigraayii wal hin dangessan.

Furmata:

1. Soba, dhaloota uumamaa jiru irraa harreen dhaltuun harree malee gaangee dhaluu hin dandeessuu.
2. Dhugaa, hiikaa ji'oomeetrii irraa sararonni lama kamiyyuu yoo kennaman tuqaa tokkoo qofa irratti wal-qaxxaamuru.
3. Soba, muuxannoo uumamaa jiru irra dhiirri umriin isaa 10'n fi gad ta'e dhalchuu hin danda'u.
4. Dhugaa, muuxannoo jiru irraa torban tokko guyyota torba qaba.
5. Soba, muuxannoo jiru irraa aduun karaa bahaa bati malee karaa lixaa hin batu.
6. Dhugaa, beekumsa barnoota hawaasaa qabnuun naannoo Oromiyaa fi Tigraayii wal hindangeessan.

Hiikoo: Ta'iin ba'ii tokkoo shakkii hinqabu yoo ta'e, **ba'ii shakkii hin qabne** jedhama. Carraan ta'umsa isaas **1** dha.

Fakkeenya:

- Abbaan gaangee Haree dha.
- Torban tokko guyyota torba qaba.
- Aduun karaa bahaa baati.

Hiikoo: Ta'iitiin ba'ii tokkoo kan hin danda'amne yoo ta'e **ba'ii ta'uu hin dandeenye** jedhama.
Carraan ta'umsa isaas **0** dha.

Fakkeenya:

- Namni miila afur qaba.
- 1 lakkoofsa kophxiitti.
- 7 Hirmaataa 36tti.

Hiikoo: Ta'iitiin ba'ii irratti carraan shakkii malee ta'uu yoo jiraate ba'iin akkasii **ba'ii ta'uu danda'u** jedhama.

Fakkeenya:

- Dinaarri tokko yoo ol darbannee fakkii leencaa argana.
- Daayii tokko yoo ol darbannee lakkoofsa 3 argana.

Gilgaala 6.1

- Gaafiilee armaan gadii dhugaa yookiin soba yookiin lamaanuu miti jechuun deebii kenni.
 - Leencii beelada manaati.
 - Magaalii guddiitiin keeniyaa Naayiroobii dha.
 - Caamsaa 20 roobni ni rooba.
 - Lukkuun hosiftoota dha.
 - 100 lakkoofsa iskuweerii sirriitti.
 - Barattoota bara kana qormaata naannoo kutaa 8^{ffaa} fudhatan keessaa 100% kutaa 9^{ffaa}tti darbu.
- Dinaarri tokkoo fi daayii tokko yeroo tokkotti al tokko yoo ol darbataman kanneen armaan gadii ba'iilee shakkii hin qabne, ba'iilee ta'uu danda'an yookiin ta'iilee gonkumaa ta'uu hin dandeenye jechuun barreessi.
 - Fakkii namaa fi lakkoofsa afur.
 - Fakkii leencaa fi lakkoofsa 8.
 - Fakkii namaa yookiin fakkii leencaa fi lakkoofsa 1 hamma 6 jiru.
- Kachoon tokko kubbaalee shan kan halluu Gurraacha ykn Magariisa ykn Adii ykn Diimaa ykn Keelloo qabatee jira. Ba'iilee armaan gadii ta'itiin isaan shakkii hin qabne, ta'uu danda'an yookiin ta'uu hin dandeenye barreessi.

- Kachoo kana keessaa carraan kubbaa Adii fudhachu.
- Kachoo kana keessaa carraan kubbaa Gurraacha fudhachu.
- Kachoo kana keessaa carraan kubbaa Cuquliisa fudhachu.
- Kachoo kana keessaa carraan kubbaalee Gurraacha, Magaariisa, Adii, Diimaa fi Kelloo fudhachu.
- Kachoo kana keessaa carraan kubbaalee Diimaa fi Cuquliisaa fudhachu.
- Kachoo kana keessaa carraan kubbaalee Adii ykn Gurraacha fudhachu.

6.2. Carraan Ta'umsaa Ta'iilee Sassalphoo

Hiikoo: yaalii tasaa kamiifuu tuutni ba'iilee ta'uu danda'an hunda qabate **tuuta carraa ta'umsaa** (tuuta ba'iilee ta'uu danda'anii) (sample space) jedhama. Tuuta kana qubee S'n bakka buufama.

Fakkeenya:

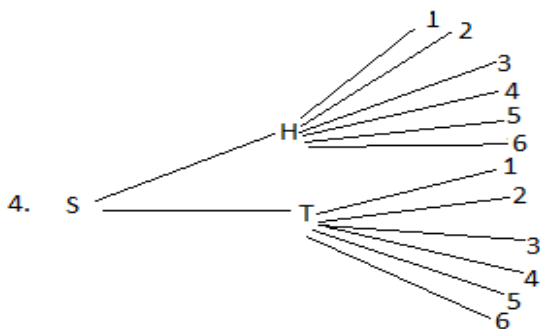
- Darbannaa dinaara tokko keessatti tuuta carraa ta'umsaa barbaadi.
- Darbannaa daayii tokko keessatti tuuta carraa ta'umsaa barbaadi.
- Oldarbannaa altokkoo dinaara lamaa keessatti tuuta carraa ta'umsaa barbaadi.
- Ol darbannaa al tokko dinaaraa fi daayii keessatti tuuta carraa ta'umsaa barbaadi.

Furmaata:

- Yomuu dinaara ol darbannu ba'iileen ta'uu danda'an fakkii leencaa, mallattoo H fi fakkii namaa mallattoo T'n agarsiifama.

Kanaafuu tuutni carraa ta'umsaa yaalii kanaa $S = \{H, T\}$.

- Yommuu daayii tokko ol darbannu ba'iileen argamuu danda'an 1,2,3,4,5 fi 6 dha. Kanaafuu tuutni carraa ta'umsaa (S) yaalii kanaa $S = \{1, 2, 3, 4, 5, 6\}$ dha.
- Dinaara lama al tokkootti ol darbannu dhaan ba'iileen argamuu danda'an HH, HT, TH fi TT. Kanaafuu ba'iileen waliigalaa $S = \{HH, HT, TH, TT\}$ dha.



$S = \{H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6\}$

Hiikoo: Ta'ii (event) (E) yaalii tokkoo cita tuuta tuuta carraa ta'umsaa yaalii kanaati.

Fakkeenya:

1. Dinaara tokkoo fi daayii tokko al tokkotti yoo ol darbanne ta'ii armaan gadii barbaadi.
 - a. Fakkii namaa fi lakkoofsota mangoos.
 - b. Fakkii leencaa fi lakkoofsa irra gudda 3.

Furmaata:

Dinaara tokkoo fi daayii tokko al tokkotti yoo oldarbanne tuutni ba'iilee ta'uu danda'anii kan yaalii kanaa:-

$$S = \{ H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6 \}$$

- a. Ta'iin fakkii namaa fi lakkoofsota mangoos argachuu

$$E = \{ T1, T3, T5 \}$$
 - b. Fakkii leencaa fi lakkoofsa irra gudda 3 $E = \{ H4, H5, H6 \}$
2. Jecha "MATHEMATICS" jedhu fudhadhu. Qubeewwan jecha kana keessa jiran kaardota walqixa ta'anii fi haalluu walfakkaatan qabu irratti tokkoon, isaanii barreessuun saanduqa wayii keessa kaa'i. Al tokkotti kaardii tokko yoo baafte.
 - a. Ta'ii kaardii qubee dubbachiiftuu qabu baasuu barbaadi.
 - b. Ta'ii kaardii qubee dubbifamaa qabu baasuu barbaadi.
 - c. Ta'ii kaardii qubee M qabu baasuu barbaadi.
 - d. Reeshoo:
 - i. Ta'ii qubee dubbachiiftuu garaqubeewwan walii galatti meeqa?
 - ii. Ta'ii qubee dubbifamaa gara qubeewwan walii galaatti meeqa?
 - iii. Ta'ii qubee M gara qubeewwan walii galatti meeqa?

