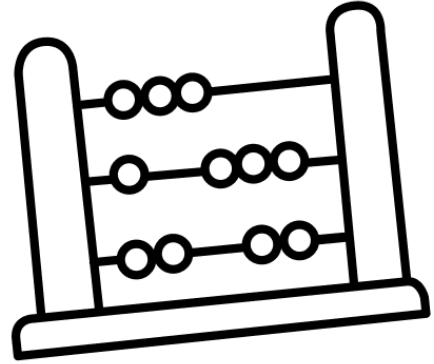


Saamiyada sine iyo cosine (Sine and cosine ratios)

Maths

Cutub: Trigonometry (Trigonometry)



Natiijo

Waxaan ka soo saari karaa saamiyada sine iyo cosine (sine and cosine ratios) dhinacyada saddexagalka qumman (right-angled triangle).

Erayada muhiimka ah

Hypotenuse (hypotenuse) waa dhinaca saddexagalka qumman (right-angled triangle) ee ka soo horjeeda xagasha qumman (right angle).

Dhinaca ku xiga (adjacent side) ee saddexagalka qumman (right-angled triangle) waa dhinaca ku xiga labada xagal ee qumman iyo xagasha calaamadsan.

Dhinaca ka soo horjeeda (opposite side) ee saddexagalka qumman (right-angled triangle) waa dhinaca ka soo horjeeda xagasha calaamadsan.

Saamiyada trigonometric (trigonometric ratios) waa saamiyo u dhexeeya laba dhinac oo ka mid ah saddexagalka qumman (right-angled triangle).

Qaabka casharka

Saamiyada sine iyo cosine (Sine and cosine ratios)



Shaxaha saamiyada (Ratio tables) iyo goobada halbeegga (unit circle)



Dhinaca ka soo horjeeda (opposite) iyo hypotenuse (hypotenuse)



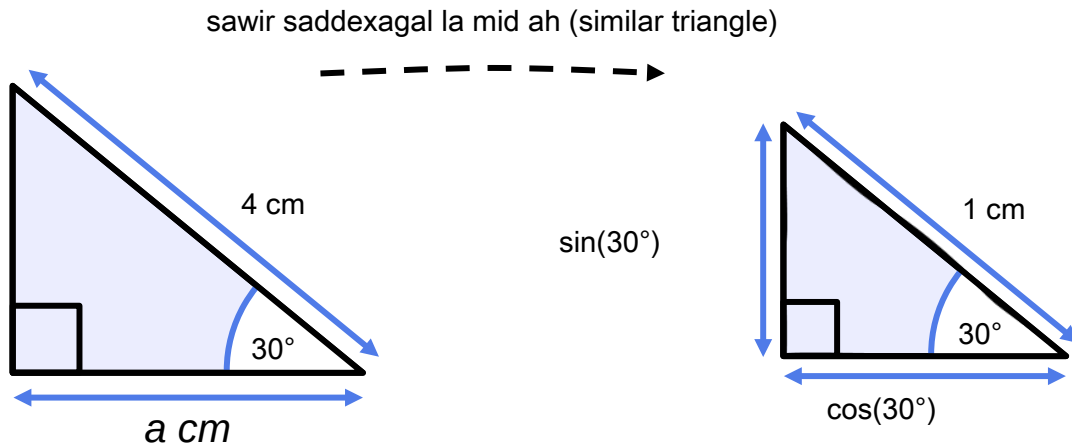
Dhinaca ku xiga (adjacent) iyo hypotenuse (hypotenuse)



Isticmaalka xisaabiyaha (calculator) iyada oo aan la helin goobada halbeegga (unit circle)

Haddii aad u baahan tahay inaad hesho dhererka dhinaca saddexagalka oo hypotenuse (hypotenuse) aysan ahayn 1...

Markaas waxaad sawiri kartaa saddexagal la mid ah (similar triangle) oo hypotenuse (hypotenuse) uu yahay 1.

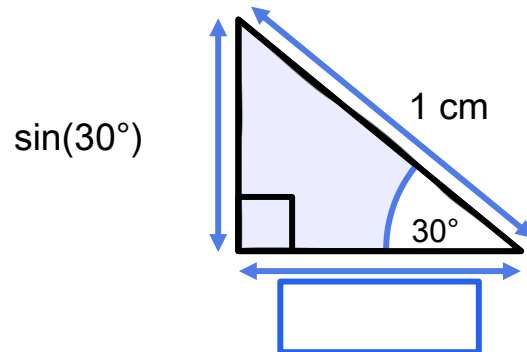
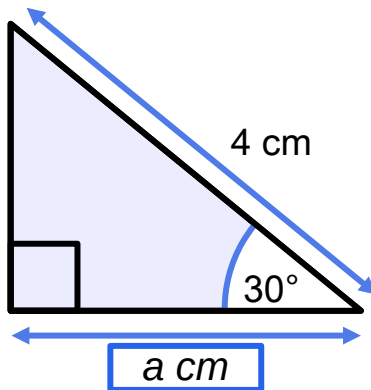


Jaantusyada saamiga (ratio tables) ee goobta wareegta (unit circle)

xagal (angle)	sine (sine)	cosine (cosine)	tangent (tangent)
0	0	1	0
5	0.087	0.996	0.087
10	0.174	0.985	0.176
15	0.259	0.966	0.268
20	0.342	0.94	0.364
25	0.423	0.906	0.466
30	0.5	0.866	0.577
35	0.574	0.819	0.7
40	0.643	0.766	0.839
45	0.707	0.707	1
50	0.766	0.643	1.192
55	0.819	0.574	1.428
60	0.866	0.5	1.732
65	0.906	0.423	2.145
70	0.94	0.342	2.747
75	0.966	0.259	3.732
80	0.985	0.174	5.671
85	0.996	0.087	11.43
90	1	0	∞

Isticmaal jaantuska qiimaha (trig values) si aad u hesho dhererka dhinaca u dhigma ee saddexagalka aad sawirtay.

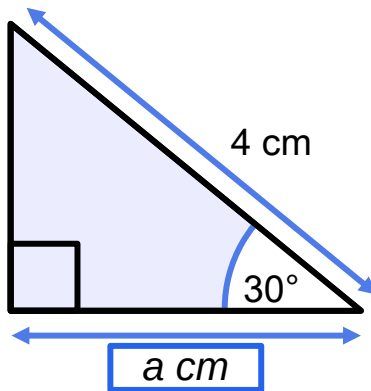
Waxaan dooneynaa inaan helno dhererka dhinaca ku xiga xagasha 30° iyo xagasha qumman (right angle).



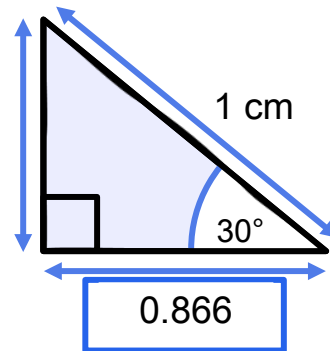
Jaantusyada saamiga (ratio tables) ee goobta wareegta (unit circle)

Hadda waxaan isticmaali karnaa sababaynta saamiga (proportional reasoning) si aan u helno dhererka dhinaca ku xiga ee saddexagalkeenii asalka ahaa.

hypotenuse (hypotenuse)	adjacent (adjacent)



$\sin(30^\circ)$



$\times 4$

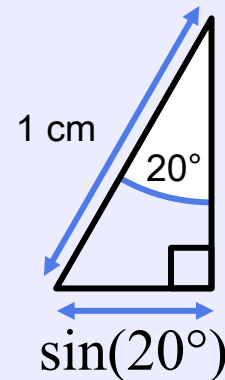
Miisaska saamiga (Ratio tables) ee goobada halbeegga (unit circle)



Hubi

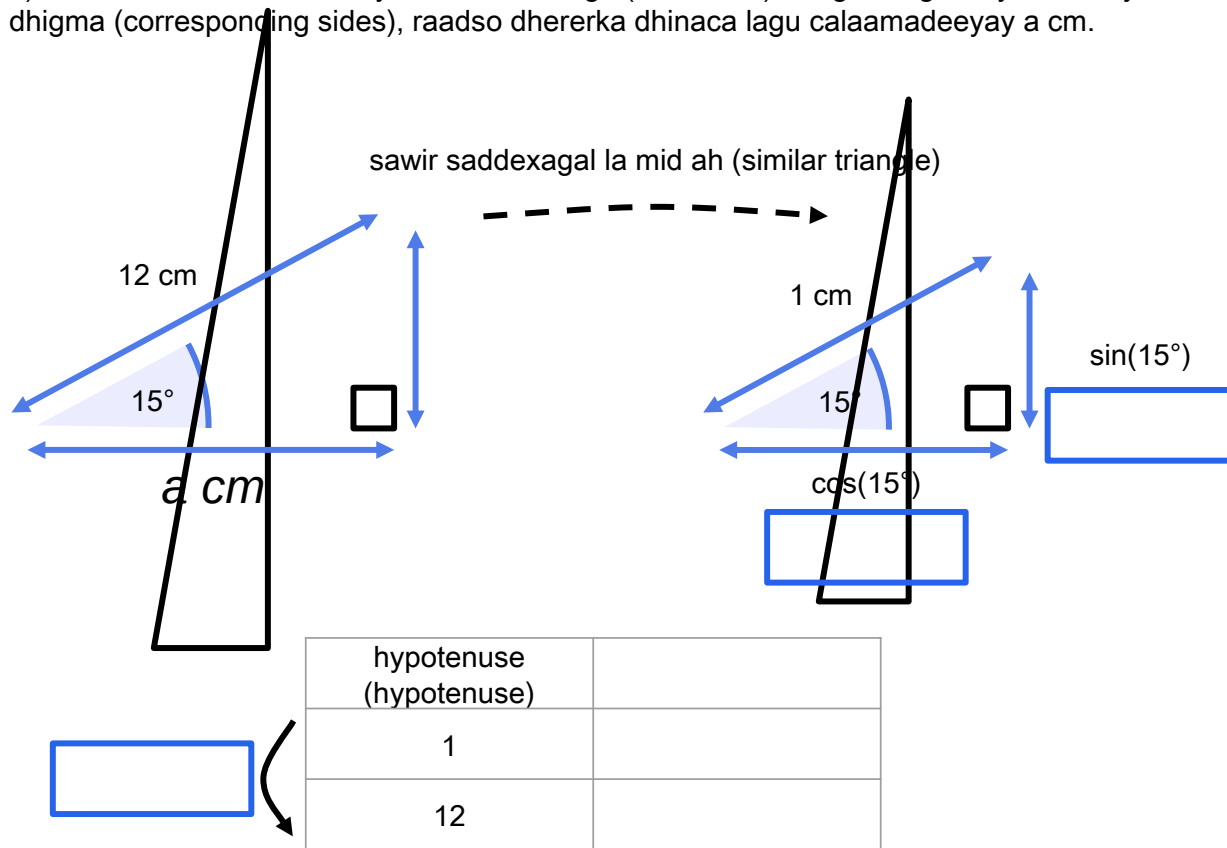
xagal (angle)	sine (sine)	cosine (cosine)	tangent (tangent)
0	0	1	0
5	0.087	0.996	0.087
10	0.174	0.985	0.176
15	0.259	0.966	0.268
20	0.342	0.94	0.364
25	0.423	0.906	0.466
30	0.5	0.866	0.577
35	0.574	0.819	0.7
40	0.643	0.766	0.839
45	0.707	0.707	1
50	0.766	0.643	1.192
55	0.819	0.574	1.428
60	0.866	0.5	1.732
65	0.906	0.423	2.145
70	0.94	0.342	2.747
75	0.966	0.259	3.732
80	0.985	0.174	5.671
85	0.996	0.087	11.43
90	1	0	∞

Isticmaal jaantuskan qiimaha (trig values), hel dhererka dhinaca lagu calaamadeeyay x cm ee saddexagalka la sawiray.



