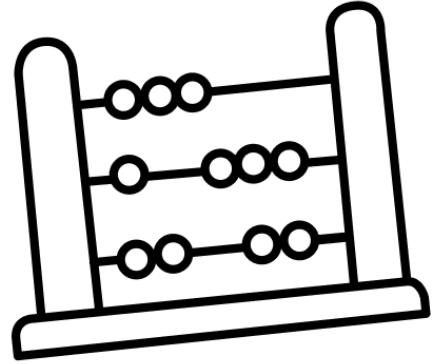


Hubinta iyo xaqiiijinta fahamka saddexagallada isku midka ah (similar triangles)

Maths

Cutub: Trigonometry



Natiijo

Waxaan garan karaa in qaababka isku midka ah (similar shapes) ay leeyihiin dhinacyo isku saami ah (proportion) laakiin cabbirka xaglaha (angles) waa la ilaaliyaa.

Erayada muhiimka ah

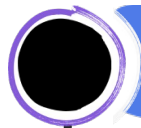
Laba qaab (shapes) waa isku mid (similar) haddii farqiga ugu weyn ee u dhexeeya ay tahay cabbirkooda. Dhererka dhinacyadoodu waa isku saami (proportion).

Weyneyn (Enlargement) waa isbeddel (transformation) keenaya isbeddel cabbirka.

Qiyaasta weyneyn (Scale factor) waa tirada lagu dhufto qaababka isku midka ah (similar shapes) oo qeexaysa inta uu qaabku ka weyn yahay kan kale.

Qaabka casharka

Hubinta iyo xaqiijinta fahamka saddexagallada isku midka ah (similar triangles)



Aqoonsiga saddexagallada isku midka ah (similar triangles)

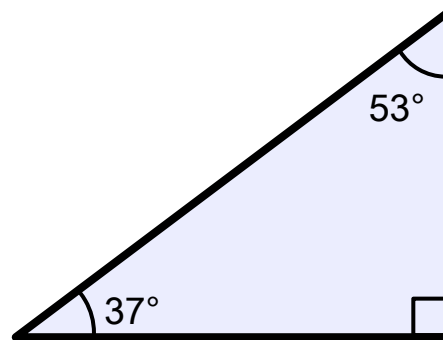
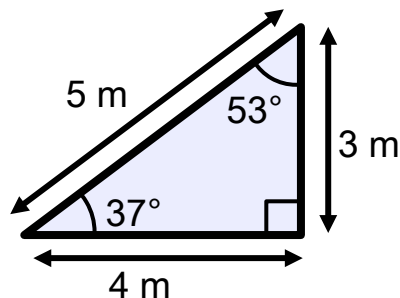


Helista dhererka maqan ee saddexagallada isku midka ah (similar triangles)

Aqoonsiga saddexagallada isku midka ah (similar triangles)

Marka qaab la weyneeyo (enlarged), xaglaha (angles) ma beddelmaan.

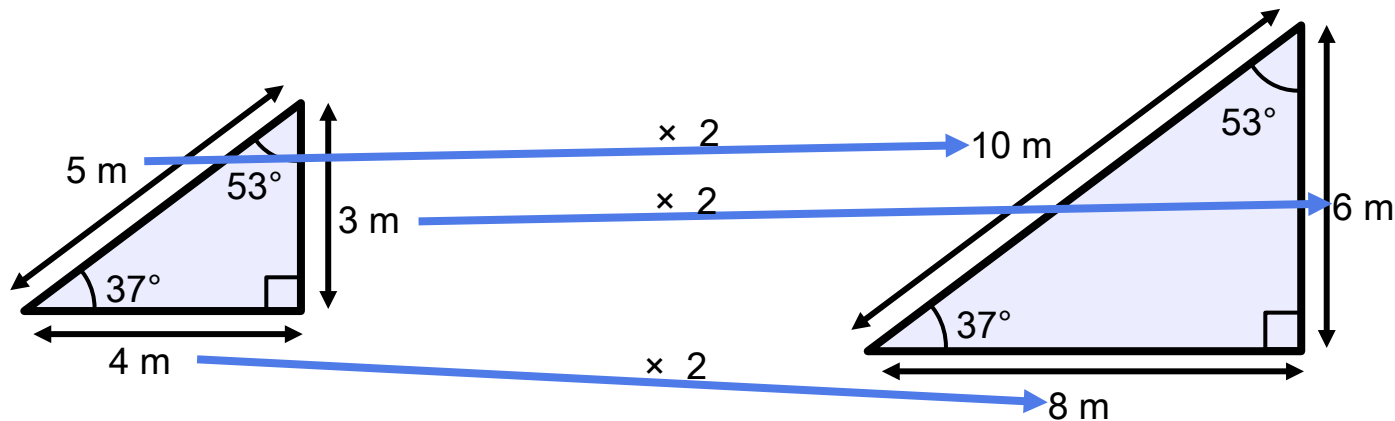
Sidaas darteed, qaababka isku midka ah (similar shapes) waxay leeyihiin xaglo (angles) isku mid ah.



Aqoonsiga saddexagallada isku midka ah (similar triangles)

Marka qaab la weyneeyo (enlarged), dhererka ayaa laga yaabaa inuu beddelmo. Tani waxay ku xiran tahay qiyaasta weyneyn (scale factor).

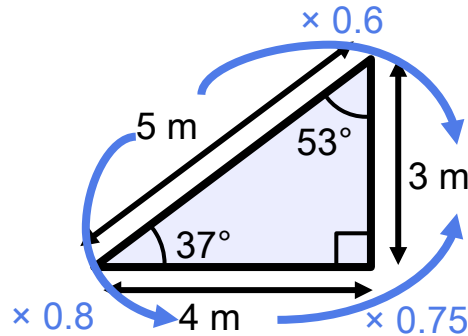
Sidaas darteed, qaababka isku midka ah (similar shapes) waxay yeelan karaan dhererro kala duwan.



Aqoonsiga saddexagallada isku midka ah (similar triangles)

Marka qaab la weyneeyo (enlarged), saamiyada (proportions) u dhexeeya labada dherer kama beddelmaan.

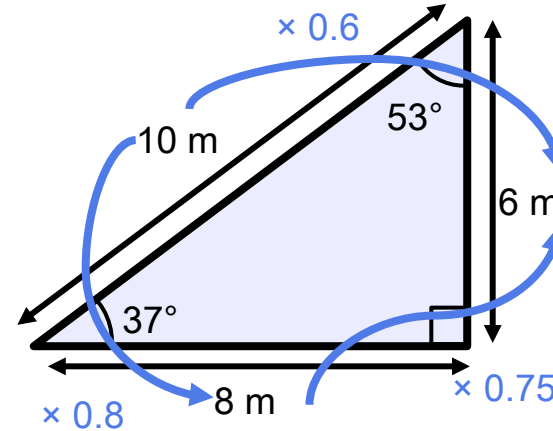
Sidaas darteed, qaababka isku midka ah (similar shapes) waxay leeyihiin dhererro isku saami ah (proportions).



$$\frac{3}{5} = 0.6$$

$$\frac{4}{5} = 0.8$$

$$\frac{3}{4} = 0.75$$



$$\frac{6}{10} = 0.6$$

$$\frac{8}{10} = 0.8$$

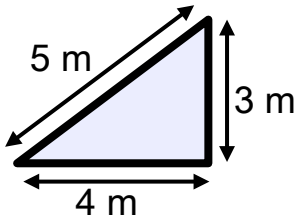
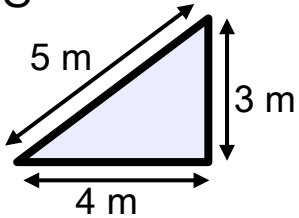
$$\frac{6}{8} = 0.75$$

Aqoonsiga saddexagallada isku midka ah (similar triangles)

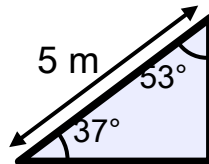
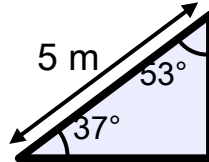
Shuruudaha saddexagallada isku eg (congruent triangles) waxaa loo isticmaali karaa in lagu muujiyo in dhererrada iyo xaglaha aan la garanayn ay go'an yihiin cabbirada la yaqaan.

Shuruudahan waa la habeyn karaa si loo go'aamiyo isku ekaanshaha (similarity) saddexagallada.

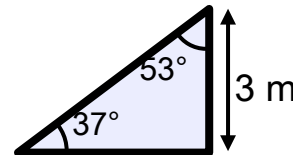
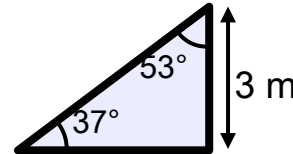
SSS



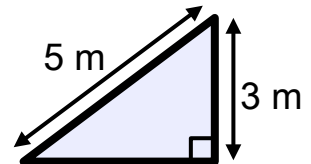
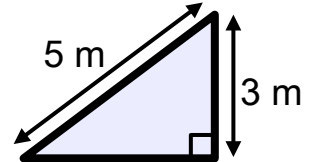
ASA



AAS



RHS



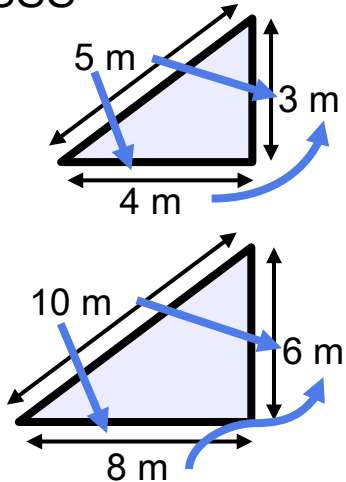
Aqoonsashada saddexagallada isku eg (similar triangles)

Shuruudaha saddexagallada isku midka ah (congruent triangles) waxaa loo isticmaali karaa in la muujiyo in dhererka iyo xaglaha aan la aqoon ay go'an yihiin cabbirada la yaqaan.

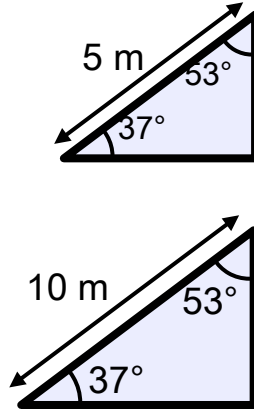
Shuruudahan waa la habeyn karaa si loo go'aamiyo isku ekaanshaha (similarity) saddexagallada.

