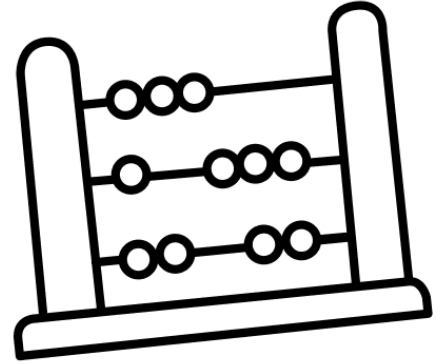


Weyneyn (Enlargement) saddexagalka xagal-qumman ee goobada halbeegga ah



Maths

Cutub: Trigonometry

Natiijo

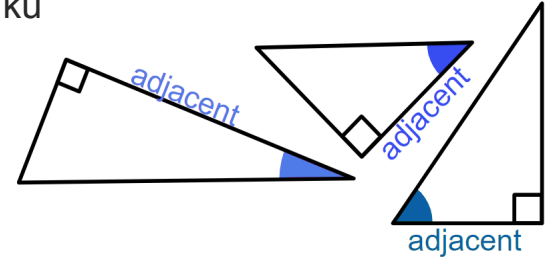
Waxaan aqoonsan karaa saddexagalka xagal-qumman ee goobada halbeegga ah waxaana u isticmaali karaa saami (proportion) si aan u weyneeyo (enlargement) saddexagallo la mid ah.

Radius waa qayb kasta oo xariiq ah oo isku xirta xarunta goobada iyo meel kasta oo ka mid ah wareegeeda.

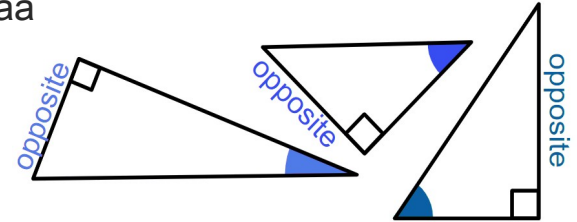
Hypotenuse waa dhinaca saddexagalka xagal-qumman ee ka soo horjeeda xagasha qumman.

Erayada muhiimka ah

Dhinaca adjacent (ku xiga) ee saddexagalka xagal-qumman waa dhinaca ku xiga xagasha qumman iyo xagasha la calaamadeeyay labadaba.



Dhinaca opposite (ka soo horjeeda) ee saddexagalka xagal-qumman waa dhinaca ka soo horjeeda xagasha la calaamadeeyay.

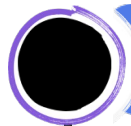


Saamivada trigonometric (trigonometric ratios) waa saamiyada u dhexeeya laba dhinac oo ka mid ah saddexagalka xagal-qumman:

$$\sin(\theta^\circ) = \frac{\text{opposite}}{\text{hypotenuse}} \quad \cos(\theta^\circ) = \frac{\text{adjacent}}{\text{hypotenuse}} \quad \tan(\theta^\circ) = \frac{\text{opposite}}{\text{adjacent}}$$

Qaabka casharka

Weyneyn (Enlargement) saddexagalka xagal-qumman ee goobada halbeegga ah



Calaamadaynta dhinacyada saddexagalka xagal-qumman



Isticmaalka sine iyo cosine ee goobada halbeegga ah

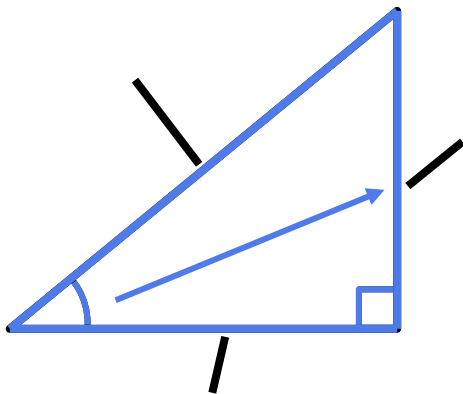


Isticmaalka tangent ee goobada halbeegga ah

Saddexagalka xagal-qumman ee hoose, mid ka mid ah xagasha fiqan (acute) ayaa la calaamadeeyay.

Hypotenuse had iyo jeer waa dhinaca ugu dheer.

Waxaan u tixraaci karnaa labada dhinac ee kale ee saddexagalka iyadoo lagu salaynayo booskooda marka loo eego xagasha la calaamadeeyay.



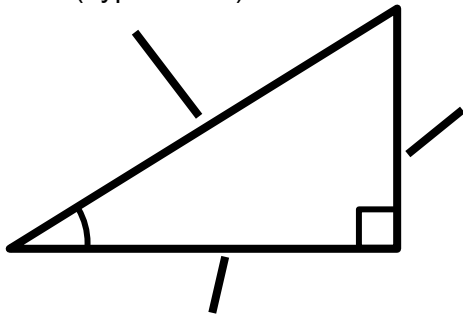
Dhinaca ka soo horjeeda xagasha fiqan ee gudaha ah ee la calaamadeeyay ee saddexagalka waxaa loo yaqaan 'opposite'.

Dhinaca ku xiga xagasha qumman iyo xagasha kale ee gudaha ah ee la calaamadeeyay waxaa loo yaqaan 'adjacent'.

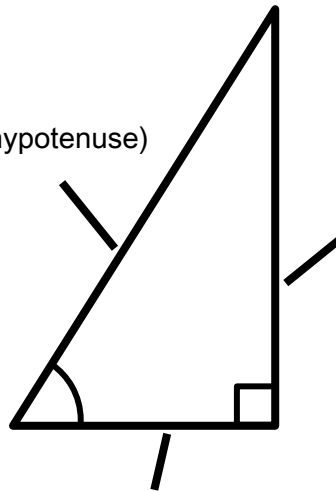
Hypotenuse-ku (hypotenuse) had iyo jeer waa dhinaca ugu dheer.

Dhererka labada dhinac ee kale saamayn kuma laha sida opposite-ka (opposite) iyo adjacent-ka (adjacent) loo magacaabo. Calaamadhan waxay ku xiran yihiin oo keliya booska xagasha fiiqan (acute angle) ee la calaamadeeyay.

hypotenuse (hypotenuse)



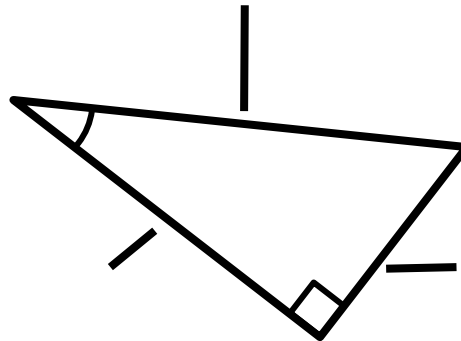
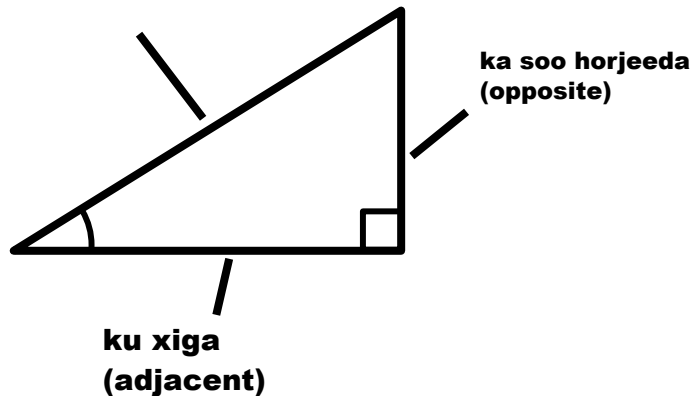
hypotenuse (hypotenuse)



Jihada (orientation) saddex-xagalku saamayn kuma laha sida opposite-ka (opposite) iyo adjacent-ka (adjacent) loo magacaabo.

Calaamadahan waxay ku xiran yihiin oo keliya booska xagasha fiiqan (acute angle) ee la calaamadeeyay.

hypotenuse (hypotenuse)



Run mise been?

Opposite-ku (opposite) had iyo jeer waa dhinaca ugu gaaban ee saddex-xagal qumman (right-angled triangle).



Run



Been



Sabab u sheeg jawaabtaada



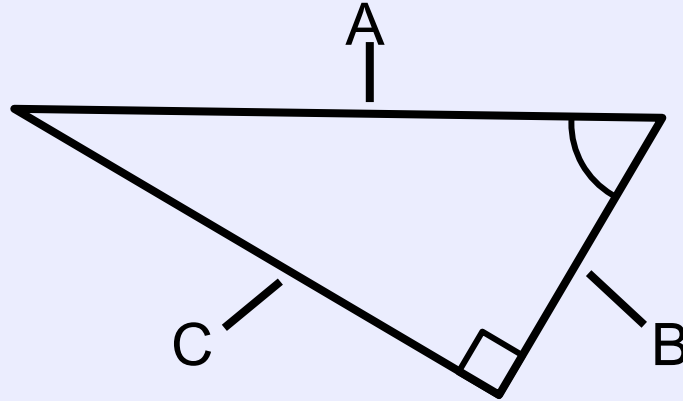
Dhinaca loo magacaabay opposite (opposite) had iyo jeer waa ka soo horjeeda xagasha fiiqan (acute angle) ee la calaamadeeyay.



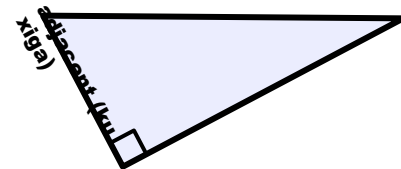
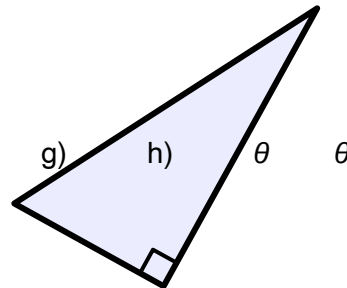
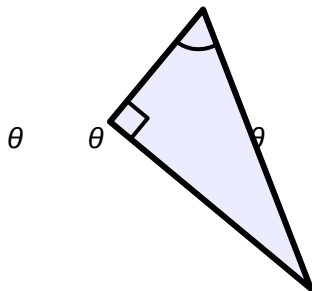
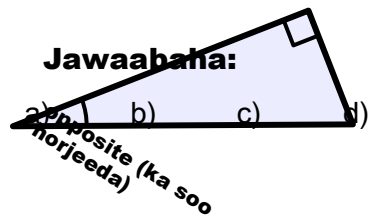
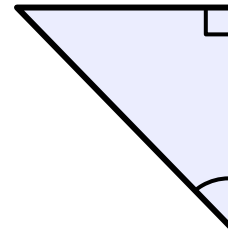
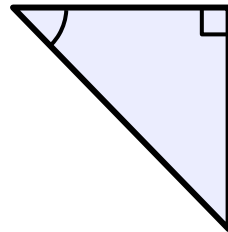
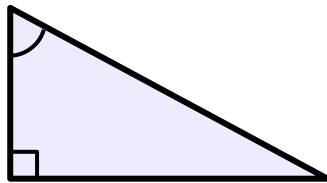
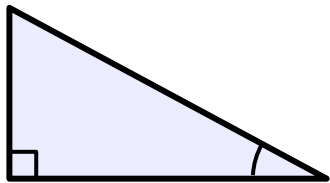
Dhinaca loo yaqaan 'opposite' (ka soo horjeeda) had iyo jeer waa ka soo horjeeda xagasha qumman.

Magacaabista dhinacyada saddexagalka xagasha qumman

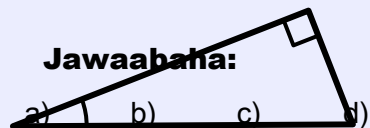
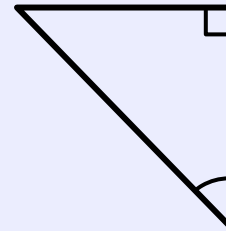
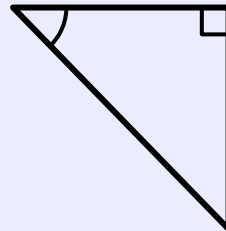
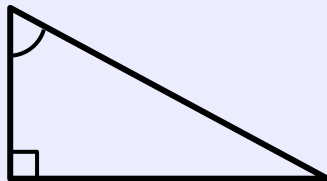
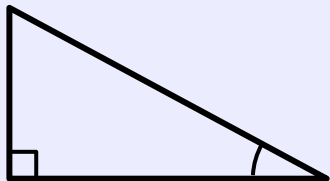
Dhinac kee baa ah 'opposite' (ka soo horjeeda) saddexagalkan?