Furmaata:

- a. Jecha "MATHEMATICS" jedhu keessa dubbachiiftu afurtu jira.

Isaanis A, E, A fi I dha. Kanaafuu ta'iin kaardii dubbachiiftuu $E = \{ A, E, A, I \}$ dha. A'n lama kan ta'eef sababi jaha kenname keessa A lama waan jiruuf dha. kana malees kaardota lama kanneen A irratti barreeffame waan jiraniif.
- b. Jecha "MATHEMATICS" jedhu keessa dubbifamaa 7tu jira. Isaanis M, T, H, M, T, C fi S dha. Kanaafuu ta'iin yaalii kanaa

$$E = \{ M, T, H, M, T, C, S \}$$
 dha. (M fi T lama lama)
- c. Jecha "MATHEMATICS" jedhu keessa qubee M lamatu jira. Kanaafuu $\{ M, M \}$ dha.
- d. Reeshoo:
 - i. Ta'ii qubee dubbachiiftuu gara qubeewwan walii galatti $\frac{4}{11}$ dha.
 - ii. Ta'ii qubee dubbifamaa gara qubeewwan walii galaatti $\frac{7}{11}$ dha.

iii. Ta'ii qubee M gara qubeewwan walii galatti $\frac{2}{11}$ dha.

Hiikoo: Tuutni ba'iilee jiraachuu danda'anii ba'iilee lakka'amu danda'anii fi carraa walqixaa qaban of keessatti qabate yoo ta'e carraa ta'umsaa ta'ii $P(E)$, reeshoo baay'ina ba'iilee ta'ii keessa jiran $n(E)$, gara baay'ina ba'iilee jiraachuu danda'an hundaa $n(S)$, ti. Mallattoon:

$$P(E) = \frac{\text{baay'ina ba'iilee ta'ii keessaa}}{\text{baay'ina ba'iilee hundaa}} = \frac{n(E)}{n(S)}$$

Fakkeenya:

1. Dinaara tokko al tokko ol darbachuun carraa ta'umsaa kanneen armaan gadii argachuu barbaadi.

- a. Ta'umsa fakkii namaa. b. Ta'umsa fakkii leencaa.

Furmata:

1. a. Dinaara tokko al tokko ol darbachuun ba'iileen waliigalaa.

$S = \{H, T\}$ fi ta'iin fakkii nama argachuu $E = \{T\}$. Kanaafuu carraa

ta'umsaa fakkii namaa argachuu $P(T) = \frac{n(E)}{n(S)} = \frac{1}{2}$

b. ta'iin fakkii leencaa argachuu $E = \{H\}$. Kanaafuu carraan ta'umsaa fakkii leencaa argachuu

$$P(H) = \frac{n(E)}{n(S)} = \frac{1}{2}$$

2. Daayii toko al tokko ol darbachuudhan carraan ta'umsaa kanneen armaan gadii argachuu barbaadi.

- a. lakkoofsa 4
b. lakkoofsa mangoos
c. lakkoofsa irraa guddaa ykn walqixaa 3
d. Lakkoofsa irra guddaa 6.

Furmaata:

2. Daayiin tokko yommuu ol darbatamu tuutni ba'iileen jiraachuu danda'anii $S = \{1, 2, 3, 4, 5, 6\}$ dha.

a. Ta'itiin lakkoofsa 4 argachuu. $E = \{4\}$. Kanaafuu carraan ta'umsaa lakkoofsa 4 argachuu

$$P(E) = \frac{n(E)}{n(S)} = \frac{1}{6} \text{ dha.}$$

b. Ta'iin lakkoofsa mangoos argachuu $E = \{1, 3, 5\}$.

Kanaafuu carraan ta'umsaa lakkoofsota mangoos argachuu

$$P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2} \text{ dha.}$$

c. Ta'iin lakkoofsa irra guddaa ykn walqixaa 3 argachuu $E = \{3, 4, 5, 6\}$.

Kanaafuu carraan ta'umsaa lakkoofsa irra guddaa ykn waqixa 3 argachuu $P(E) = \frac{n(E)}{n(S)} = \frac{4}{6} = \frac{2}{3}$

dha.

d. Ta'iiin lakkoofsa irra guddaa 6 argachuu $E = \{ \}$.

Kanaafuu carraan ta'umsaa lakkoofsa irra gudda 6 argachuu, $P(E) = \frac{n(E)}{n(S)} = \frac{0}{6} = 0$ dha.

3. Kachoon kubbaalee Adii 4, Gurraacha 6, keelloo 8 fi Magarsiisa 10 qabatee jira. Kubbaan kachoo keessaa, utuu halluu isaa hin ilaaliin yoo baafame, kubbaa baafameef, carraa ta'umsaa shallagi.

- a. Kan adii
- b. kan Gurraacha
- c. Kan keelloo
- d. Kan magariisa
- e. Kan Adii ykn Gurraachaf. kan keelloo ykn magariisaa

Furmaata:

3. Lakkoofsi kubbaalee waliigalaan $= 4 + 6 + 8 + 10 = 28$

kanaafuu $n(S) = 28$

a. Ta'ii, $E = \{\text{adii 4}\} = n(E) = 4$

kanaafuu, $P(E) = \frac{n(E)}{n(S)} = \frac{4}{28} = \frac{1}{7}$ dha.

b. Ta'ii, $E = \{\text{gurraacha 6}\} = n(E) = 6$

kanaafuu, $P(E) = \frac{n(E)}{n(S)} = \frac{6}{28} = \frac{3}{14}$ dha.

c. Ta'ii, $E = \{\text{keelloo 8}\} = n(E) = 8$

kanaafuu, $P(E) = \frac{n(E)}{n(S)} = \frac{8}{28} = \frac{2}{7}$ dha.

d. Ta'ii, $E = \{\text{Magariisa 10}\} = n(E) = 10$

kanaafuu, $P(E) = \frac{n(E)}{n(S)} = \frac{10}{28} = \frac{5}{14}$ dha.

e. Ta'ii, $E = \{\text{Adii 4 ykn Gurraacha 6}\} = n(E) = 10$

kanaafuu, $P(E) = \frac{n(E)}{n(S)} = \frac{10}{28} = \frac{5}{14}$ dha.

f. Ta'ii, $E = \{\text{keelloo 8 ykn Magariisa 10}\} = n(E) = 18$

kanaafuu, $P(E) = \frac{n(E)}{n(S)} = \frac{18}{28} = \frac{9}{14}$ dha.

Hubadhu: Fakkeenya armaan olii keessatti, carraan ta'ii firaakshinii fi deesimaaliin ibsameera. Yoo carraa ta'ii $P(E) = 100\%$ baay'ifne dhibbantaa carraa ta'umsaa ta'ii kennamee arganna. Fakkeenya 2b armaan olii haa ilaalluu.