Dhererku way kala duwan yihiin laakiin lammaanaha dhererka ayaa isku saami (proportions) ah.

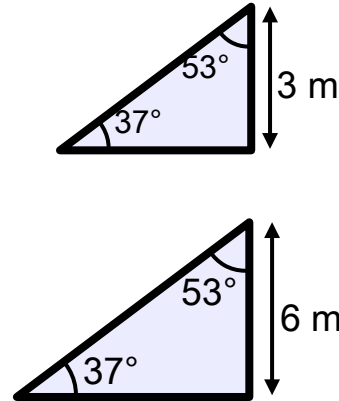
SSS



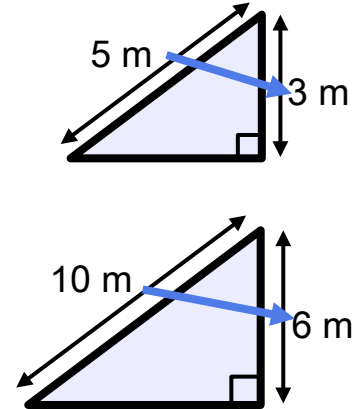
ASA



AAS



RHS

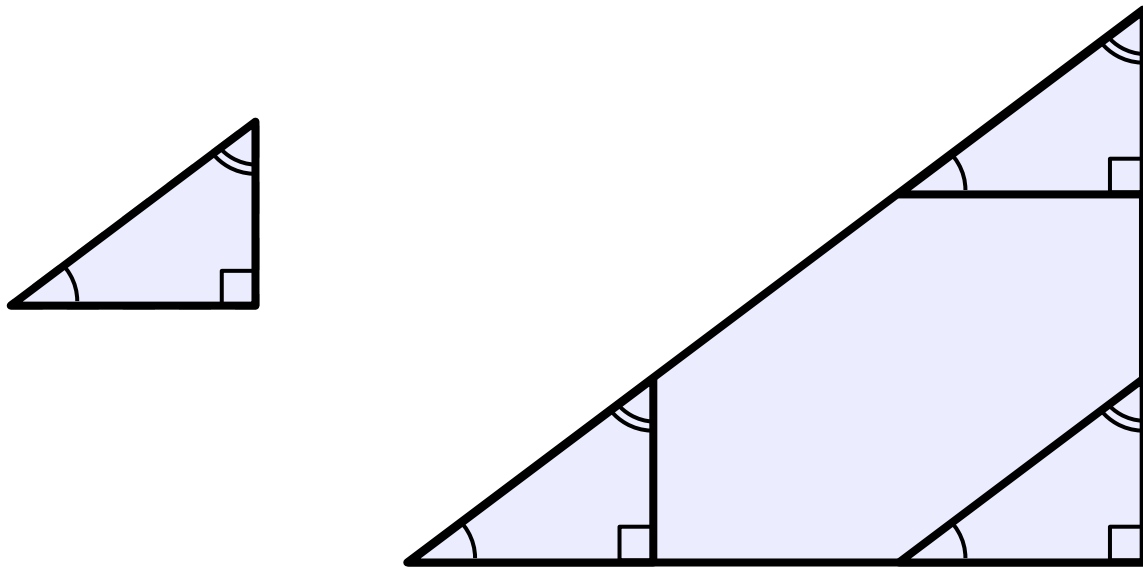


Aqoonsashada saddexagallada isku eg (similar triangles)

Isku ekaanshaha (similarity) saddexagallada waxaa sidoo kale lagu go'aamin karaa saddexda xagal oo dhan.

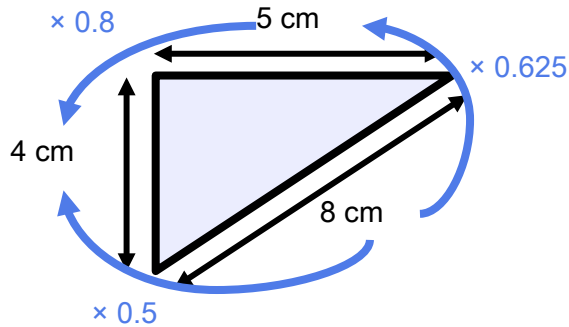
Marka laba saddexagal isku eg yihiin (similar), waxay leeyihiin xaglo isku mid ah.

Marka laba saddexagal ay leeyihiin xaglo isku mid ah, waxay isku eg yihiin (similar).



Aqoonsashada saddexagallada isku eg (similar triangles)

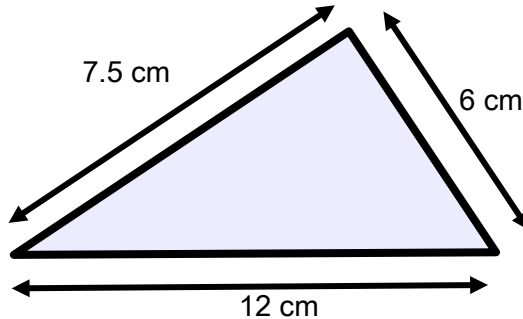
Ma jiraan macluumaad ku filan oo lagu ogaan karo in saddexagalladu isku mid yihiin?



$$5 \div 8 = 0.625$$

$$4 \div 8 = 0.5$$

$$4 \div 5 = 0.8$$



Sidee ayaan u ogaan karnaa isku ekaansho (similarity) iyada oo aanan ognayn in xagluhu isku mid yihiin?

Waxaan heli karnaa saamiyada (proportions) u dhexeeya labada dherer oo saddexagalka ah.



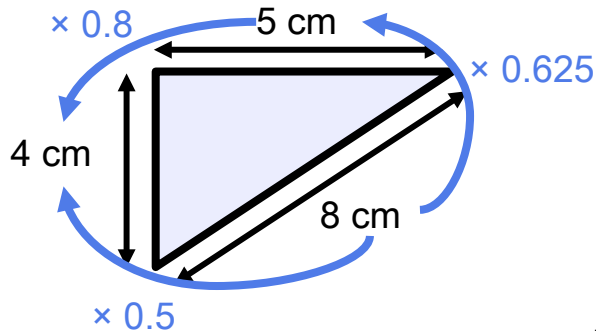
Caasha



Cabdi

Aqoonsiga saddexagallada isku midka ah (similar triangles)

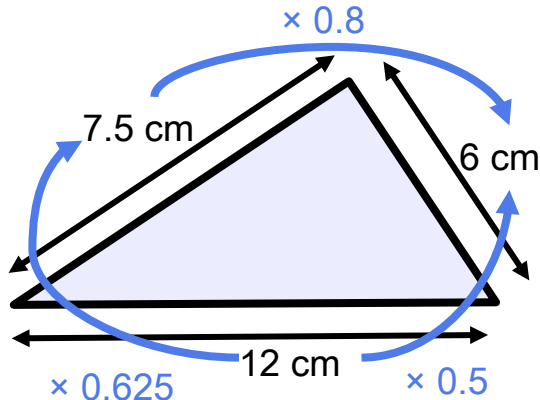
Ma jiraan macluumaad ku filan oo lagu ogaan karo in saddexagalladu isku mid yihiin?



$$5 \div 8 = 0.625$$

$$4 \div 8 = 0.5$$

$$4 \div 5 = 0.8$$



Dhererka saddexagalladu waa isku saami (proportions), markaa xagluhu waa inay isku mid ahaadaan.

Ka dibna hubi in saamiyadaas laga heli karo saddexagalka kale.



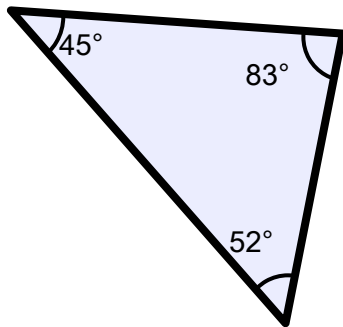
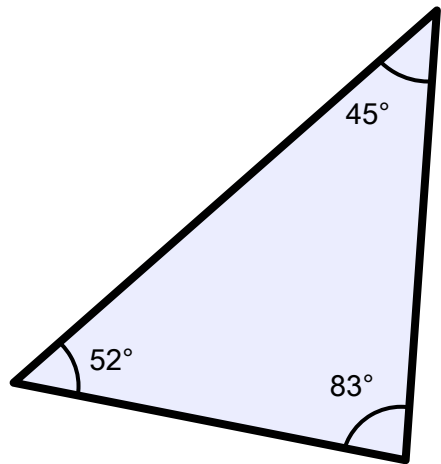
Caasha



Cabdi

Aqoonsiga saddexagallada isku midka ah (similar triangles)

Ma jiraan macluumaad ku filan oo lagu ogaan karo in saddexagalladu isku mid yihiin?



Sidee ayaan u ogaan karnaa isku ekaansho (similarity) iyada oo aanan ognayn dherer kasta?

Labada saddexagal waxay leeyihiin xaglo isku mid ah, sidaas darteed dhererkoodu waa inuu ahaadaa isku saami (proportion). Marka waa isku mid yihiin.



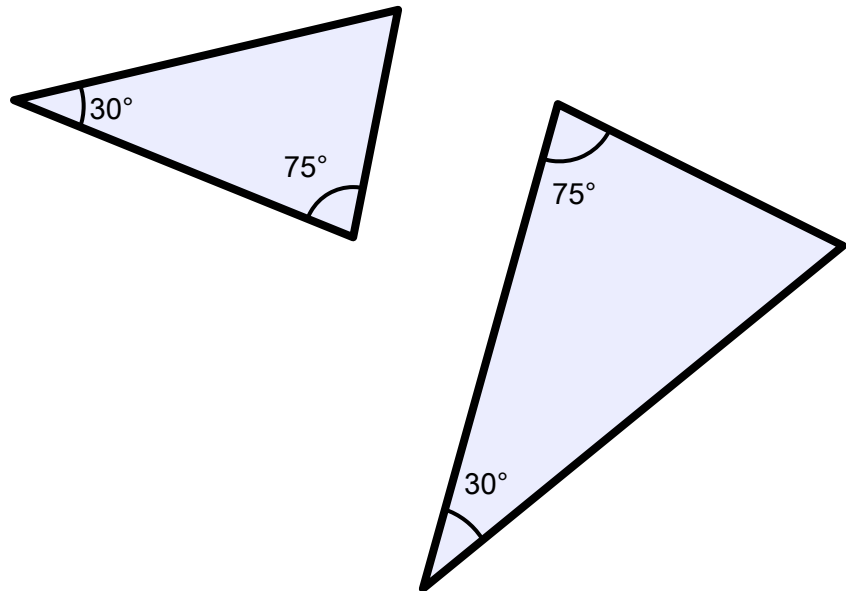
Yacquub



Saciid

Aqoonsashada saddex-xagalka isku midka ah (Identifying similar triangles)

Ma jiraan macluumaad ku filan oo lagu go'aamin karo in saddex-xagallada (triangles) ay isku mid yihiin (similar)?