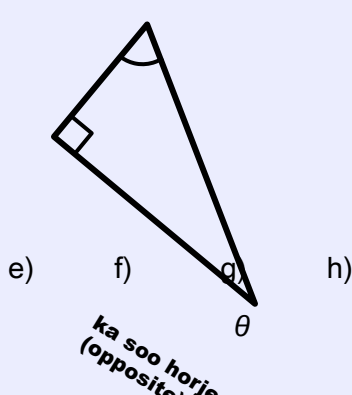
1) Ku magacaab dhinacyada saddexagal kasta ereyada 'opposite' (ka soo horjeeda), 'adjacent' (ku xiga) iyo 'hypotenuse' (jifaarka).
Qaybaha (g) iyo (h), sidoo kale ku calaamadee xagasha ku habboon θ .



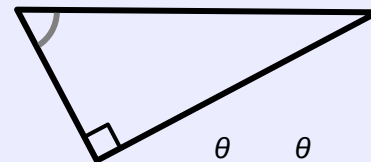
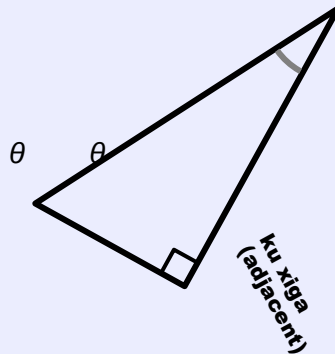
1) Ku magacaab dhinacyada saddexagal kasta ereyada 'opposite' (ka soo horjeeda), 'adjacent' (ku xiga) iyo 'hypotenuse' (jifaarka).
Qaybaha (g) iyo (h), sidoo kale ku calaamadee xagasha ku habboon θ .



θ



θ



Qaabka casharka

Cabbiridda saddex-xagalka qumman ee goobada halbeegga (Scaling the right-angled triangle from the unit circle)



Calaamadaynta dhinacyada saddex-xagal qumman (Labelling sides of a right-angle triangle)



Isticmaalka sine iyo cosine ee goobada halbeegga (Using sine and cosine from the unit circle)



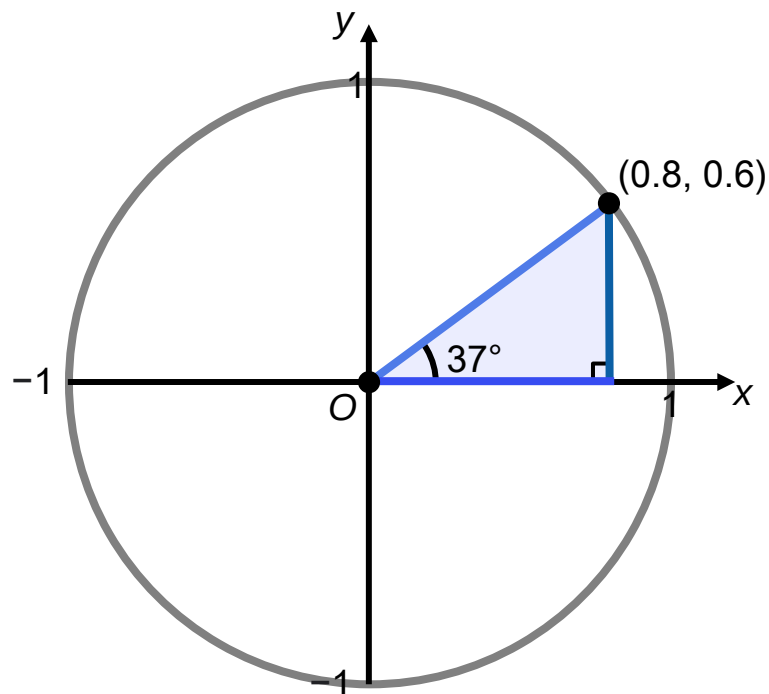
Isticmaalka tangent ee goobada halbeegga (Using tangent from the unit circle)

Isticmaalka sine iyo cosine ee goobada halbeegga (Using sine and cosine from a unit circle)



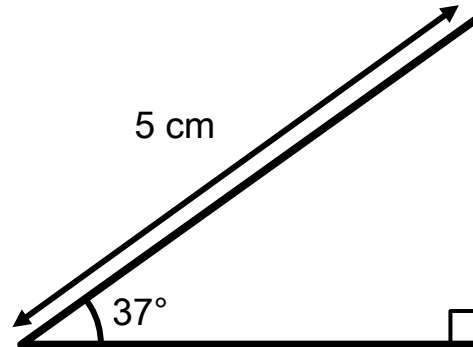
Sharaxaad

Jaantusku wuxuu muujinayaa saddex-xagal qumman oo ku dhex jira goobada halbeegga.



Waxaan sawiray saddex-xagal la mid ah.

Waa kuwo isku mid ah (similar) sababtoo ah waxay leeyihiin xaglo (angles) isku mid ah.

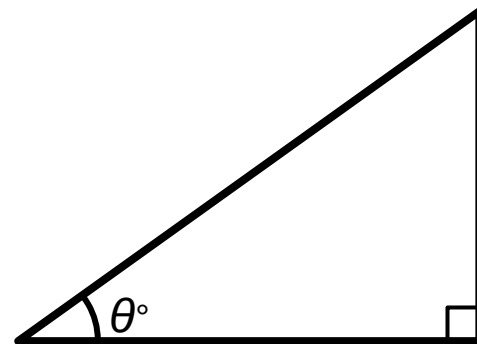
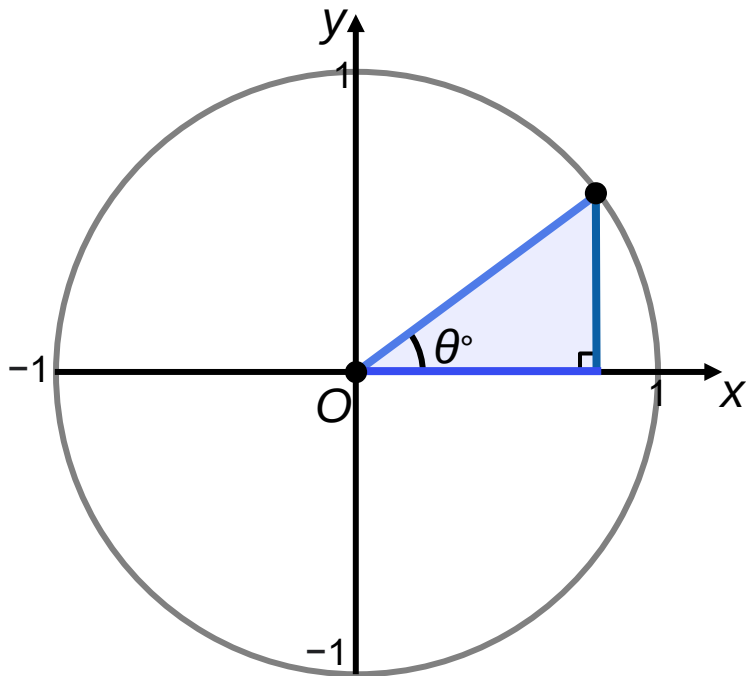


Yacquub

Sidee buu Yacquub u ogyahay inay isku mid yihiin?

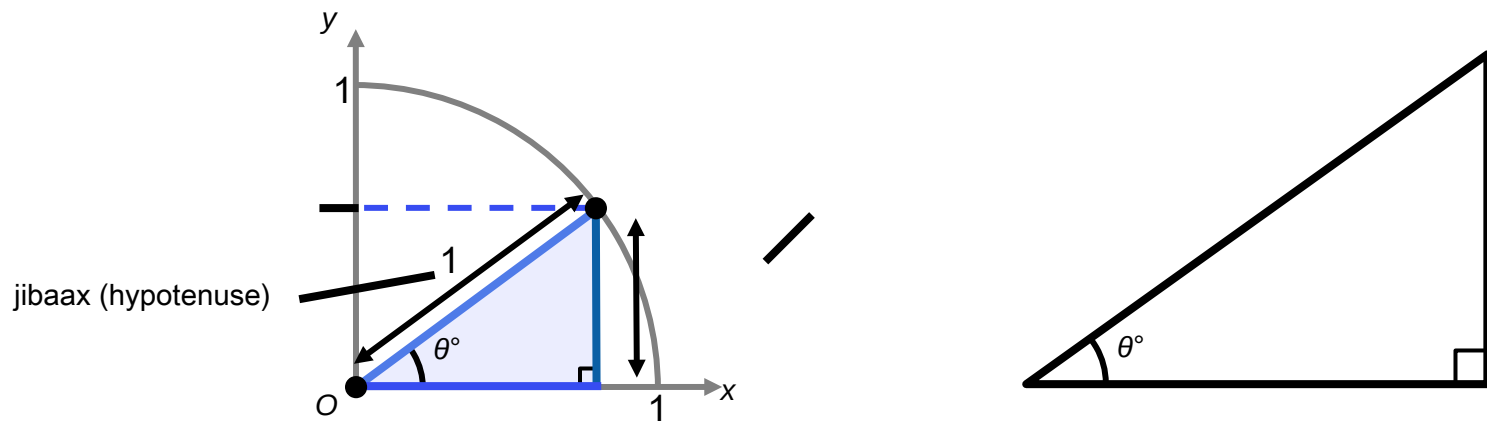
Isticmaalka sine iyo cosine ee goobada halbeegga (unit circle)

Saddexagal kasta oo xagal qumman (right-angled triangle) ah, saddexagal isku mid ah (similar triangle) ayaa laga samayn karaa gudaha goobada halbeegga (unit circle).



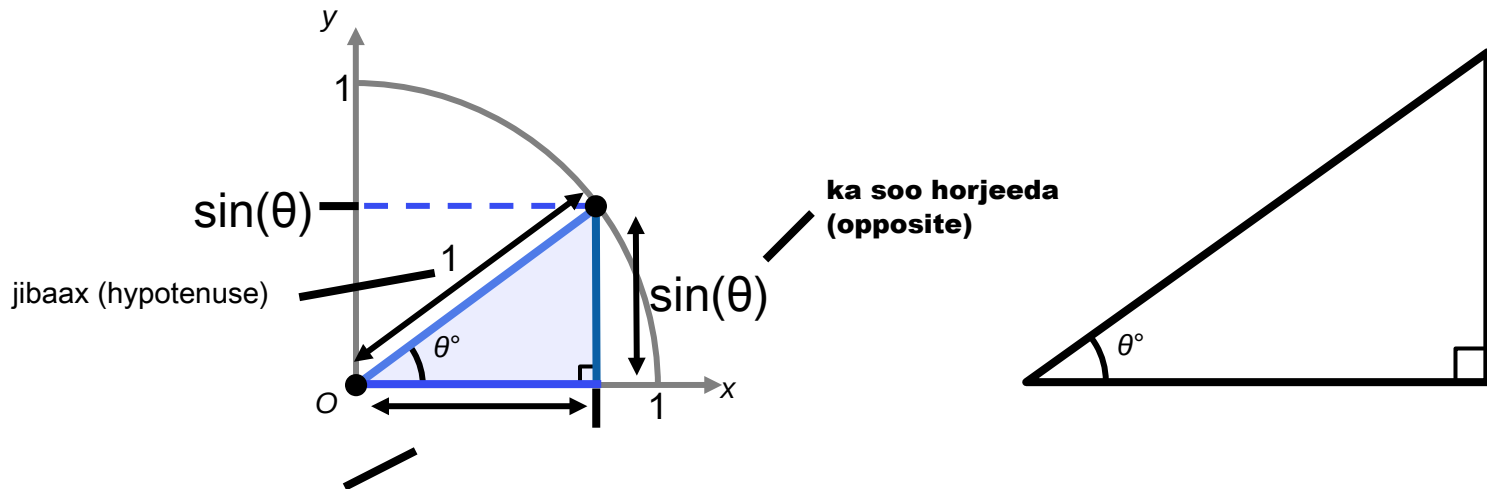
Rubuca koowaad (first quadrant) waa qaybta kaliya ee goobada halbeegga (unit circle) halkaas oo θ° uu la mid yahay xagasha gudaha (interior angle) ee saddexagalka.

Sine-ga xagasha, $\sin(\theta)$, waa isku-dubbaridka y (y-coordinate) ee barta halka radius-ka loo wareejiyay xagashaas.