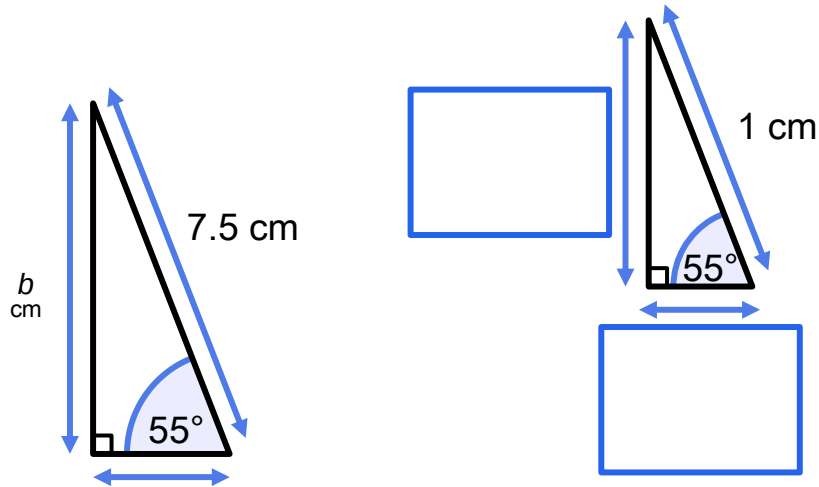
xagal (angle)	sine (sine)	cosine (cosine)	tangent (tangent)
0	0	1	0
5	0.087	0.996	0.087
10	0.174	0.985	0.176
15	0.259	0.966	0.268
20	0.342	0.94	0.364
25	0.423	0.906	0.466
30	0.5	0.866	0.577
35	0.574	0.819	0.7
40	0.643	0.766	0.839
45	0.707	0.707	1
50	0.766	0.643	1.192
55	0.819	0.574	1.428
60	0.866	0.5	1.732
65	0.906	0.423	2.145
70	0.94	0.342	2.747
75	0.966	0.259	3.732
80	0.985	0.174	5.671
85	0.996	0.087	11.43
90	1	0	∞

1) Buuxi meelaha bannaan iyo miiska saamiga (ratio table). Adigoo tixgelinaya dhinacyada u dhigma (corresponding sides), raadso dhererka dhinaca lagu calaamadeeyay a cm.

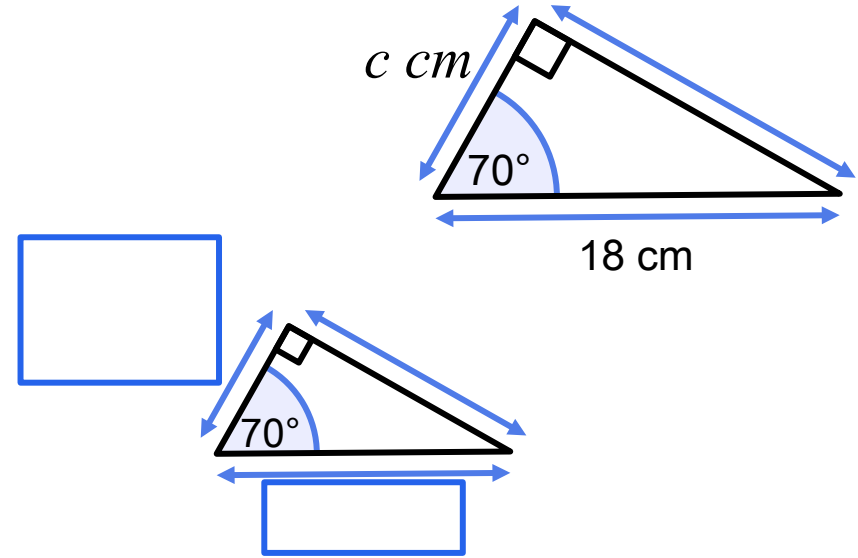


Hawsha A Jaantusyada saamiga (Ratio tables) ee goobta wareegta (unit circle)

2) Buuxi dhammaan meelaha bannaan iyo jaantusyada saamiga (ratio tables) si aad u hesho qiimaha (values) b iyo c adigoo tixgelinaya dhinacyada u dhigma (corresponding sides).



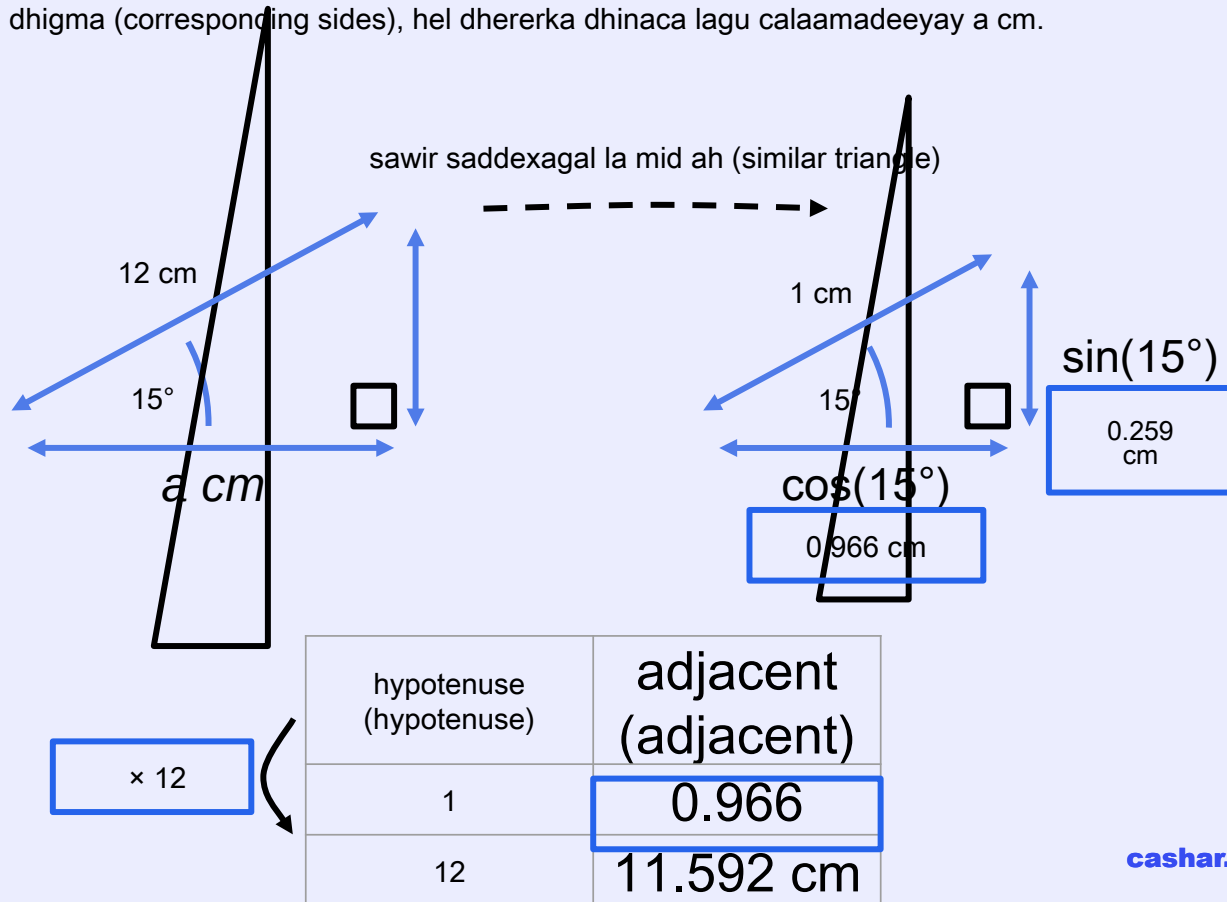
	hypotenuse	
	(hypotenuse)	
	1	
	7.5	



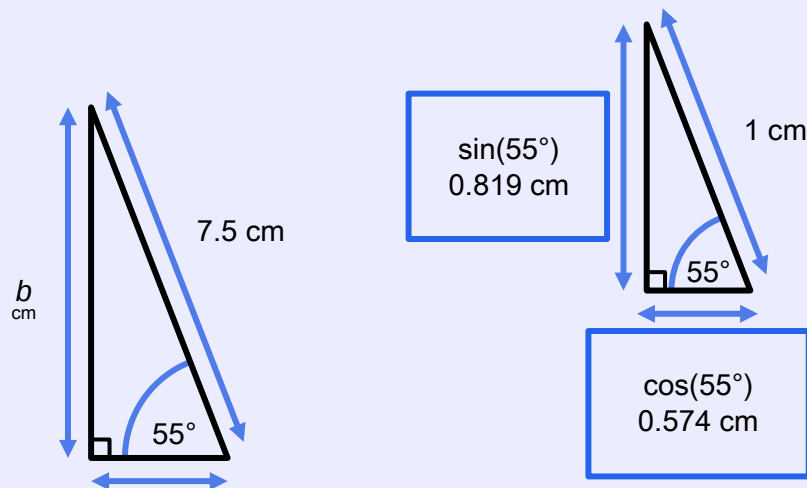
	hypotenuse	
	(hypotenuse)	
	1	
	18	

angle (angle)	sine (sine)	cosine (cosine)	tangent (tangent)
0	0	1	0
5	0.087	0.996	0.087
10	0.174	0.985	0.176
15	0.259	0.966	0.268
20	0.342	0.94	0.364
25	0.423	0.906	0.466
30	0.5	0.866	0.577
35	0.574	0.819	0.7
40	0.643	0.766	0.839
45	0.707	0.707	1
50	0.766	0.643	1.192
55	0.819	0.574	1.428
60	0.866	0.5	1.732
65	0.906	0.423	2.145
70	0.94	0.342	2.747
75	0.966	0.259	3.732
80	0.985	0.174	5.671
85	0.996	0.087	11.43
90	1	0	∞

1) Buuxi meelaha bannaan iyo shaxda saamiga (ratio table). Adigoo tixgelinaya dhinacyada u dhigma (corresponding sides), hel dhererka dhinaca lagu calaamadeeyay a cm.



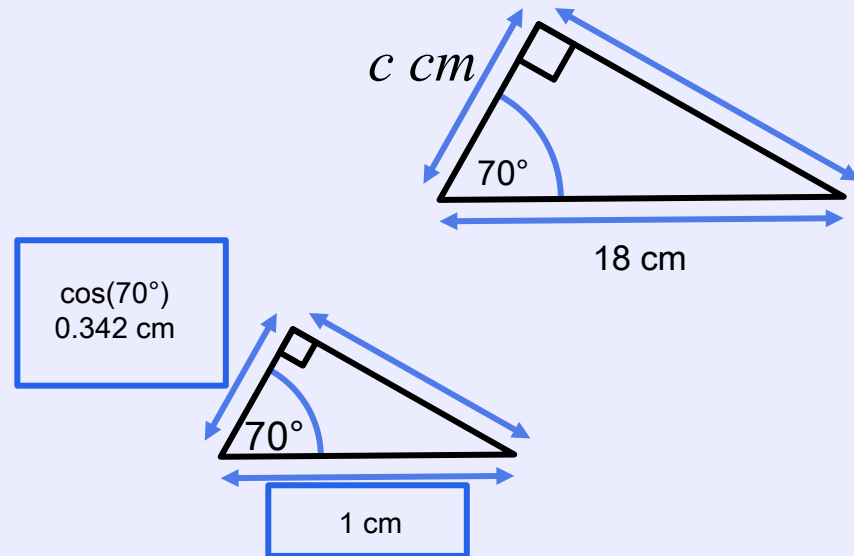
2) Buuxi dhammaan meelaha bannaan iyo shaxaha saamiga (ratio tables) si aad u hesho qiimaha (values) b iyo c.



× 7.5

{

hypotenuse (hypotenuse)	opposite (opposite)
1	0.819
7.5	6.1425



× 18

{

hypotenuse (hypotenuse)	adjacent (adjacent)
1	0.342
18	6.156

Qaabka casharka

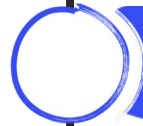
Saamiyada sine iyo cosine (Sine and cosine ratios)



Shaxda saamiga (Ratio tables) ee goobada cutubka (unit circle)



Dhinaca ka soo horjeeda (opposite) iyo jibaabka (hypotenuse)



Dhinaca ku xiga (adjacent) iyo jibaabka (hypotenuse)



Isticmaalka xisaabiyaha (calculator) la'aanteed goobada cutubka (unit circle)

Dhinaca ka soo horjeeda (opposite) iyo jibaabka (hypotenuse)



Sharaxaad

Miyaanay macnaheedu in dhammaan dhinacyada kale ay sidoo kale lagu dhufto isla factor-ka (scale factor)?