Waxaan ognahay laba xagal oo keliya markan. Miyaan wali go'aamin karnaa isku midnimada (similarity)?

Waxaan arka karnaa laba ka mid ah xaglaha (angles) ayaa isku mid ah saddex-xagal kasta. Taas macneheedu waa in xagalka (angle) saddexaad uu sidoo kale isku mid yahay. Waxaan hubin karnaa anagoo helayna xagasha (angle) maqan mid kasta.

Marka, saddex-xagalladu (triangles) waa isku mid (similar).



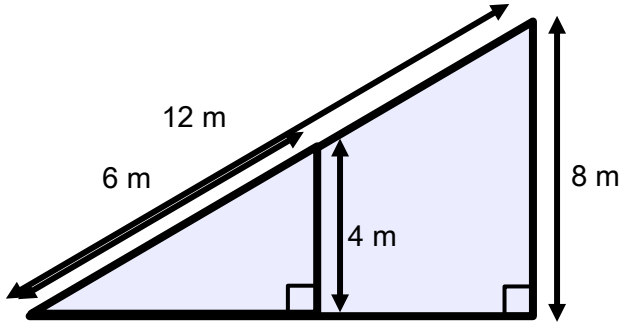
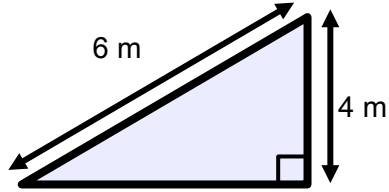
Yacquub



Saciid

Aqoonsashada saddex-xagalka isku midka ah (Identifying similar triangles)

Ma jiraan macluumaad ku filan oo lagu go'aamin karo in saddex-xagallada (triangles) ay isku mid yihiin (similar)?



Waxaan haysannaa xagal qumman (right-angle) waxaana naqaan dhererka (lengths) hypotenuse-ka iyo dhinac kale (RHS).

Haddii dhererka (lengths) isku mid ahaan lahaa, markaas waxaan caddayn karnaa inay isku mid yihiin (congruent).

Taasi waxay ka dhigan tahay in saddex-xagallada (triangles) ay leeyihiin xaglo (angles) isku mid ah oo uu jiro hal dherer (length) oo keliya oo suurtooga ah oo cidhifka (edge) saddexaad.



Nuur



Axmed



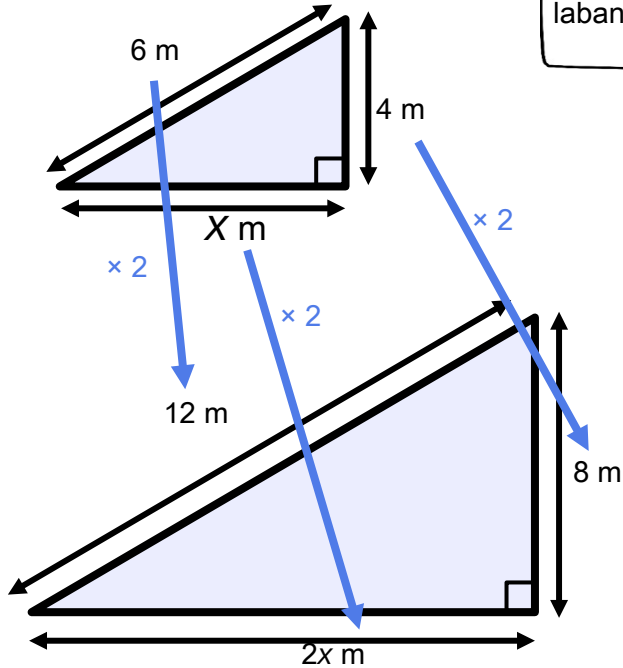
Layla

Aqoonsashada saddex-xagalka isku midka ah (Identifying similar triangles)



Sharaxaad

Ma jiraan macluumaad ku filan oo lagu go'aamin karo in saddex-xagallada (triangles) ay isku mid yihiin (similar)?



Laba dherer (lengths) oo la yaqaan oo ka mid ah saddex-xagalka (triangle) weyn ayaa labanlaab ah dhererkooda (lengths) u dhigma ee saddex-xagalka (triangle) yar.

Waxaan u isticmaali karnaa RHS si aan u ogaano in ay jirto ha dherer (length) oo keliya oo suurtoagal ah oo loogu talagalay cidhifka (edge) haray ee saddexagalka weyn.



Nuur



Axmed

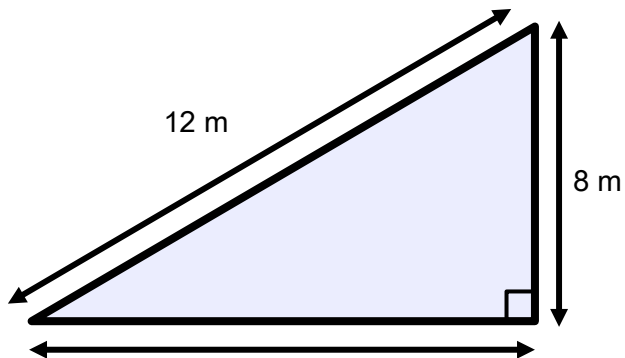
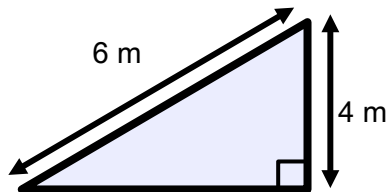
Sidaa darteed cidhifkani (edge) waa inuu sidoo kale laba jibaar ku yahay dhererka (length) cidhifkiisa u dhigma.



Layla

Aqoonsiga saddexagallada isku midka ah (similar triangles)

Ma jiraan macluumaad ku filan oo lagu ogaan karo in saddexagalladu ay isku mid yihiin (similar)?



Saddexagalladu waa isku mid yihiin (similar)!

Saddexagalladu waa isku mid yihiin (similar)!

Saddexagalladu waa isku mid yihiin (similar)!



Nuur



Axmed



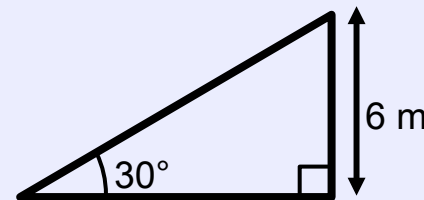
Layla

Aqoonsiga saddexagallada isku midka ah (similar triangles)

Yaa run ah?

a

Saddexagalladu waa isku mid yihiin (similar).

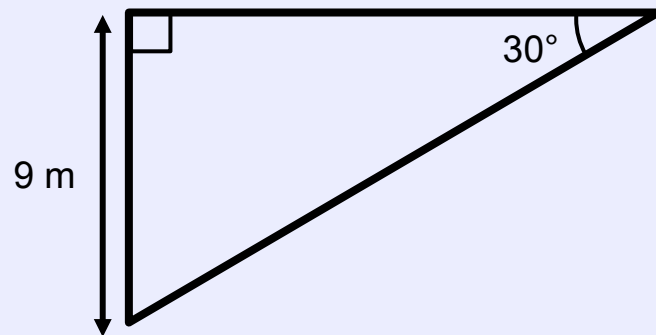


b

Saddexagalladu ma aha kuwa isku mid ah (similar).

c

Ma jiraan macluumaad ku filan oo lagu ogaan karo isku midnimada (similarity).

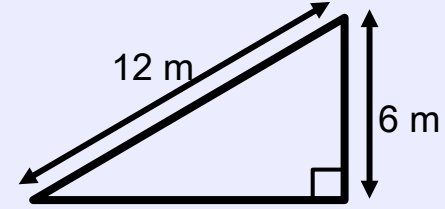


Aqoonsiga saddexagallada isku midka ah (similar triangles)

Yaa run ah?

a

Saddexagalladu waa isku mid yihiin (similar).

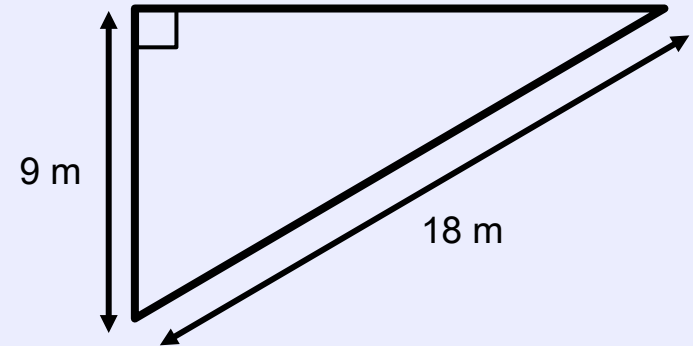


b

Saddexagalladu ma aha kuwa isku mid ah (similar).

c

Ma jiraan macluumaad ku filan oo lagu ogaan karo isku midnimada (similarity).