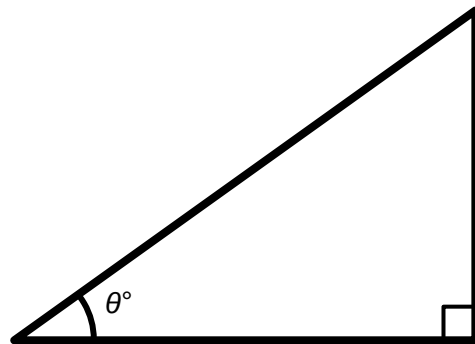
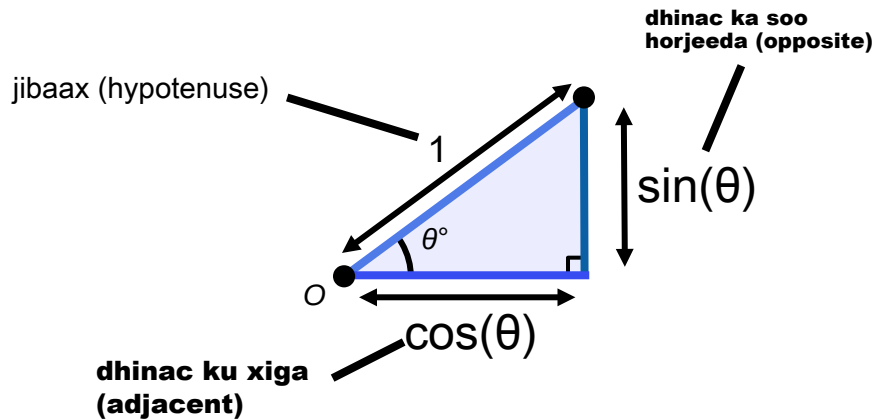
Saddexagalka gudaha rubuca koowaad (first quadrant) ee goobada halbeegga (unit circle), dhererka dhinaca ka soo horjeeda (opposite) wuxuu la mid yahay $\sin(\theta)$.

Cosine-ga xagasha, $\cos(\theta)$, waa isku-dubbaridka x (x-coordinate) ee barta halka radius-ka loo wareejiyay xagashaas.



Saddexagalka gudaha goobada halbeegga (unit circle), dhererka dhinaca ku xiga (adjacent) wuxuu la mid yahay $\cos(\theta)$.

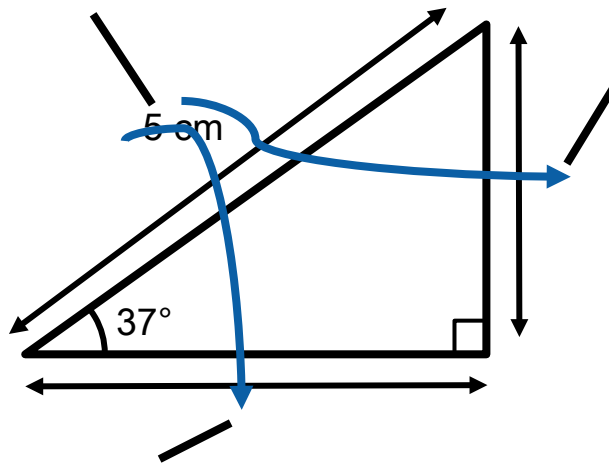
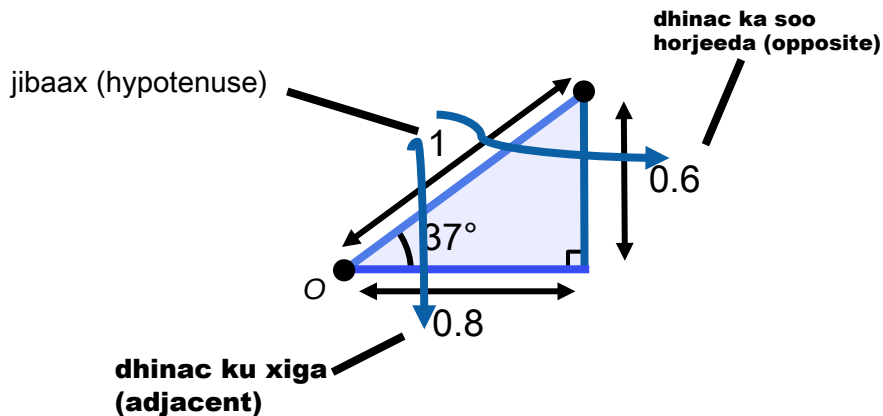
Haddii θ iyo mid ka mid ah dhererka geesaha (edge lengths) ee saddex-xagalka la yaqaan, kuwa kale waxaa loo xisaabin karaa iyadoo la isticmaalayo isla saamiyada (ratios) sida saddex-xagalka ee goobada cutubka (unit circle).



Haddii θ iyo mid ka mid ah dhererka geesaha (edge lengths) ee saddex-xagalka la yaqaan, kuwa kale waxaa loo xisaabin karaa iyadoo la isticmaalayo isla saamiyada (ratios) sida saddex-xagalka ee goobada cutubka (unit circle).



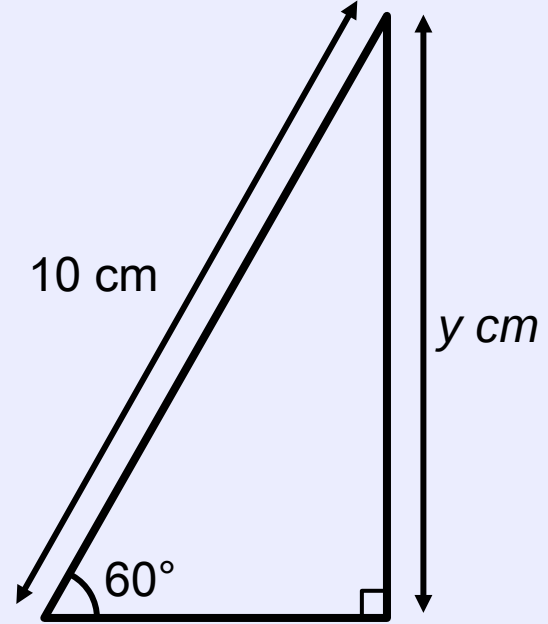
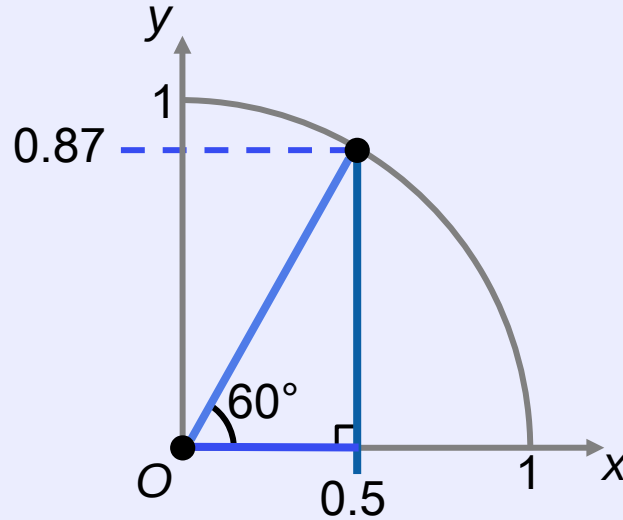
Tusaalaha Yacquub:

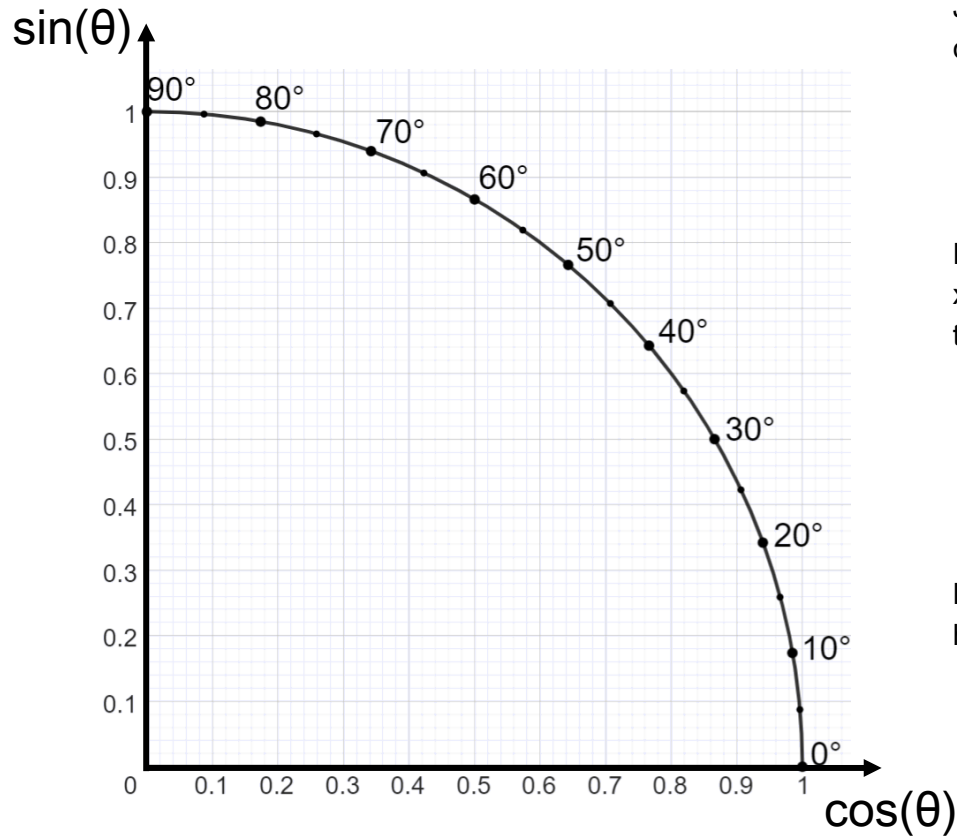


Isticmaalka sine iyo cosine ee goobada cutubka (unit circle)

Waa maxay qiimaha (value) y ?

- a** 0.5
- b** 0.87
- c** 5
- d** 8.7 ✓

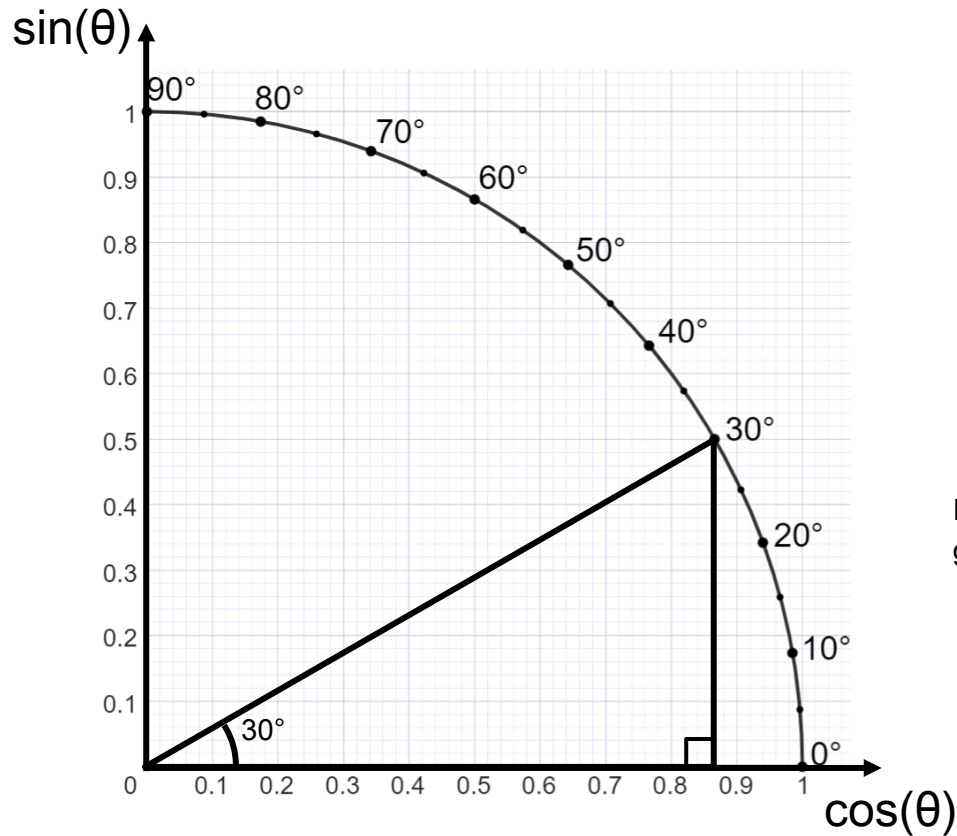




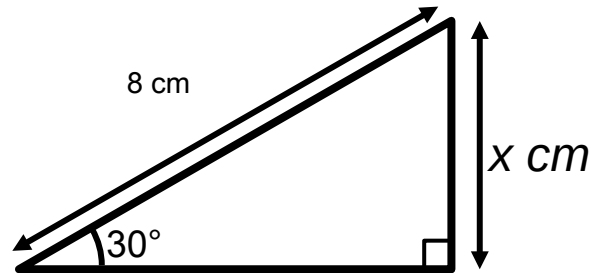
Jaantusku wuxuu muujinayaa qaybta goobada halbeegga (unit circle) ee ku taal rubuca koowaad.