- Daayii tokko al tokko ol darbachuudhaan carraan lakkoofsa mangoos argachuu $P(\text{magoo}) = 0.5 \times 100\% = 50\%$

Hubdhu:

- Carraan ta'umsaa ta'ii shakkii hin qabnee 1 dha.
 - Carraan ta'umsaa ta'ii ta'uu hin dandeenye 0 dha.
 - Baay'inni miseensota ta'ii E yeroo maraa irra xiqqaa yookiin walqixaa baay'inna miseensota tuuta ba'iilee jirachuu danda'anii S ti.
- Kana jechuun, $0 \leq P(E) \leq 1$ dha.
- kanaafuu ta'ii E kamiifuu $0 \leq P(E) \leq 1$.

Gilgaala 6.2

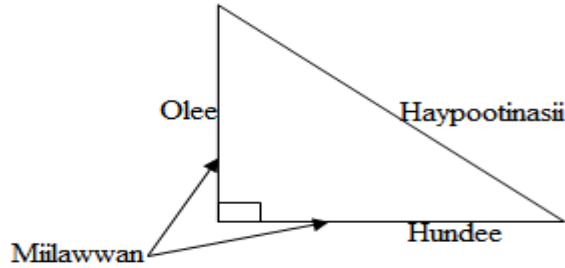
1. Dinaara tokko al sadi yoo ol darbanne carraa ta'umsaa ta'iilee armaan gadii barbaadi.
 - a. Fakkiin namaa lama olgaragalee mul'achuu isaa.
 - b. Fakkiin namaa al tokko ol garagalee mul'achuu isaa.
 - c. Fakkii leencaa al sadii olgaragalee mul'achuu isaa.
2. Daayiin lama yoo darbataman carraa ta'umsaa ida'ama lamaanuu lakkoofsota armaan gadii itti ta'uu danda'an barbaadi.
 - a. 7
 - b. 9
3. Kutaa 8^{ffaa} daree tokkoo kan Barattoota 50 qabuu keessaa 30 dhiirota dorgoomii ispoortitiif filamuufi, carraa dorgoomii ispoortii filatamuu barattootaa ta'uu kan dubartootaa meeqa? Kan dhiirota meeqa?
4. Jechoota armaan gadii keessaa carraa ta'umsaa shallagi.
 - a. G jecha "ENGLISH" keessaa
 - b. D jecha "GOOD" keessaa
 - c. M jecha "MOBILE" keessaa
 - d. Qubee dubbachiftuu jecha "MOBILE" keessaa
5. Carraan ta'umsa ta'ii tokkoo kan argamu _____ fi _____ gidduutti.
6. Lakkoofsota armaan gadii keessaa carraa ta'umsaa ta'uu kan hin dandeenye kami?
 - a. -1
 - b. $\frac{1}{2}$
 - c. 1.1
 - d. 1
 - e. 0
 - f. 90%

BOQONNAA 7

7. JI'OOMEETIRII FI SAFARA

7.1. Tiyooramoota Rog-sadee Kofa Sirrii

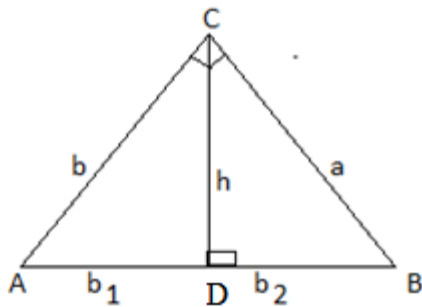
Rog-sadeen tokko rog-sadee kofa sirriiti kan jennu yoo safarri kofa tokkoo 90° ta'u akka ta'e ni beekama.



Tiyooramii paaytaagoras kennuu fi mirkaneessun duratti tiyooramii isa kanaaf nu gargaaru ilaalla.

Tiyooramii Olee

Rog-sadee kofa sirrii oleen gara haypootinasii ta'e, keessatti iskuweeriin safara olee baay'ata safara miila lamaaniitin wal qixa ta'a. Kan jechuun: $h^2 = b_1 b_2$ jechuudha.



Fakkeenya:

a. ABC'n rog-sadee kofa sirrii kofa 'c' n kofa sirrii ta'e dha. Yoo 'CD' n oleen gara haypootinasii ta'ee fi akkasumas $AD=3\text{cm}$, $DB=12\text{cm}$ ta'an, dheerina CD barbaadi.

Furmaata: Tiyooramii armaan oliitiin

$$(\overline{CD})^2 = \overline{AD} \times \overline{DB}$$

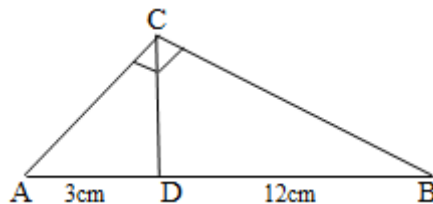
Kunis ,

$$\overline{CD} = \sqrt{\overline{AD} \times \overline{DB}}$$

$$\overline{CD} = \sqrt{3\text{cm} \times 12\text{cm}}$$

$$\overline{CD} = \sqrt{36\text{cm}^2}$$

$$\overline{CD} = 6\text{cm}$$



Tiyooramii olee keessatti “h”n olee rog-sadee kofa sirrii, b_1 fi b_2 ’n ammoo dheerina sararoota dhaabatoo haypootinasirraa yoo ta’an $h^2 = b_1 b_2$ ta’uu isaa argineera. Gargagaltoon tiyooramii olee dhugaa yoo ta’u haala armaan gadiitiin kennama.

Tiyooramii: Rog-sadee ABC oleen gara roga isa dheeratti hojjatame keessatti iskuweeriin olee yoo baay’ate dheerina sararoota dhaabatoo roga dheerarraa wajjin qixxee ta’e ABC’n rog-sadee kofa sirrii ta’a.

Kunis $h^2 = b_1 b_2$ yoo ta’e $\triangle ABC$ kofa sirrii ta’e jechuudha.

Yaadannoo: Rog-sadee oleen gara roga isa dheeraa h, dheerinni sararoota rog-sadee kofa sirrii kan ta’u danda’u, yoo himni walqixaa $h^2 = b_1 b_2$ dhugaa ta’ee dha.

Mallattoodhaanis yoo barreeffamu $\triangle ABC$ kofa sirrii yoo ta’ee $h^2 = b_1 b_2$ ta’a jechuudha.

Fakkeenya:

Danaa armaan gadii keessatti

$\overline{AD} = 8\text{cm}$, $\overline{BD} = 16\text{cm}$ fi $\overline{CD} = 12\text{cm}$ yoo ta’e rog-sadee ABC’n kofa sirrii ni ta’aa?

Furmaata:

Gargaltoo tiyooramii oleetiin

$$h^2 = b_1 b_2 \text{ ta’u agarsiisuun ni ga’a } h = \overline{CD}$$

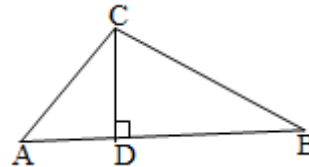
$$= 12\text{cm},$$

$$b_1 = \overline{AD} = 8\text{cm}$$

$$\text{fi } b_2 = \overline{BD} = 12\text{cm nuu kennamaniiru.}$$

$$(12\text{cm})^2 = 8\text{cm} \times 16\text{cm}$$

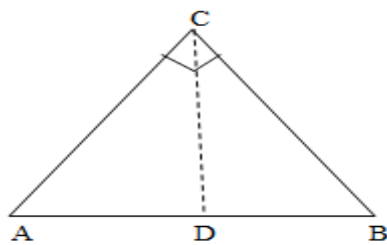
$$144\text{cm}^2 = 144\text{cm}^2$$



Kanaafuu, $\triangle ABC$ ’n rog-sadee kofa sirriiti jechuudha.