Aqoonsiga saddex-xagallada isku midka ah (similar triangles)

Yaa run ah?

a

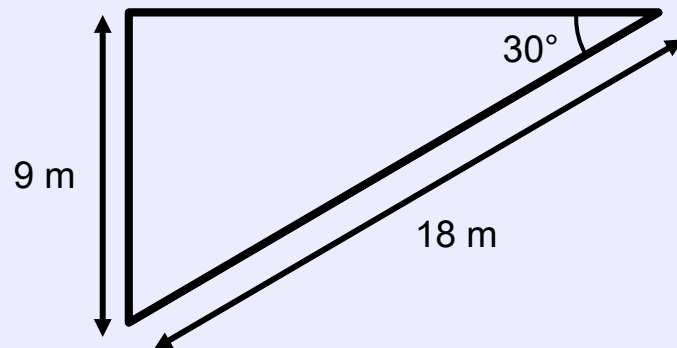
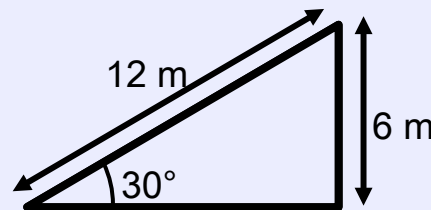
Saddex-xagalladu waa isku mid (similar).

b

Saddex-xagalladu ma aha isku mid (similar).

c

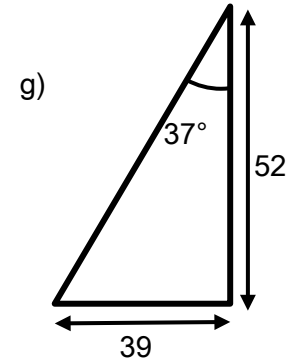
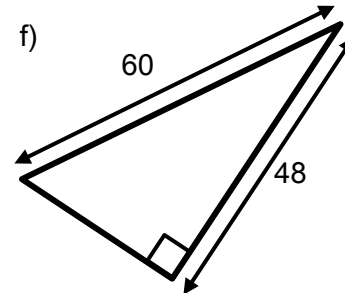
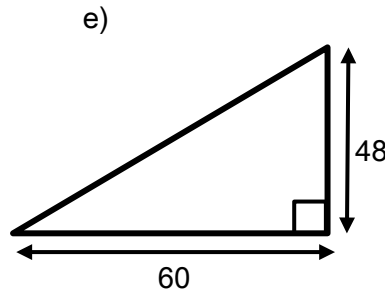
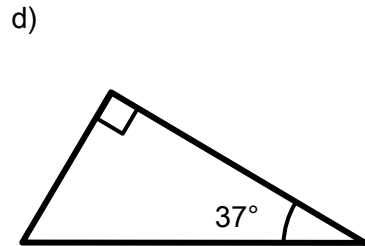
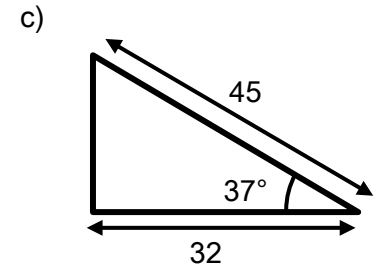
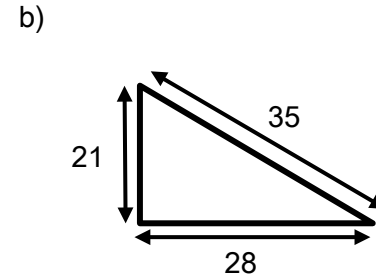
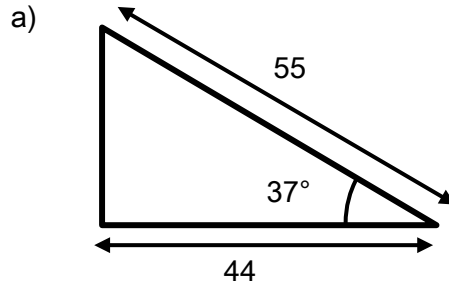
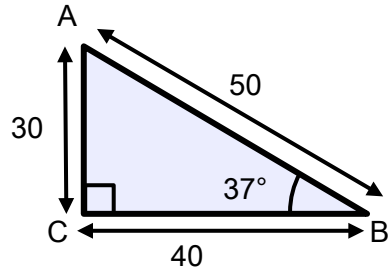
Ma jiro macluumaad ku filan oo lagu go'aamiyo isku midnimada (similarity).



Hawsha A Aqoonsiga saddex-xagallada isku midka ah (similar triangles)

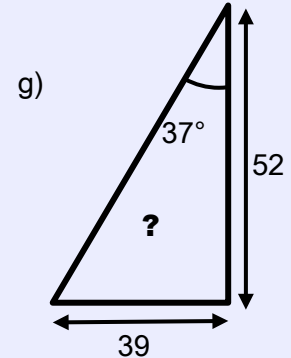
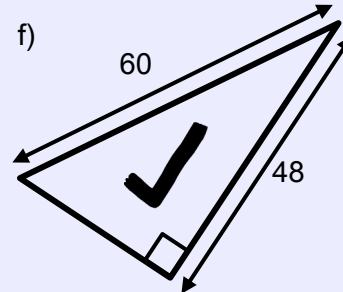
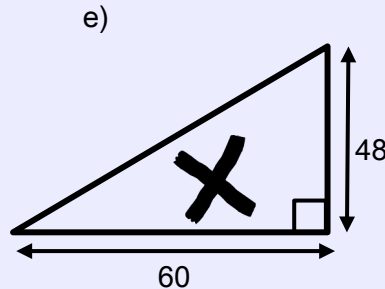
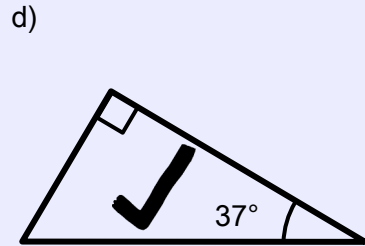
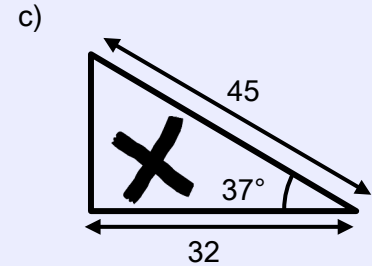
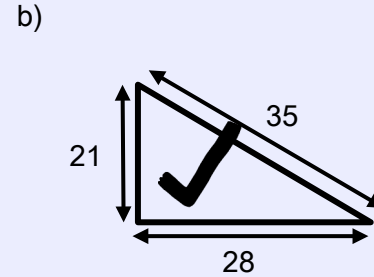
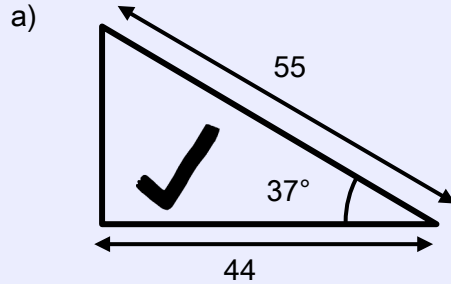
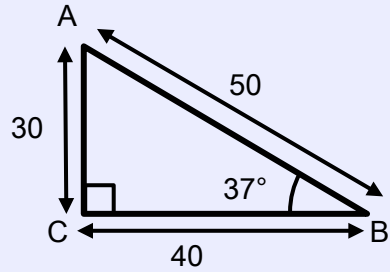


1) Saddex-xagal kasta, ku qor calaamad (tick) haddii uu la mid yahay $\triangle ABC$, iskutallaab (cross) haddii aanu la mid ahayn, iyo su'aal (question mark) haddii aysan jirin macluumaad ku filan oo lagu go'aamiyo isku midnimada (similarity). Jaantusyada si sax ah looma sawirin, dhererka oo dhami waa isku halbeeg (same units).



Hawsha A Aqoonsiga saddex-xagallada isku midka ah (similar triangles)

1) Saddex-xagal kasta, ku qor calaamad (tick) haddii uu la mid yahay $\triangle ABC$, iskutallaab (cross) haddii aanu la mid ahayn, iyo su'aal (question mark) haddii aysan jirin macluumaad ku filan oo lagu go'aamiyo isku midnimada (similarity). Jaantusyada si sax ah looma sawirin, dhererka oo dhami waa isku halbeeg (same units).



Qaabka casharka

Hubinta iyo xoojinta fahamka saddex-xagallada isku midka ah (similar triangles)



Aqoonsiga saddex-xagallada isku midka ah (similar triangles)



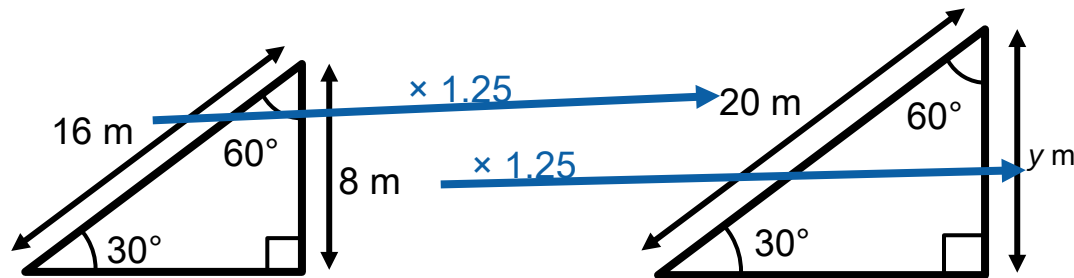
Helista dhererka maqan iyadoo la adeegsanayo saddex-xagallada isku midka ah (similar triangles)

Laba saddex-xagal ee hoose waa isku mid (similar).

Tan waxaa lagu caddayn karaa iyadoo la helo xagasha (angle) hadhay.

Haddii dherer labaad laga ogaado hal saddex-xagal, dhererka u dhigma (corresponding length) ee saddex-xagalka kale waxaa laga heli karaa iyadoo la adeegsanayo sababaynta saami (proportional reasoning).

Habka 1aad (Method 1):



$$\frac{20}{16} = 1.25$$

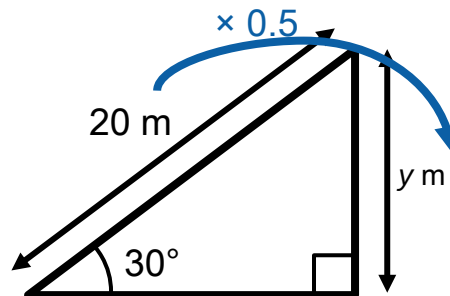
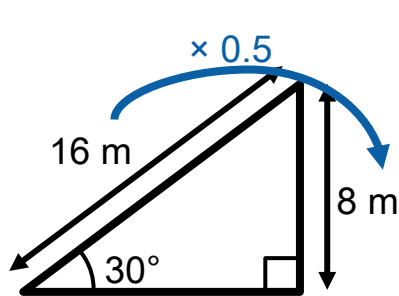
$$y = 8 \times 1.25 \\ = 10$$

Laba saddex-xagal ee hoose waa isku mid (similar).