Dhibcaha ku wareegsan wareegga waxay muujinayaan xagasha wareegga (θ) ee ka soo bilaabmaysa dhidibka toosan ilaa radius ee dhibic kasta.

Link si ay u noqoto mid isdhexgala: goobada halbeegga ee rubuca koowaad [🔗](#)

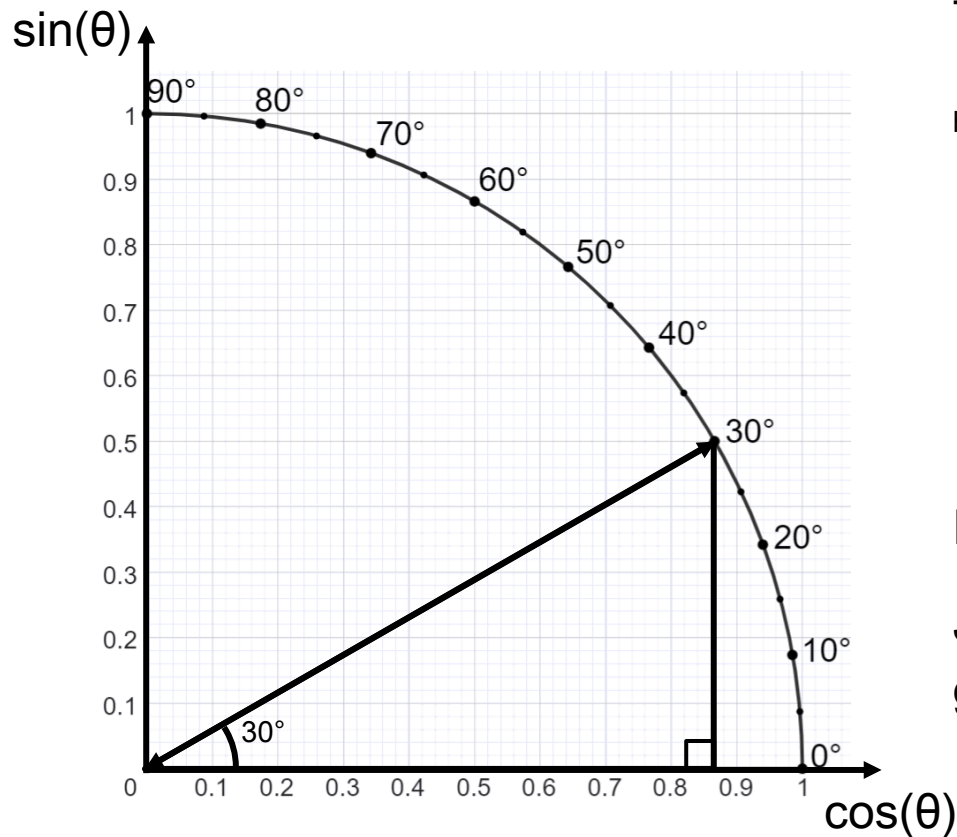


Tusaale 1: Raadi qiimaha (value) x.

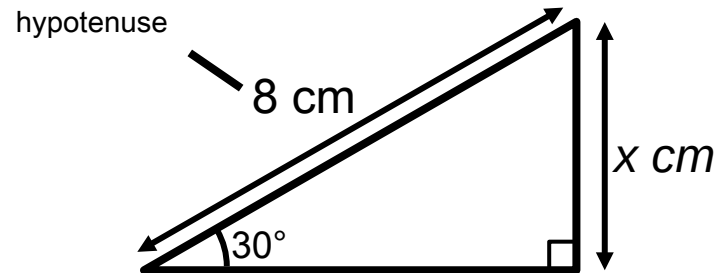


Isticmaal xagasha si aad u abuurto saddexagal la mid ah gudaha goobada halbeegga (unit circle).

Isticmaalka sine iyo cosine ee goobada halbeegga (unit circle)

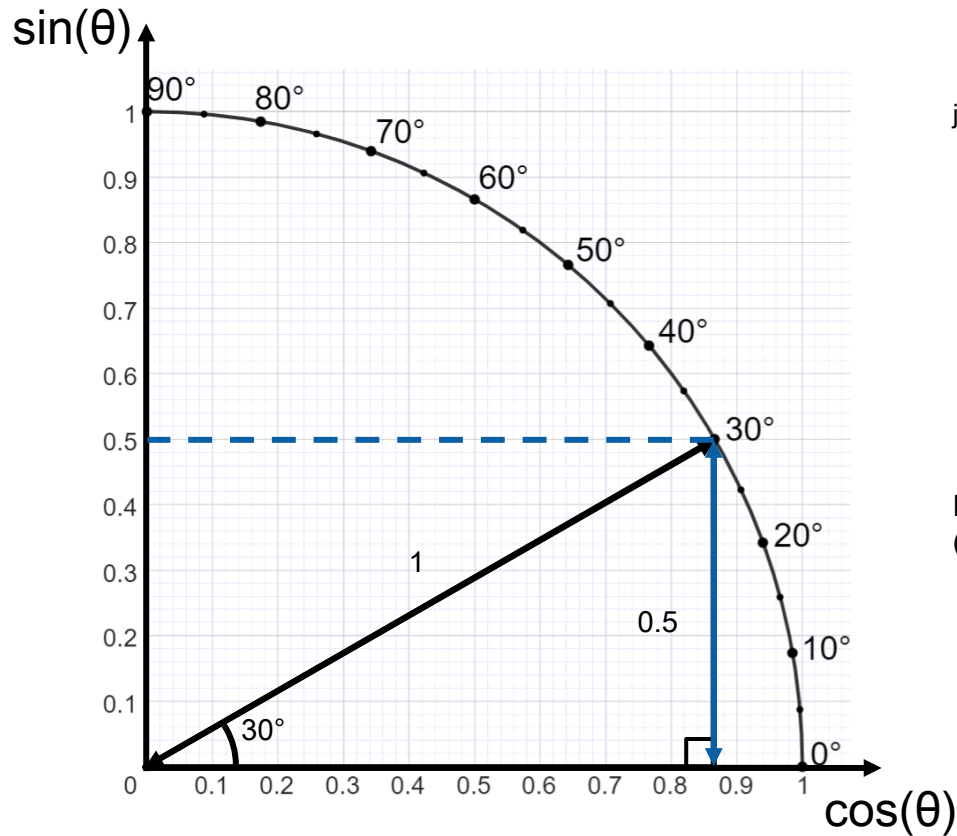


Tusaale 1: Raadi qiimaha (value) x.

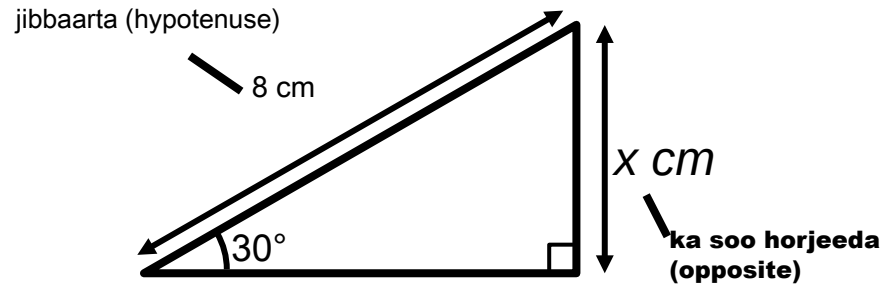


Dhererka 8 cm waa hypotenuse.

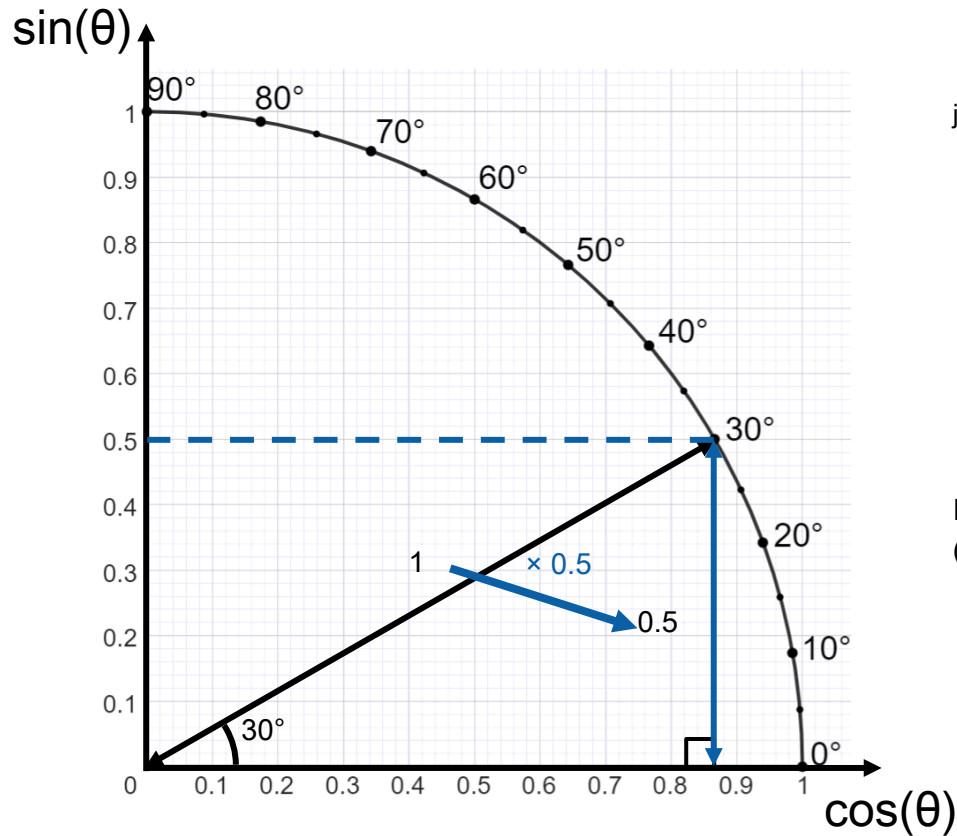
Jibbaarta (hypotenuse) saddexagalka goobada cutubka waa 1 cutub (unit).



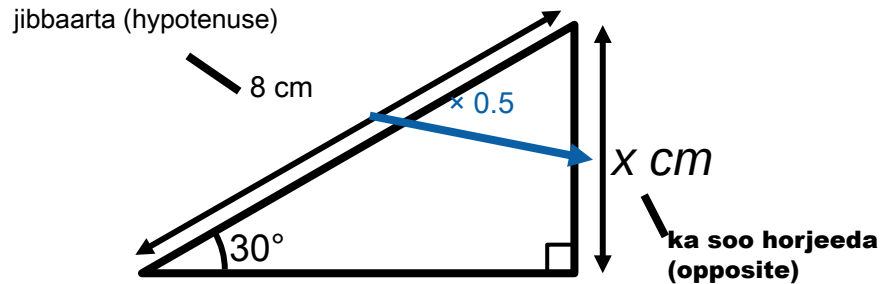
Tusaale 1: Soo hel qiimaha (value) x.



Dhinaca lagu calaamadeeyay x waa dhinaca ka soo horjeeda (opposite).



Tusaale 1: Soo hel qiimaha (value) x.