Fakkeenya:

1. Danaa armaan gadiirratti yoo dheerinni $\overline{CD} = 7$ ta’e baay’inni $\overline{AD} \times \overline{BD}$ meeqa ta’a?



Furmaata:

Tiyooramii oleettiin

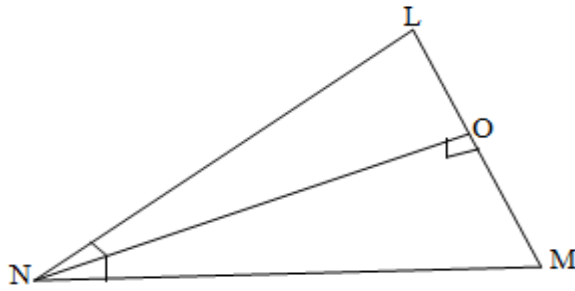
$$(\overline{CD})^2 = \overline{AD} \times \overline{BD}$$

$$7^2 = \overline{AD} \times \overline{BD}$$

$$49 = \overline{AD} \times \overline{BD}$$

$$\text{kanaafuu, } \overline{AD} \times \overline{BD} = 49$$

2. Danaa armaan gadii keessatti rog-sadeen LMN kofa sirriidha. LM haypootinasii yoo ta'eefi LO=3cm akkasumas OM=27cm yoo ta'an
- a. Dheerinni LM meeqa? b. Dheerinni ON meeqa?



Furmaata:

- a. $LM = LO + OM$
 $LM = 3\text{cm} + 27\text{cm}$
 $LM = 30\text{cm}$
- b. Tiyooramii Oleetiin
 $(ON)^2 = LO \times OM$
 $ON = \sqrt{LO \times OM}$
 $ON = \sqrt{3\text{cm} \times 27\text{cm}}$
 $ON = \sqrt{81\text{cm}^2}$
 $ON = 9\text{cm}$
 kanaafuu, $ON = 9\text{cm}$ dha.

Tiyooramii Ikuulidii

Rog-sadee kofa sirrii oleen gara haypootinasii keessatti iskuweerin dheerina tokko tokkoo miilotaa baay'ataa haypootinasii fi dheerina hundeewwan oleen haypootinasicha itti qooden walqixa. (baay'ataa haayipootinasii fi roga miila kanaaf ta'ee dha).

Yoo rog-sadee kofa sirrii

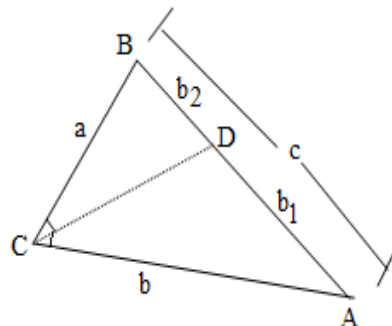
$\triangle ABC$ fi $\overline{CD}$ 'n olee gara

haayipootinasichaa

$\overline{AB}$ tti ta'e.

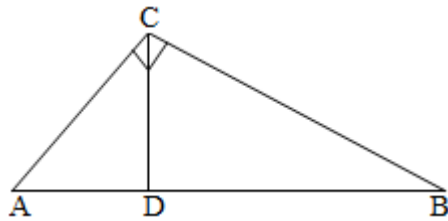
i. $a^2 = cb_2$

ii. $b^2 = cb_1$



Fakkeenya:

1. Rog-sadeen ABC'n armaan gadii CD olee gara haypootinasii ta'ee dha. $AB = 27\text{cm}$, $DB = 24\text{cm}$ yoo ta'e AC meeqa ta'a?



Furmaata:

Kan kenname: $AB=27\text{cm}$ $DB=24\text{cm}$

Kan barbaadamu: Dheerina AC

Tiyooramii Ikuuliidiin $(AC)^2 = AB \times AD$

$$(AC)^2 = AB \times (AB - DB)$$

$$(AC)^2 = 27\text{cm} \times (27\text{cm} - 24\text{cm})$$

$$(AC)^2 = 27\text{cm} \times 3\text{cm}$$

$$(AC)^2 = 81\text{cm}^2$$

$$AC = \sqrt{81\text{cm}^2}$$

$$AC = 9\text{cm}$$

2. Rog-sadee kofa sirrii tokkoo keessatti oleen gara haayipootinasii 12cm dheerata. Yoo dheerinni rogoota haayipootinasii irraa kanneen oleen uumaman x cm fi $16x$ cm ta'an, dheerina roga miilota rogsadichaa barbaadi.

Furmaata : Tiyooramii Oleettiin

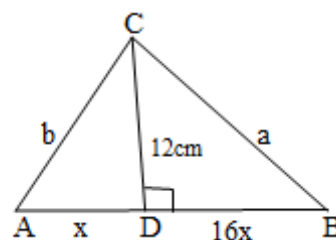
$$(12\text{cm})^2 = x \times 16x$$

$$144\text{cm}^2 = 16x^2$$

$$x^2 = \frac{144\text{cm}^2}{16}$$

$$x = \sqrt{\frac{144\text{cm}^2}{16}} = \frac{12\text{cm}}{4}$$

$$x = 3\text{cm}$$



$$c = AB = AD + DB = x + 16x$$

$$c = 3\text{cm} + 16(3\text{cm})$$

$$c = 3\text{cm} + 48\text{cm} = 51\text{cm}$$

$$a^2 = 16x \times 17x = 16 \times 3\text{cm} \times 17 \times 3\text{cm} =$$

$$2448\text{cm}^2$$

$$a^2 = 2448\text{cm}^2$$

$$a = \sqrt{2448\text{cm}^2}$$

$$a = 12\sqrt{17} \text{ cm}$$

$$b^2 = x \times 17x = 3\text{cm} \times 17 \times 3\text{cm} = 153\text{cm}^2$$

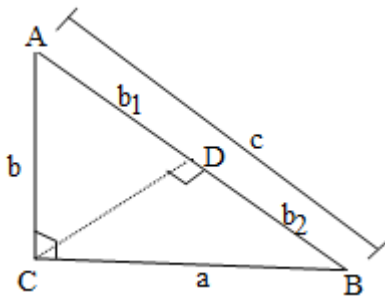
$$b = \sqrt{153\text{cm}^2}$$

$$b = 3\sqrt{17} \text{ cm}$$

Tiyooramii Paayitagorasii fi Galgaltoo

Rog-sadee kofa sirrii ABC armaan gadii irraa $cb_1 + cb_2 = c(b_1 + b_2) = c(c) = c^2$ kan jedhu ni arganna. Haa ta'u malee tiyooramii Ikuuliidiin $cb_1 = b^2$ fi $cb_2 = a^2$ ta'a. Kanaafuu hima walqixaa

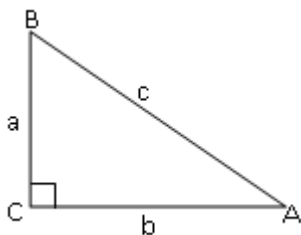
$a^2 + b^2 = c^2$ jedhu barreessuu ni dandeenya. Kunis tiyooramii paaytaagoras jedhama.



Tiyooramii Paayitagorasii

Rog-sadee kofa sirrii dheerinni miilotaa a fi b, akkasumas dheerinni haypootinasii c ta'e

$a^2 + b^2 = c^2$ ni ta'a.