Marka qodobka (scale factor) u dhexeeya waa had iyo jeer jibaabka (hypotenuse) saddex-xagalka kale!

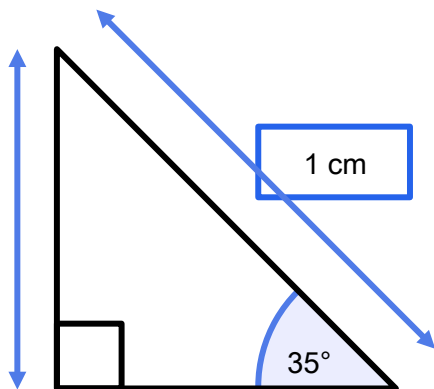


Yacquub

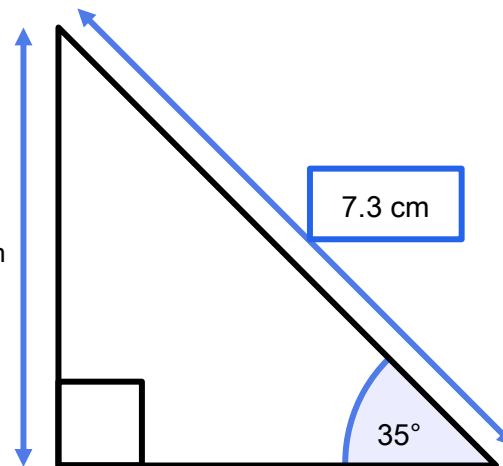


Isra

$\times 7.3$



$7.3 \times 0.574 \text{ cm}$

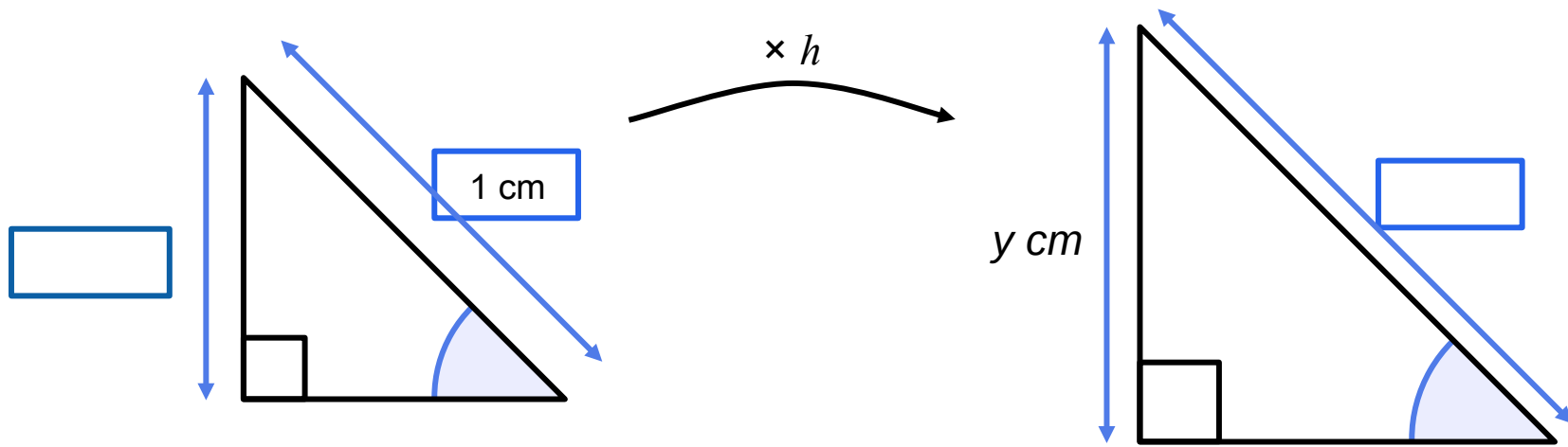


Dhinaca ka soo horjeeda iyo hypotenuse-ka

Qaabka (pattern) Isra ay ogaatay wuxuu u shaqeeyaa dhammaan saddexagalka qumman (right-angled) ee la midka ah (similar) kan goobada halbeegga (unit circle).

Saddexagalkan wuxuu yeelan karaa hypotenuse dherer kasta (aan ku qoro h),

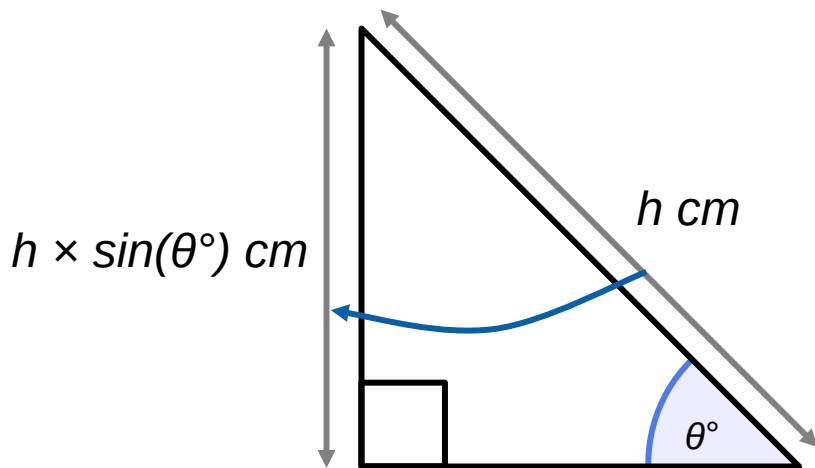
markaas dhinaca ka soo horjeeda xagasha θ° wuxuu noqon doonaa $h \times \sin(\theta^\circ)$.



Dhinaca ka soo horjeeda iyo hypotenuse-ka

Dhinaca ka soo horjeeda xagal (oo leh cabbir θ°) ee saddexagal qumman (right-angled) had iyo jeer waa $\sin(\theta^\circ)$ lagu dhuftay dhererka hypotenuse-ka.

$$\text{dhinaca ka soo horjeeda} = h \times \sin(\theta^\circ)$$



Waxa kale oo aad ku heli kartaa natijada isla markaas adiga oo tixgelinaya xiriirka isku dhufashada (multiplicative) ee u dhexeeya hypotenuse-ka iyo dhinacyada ka soo horjeeda.



Isra

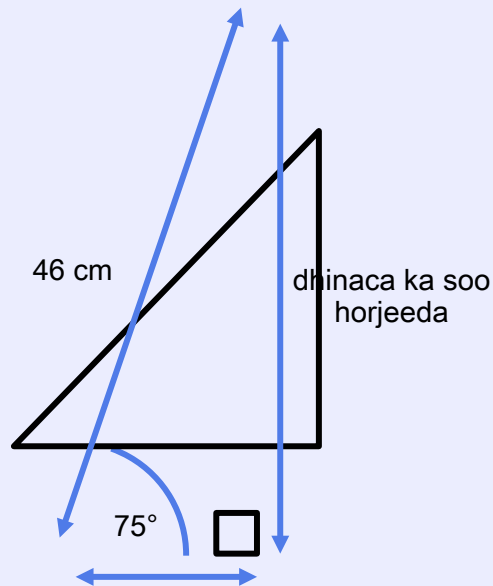
Dhinaca ka soo horjeeda iyo hypotenuse-ka

Adigoo isticmaalaya xiriirkan, soo hel qiimaha (value) ay tahay in la geliyo meelahan bannaan.

$$\text{dhinaca ka soo horjeeda} = \text{hypotenuse} \times \sin(\text{angle})$$

$$\text{dhinaca ka soo horjeeda} = h \times \sin(\theta^\circ)$$

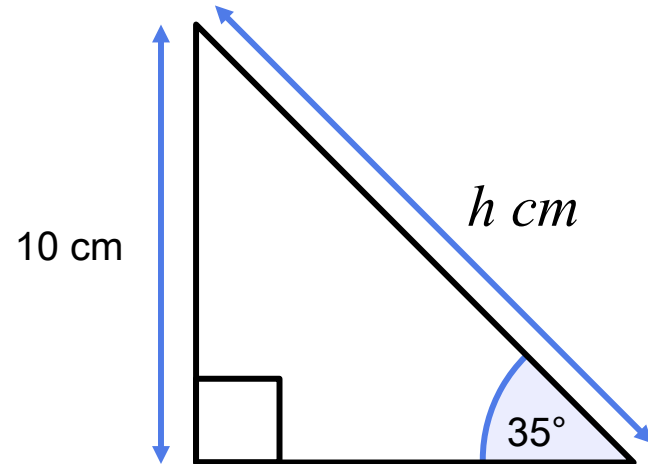
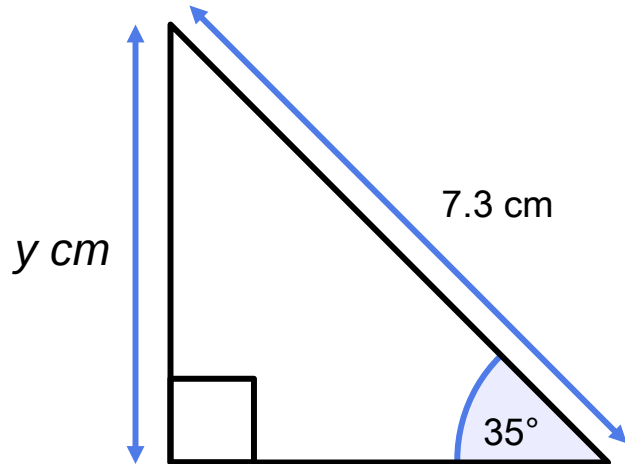
Sidaas awgeed, soo hel dhererka dhinaca ka soo horjeeda xagasha 75° .



...laakiin, ma suurto gal tahay in la helo dhererka hypotenuse-ka haddii aan ognahay xagal iyo dhererka dhinaca ka soo horjeeda?



Yacquub



Waa suurtoagal in la helo dhererka hypotenuse-ka haddii aan ognahay:

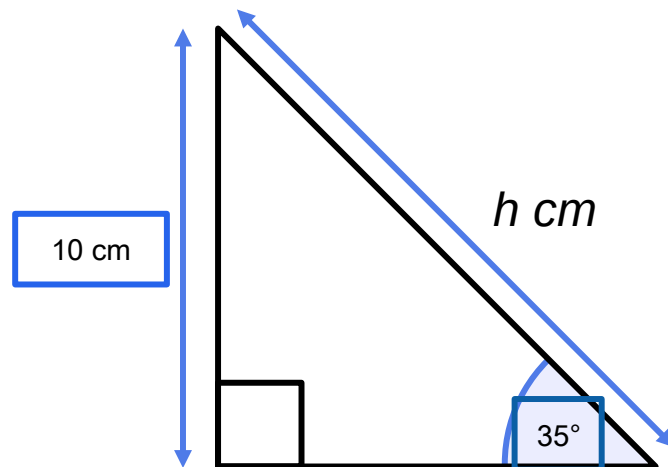
- xagal kale oo ku yaal saddexagalka qumman (right-angled triangle)
- dhererka dhinaca ka soo horjeeda xagashan

Waxaan tan ku samayn karnaa annagoo ku beddelaya qiimaha (value) la yaqaan ee saddex-xagalka, oo dib u habeyn ku sameynayna isla'egta aan ku dhammaanayno.

dhinaca ka soo horjeeda (opposite side) = $h \times \sin(\theta^\circ)$

$10 = h \times 0.574$

$h = \frac{10}{0.574}$



Dhinaca ka soo horjeeda (opposite) iyo hypotenuse



Hubi

Adigoo isticmaalaya xiriirkan, hel qiimaha (values) ee waa in ay galaan meelahan bannaan.

$$\text{dhinaca ka soo horjeeda (opposite side)} = h \times \sin(\theta^\circ)$$

$$\boxed{} = h \times \sin()$$

a

$$\boxed{}$$

b

Waa maxay qiimaha (value) ee gala meelahan bannaan?