Tan waxaa lagu caddayn karaa iyadoo la helo xagasha (angle) hadhay.

Haddii dherer labaad laga ogaado hal saddex-xagal, dhererka u dhigma (corresponding length) ee saddex-xagalka kale waxaa laga heli karaa iyadoo la adeegsanayo sababaynta saami (proportional reasoning).

Habka 2aad (Method 2):



$$\frac{8}{16} = 0.5$$

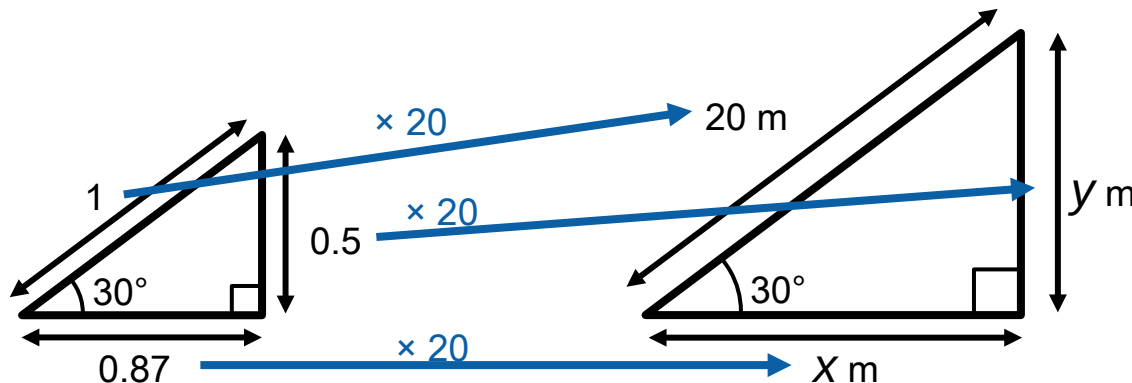
$$y = 20 \times 0.5 \\ = 10$$

Helista dhererka maqan ee saddexagallada isku qaabka (similar triangles)

Cabbiraadaha isku dhufashada (scale factors) iyo tiro-dhufashada (multipliers) gudaha saddex-xagallada ayaa noqon kara kuwa fudud in la helo marka ay jirto gees (edge) dhererkeedu yahay 1 halbeeg (unit).

Tusaale: hel qiimaha (value) x iyo y .

Habka 1aad:



$$x = 0.87 \times 20 \\ = 17.4$$

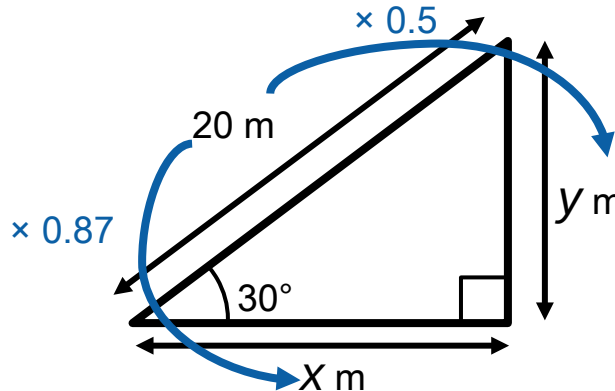
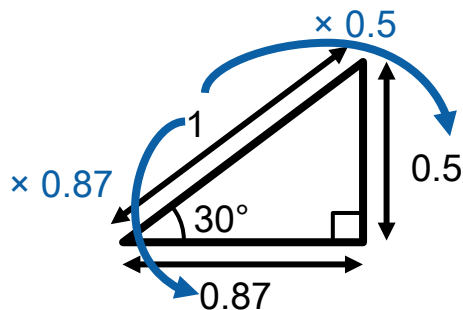
$$y = 0.5 \times 20 \\ = 10$$

Helista dhererka maqan ee saddexagallada isku qaabka (similar triangles)

Qiyaasaha (scale factors) iyo isku dhufashada (multipliers) gudaha saddexagallada way fududaan karaan in la helo marka ay jirto gees dhererkiisu yahay 1 halbeeg (unit).

Tusaale: hel qiimaha (value) x iyo y .

Habka 2aad:



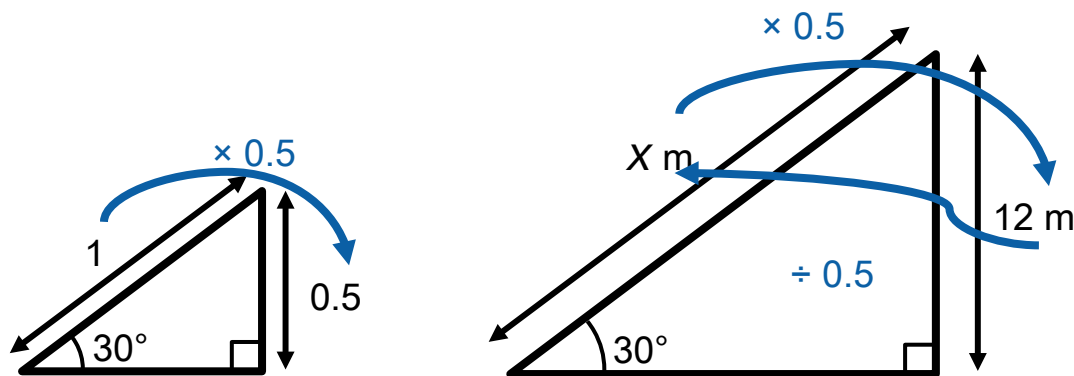
$$x = 20 \times 0.87 \\ = 17.4$$

$$y = 20 \times 0.5 \\ = 10$$

Helista dhererka maqan ee saddexagallada isku qaabka (similar triangles)

Maadaama mid ka mid ah saddexagallada uu leeyahay gees dhererkiisu yahay 1 halbeeg (unit), waxaa laga yaabaa inay fududaato in la arko xiriirka saamiyada (proportional relationships) gudaha saddexagallada halkii laga xisaabin lahaa qiyaasta (scale factor) ee u dhexeeya saddexagallada.

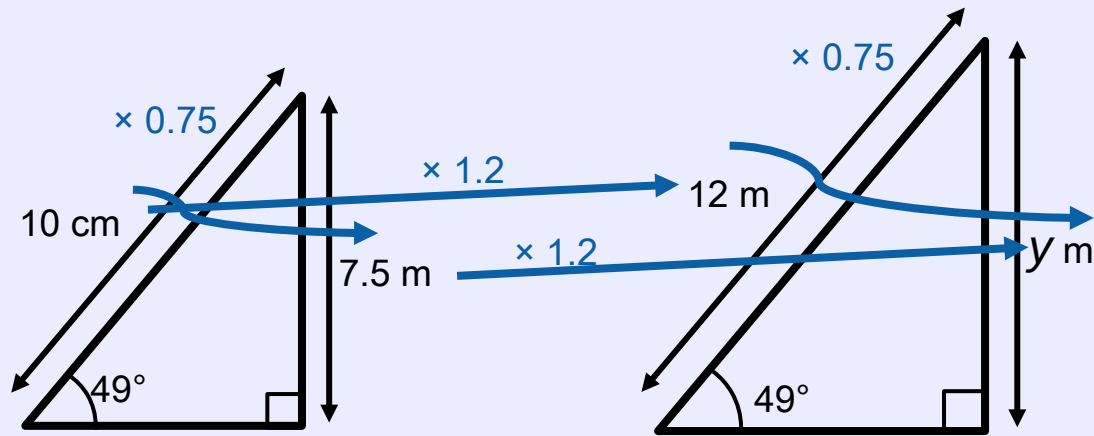
Hawlaha rogaal celiska (inverse operations) ayaa loo isticmaali karaa in lagu helo qiimaha (value) x .



$$\begin{aligned}x &= 12 \div 0.5 \\ &= 24\end{aligned}$$

Helista dhererka maqan ee saddexagallada isku qaabka (similar triangles)

Hel qiimaha (value) y .



$$12 \div 10 = 1.2$$

$$y = 7.5 \times 1.2 \\ = 9$$

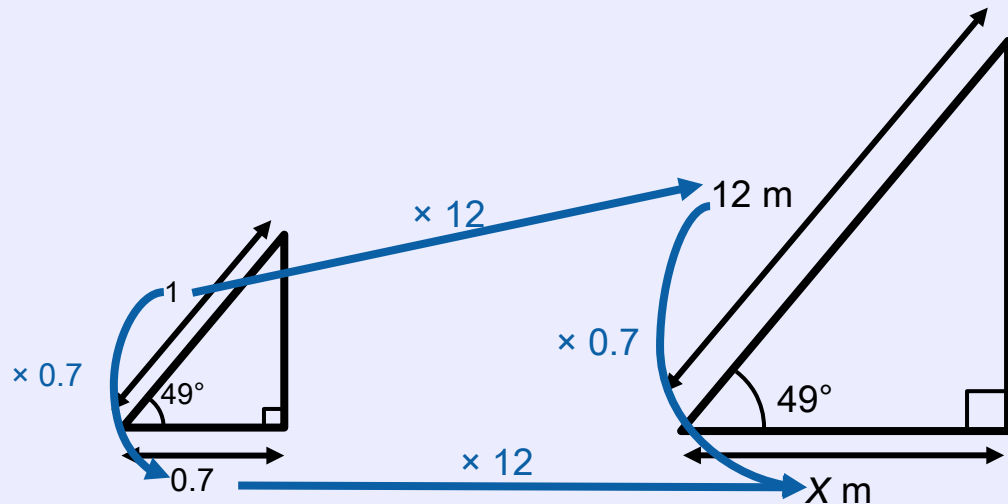
ama

$$7.5 \div 10 = 0.75$$

$$y = 12 \times 0.75 \\ = 9$$

Helista dhererka maqan ee saddexagallada isku qaabka (similar triangles)

Hel qiimaha (value) x.