Fakkeenya:

1. Rog-sadee kofa sirrii tokko keessatti yoo dheerinni miilotaa 6cm fi 8cm ta'e dheerinni haypootinasii meeqa ta'a?

Furmaata:

Kan kenname: $a = 6\text{cm}$ $b = 8\text{cm}$

Kan barbaadamu: $c = ?$

Tiyooramii Paaytaagorasiin

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

$$(6\text{cm})^2 + (8\text{cm})^2 = c^2$$

$$36\text{cm}^2 + 64\text{cm}^2 = c^2$$

$$100\text{cm}^2 = c^2$$

$$c = \sqrt{100\text{cm}^2}$$

$$c = 10\text{cm}$$

Kanaafuu, dheerinni haaypootinasii 10cm dha.

2. Rog-sadee kofa sirrii tokko keessatti yoo dheerinni miilota lamaanii walqixa ta'ee fi dheerinni haaypootinasii 16cm ta'e, dheerinni miilota meeqa ta'a?

Furmaata:

yoo dheerina miilota x jenne fudhanne, tiyooramii paaytaagorasiin hima walqixaa $a^2 + a^2 = 16^2$ jedhu arganna.

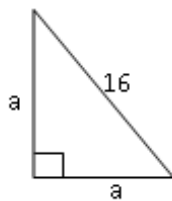
$$\text{Kunis, } 2a^2 = 256$$

$$a^2 = \frac{256}{2}$$

$$a^2 = 128$$

$$a = \sqrt{128}$$

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



Kanaafuu, $\triangle ABC$ 'n rog- sadee kofa sirriidha.

3. Rog-sadeen ABC kofa sirrii yoo ta'u, dheerinni haaypootinasii c , dheerinni miilota lamaanii immoo a fi b dha.

$$c = 17\text{cm}, a = 8\text{cm} \text{ yoo ta'e } b \text{ 'n meeqa ta'a?}$$

Furmaata:

$$\text{kan kenname: } c = 17\text{cm}$$

$$a = 8\text{cm}$$

$$\text{kan barbaadame: } b = ?$$

Tiyooramii paaytaagorasiin

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

$$(17\text{cm})^2 = (8\text{cm})^2 + b^2$$

$$289\text{cm}^2 = 64\text{cm}^2 + b^2$$

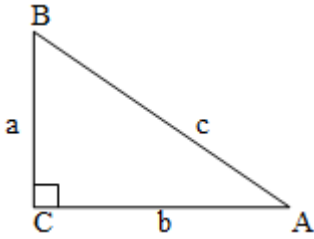
$$b^2 = 289\text{cm}^2 - 64\text{cm}^2$$

$$b^2 = 225\text{cm}^2$$

$$b = \sqrt{225\text{cm}^2}$$

$$b = 15\text{cm}$$

Tiyooramii: Dheerinni rogoota rog-sadee a , b fi c yoo ta'ee fi rog-sadichi rog-sadee $a^2 + b^2 = c^2$ yoo ta'e rog-sadichi rog-sadee kofa sirriiti.



Tiyyooramii paaytaagorasiif gargaltoo isaa walqunnamsiisun yaadannoo armaan gadii barreessun ni danda'ama.

Yaadannoo: Rog-sadeen ABC , rog-sadee kofa sirrii kan ta'u yoo $c^2 = a^2 + b^2$ dhuga ta'e qofaadha.

Mallattoodhaanis, $c^2 = a^2 + b^2$ yoo ta'ee, ''c'' irratti ΔABC kofa sirrii ta'a.

Fakkeenya:

Dheerinni rogoota rog-sadee ABC 20cm, 21cm fi 29cm dha. Rog-sadeen kun kofa sirrii ta'uu mirkanussi.

Furmaata:

Lakkoofsonni kennaman garagaltoo tiyyooramii paaytaagoras dhugaa godhuu isaanii mirkaneessu.

$$a = 20\text{cm}, b = 21\text{cm} \text{ fi } c = 29\text{cm}$$

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

$$(29\text{cm})^2 = (20\text{cm})^2 + (21\text{cm})^2$$

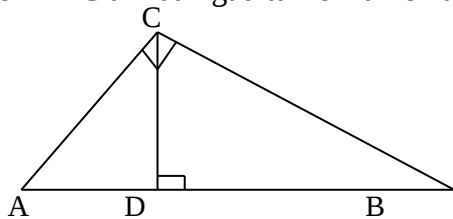
$$841\text{cm}^2 = 400\text{cm}^2 + 441\text{cm}^2$$

$$\text{kunis } a^2 + b^2 = c^2$$

Kanaafuu, ΔABC 'n rog-sadee kofa sirriidha.

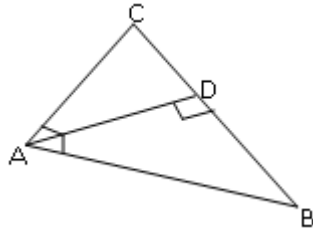
Gilgaala 7.1

1. Rog-sadeen ABC armaan gaditti kenname kun rog-sadee kofa sirriidha. Yoo C kofa sirrii ta'ee fi



- CD=8cm, AD=4cm yoo ta'e BD meeqa ta'a?
 - AB=12cm, AD=4cm yoo ta'e CD meeqa ta'a?
 - CD=6cm fi DB=9cm yoo ta'e AD fi AB barbaadi.
2. Rog sadeen armaan gadii kofa sirriidha. AC=8cm fi CD=5cm yoo ta'an, dheerina rogoota armaan gadii shallagi.

- CB
- AD
- DB
- AB



3. Rog-sadee kofa sirrii ABC dheeriini miilotasaa 12cm fi 16cm yoo ta'e, dheerinni haypootinasii meeqa ta'a?
4. Rog-sadee kofa sirrii ABC dheerinni miila tokko 10cm fi dheerinni haaypootinasii 26cm yoo ta'e, dheerinni miila lammaffaa meeqa ta'a?
5. Lakkoofsota armaan gaditti kennaman keessa kan dheerinna rogoota rog-sadee kofa sirrii kan ta'anii fi hin ta'in gargaar baasi.

a. 1.5 , 2, 2.5	b. 7, 8, 9	c. 7, 40, 41
d. 16, 30, 34	e. 15, 56, 39	f. 20, 30, 40

7.2. Seensa Tiriigonoometirii

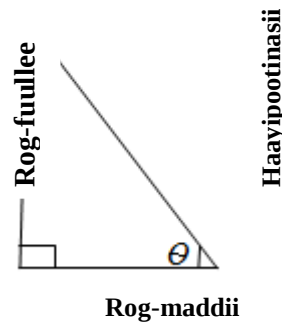
Kutaa Herregaa kan waa'ee safara rog sadootaa qo'atu **Tiriigonoometirii** jedhama.

Tiriigonoometirii reeshota rogoota lamaan rog-sdee kofa sirrii irratti xiyyeeffatu reeshota tiriigonoometirii jenna.

Reeshota Tiriigonoometirii

Rog-sadee kofa sirrii, kan kofa akkiyuutii θ , armaan gadii ilaali.

- Rogni kofa sirriitiif fuullee ta'e haayipootinasii jedhama.
- Rogni kofa θ fuullee ta'e roga fuullee jedhama.
- Rogni kofa cinaa θ tti argamu roga madii jedhama.