$$46 = h \times \sin(75^\circ)$$

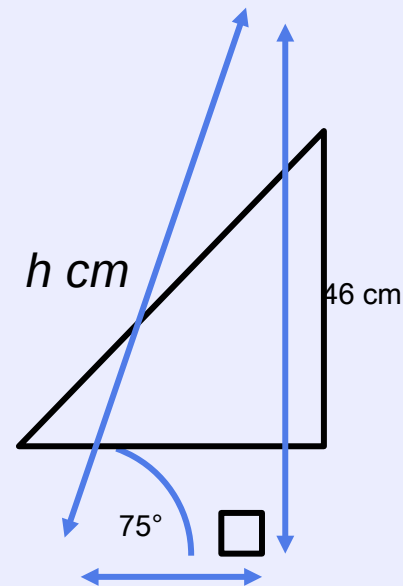
$$\boxed{0.966}$$

c

$$\boxed{0.966}$$

d

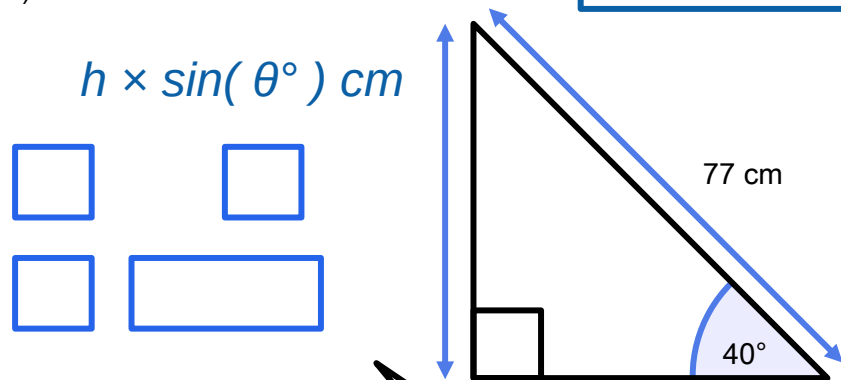
Waxaan isticmaali karnaa shaxda qiimaha (table of values) si aan u aragno in $\sin(75^\circ)$ uu leeyahay qiime (value) ah 0.966



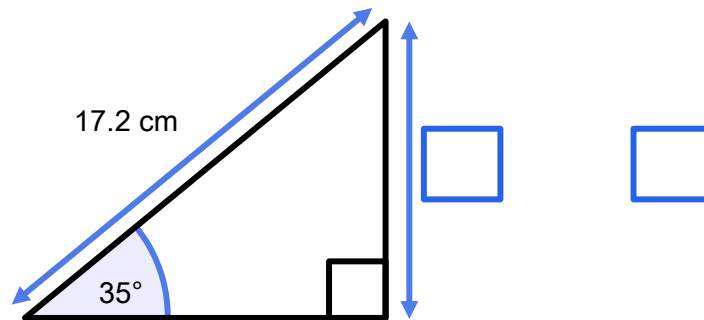
1) Hel dhererka dhinaca ka soo horjeeda (opposite side) xagasha calaamadsan adigoo isticmaalaya xiriirkan.

$$\text{dhinaca ka soo horjeeda (opposite side)} = h \times \sin(\theta^\circ)$$

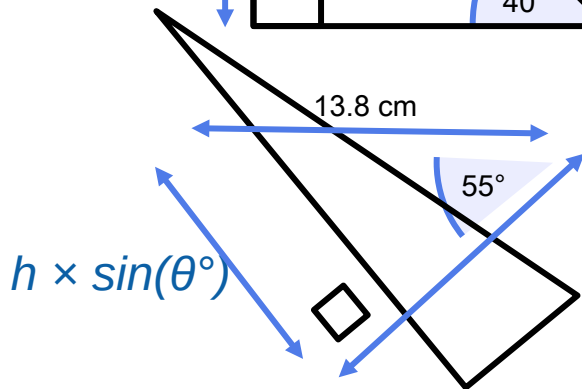
a)



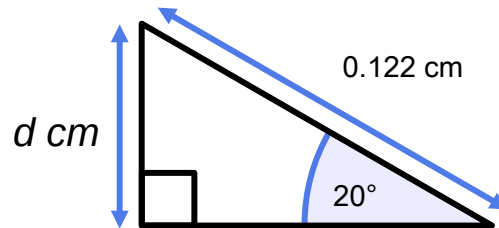
b)



c)

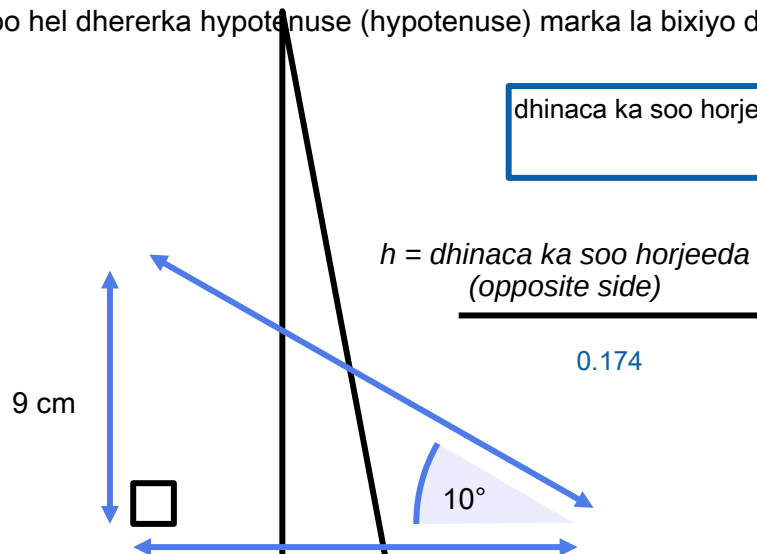


d)



2) Soo hel dhererka hypotenuse (hypotenuse) marka la bixiyo dhinaca ka soo horjeeda xagasha la calaamadeeyay.

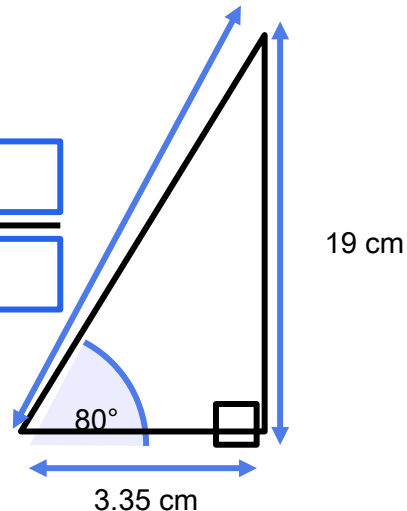
a)



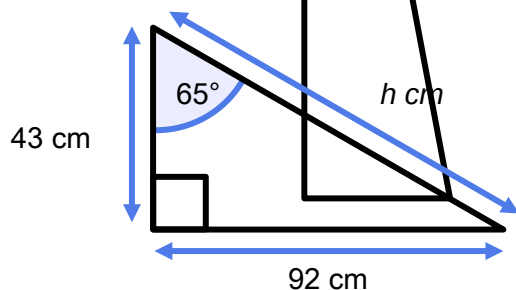
$$\text{dhinaca ka soo horjeeda (opposite side)} = h \times \sin(\theta^\circ)$$

b)

$h =$



c)



d) Saddex-xagal qumman (right-angled triangle) wuxuu leeyahay xagal 85°.

Dhererka dhinaca ka soo horjeeda xagashan waa 142 cm.

1) Soo hel dhererka dhinaca ka soo horjeeda xagasha la calaamadeeyay adigoo isticmaalaya xiriirkan.

$$\text{dhinaca ka soo horjeeda (opposite side)} = h \times \sin(\theta^\circ)$$

a)

$$h \times \sin(\theta^\circ) \text{ cm}$$

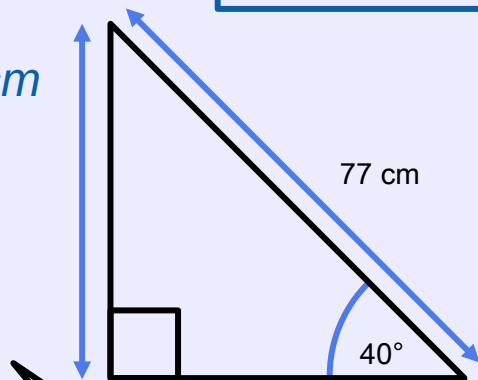
77

40

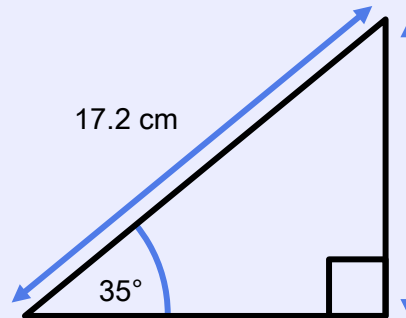
77

0.643

$$= 49.511 \text{ cm}$$



b)



17.2

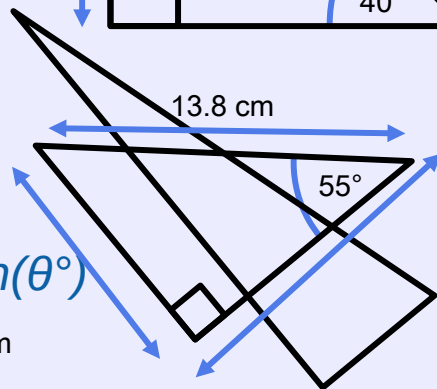
35

$$= 9.8728 \text{ cm}$$

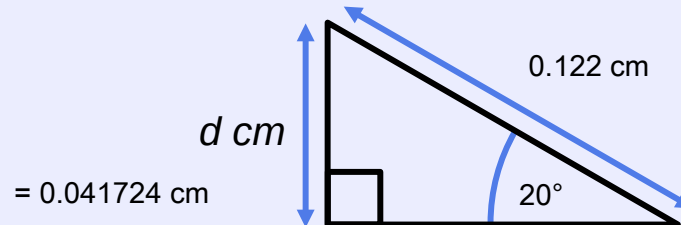
c)

$$h \times \sin(\theta^\circ)$$

$$= 11.3022 \text{ cm}$$



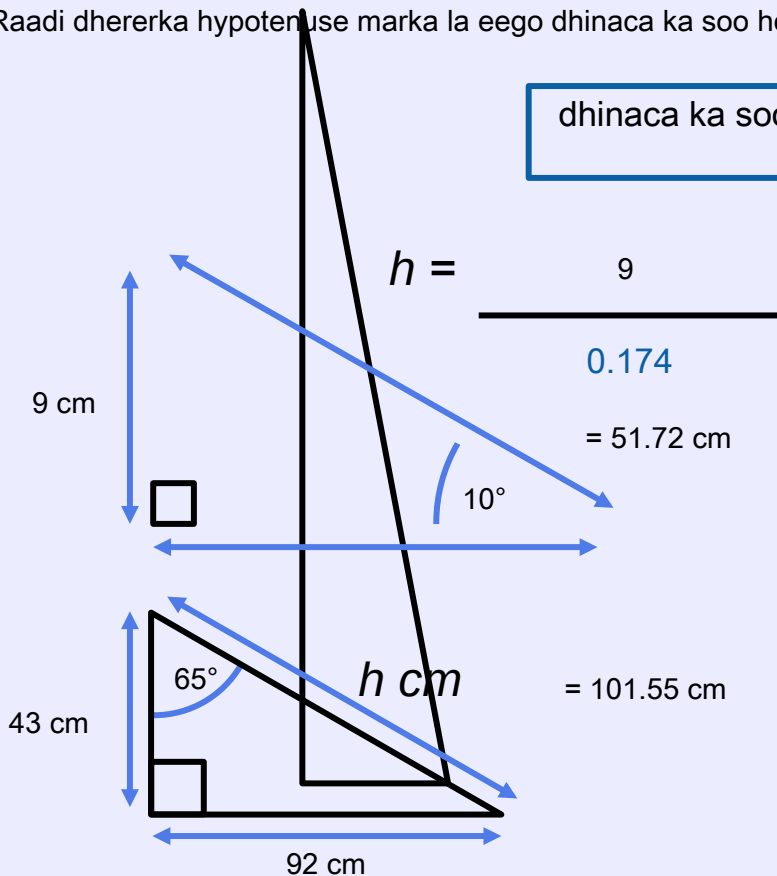
d)



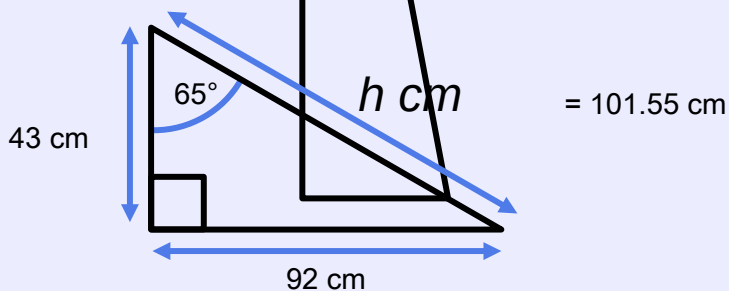
$$= 0.041724 \text{ cm}$$

2) Raadi dhererka hypotenuse marka la eego dhinaca ka soo horjeeda xagasha calaamadeysan.