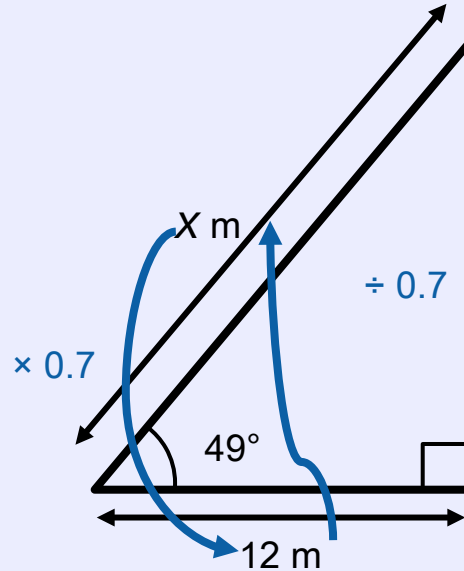
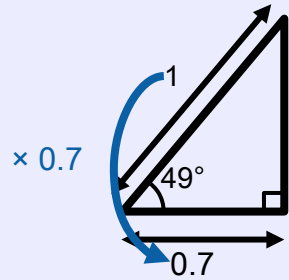
$$\begin{aligned}x &= 0.7 \times 12 \\ &= 8.4\end{aligned}$$

ama

$$\begin{aligned}x &= 0.7 \times 12 \\ &= 8.4\end{aligned}$$

Helista dhererka maqan ee saddexagallada isku qaabka (similar triangles)

Hel qiimaha (value) x.



$$\begin{aligned}x &= 12 \div 0.7 \\ &= 17.1\end{aligned}$$

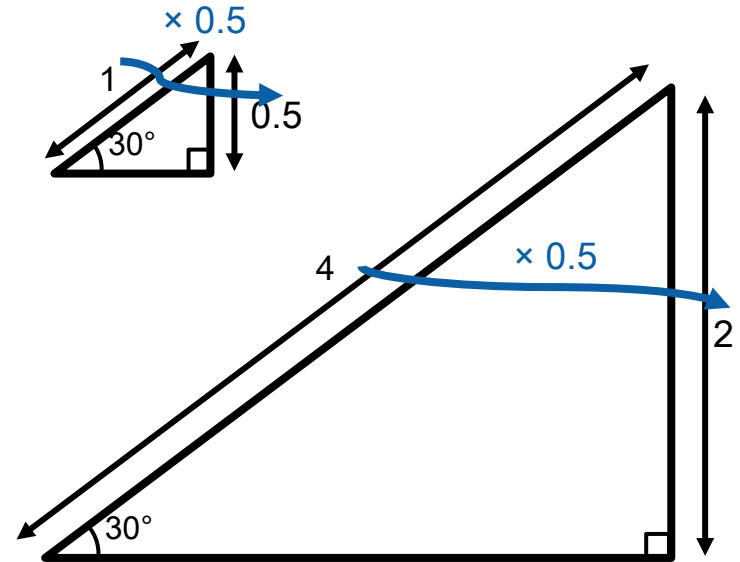
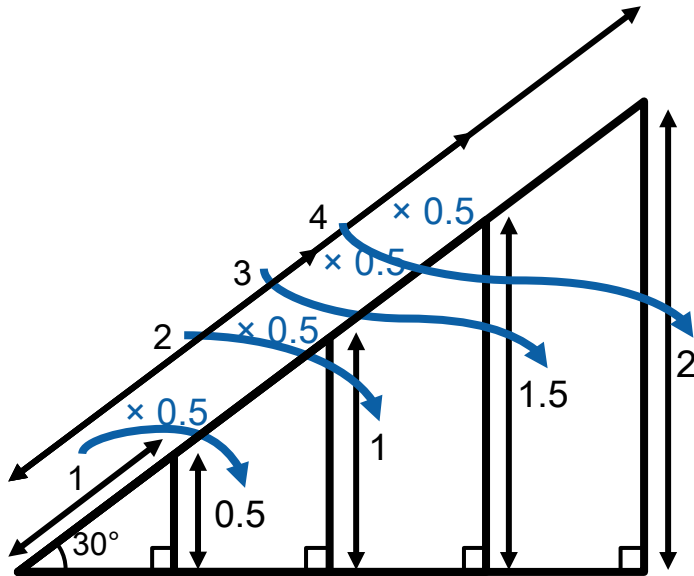
Helista dhererka maqan ee saddexagallada isku qaabka (similar triangles)



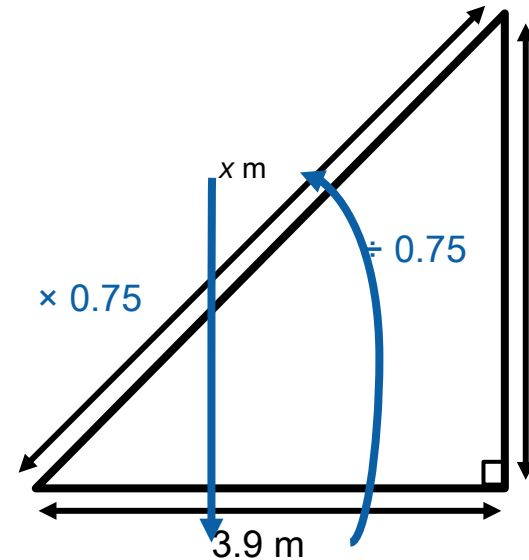
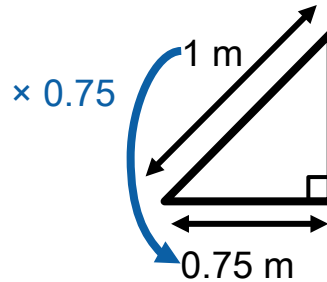
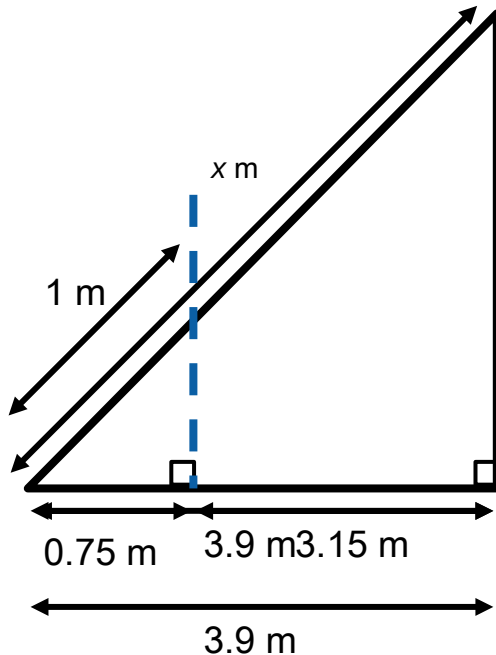
Sharaxaad

Marka saddexagal la weyneeyo (enlarged), isku dhufashada (multipliers) ee u dhexeeya lammaaneyaasha dhererka ayaa isku midi ahaanaya.

Tan waxaa la arki karaa marka saddexagallada la isku dhex geliyo (nested) iyo marka si gooni ah loo sawiro.

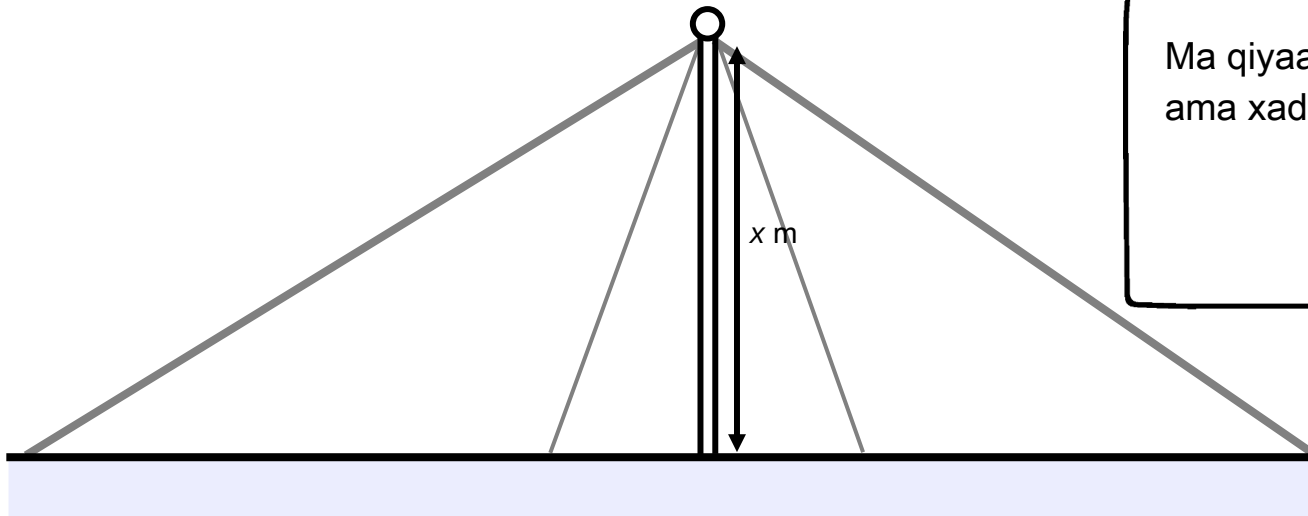


Laba saddex-xagal oo isku mid ah (similar triangles) ayaa laga samayn karaa hal saddex-xagal iyadoo la qaado cabbiro (measurements) qayb ka mid ah geesihisa.



$$x = 3.95 \div 0.75 = 5.27$$

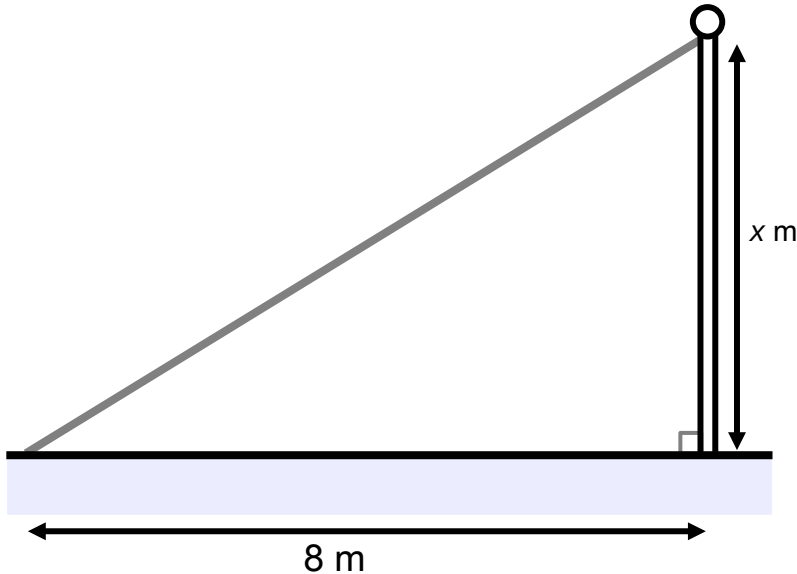
Tiir dheer ayaa taagan oo ay xadhiggu hayaan. Saciid wuxuu doonayaa inuu ogaado dhererka tiirka.