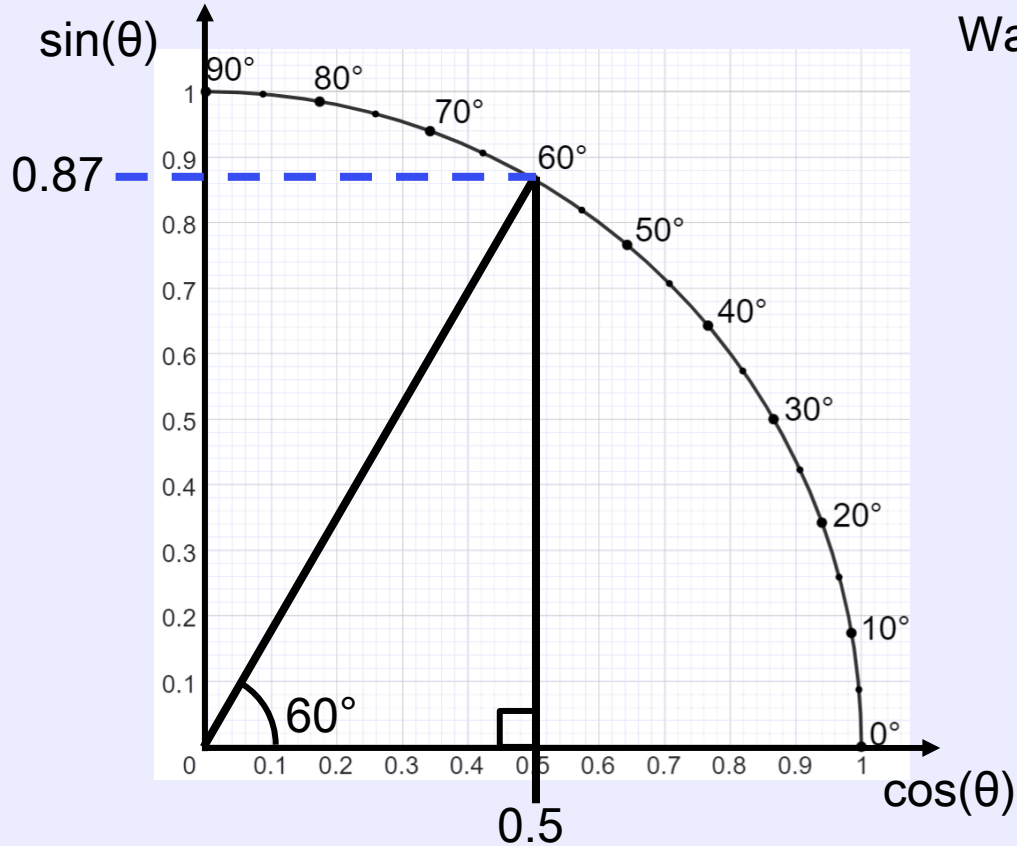


Isticmaal isla saamiyada (proportions) si aad u hesho qiimaha (value) x.

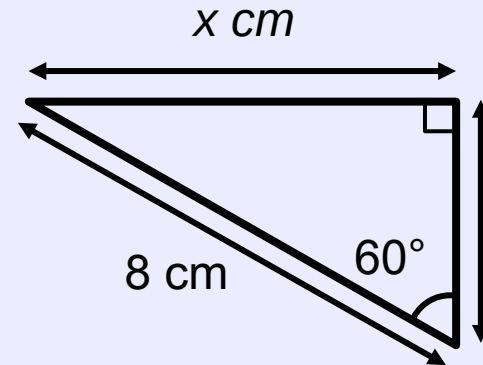
$$x = 8 \times 0.5$$

$$= 4$$

Isticmaalka sine iyo cosine ee goobada cutubka

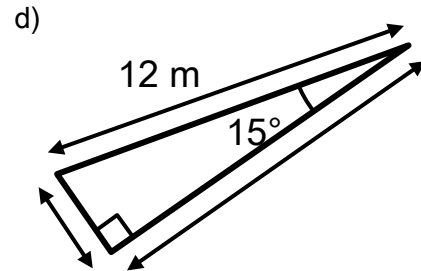
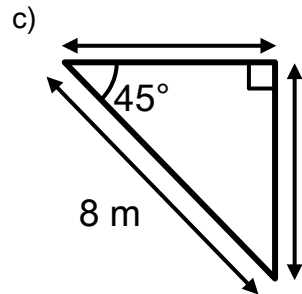
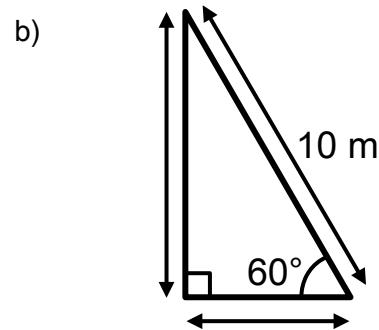
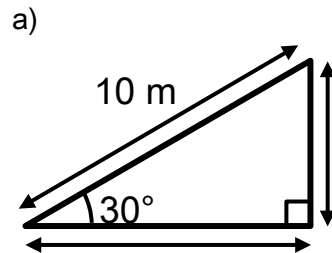
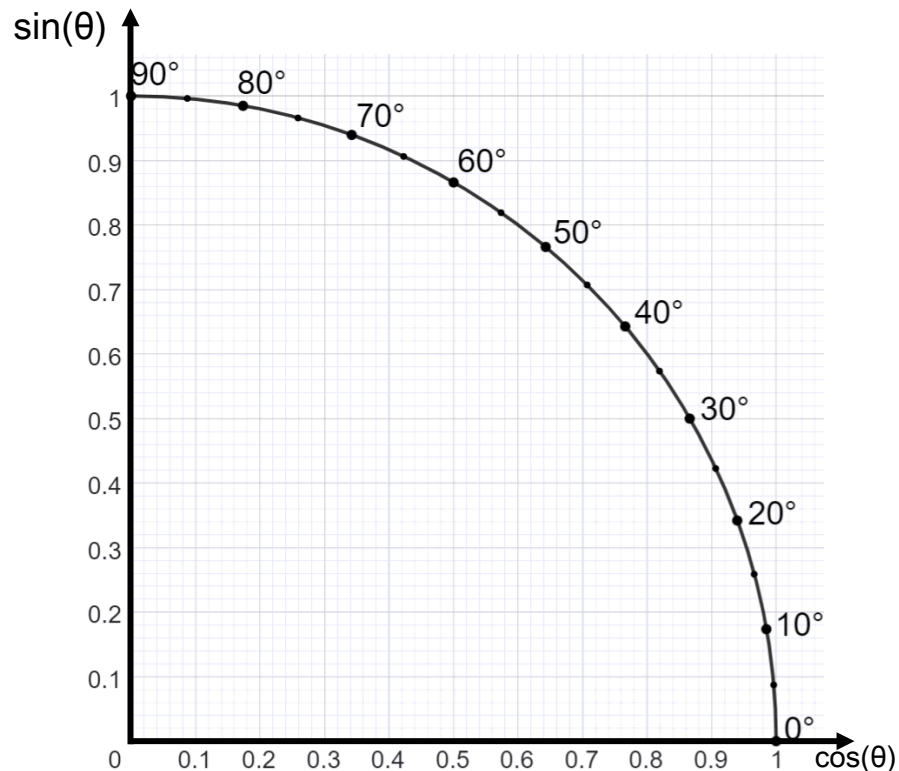


Waa maxay qiimaha (value) x?



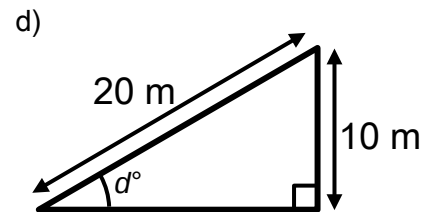
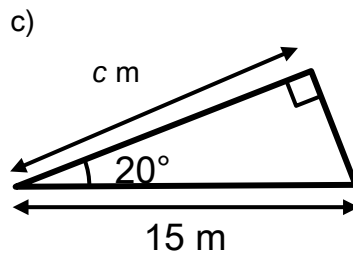
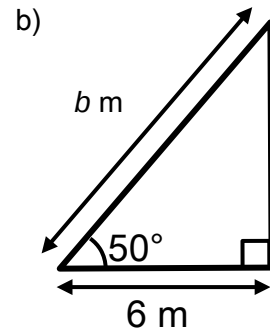
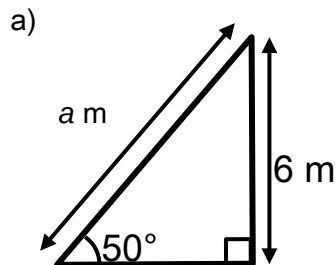
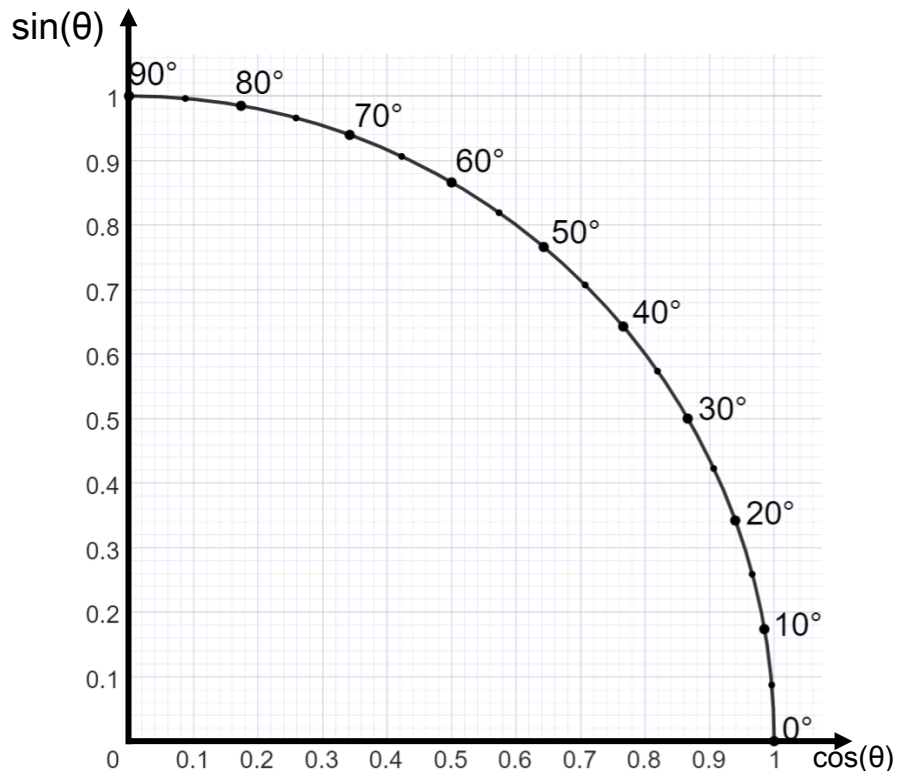
$$X = 8 \times 0.87 \\ = 6.96$$

1) Isticmaal qaybtan goobada halbeegga ah si aad u hesho dhererka maqan ee saddexagal kasta.



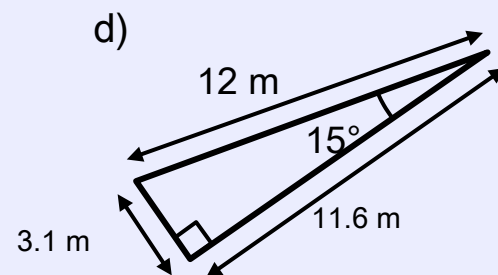
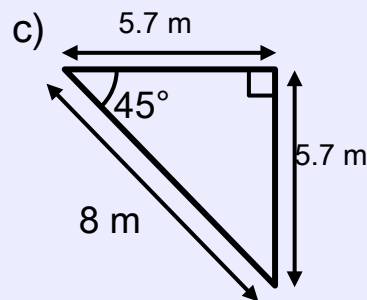
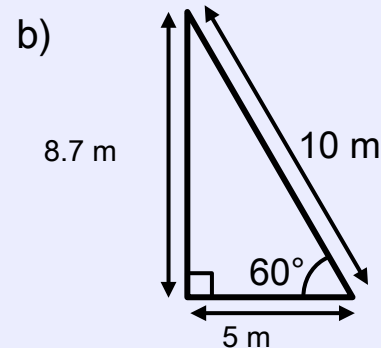
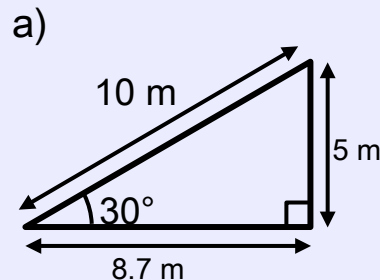
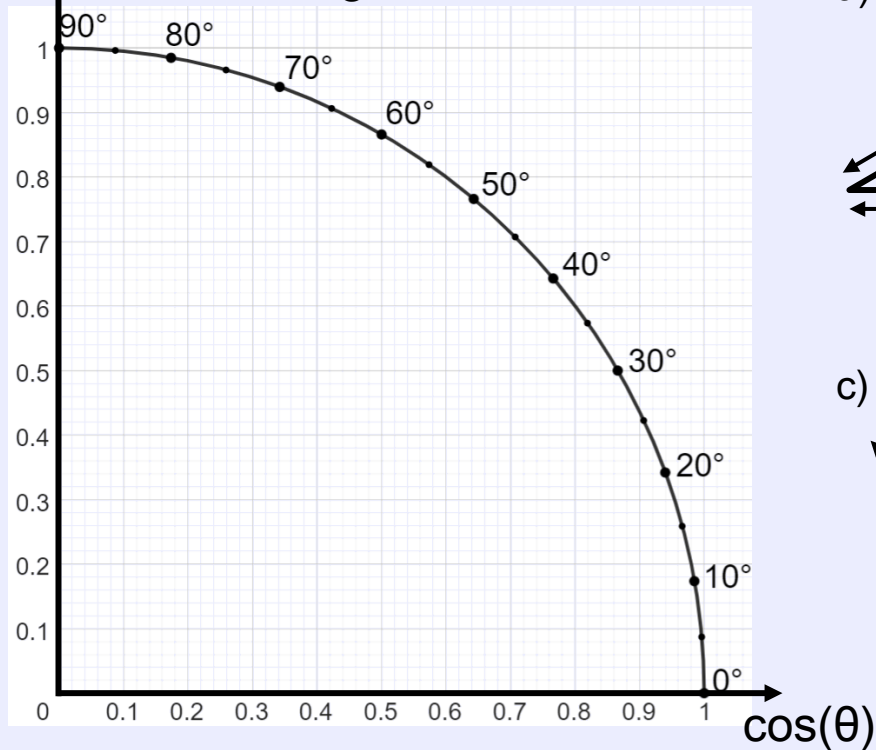
Ku xidh nooc isdhexgal ah: goobo halbeeg ah rubuc kowaad

2) Isticmaal qaybtan goobada halbeegga ah si aad u hesho qiimaha (value) mid kasta oo aan la garanayn.