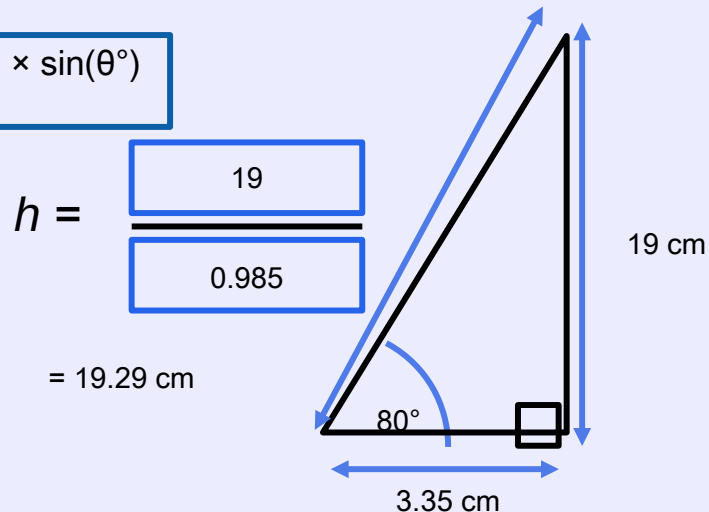
a)



c)



b)



d) Saddex-xagal qumman wuxuu leeyahay xagal 85° .
Dhererka dhinaca ka soo horjeeda xagashan waa 142 cm.

$$= 142.57 \text{ cm}$$

Qaabka casharka

Saamiyada sine iyo cosine (Sine and cosine ratios)



Shaxda saamiga (Ratio tables) ee goobada halbeegga (unit circle)



Dhinaca ka soo horjeeda (opposite) iyo hypotenuse-ka



Dhinaca ku xiga (adjacent) iyo hypotenuse-ka

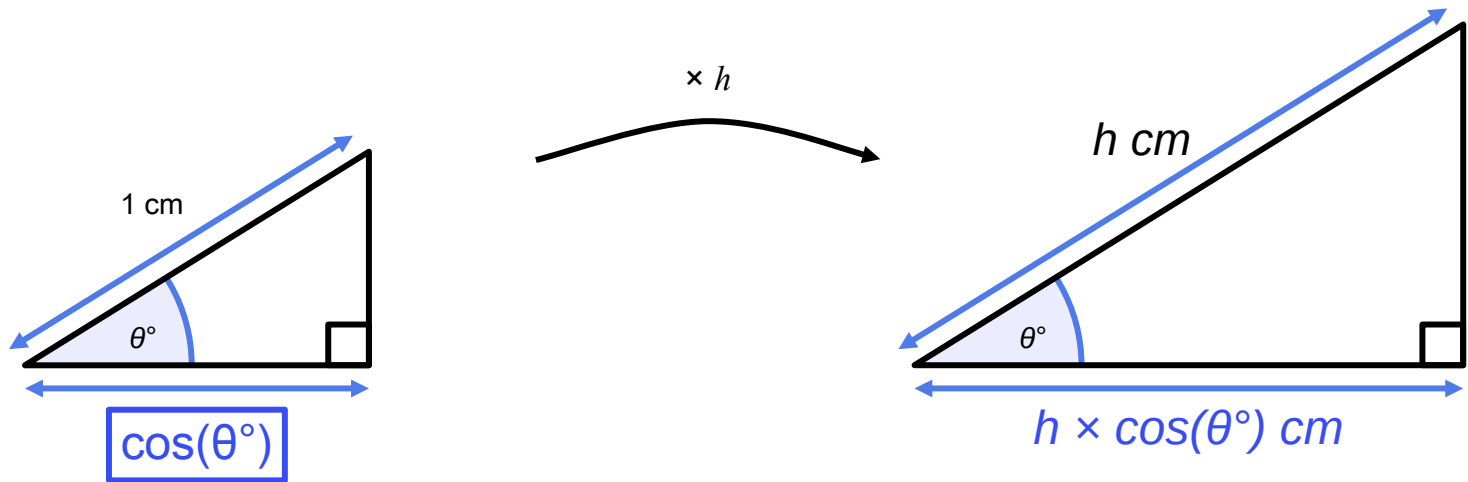


Isticmaalka xisaabiyaha (calculator) iyada oo aan la helin goobo halbeeg (unit circle)

Dhinaca ku xiga (adjacent) iyo hypotenuse-ka

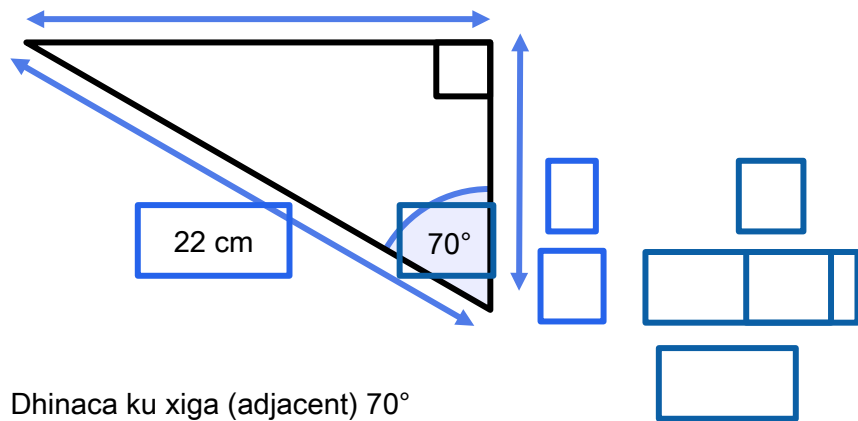
Dhinaca ku xiga xagasha (angle θ°) ee saddex-xagalka qumman (right-angled triangle) waa had iyo jeer $\cos(\theta^\circ)$ oo lagu dhufatay dhererka hypotenuse-ka.

$$\text{dhinaca ku xiga (adjacent side)} = h \times \cos(\theta^\circ)$$



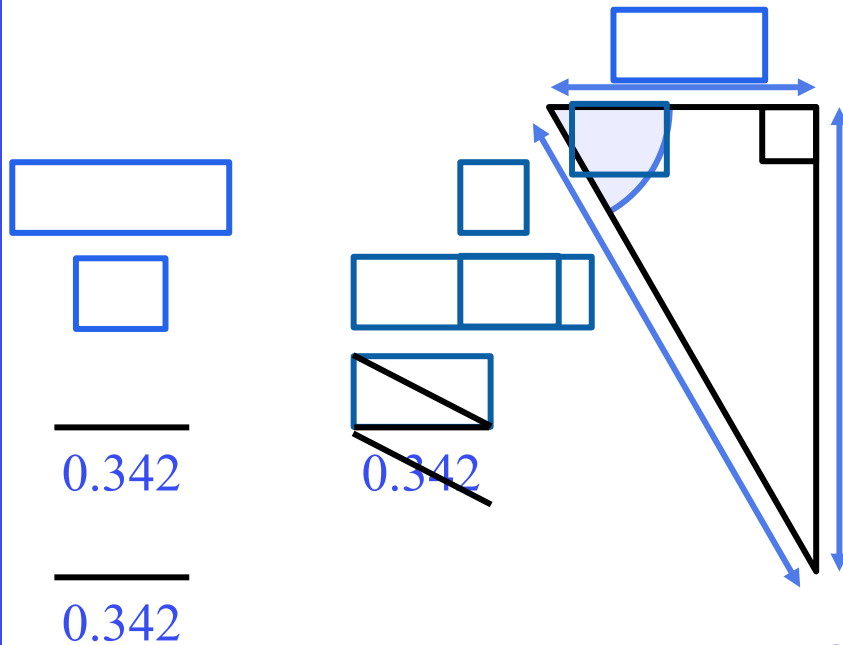
Dhinaca ku xiga (adjacent) iyo hypotenuse-ka

Haddii aan ognahay hypotenuse-ka iyo xagal (angle), waxaan heli karnaa dhererka dhinaca ku xiga xagashaas iyo xagasha qumman (right-angle).



Dhinaca ku xiga (adjacent) 70° iyo xagasha qumman (right-angle) waa 7.524 cm.

Haddii aan ognahay xagal (angle) iyo dhererka dhinaca ku xiga (adjacent) xagashaas iyo xagasha qumman (right-angle), waxaan heli karnaa dhererka hypotenuse-ka.



Dhinaca ku xiga (adjacent) iyo hypotenuse-ka



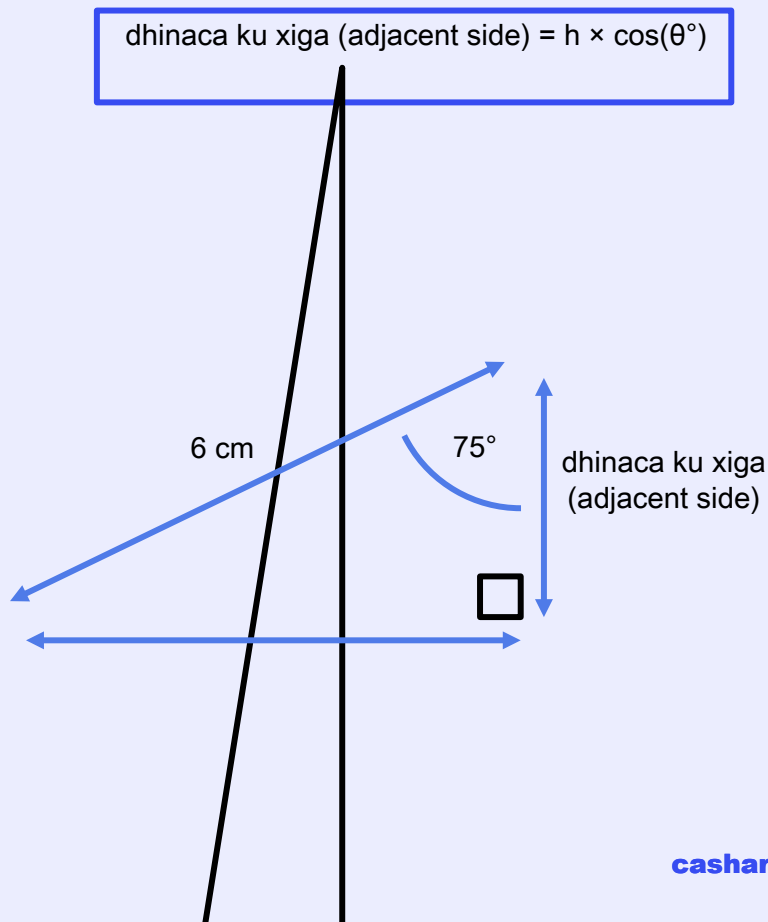
Hubi

Adigoo isticmaalaya xiriirkan, hel qiimaha (values) ee tahay inay galaan meelahan bannaan.

$$\text{dhinaca ku xiga (adjacent side)} = \times \cos()$$

a **b**

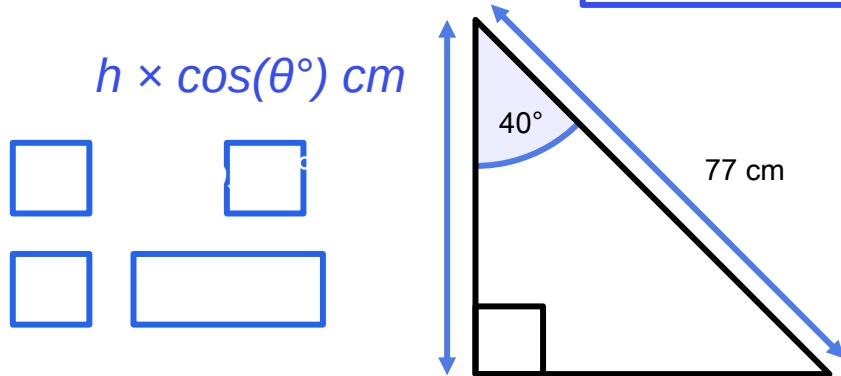
Sidaa awgeed, hel dhererka dhinaca ku xiga (adjacent) xagasha 75° iyo xagasha qumman (right-angle).