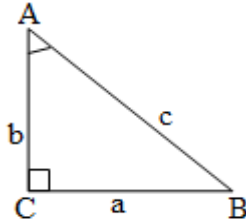


$$\frac{\text{roga fuulee}}{\text{haayipootinasii}}, \frac{\text{rog} - \text{maddii}}{\text{haayipootinasii}} \text{ fi } \frac{\text{roga fuulee}}{\text{rog} - \text{maddii}}$$

Reeshoowwan tiriigonoometirii kofa sirrii jedhamu.

Mee hiikoo reeshoowwan tiriigonoometirii sadan haa ilaalu. Isaanis: **saayinii**, **kosaayinii** fi **taanjeentii** kofa akkiyuutii rog-sadee kofa sirriiti.

Hiikoo: Rog-sadee kofa sirrii ACB ilaali.



i. Saayinii A gabaabinaan “sin A” yeroo hiikamu.

$$\sin A = \frac{\text{safara roga fuulee}}{\text{safara haayipootinasii}} = \frac{a}{c}$$

ii. Koosaayinii A gabaabinaan “cos A” yeroo hiikamu.

$$\cos A = \frac{\text{safara roga – maddii}}{\text{safara haayipootinasii}} = \frac{b}{c}$$

iii. Taanjantii A gabaabinaan “tan A” yeroo hiikamu.

$$\tan A = \frac{\text{safara roga fuulee}}{\text{safara roga – maddii}} = \frac{a}{b}$$

Hubannoo:

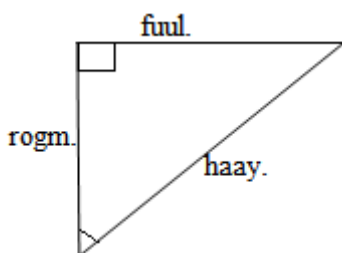
a. Sin A, cos A fi tan A keessatti safarri kofa A fudhatameera.

b. Kofa akkiyuuti θ 'f haayipootinasiin roga hundaarra dheeraa ta'e dha.

Kanaaf $0 < \sin \theta < 1$ fi $0 < \cos \theta < 1$ ta'a.

Mallattoo: Dheerinni rog-fullee, rog-maddii fi haayipootinasii haala **fuul.** , **rogm.** fi **haay.** tiin gabaabaatti tartiibaan barreessu ni dandeenya.

Haaluma kanaan, reeshoowwan tiriignoometirii kofa A akka armaan gadii ta'a.



$$\sin A = \frac{\text{fuul.}}{\text{haay.}}$$

$$\cos A = \frac{\text{rogm.}}{\text{haay.}}$$

$$\tan A = \frac{\text{fuul.}}{\text{rogm.}}$$

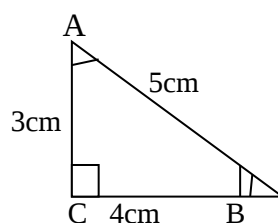
Fakkeenya:

1. Rog-sadee ABC armaan gadii rog-sadee kofa sirrii AC=3cm fi BC=4cm dha.

i. sin A, cos A, tan A

ii. sin B, cos B, tan B

barbaadi.



Furmaata:

a. $\sin A = \frac{4}{5}$

b. $\sin B = \frac{3}{5}$

$\cos A = \frac{3}{5}$

$\cos B = \frac{4}{5}$

$\tan A = \frac{4}{3}$

$\tan B = \frac{3}{4}$

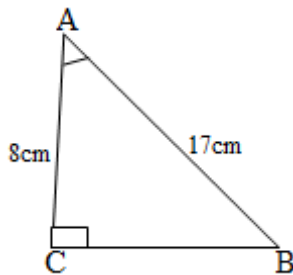
Hubadhu: A fi B'n kofoota guuchisoo walii (kan ida'amni isaanii 90° ta'e) yoo ta'an,

$\sin A = \cos B$, $\cos A = \sin B$ fi $\tan A = \frac{1}{\tan B}$ ta'a. Fakkeenya armaan olii ilaali.

$$\sin A = \frac{4}{5} = \cos B, \cos A = \frac{3}{5} = \sin B \text{ fi}$$

$$\tan A = \frac{4}{3} = \frac{1}{\left(\frac{3}{4}\right)} = \frac{4}{3} = \frac{1}{\tan B}$$

2. $\triangle ABC$ armaan gadii rog-sadee kofa sirriiti $\sin A$, $\cos A$ fi $\tan A$ barbaadi.

**Furmaata:**

Dursa BC barbaadudha, $\triangle ABC$ 'n rog-sadee kofa sirrii waan ta'eef

$$(AB)^2 = (AC)^2 + (BC)^2$$

$$(17\text{cm})^2 = (8\text{cm})^2 + (BC)^2$$

$$289\text{cm}^2 = 64\text{cm}^2 + (BC)^2$$

$$(BC)^2 = 289\text{cm}^2 - 64\text{cm}^2$$

$$(BC)^2 = 225\text{cm}^2$$

$$BC = \sqrt{225\text{cm}^2}$$

$$BC = 15\text{cm}$$

$$\sin A = \frac{\text{fuul.}}{\text{haay.}} = \frac{15\text{cm}}{17\text{cm}} = \frac{15}{17}$$

$$\cos A = \frac{\text{rogm.}}{\text{haay.}} = \frac{8\text{cm}}{17\text{cm}} = \frac{8}{17}$$

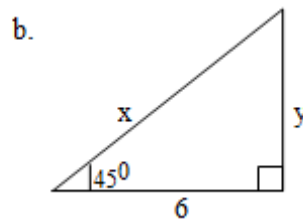
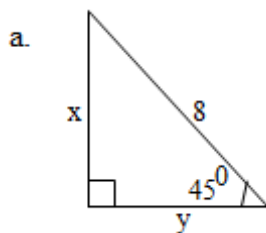
$$\tan A = \frac{\text{fuul.}}{\text{rogm.}} = \frac{15\text{cm}}{8\text{cm}} = \frac{15}{8}$$

Gatiwwan saayinii, kosaayinii fi taanjeentii kofoota 45^0 , 30^0 fi 60^0

Kofoota	Saayinii	kosaayinii	taanjeentii
45^0	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
30^0	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
60^0	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$

Fakkeenya:

1. Danaa armaan gadii irraa gatii x fi y barbaadi.



Furmaata:

a. $\sin 45^0 = \frac{x}{8}$

$$\frac{\sqrt{2}}{2} = \frac{x}{8}$$

$$x = \frac{\sqrt{2} \times 8}{2}$$

$$x = 4\sqrt{2}$$

$$\cos 45^0 = \frac{y}{8}$$

$$\frac{\sqrt{2}}{2} = \frac{y}{8}$$

$$y = \frac{\sqrt{2} \times 8}{2}$$

$$y = 4\sqrt{2}$$

b. $\tan 45^0 = \frac{y}{6}$

$$1 = \frac{y}{6}$$

$$y = 6 \times 1$$

$$y = 6$$

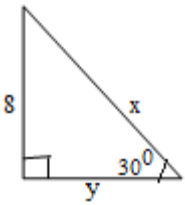
$$\cos 45^0 = \frac{6}{x}$$

$$\frac{\sqrt{2}}{2} = \frac{6}{x}$$

$$x = \frac{6 \times 2}{\sqrt{2}}$$

$$x = \frac{12}{\sqrt{2}}$$

2. Danaa armaan gadii irraa x fi y barbaadi.



Furmaata:

$$\sin 30^\circ = \frac{8}{x}$$

$$\tan 30^\circ = \frac{8}{y}$$

$$\frac{1}{2} = \frac{8}{x}$$

$$\frac{1}{\sqrt{3}} = \frac{8}{y}$$

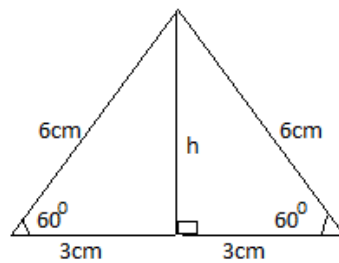
$$X = 16$$

$$y = 8\sqrt{3}$$

3. Rog-sadee roga walqixaa, dheerinni roga isaa 6cm ta'eef, dheerina olee barbaadi.

Furmaata:

Jalqaba rog-sadee ijaari.



$$\sin 60^\circ = \frac{h}{6cm}$$

$$\frac{\sqrt{3}}{2} = \frac{h}{6cm}$$

$$h = \frac{6cm \times \sqrt{3}}{2}$$

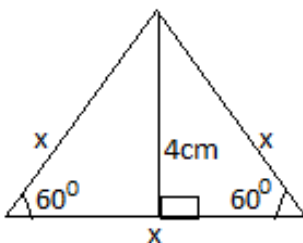
$$h = 3\sqrt{3} \text{ cm}$$

kanaafuu, oleen $3\sqrt{3}$ cm ta'a.

4. Rog-sadee rogoota walqixaa, kan oleen isaa 4cm ta'e, dheerina roga isaa barbaadi.

Furmaata:

Jalqaba rog-sadee ijaari.



$$\sin 60^\circ = \frac{4\text{cm}}{x}$$

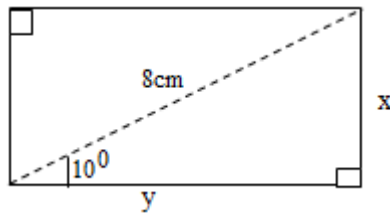
$$\frac{\sqrt{3}}{2} = \frac{4\text{cm}}{x}$$

$$x = \frac{4\text{cm} \times 2}{\sqrt{3}}$$

$$x = \frac{8\text{cm}}{\sqrt{3}}$$

kanaafuu, dheerinni roгаа $\frac{8}{\sqrt{3}}$ cm ta'a.

5. Sarbiin rektaangilii 8cm dheeratu roгаа rektaangilii wajjiin kofa 30° uuma. Dheerina rogoota rektaangilii barbaadi.



$$\sin 30^\circ = \frac{x}{8\text{cm}}$$

$$\cos 30^\circ = \frac{y}{8\text{cm}}$$

$$\frac{1}{2} = \frac{x}{8\text{cm}}$$

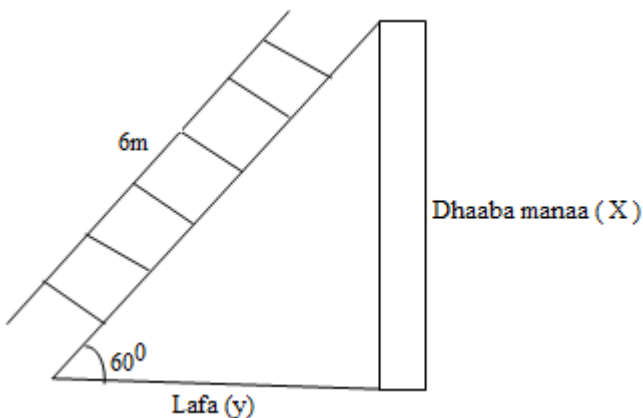
$$\frac{\sqrt{3}}{2} = \frac{y}{8\text{cm}}$$

$$x = 4\text{cm}$$

$$y = 4\sqrt{3}\text{cm}$$

Kanaafuu rogootni rektangilii 4cm fi $4\sqrt{3}\text{cm}$ dha.

6. Hirkisni 6m dheeratu dhaaba manaatti hirkatee jira. Lafa fi hirkisaa giddu kofti jiru 60° yoo ta'e, dheerina dhaaba manaa fidheerina lafa miila hirkisa hamma dhaabaa manaa jiru barbaadi.



Furmaata:

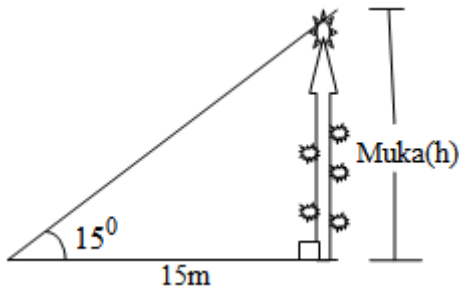
$$\sin 60^\circ = \frac{x}{6\text{m}} \Rightarrow \frac{\sqrt{3}}{2} = \frac{x}{6\text{m}} \Rightarrow x = \frac{6\text{m} \times \sqrt{3}}{2}$$

$$\Rightarrow x = 3\sqrt{3}m$$

$$\cos 60^\circ = \frac{y}{6m} \Rightarrow \frac{1}{2} = \frac{y}{6m} \Rightarrow y = \frac{6m}{2} \Rightarrow y = 3m$$

Kanaafuu, dheerinni dhaabaa manaa $3\sqrt{3}m$ yoo ta'u, dheerinni lafaa miila hirkisa hamma dhaabaa manaa jiru 3m dha.

7. Akka danaa armaan gadii mul'isuti, gaadidduun mukaa lafa irra 15m dheerata. Kofti gaadidduu fi muka giddutti uumame 45° yoo ta'e, dheerinni mukaa meeqa?



Furmaata:

$$\tan 45^\circ = \frac{h}{15m}$$

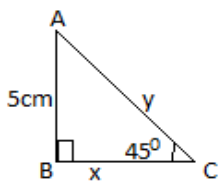
$$1 = \frac{h}{15m}$$

$$h = 15m$$

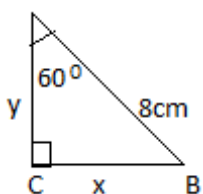
Dheerinni mukaa 15m dha.

Gilgaala 7.2

1. Rog-sadee kofa sirrii armaan gadiitti kennameef gatiiwwa x fi y barbaadi.



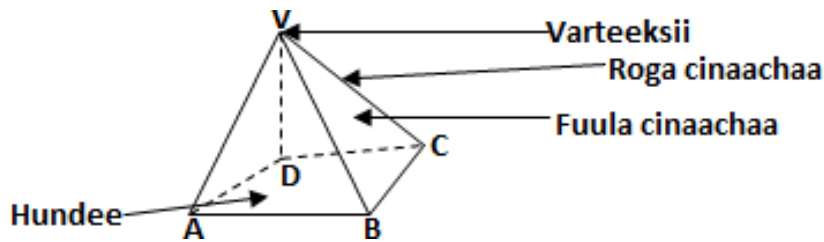
2. Hirkisani 10m dheeratu mana oleen isaa 5m dheeratutti hirkateera. Kofa hirkisni kun lafa wajjin uumu meeqa?
3. Danaa armaan gadii jiru irra dheerina x fi y barbaadi.



7.3. Danaalee Jaboo

7.3.1. Piraamidoota

Piraamidiin hundee jalaa qofaa yommuu qabaatu gubbaan isaa immoo tuqaa varteeksii jedhamuu dha. Hundeen piraamidii rog-baay'ee yommu ta'uu fuulli cinaacha isaa martuu rog-sadee dha.



⇒ ABCD'n hundee dha.

⇒ V'n varteeksii dha.