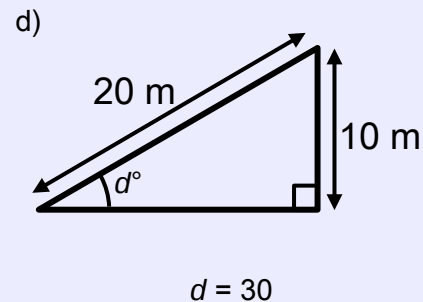
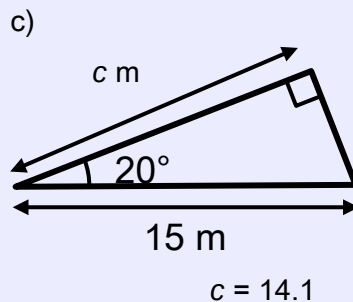
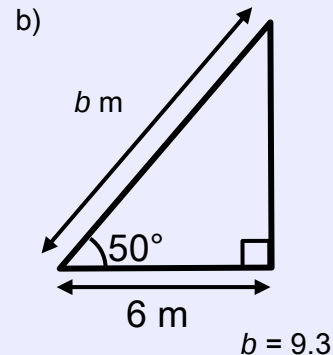
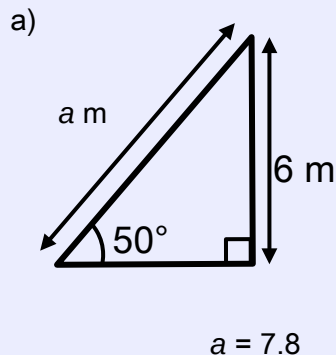
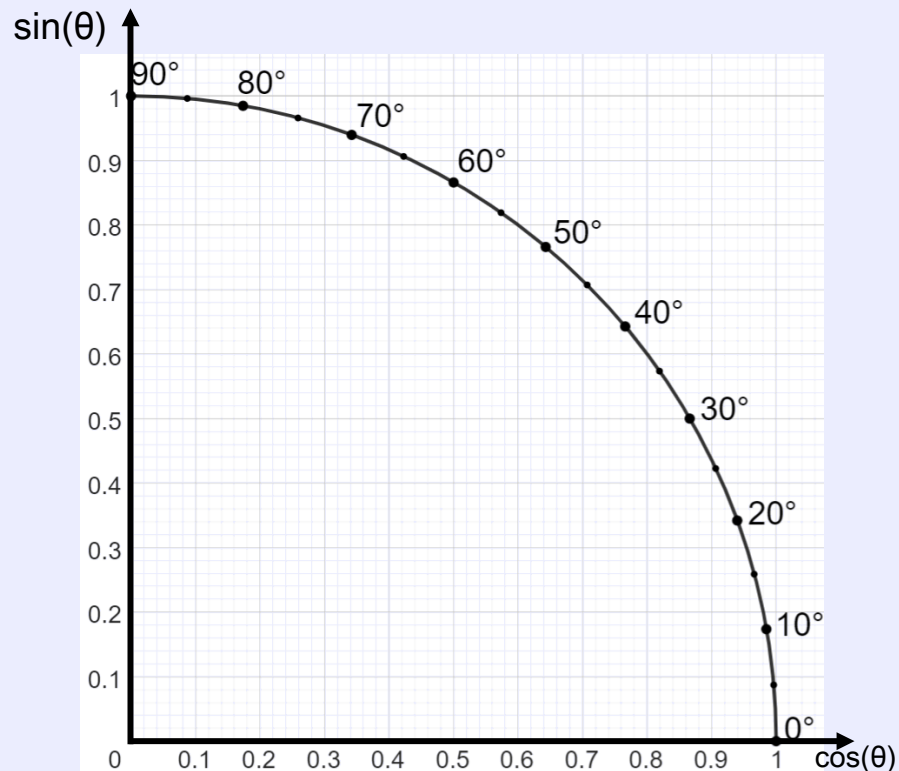


Ku xidh nooc isdhexgal ah: goobo halbeeg ah rubuc kowaad

1) Isticmaal qaybtan goobada halbeegga ah si aad u hesho dhererka maqan $\sin(\theta)$ ee saddexagal kasta.



2) Isticmaal qaybtan goobada halbeegga ah si aad u hesho qiimaha (value) mid kasta oo aan la garanayn.



Qaabka casharka

Cabbiridda (scaling) saddex-xagalka qumman (right-angled triangle) ee goobta cutubka (unit circle)



Magacaabista dhinacyada saddexagal qumman (right-angle triangle)



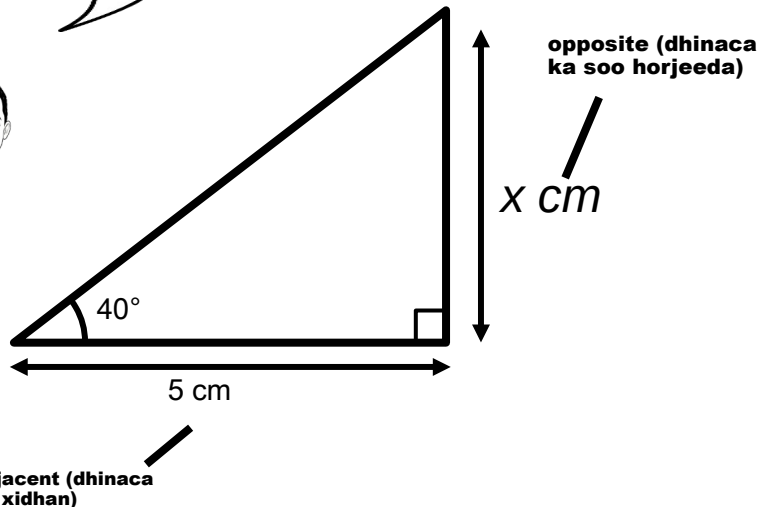
Isticmaalka sine iyo cosine ee goobta cutubka (unit circle)



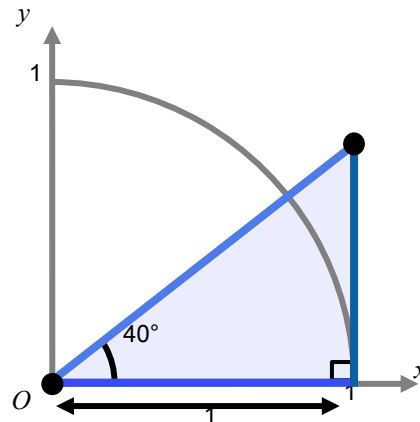
Isticmaalka tangent ee goobta cutubka (unit circle)

Cali iyo Isra waxay raadinayaan qiimaha (value) x ee saddex-xagalka (triangle).

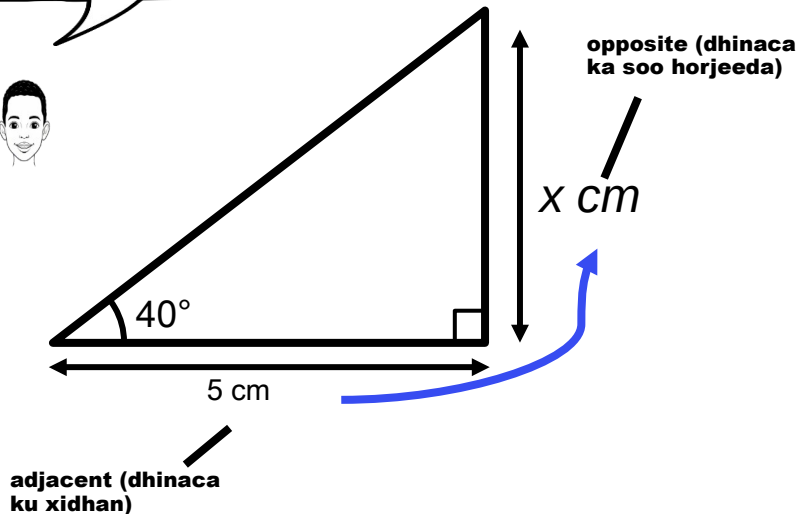
Waxaan isticmaali karnaa goobta cutubka (unit circle) si aan u abuurno saddex-xagal (triangle) halkaas oo adjacent (dhinaca ku xidhan) uu dhererkiisu yahay 1 cutub (unit).



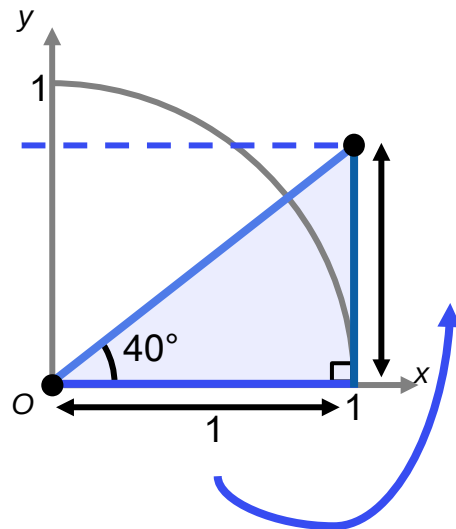
Opposite (dhinaca ka soo horjeeda) ee saddex-xagalkan cusub waa hadda tangent (taabte) goobta cutubka (unit circle).



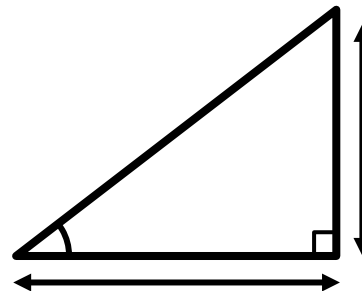
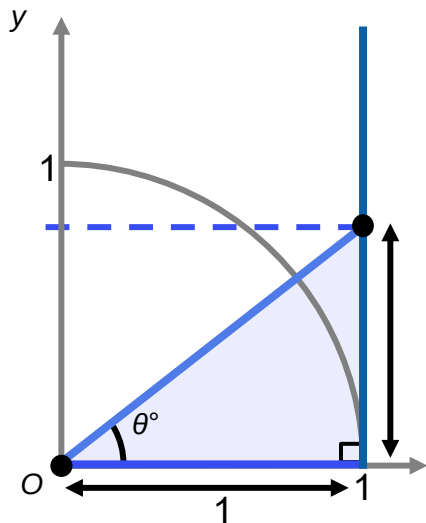
Waxaan tan u isticmaali karnaa si aan u helno dhererka opposite (dhinaca ka soo horjeeda) ee saddex-xagalka (triangle) ku jira goobta cutubka (unit circle).