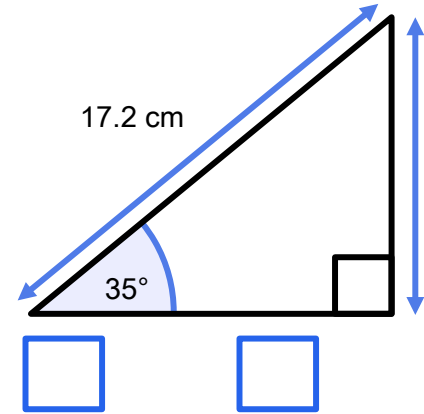
1) Hel dhererka dhinaca ku xiga (adjacent) xagasha calaamadeysan adigoo isticmaalaya xiriirkan.

$$\text{dhinaca ku xiga (adjacent side)} = h \times \cos(\theta^\circ)$$

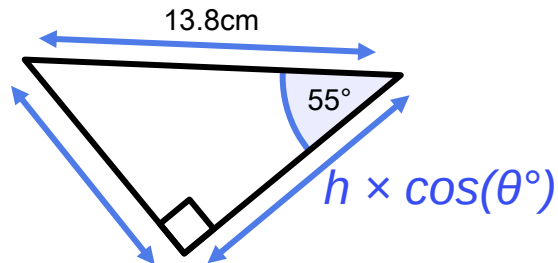
a)



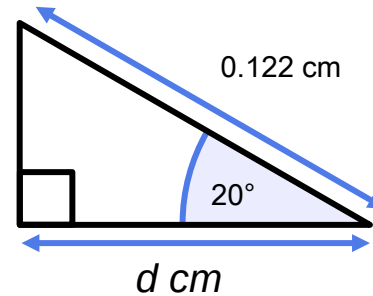
b)



c)



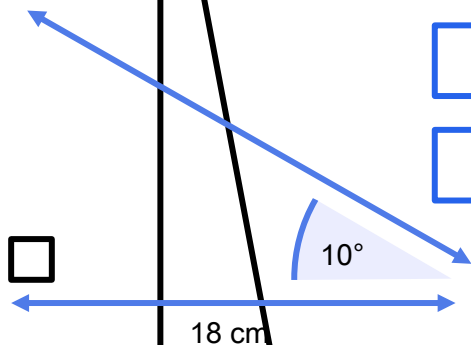
d)



2) Soo hel dhererka hypotenuse (hypotenuse) marka la siiyo dhinaca ku xiga xagasha la calaamadeeyay.

$$\text{dhinaca ku xiga (adjacent side)} = h \times \cos(\theta^\circ)$$

a)



$$\boxed{} = h \times \cos()$$

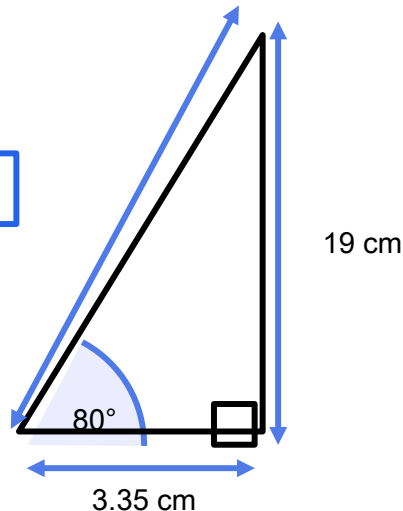
$$\boxed{} = h \times$$

$$\boxed{}$$

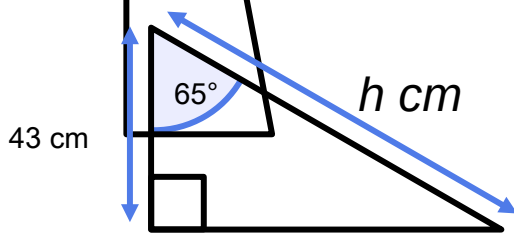
b) $\boxed{} = h \times \cos()$

$$\boxed{}$$

$$\boxed{}$$



c)



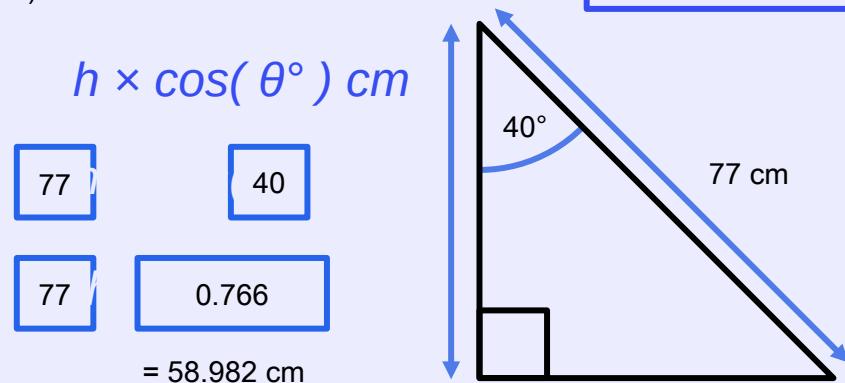
d) Saddex-xagal qumman (right-angled triangle) wuxuu leeyahay xagal 35° .

Dhererka dhinaca ku xiga (adjacent) xagashan iyo xagasha qumman (right-angle) waa 142 cm.

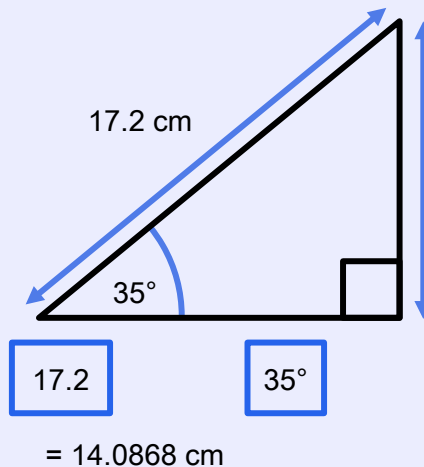
1) Soo hel dhererka dhinaca ku xiga (adjacent) xagasha la calaamadeeyay adigoo isticmaalaya xiriirkan.

$$\text{dhinaca ku xiga (adjacent side)} = h \times \cos(\theta^\circ)$$

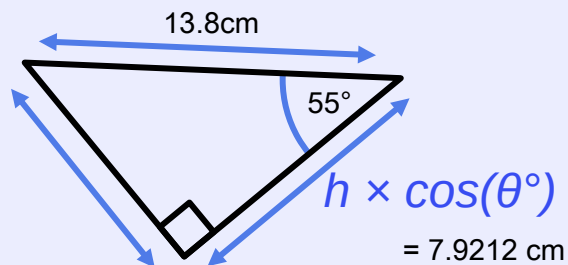
a)



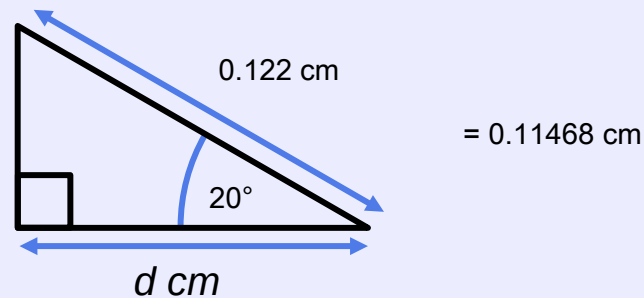
b)



c)

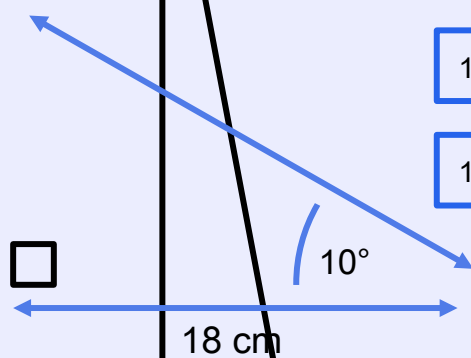


d)



2) Raadi dhererka hypotenuse marka la eego dhinaca ku xiga xagasha la calaamadeeyay.

a)



$$\text{dhinaca ku xiga} = h \times \cos(\theta^\circ) \quad b)$$

$$18 = h \times \cos(10^\circ)$$

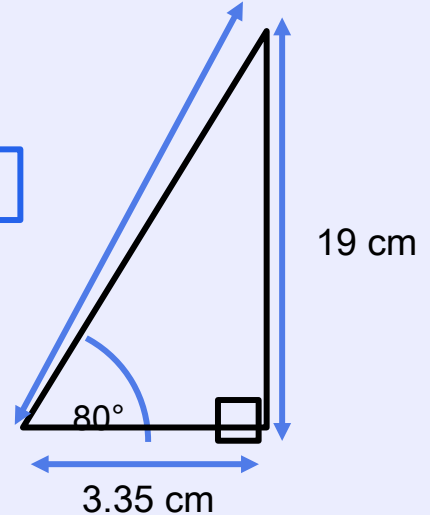
$$18 = h \times 0.985$$

$$h = 18.27 \text{ cm}$$

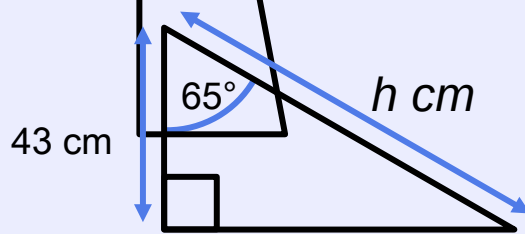
$$3.35 = h \times \cos(80^\circ)$$

$$3.35 = h \times 0.1736$$

$$h = 19.25 \text{ cm}$$



c)



$$h = 101.65 \text{ cm}$$

d) Saddex-xagal qumman wuxuu leeyahay xagal 35° .

Dhererka dhinaca ku xiga xagashan iyo xagasha qumman waa 142 cm.

$$h = 173.38 \text{ cm}$$

Qaabka casharka

Saamiyada sine iyo cosine (sine and cosine ratios)



Jaantusyada saamiga (ratio) ee goobada cutubka (unit circle)



Dhinaca ka soo horjeeda (opposite) iyo jibaabka (hypotenuse)



Dhinaca ku xiga (adjacent) iyo jibaabka (hypotenuse)



Isticmaalka xisaabiyaha (calculator) iyada oo aan lahayn goob cutub (unit circle)

Isticmaalka xisaabiyaha (calculator) iyada oo aan lahayn goob cutub (unit circle)



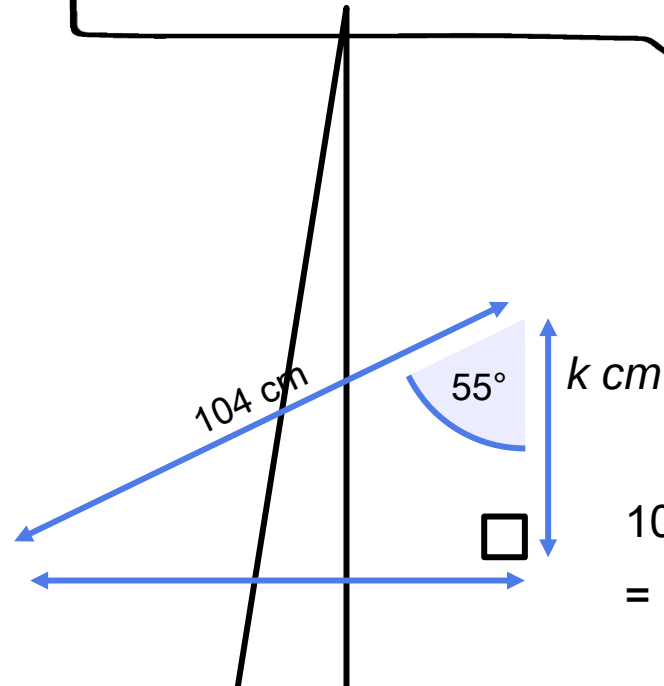
Sharaxaad

xagal (angle)	sine (sine)	cosine (cosine)	tangent (tangent)
0	0	1	0
5	0.087	0.996	0.087
10	0.174	0.985	0.176
15	0.259	0.966	0.268
20	0.342	0.94	0.364
25	0.423	0.906	0.466
30	0.5	0.866	0.577
35	0.574	0.819	0.7
40	0.643	0.766	0.839
45	0.707	0.707	1
50	0.766	0.643	1.192
55	0.819	0.574	1.428
60	0.866	0.5	1.732
65	0.906	0.423	2.145
70	0.94	0.342	2.747
75	0.966	0.259	3.732
80	0.985	0.174	5.671
85	0.996	0.087	11.43
90	1	0	∞

Waxaan si fudud u heli karaa dhererka k.