Ma qiyaasi karo dhammaan tiirka
ama xadhigga oo dhan.



Tiir dheer ayaa taagan oo ay xadhiggu hayaan. Saciid wuxuu doonayaa inuu ogaado dhererka tiirka.



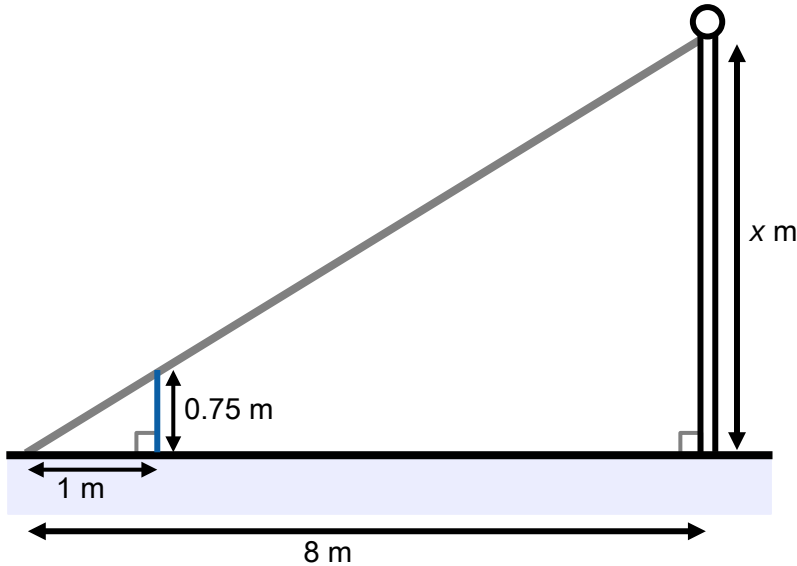
Ma qiyaasi karo dhammaan tiirka ama xadhigga oo dhan.

Laakiin waxaan qiyaasi karaa masaafada (distance) dhulka.



Sidee bay saddex-xagallo isku mid ah (similar triangles) uga caawin karaan Saciid dhibaatan?

Tiir dheer ayaa taagan oo ay xadhiggu hayaan. Saciid wuxuu doonayaa inuu ogaado dhererka tiirka.

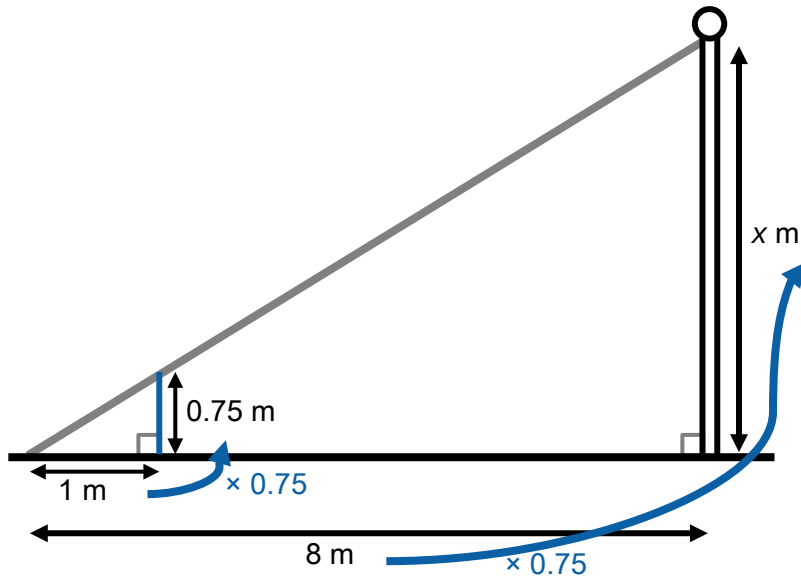


Waxaan qiyaasi karaa 1 m dhulka laga bilaabo halka xadhiggu taabto.

Halkaas, waxaan qiyaasi karaa masaafada (distance) toosan (vertical) ee u dhaxaysa xadhigga iyo dhulka.



Tiir dheer ayaa taagan oo ay xadhiggu hayaan. Saciid wuxuu doonayaa inuu ogaado dhererka tiirka.



Waxaan markaas helayaa laba saddex-xagal oo isku mid ah (similar triangles) oo is-dhex-galay (nested), kuwaas oo aan u isticmaali karo inaan helo dhererka tiirka.

$$\begin{aligned}x &= 8 \times 0.75 \\ &= 6\end{aligned}$$

Tiirku waa 6 m dheer.



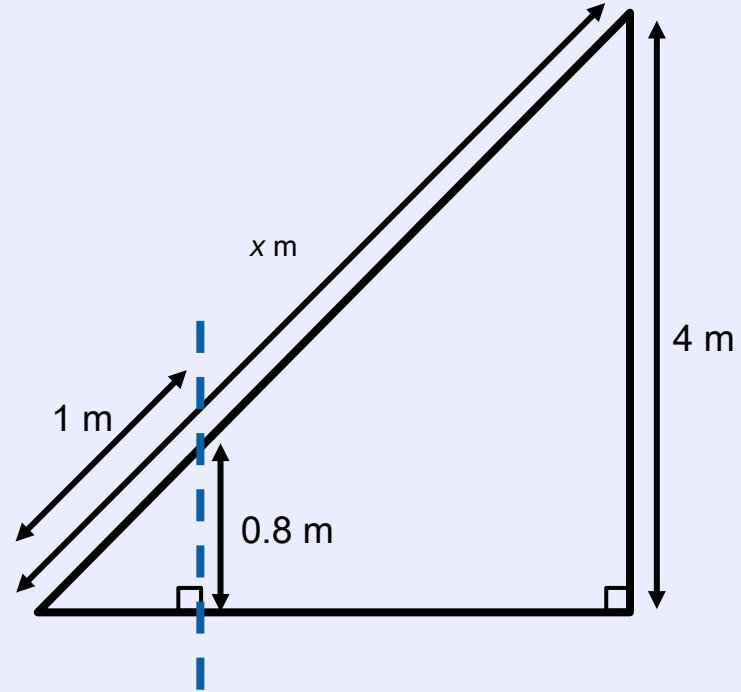
Waa maxay qiimaha (value) x ?

a 2.2

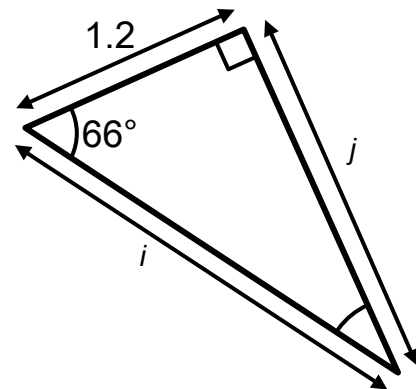
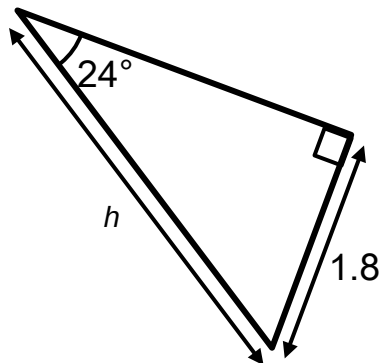
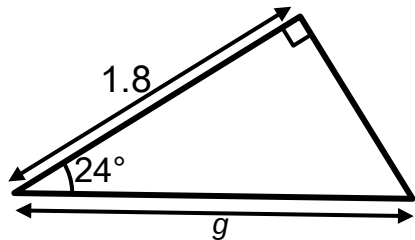
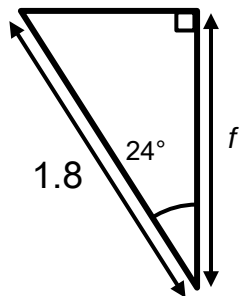
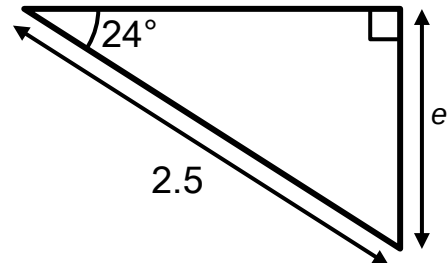
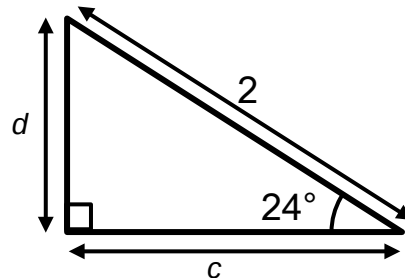
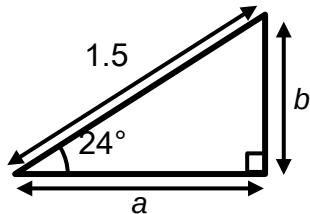
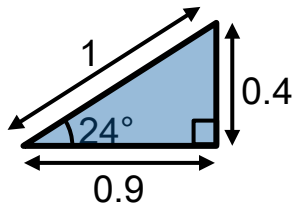
b 3.2