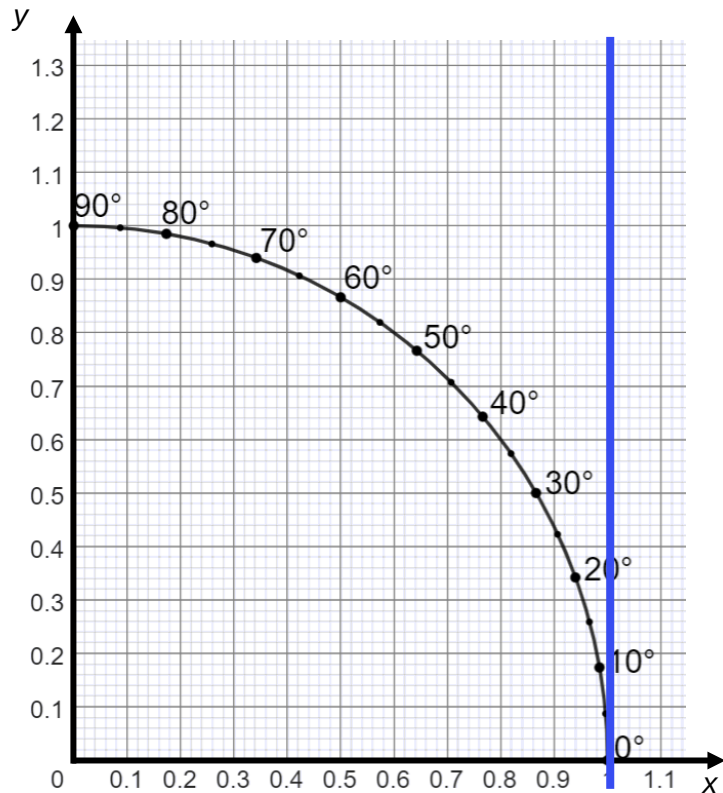
Waxaan markaas u isticmaali karnaa saamiga (proportions) si aan u helno qiimaha (value) x .



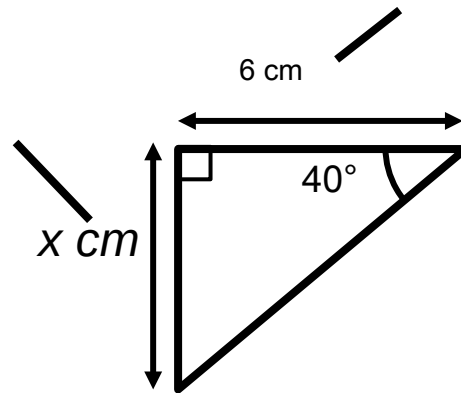
Tangent (taabte) xagal (angle) ($0 \leq \theta \leq 90$) waa dhererka dhinaca opposite (dhinaca ka soo horjeeda), kaas oo ku yaal tangent (taabte) goobta cutubka (unit circle) ee $(1, 0)$.



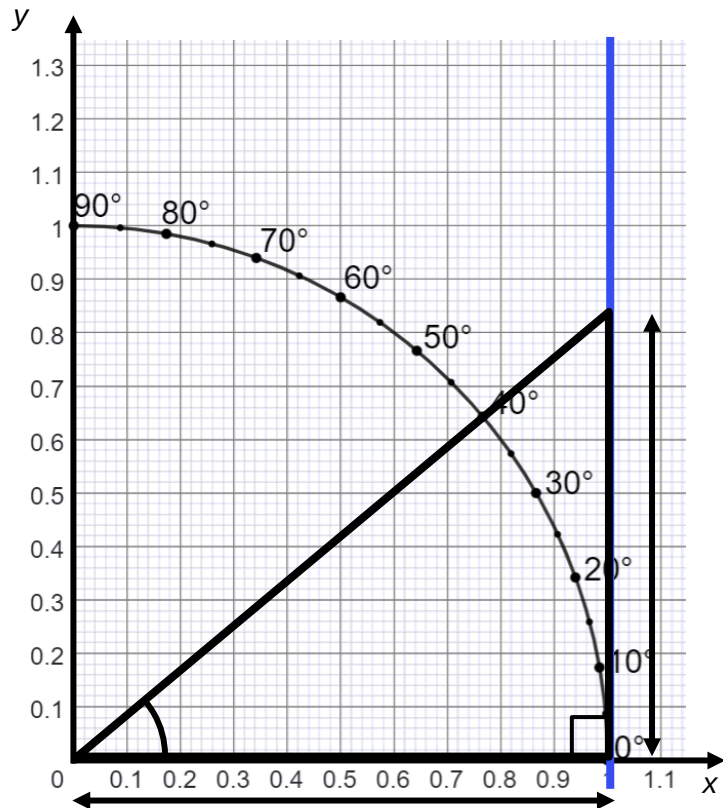
Tangent (taabte) waxaa loo isticmaali karaa in lagu helo mid ka mid ah opposite (dhinaca ka soo horjeeda) ama adjacent (dhinaca ku xidhan) ee saddex-xagal qumman (right-angle triangle), marka dhererka kale iyo xagal (angle) la yaqaan.



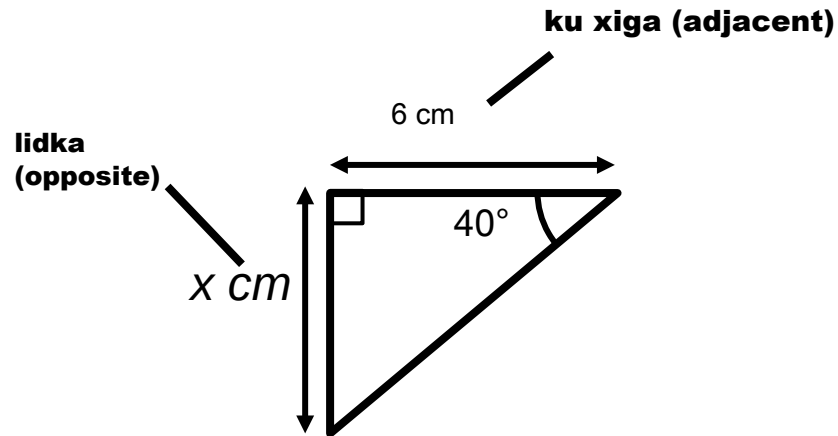
Tusaale 1: Raadi qiimaha (value) x.



Waxaan isticmaaleynaa lidka (opposite) iyo ku xiga (adjacent), marka sawir tangent (tangent) $x = 1$.

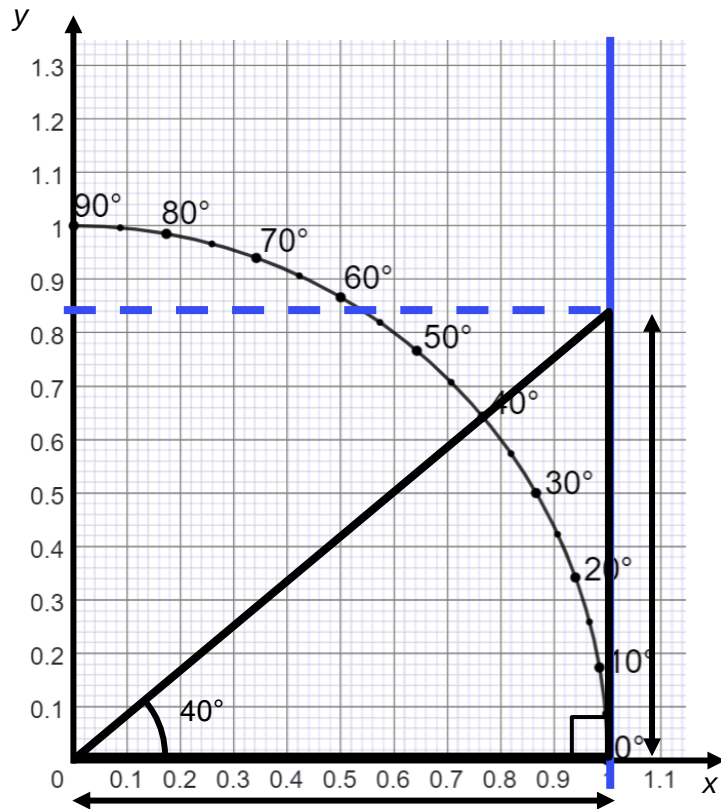


Tusaale 1: Raadi qiimaha (value) x .

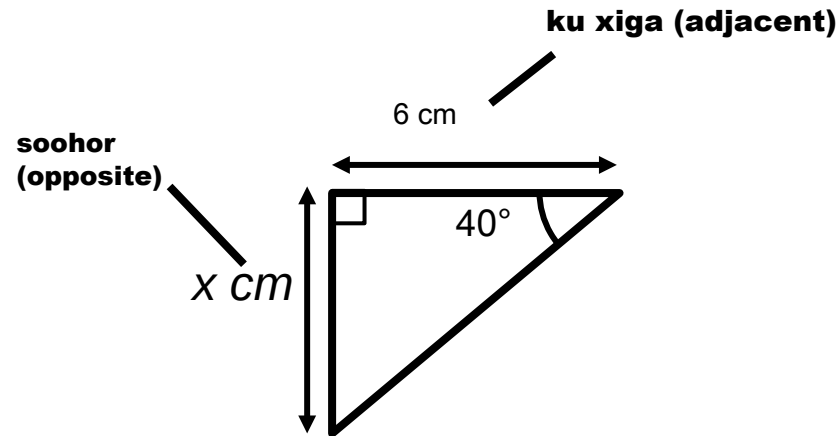


Isticmaal tangent-ka (tangent) si aad u abuurto saddexagal isku mid ah (similar triangle).

Hubi cidhifyada (edges) ee u dhigma saddexagallada.

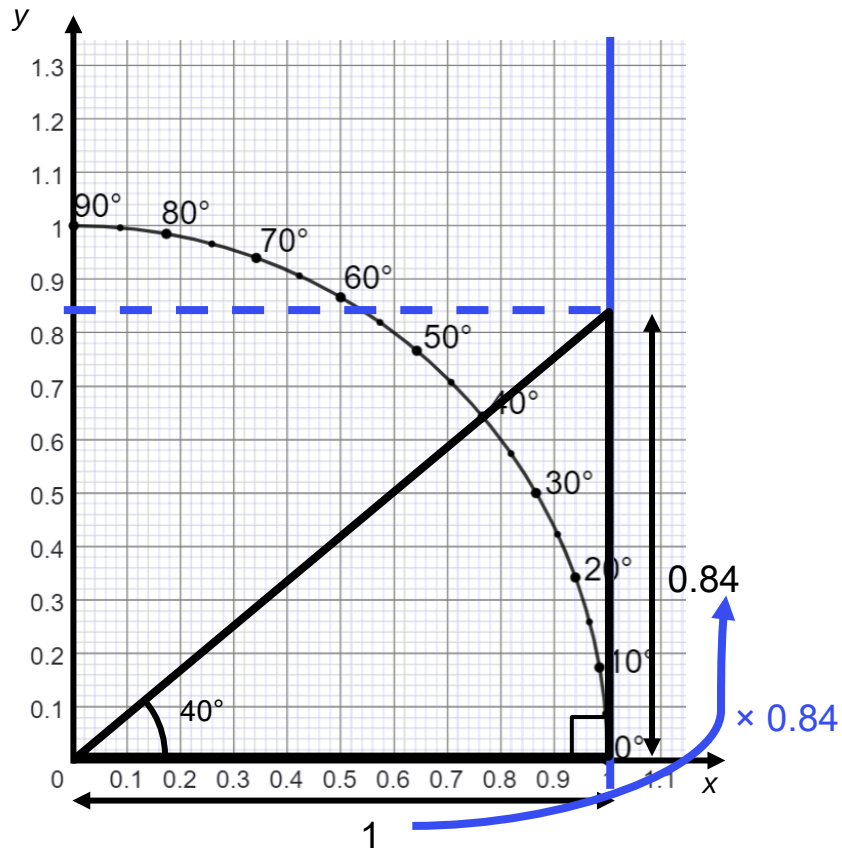


Tusaale 1: Raadi qiimaha (value) x.

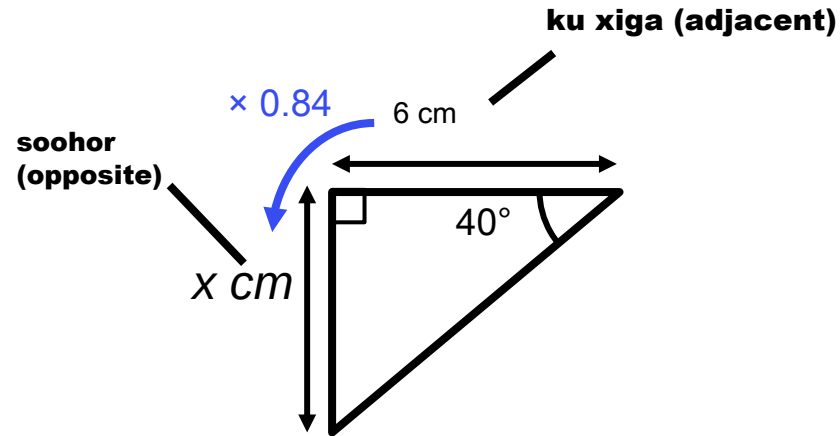


Ku xiga (adjacent) ee goobta cutubka (unit circle) wuxuu leeyahay dherer 1 cutub (unit).