Yacquub



$$104 \times 0.574 = 59.70$$

Isticmaalka xisaabiyaha (calculator) iyada oo aan lahayn goobo (unit circle)



Sharaxaad

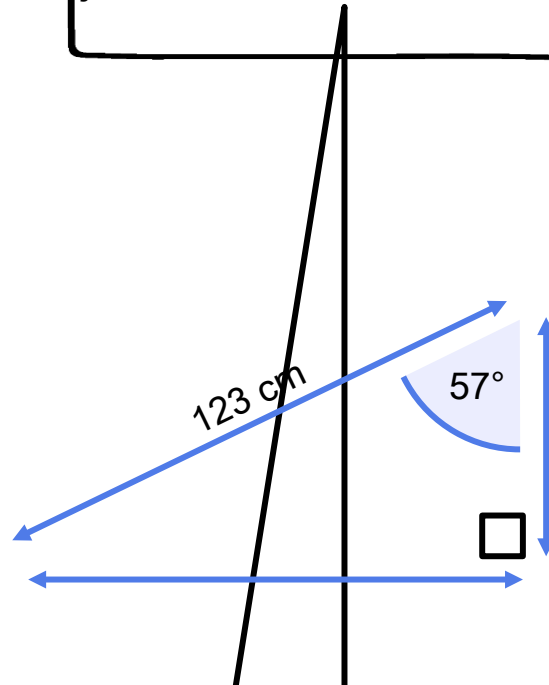
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0	0	1	0
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Laakin sidee aan u heli karaa dhererka dhinacan?

Waan ogahay inay noqon doonto $123 \times \cos(57^\circ)$, laakiin $\cos(57^\circ)$ kuma jiro jaantuskan?



Yacquub

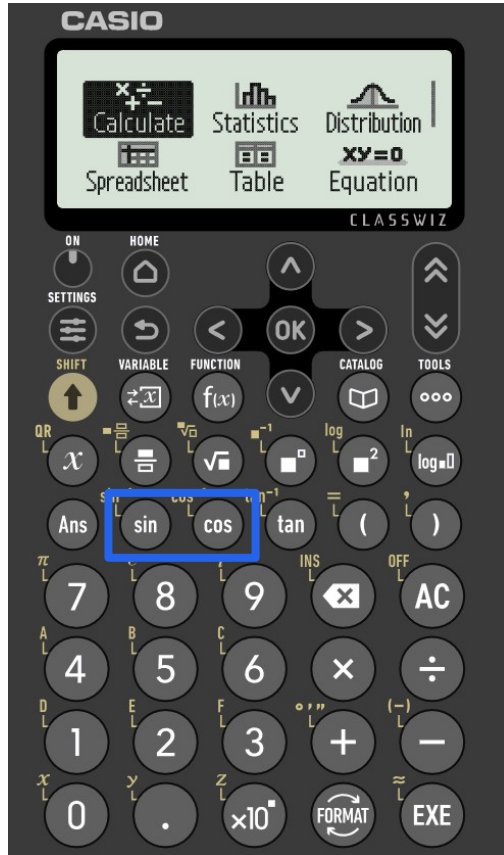


$m \text{ cm}$

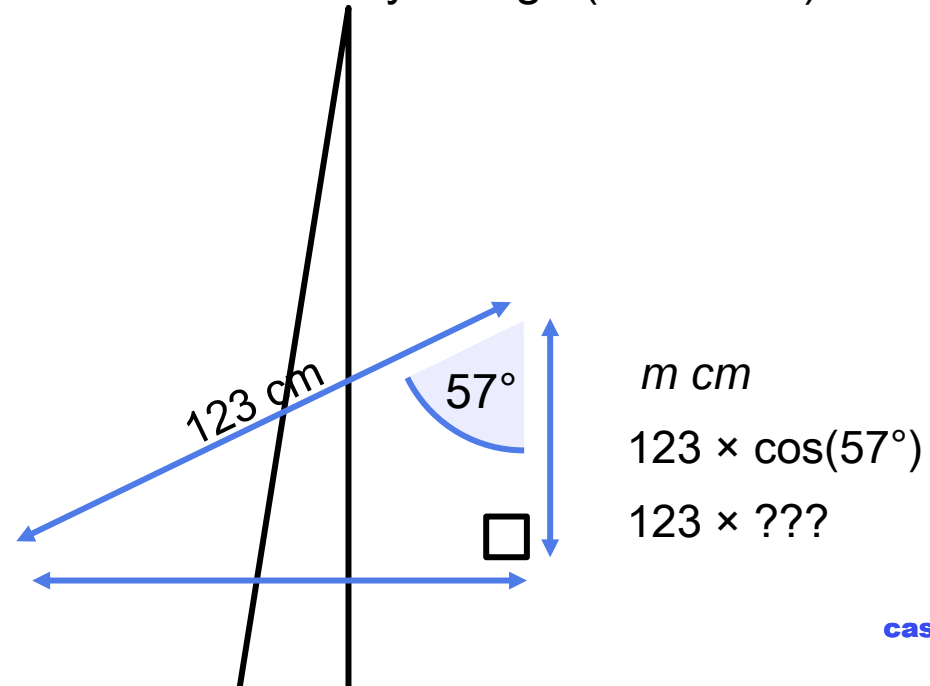
$123 \times \cos(57^\circ)$

$123 \times ???$

Isticmaalka xisaabiyaha (calculator) iyada oo aan lahayn goobo (unit circle)



Qiimaha (value) $\sin(\theta^\circ)$ ama $\cos(\theta^\circ)$ waxaa laga heli karaa xagal (angle) kasta adigoo isticmaalaya mid ka mid ah badhamadan xisaabiyahaaga (calculator).



Isticmaalka xisaabiyaha (calculator) oo aan lahayn goobo halbeeg (unit circle)



Laakiin marka hore, waxaad u baahan tahay inaad hubiso in xisaabiyahaagu (calculator) ku jiro qaabka (mode) saxda ah si uu ula shaqeeyo xaglaha (angles) lagu qiyaasay darajooyin (degrees).

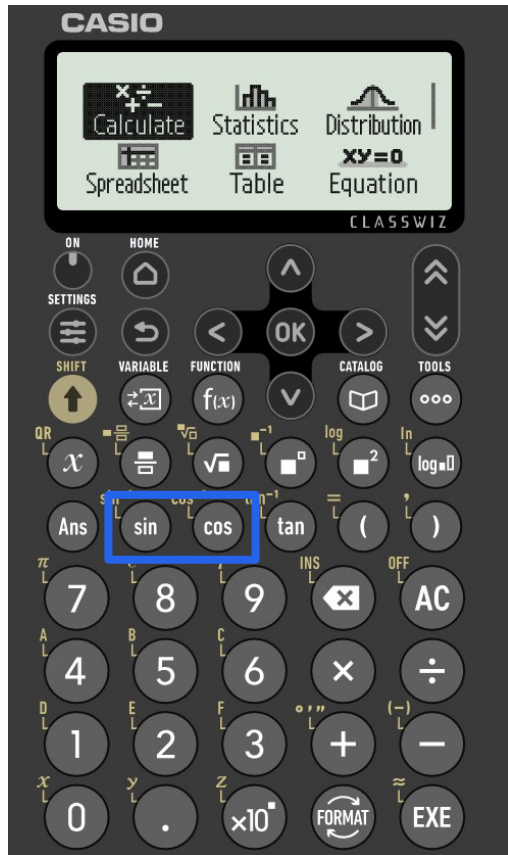


Riix badhanka dejinta (settings) oo dooro dejinta xisaabiyaha (calc settings).

Dooro halbeegga xagasha (angle unit) oo hubi in degree la doortay, ma aha radian ama gradian.

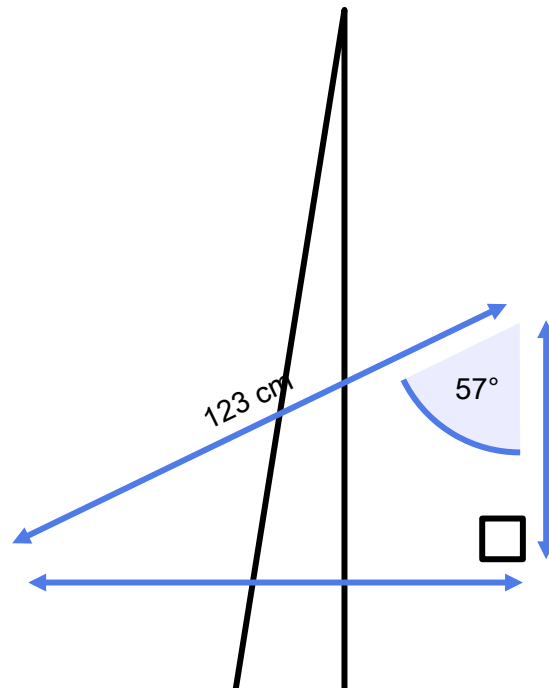
Riix OK si aad u xaqiijiso doorashadaada.





Qiimaha (value) $\sin(\theta^\circ)$ ama $\cos(\theta^\circ)$ waxaa laga heli karaa xagal (angle) kasta adigoo isticmaalaya mid ka mid ah badhannadan ku yaal xisaabiyahaaga (calculator).