c 4

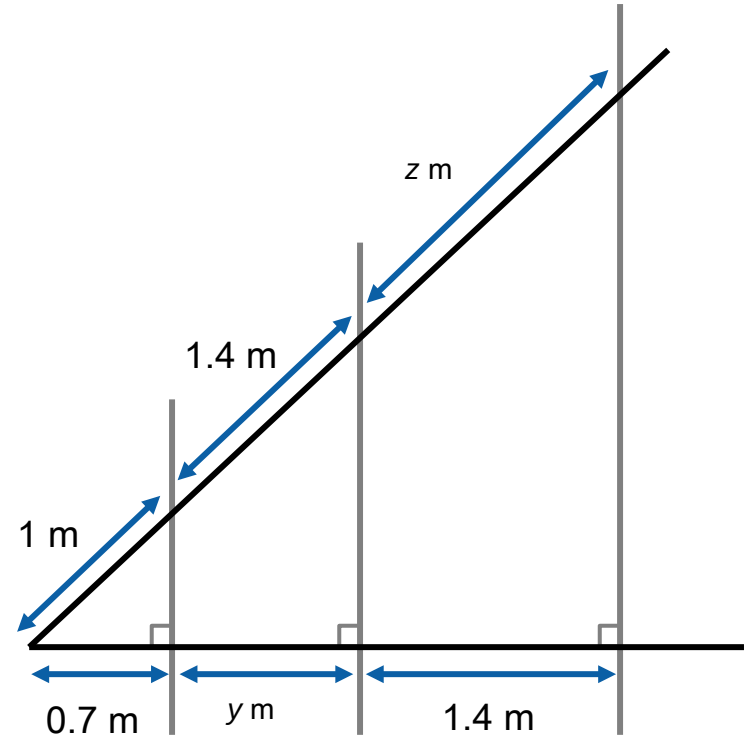
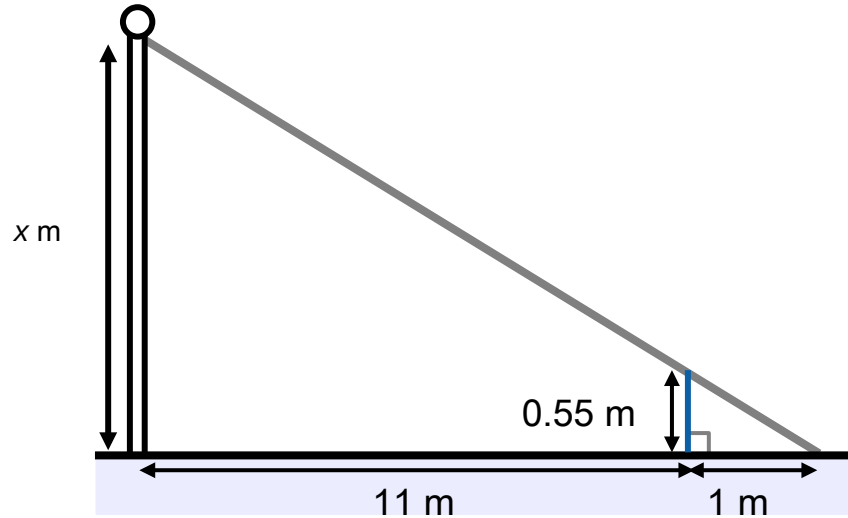
d 5 ✓



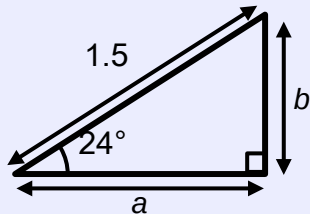
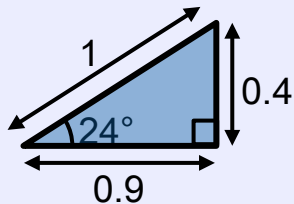
1) Dhererka (lengths) oo dhan waxaa lagu bixiyay cm. Soo hel qiimaha (values) aan la aqoon.



2) Raadi qiimaha (value) x , y iyo z .

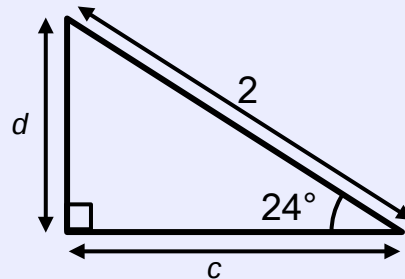


1) Dhammaan dhererka (lengths) waxaa lagu bixiyay cm. Raadi qiimaha (value) aan la garanayn.



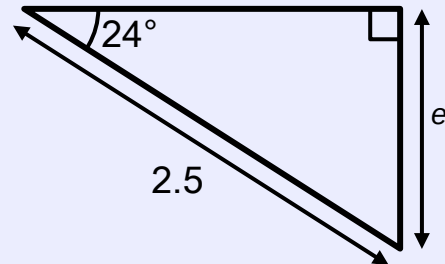
$$a = 1.35$$

$$b = 0.6$$

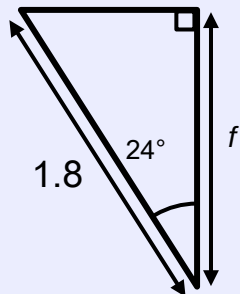


$$c = 1.8$$

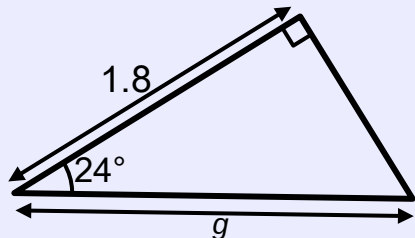
$$d = 0.8$$



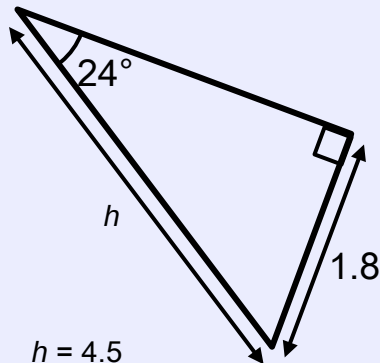
$$e = 1$$



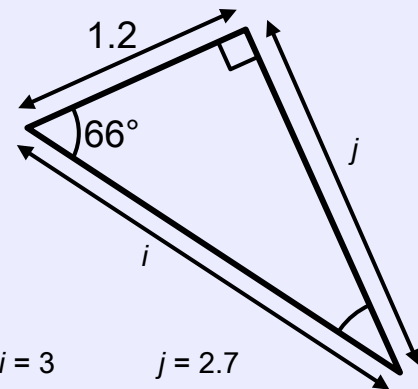
$$f = 1.62$$



$$g = 2$$



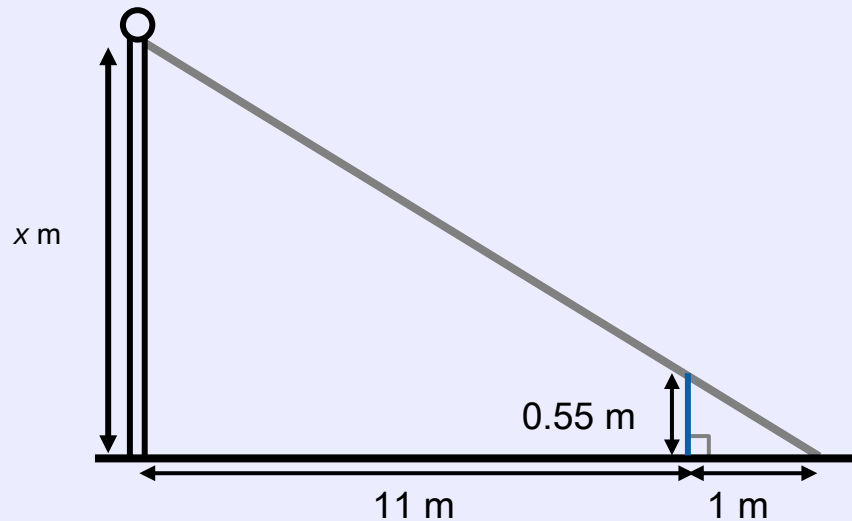
$$h = 4.5$$



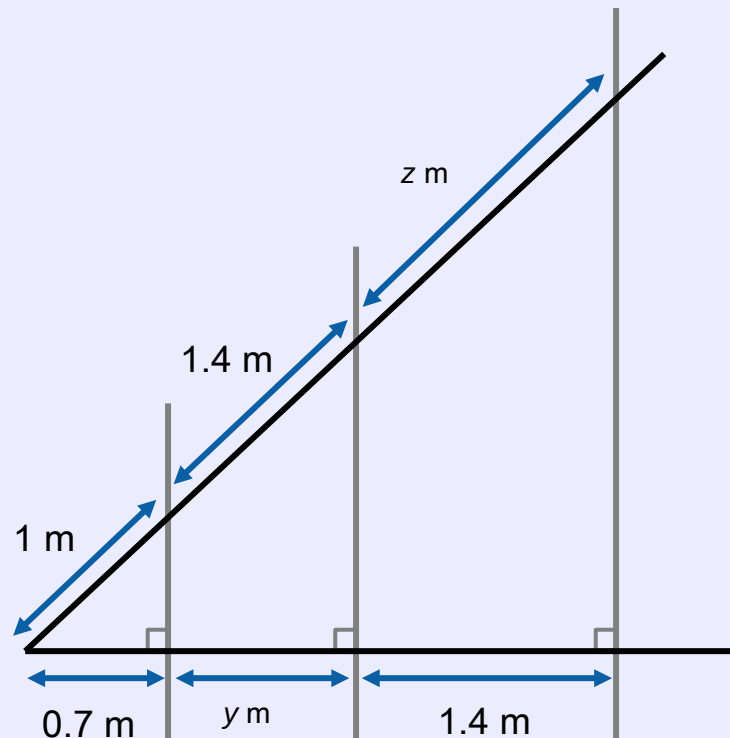
$$i = 3$$

$$j = 2.7$$

2) Raadi qiimaha (value) x , y iyo z .



$$X = 6.6$$



$$y = 0.98$$

$$Z = 2$$

Soo koobid Hubinta iyo xoojinta fahamka saddexagallada (triangles) isku midka ah (similar)

Weyneyn (Enlargement) waa isbeddel (transformation) keena isbeddel xagga cabbirka.

Marka shay la weyneeyo, sawirku waa isku mid (similar). Dhererka (lengths) waa isbedeli karaa laakiin saamiyada (proportions) gudaha qaabku waa go'an. Xaglaha (angles) ma isbedelaan.

Sida saddexagallada (triangles) isku eg (congruent), ma aha dhammaan dhererka (lengths) iyo xaglaha (angles) in la ogaado si loo go'aamiyo in laba saddexagal (triangles) ay isku mid (similar) yihiin.

Haddii laba saddexagal (triangles) ay leeyihiin xaglo (angles) isku mid ah, markaas waa isku mid (similar).

Xiriirka saamiyeed (proportional relationship) ee u dhexeeya saddexagallada (triangles) isku midka ah (similar) iyo gudaha saddexagallada (triangles) isku midka ah (similar) waxaa loo isticmaali karaa in lagu helo dhererka (lengths) maqan.