⇒ Fuulonni piraamidichaa rog-sadeekan akka

$\triangle BVC$, $\triangle CVD$, $\triangle AVB$ fi $\triangle AVD$ 'n fuulota cinaachaa jedhamu.

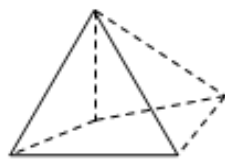
⇒ Rogonni fuulota cinaachaa kan rogoota hundee hin ta'iin kan akka VA, VB, VC fi VD'n rogoota cinaachaa jedhamu.

Piraamidiin tokkokaan moggaasamani gosa hundee isaaniitiin.

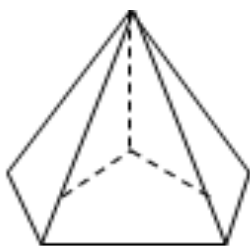
Fakkeenya: yoo hundeen isaanii rog-sadee ta'e piraamidii rog-sadee, yoo hundeen isaanii rog-afree ta'e piraamidii rog-afree jedhamu.



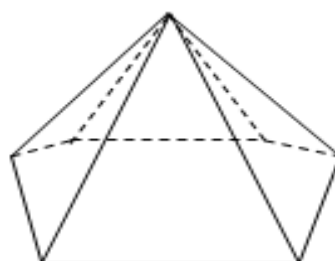
Piraamidii
rog-sadee



Piraamidii
rog-afree



Piraamidii
rog-shanee



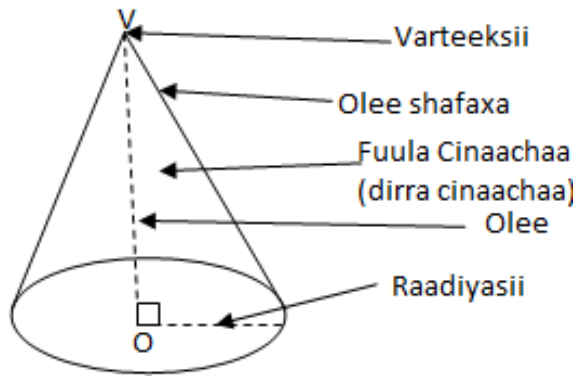
Piraamidii
rog-ja'ee

7.3.2. Koonota

Kooniin hundee jalaa qofaa fi geengoo yammuu qabaatu gubbaa isaa immoo tuqaa varteeksii jedhama.

- Fageenyi parpandikulaarii V irraa gara hundee jiru olee koonii jedhama.

- Sararri sagmentii varteksii irra tuqaalee geengoo irratti jiru olee shaffaxxaa jedhama.



Deebii Gilgaalota

Gilgaala Boqonnaa 4

1. $DF = 9\text{cm}$
2. $xy=16, AC=18$
3. a. 27cm b. 5cm
4. $DE=11.2, DF=8$
5. $EC=7\text{cm}$
6. 320cm^2
7. $\frac{10}{11}$
8. 68cm
9. 21cm
10. $\frac{12}{10} = \frac{6}{5}$

Gilgaala Boqonnaa 5

1. 50^0
2. 60^0
3. 55^0
4. 120^0
5. 85^0
6. 90^0
7. 95^0
8. $x^0 = 85^0$ fi $y^0 = 98^0$

Gilgaala 6.1

1. a. Soba b. Dhugaa c. Hinbeekamu
d. Soba e. Dhugaa f. Hin beekamu
2. a. Ba'iilee ta'uu danda'an
b. Ba'iilee gonkumaa ta'uu hindandeenye.
c. Ba'iilee shakkii hinqabne.
3. a. Ba'iilee ta'uu danda'an. b. Ba'iilee ta'uu danda'an.
c. Ba'iilee gonkumaa ta'uu hindandeenye. d. Ba'iilee shakkii hinqabne.
e. Ba'iilee gonkumaa ta'uu hindandeenye. f. Ba'iilee ta'uu danda'an.

Gilgaala 6.2

- 1a. $\frac{4}{8} = \frac{1}{2}$ b. $\frac{7}{8}$ c. $\frac{1}{8}$

2.

	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

Kanaaf, lakkoofsa tuuta ba'iilee $n(S) = 36$

a. Ida'amni 7 kan arganu:

Ta'ee, $E=\{(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)\}$

$$\text{kanaafuu, } P(E) = \frac{n(E)}{n(S)} = \frac{6}{36} = \frac{1}{6}$$

b. Ida'amni 9 kan arganu:

Ta'ee, $E=\{(3,6), (4,5), (5,4), (6,3)\}$

$$\text{kanaafuu, } P(E) = \frac{n(E)}{n(S)} = \frac{4}{36} = \frac{1}{9}$$

3. Barattoota walii gala=50

Barattoota dhiiraa=30

Barattootaa dubartootaa=50-30=20

Carraa filamuu dubartootaa:

$$P(\text{Dubartootaa}) = \frac{\text{Lakkoofsa dubartootaa}}{\text{Lakkoofsa Barattootaa walii galaa}}$$

$$\therefore P(\text{dubartootaa}) = \frac{20}{50} = \frac{2}{5} = 0.4 = 40 \%$$

Carraa filamuu Dhiirrootaa:

$$P(\text{Dhiirrootaa}) = \frac{\text{Lakkoofsa dhiirrootaa}}{\text{Lakkoofsa Barattootaa walii galaa}}$$

$$\therefore P(\text{Dhiirrootaa}) = \frac{30}{50} = \frac{3}{5} = 0.6 = 60 \%$$

4a. Ba'iilee, $s=\{E, N, G, L, I, S, H\}$, $n(s)=7$

Ta'ii, $E=\{G\}$, $n(E)=1$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{1}{7} = 0.1428 = 14.28\%$$

b. Ba'iilee, $S=\{G, O, O, D\}$, $n(s)=4$

Ta'ii, $E=\{D\}$, $n(E)=1$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{1}{4} = 0.25 = 25\%$$

c. Ba'iilee, $S=\{M, O, B, I, L, E\}$, $n(s)=6$

Ta'ee, $E=\{B\}$, $n(E)=1$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{1}{6} = 0.1667 = 16.67\%$$

d. Ba'iilee, $S=\{M,O,B,I,L,E\}$, $n(s)=6$

Ta'ee, $E=\{ O,I,E \}$, $n(E)=3$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2} = 0.5 = 50\%$$

5. 0 fi 1

6a. -1 ta'uu hindanda'u. b. $\frac{1}{2}$ ta'uu ni danda'a.

c. 1.1 ta'uu hindanda'u. d. 1 ta'uu ni danda'a.

e. 0 ta'uu ni danda'a. f. 90% ta'uu ni danda'a.

Gilgaala 7.1

1a. $BD=16\text{cm}$ b. $CD=4\sqrt{2}\text{ cm}$ c. $AD=4\text{cm}$, $AB=13\text{cm}$

2a. $CB=12.8\text{cm}$ b. $AD=\sqrt{39}\text{ cm}$ c. $BD=7.8\text{cm}$

d. $AB=\sqrt{99.84}\text{ cm}$ 3.20cm

4. 24cm

5a. Kofa sirriidha. b. Kofa sirrii miti. c. Kofa sirrii miti

d. Kofa sirriidha. e. Kofa sirrii miti. f. Kofa sirrii miti.

Gilgaala 7.2

1. $x=5\text{cm}$ fi $y = \frac{10}{\sqrt{2}}\text{ cm}$ 2. 30^0 3. $x = 4\sqrt{3}\text{ cm}$, $y = 4\text{cm}$