Dhererka sohorta (opposite) ee saddexagalkaan wuxuu la mid yahay $\tan(\theta)$.



Tusaale 1: Soo hel qiimaha (value) x.



Isticmaal isku saamiyada (proportions) si aad u xisaabiso qiimaha (value) x.

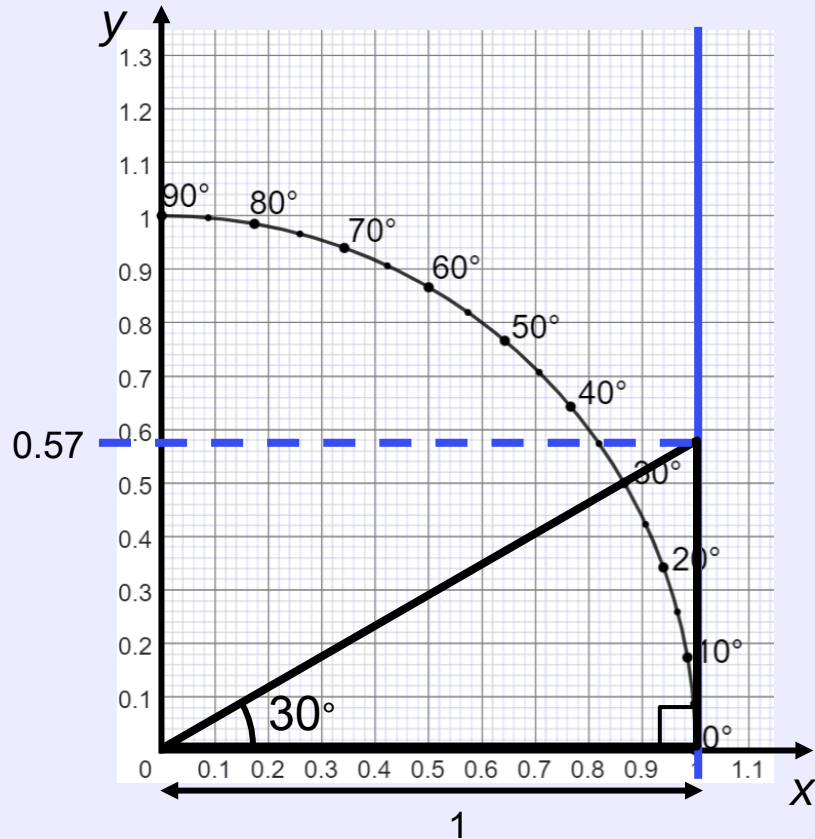
$$x = 6 \times 0.84$$

$$= 5.04$$

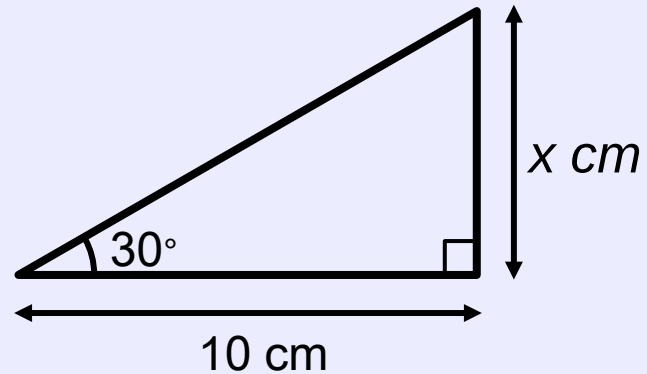
Isticmaalka taanjanta (tangent) ee goobta cutubka (unit circle)



Hubi

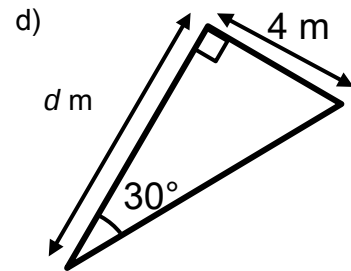
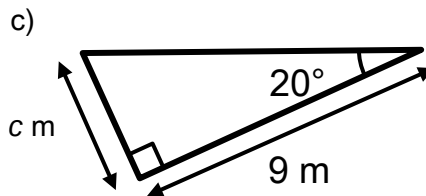
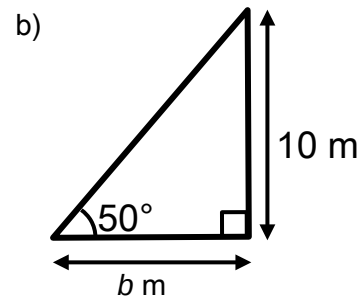
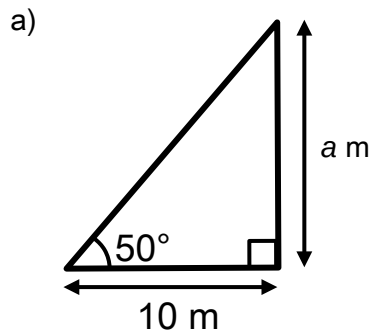
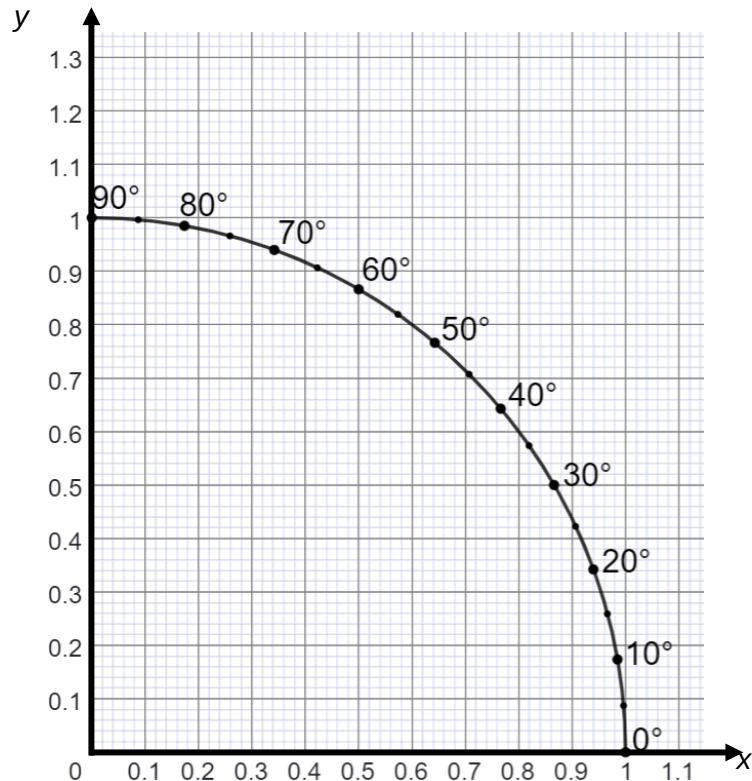


Waa maxay qiimaha (value) x?



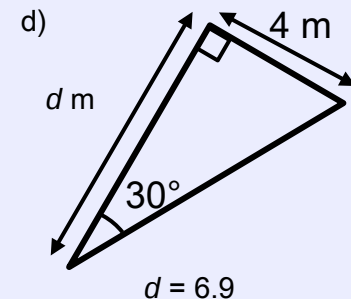
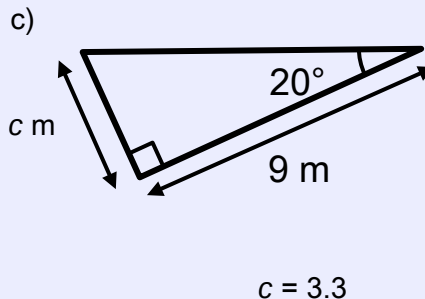
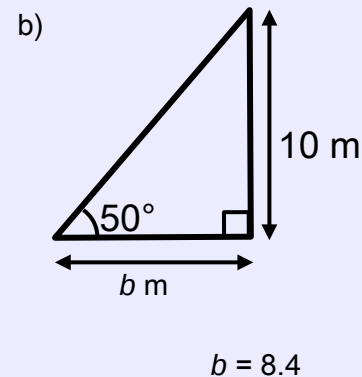
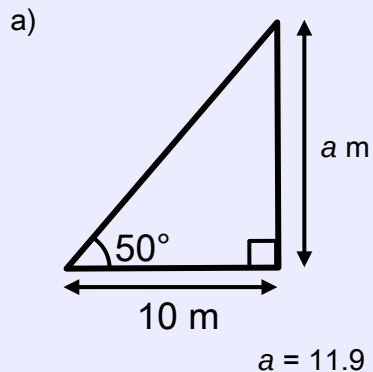
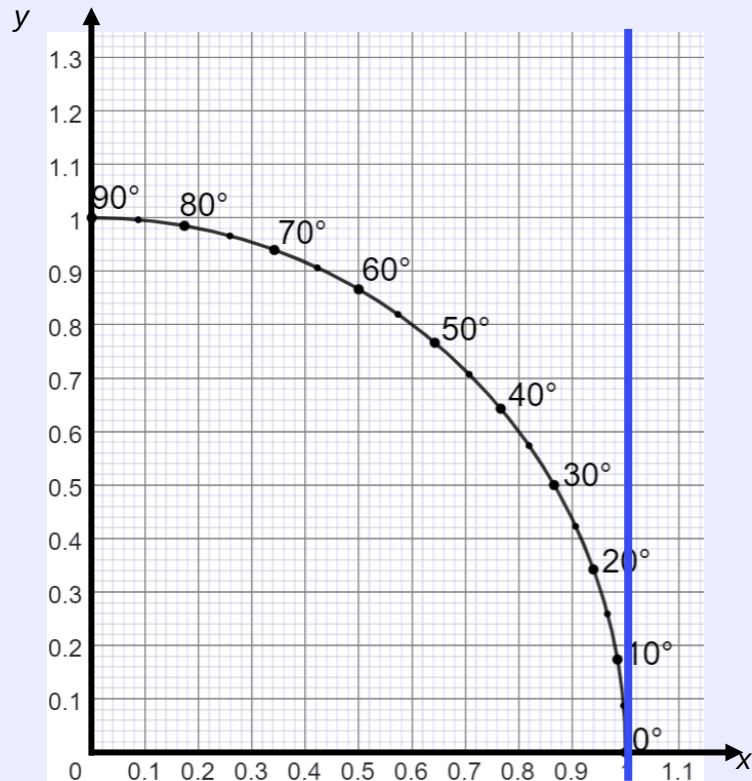
$$\begin{aligned} X &= 10 \times 0.57 \\ &= 5.7 \end{aligned}$$

1) Isticmaal qaybtan (sector) ee goobta cutubka (unit circle) si aad u hesho qiimaha (value) mid kasta oo aan la garanayn.



Ku xidh nooca is-dhexgalka (interactive version): goobta cutubka (unit circle) ee rubaca koowaad (first quadrant)

1) Isticmaal qaybtan (sector) ee goobta cutubka (unit circle) si aad u hesho qiimaha (value) mid kasta oo aan la garanayn.



Soo koobid

Cabbirka (Scaling) saddexagalka qumman ee ka yimid goobta halbeegga (unit circle)

Waxaa jira saamiyo (ratios) gaar ah oo ku dhex jira labada saddexagal qumman ee muhiimka ah ee lagu qeexay goobta halbeegga (unit circle).

Mid ka mid ah saddexagalka qumman ee muhiimka ah wuxuu leeyahay hypotenuse dhererkiisu yahay 1 unit. Dhinacyada iska soo horjeeda (opposite) iyo kuwa ku xiga (adjacent) ee saddexagalkan waxay leeyihiin dherer $\sin(\theta)$ iyo $\cos(\theta)$ siday u kala horreeyaan.

Saddexagalka qumman ee muhiimka ah ee kale wuxuu leeyahay dhinac ku xiga (adjacent) oo dhererkiisu yahay 1 unit. Dhinaca iska soo horjeeda (opposite) ee saddexagalkan wuxuu leeyahay dherer $\tan(\theta)$.

Waxaad isticmaali kartaa isku ekaansho (similarity) u dhaxaysa saddexagal qumman oo kasta iyo mid ka mid ah saddexagalka qumman ee muhiimka ah si aad u hesho dhererka maqan.