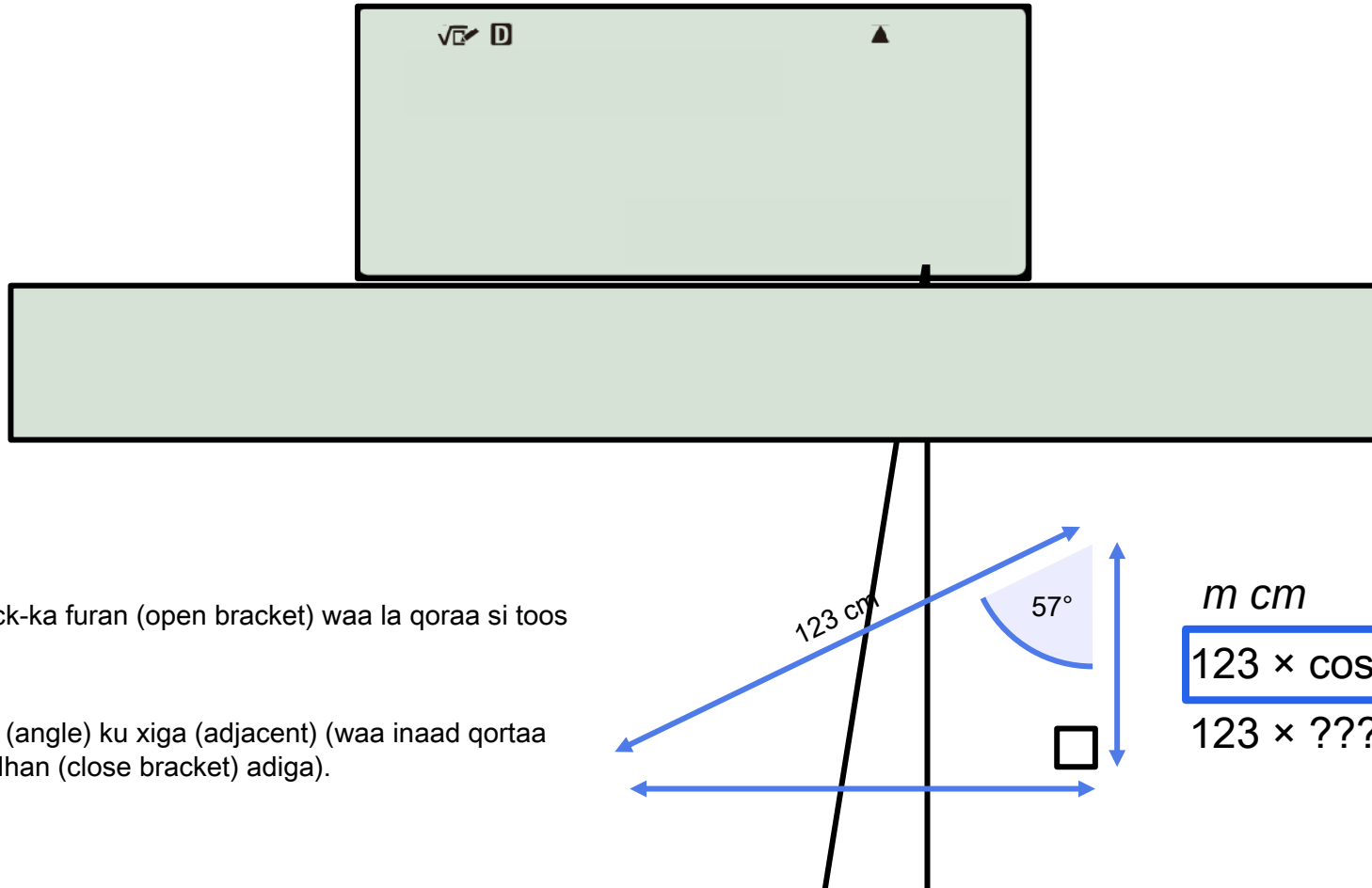
Hadda oo aad ogtahay in xisaabiyahaagu (calculator) uu shaqeyn doono xaglo (angles) lagu qiyaasay darajooyin (degrees), sidee u isticmaali kartaa xisaabiyaha (calculator) si aad u hesho dhererka (length) dhinaca (side) ku xiga xagasha toosan (right-angle) iyo xagasha 57° ?



$m \text{ cm}$

$$123 \times \cos(57^\circ)$$

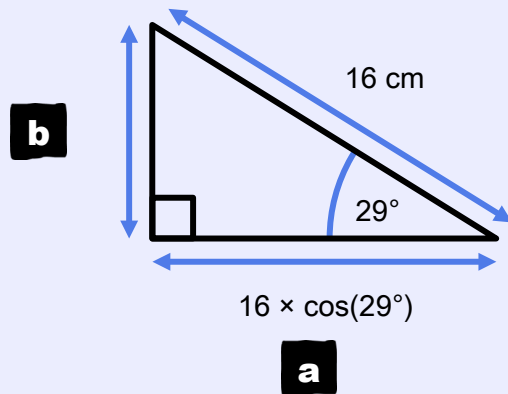
$$123 \times ???$$



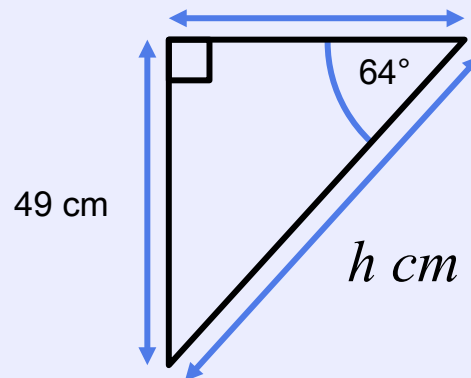
cosine (brack-ka furan (open bracket) waa la qoraa si toos ah)

ee xagasha (angle) ku xiga (adjacent) (waa inaad qortaa brack-ka xidhan (close bracket) adiga).

Adigoo isticmaalaya xisaabiye (calculator), soo hel dhererrada (lengths) labada dhinac (sides) ee saddex-xagalkan (triangle) oo loo qoro a iyo b (3 d.p.)



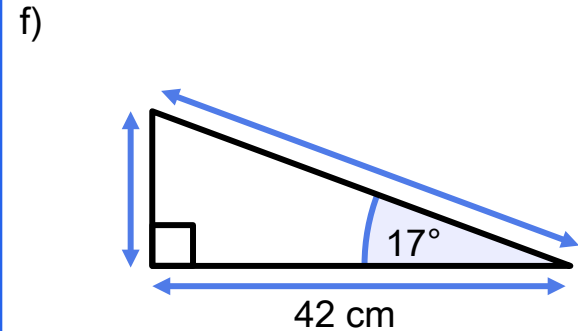
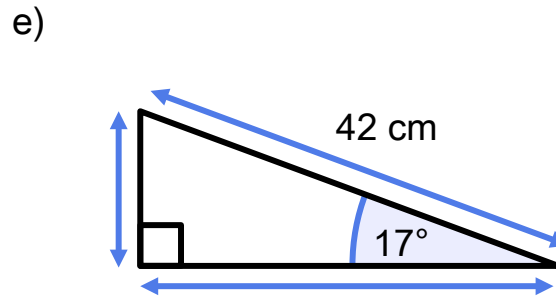
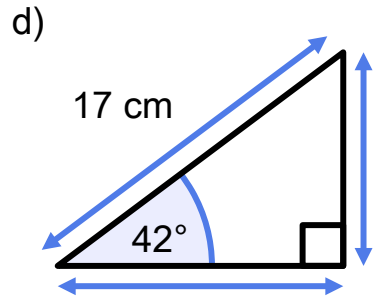
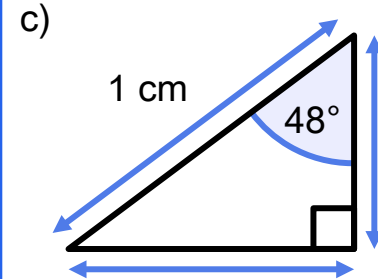
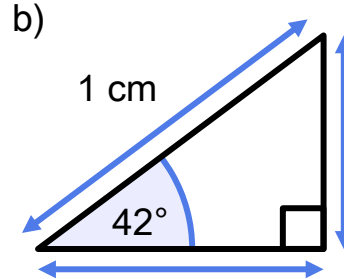
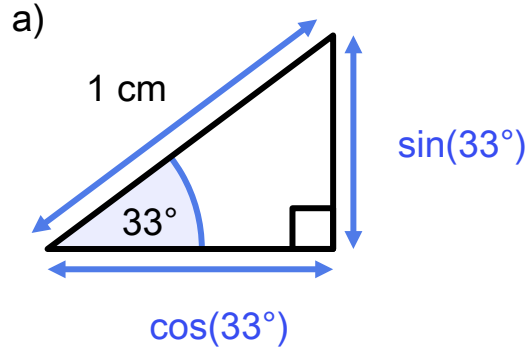
Isticmaal xisaabiyaha, raadi dhererka hypotenuse ee saddexagalka (1 d.p.)



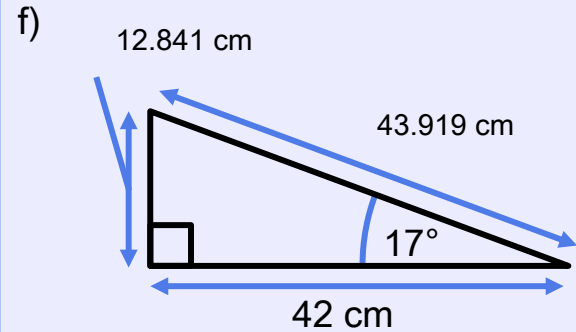
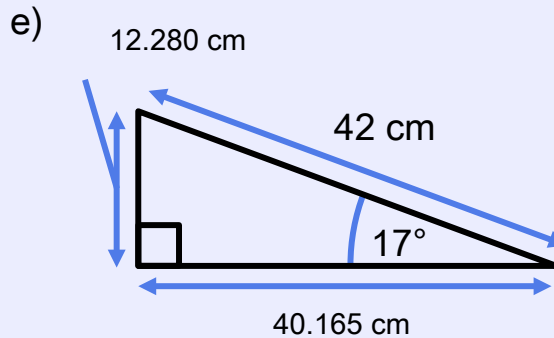
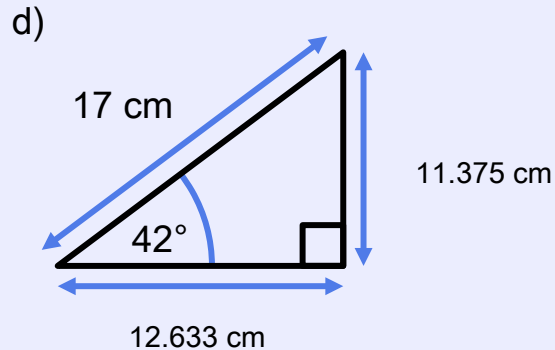
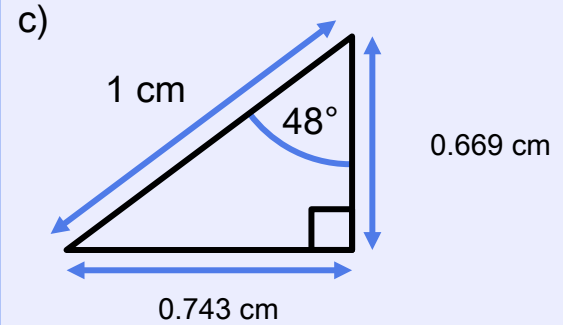
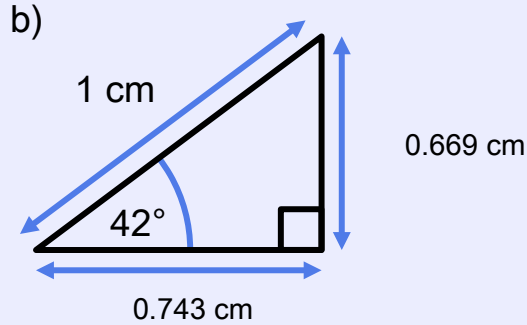
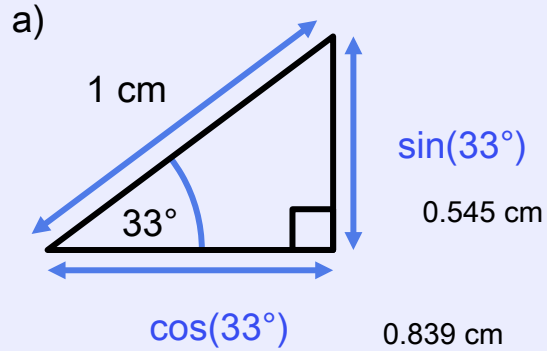
$$\text{dhinaca ka soo horjeeda} = h \times \sin(\theta^\circ)$$

$$\text{dhinaca ku xiga} = h \times \cos(\theta^\circ)$$

1) Raadi dhererka dhammaan dhinacyada saddexagalka kasta (3 d.p.)



1) Raadi dhererka dhammaan dhinacyada saddexagalka kasta (3 d.p.)



Dhererka dhinac kasta oo ka soo horjeeda ama ku xiga xagal (θ°) oo ku jira saddex-xagal quman (right-angled triangle) oo ka yimid goobada cutubka (unit circle) waxaa laga heli karaa iyadoo la isticmaalayo shaxda qiimaha trig (trig values) oo ay ku jiraan sine (sine) iyo cosine (cosine).

Dhererka dhinac kasta oo ka soo horjeeda ama ku xiga xagal (θ°) oo ku jira saddex-xagal quman (right-angled triangle) kasta waxaa laga heli karaa iyadoo la tixgelinayo saddex-xagal la mid ah (similar triangle) oo ka yimid goobada cutubka (unit circle).

Dhererka dhinaca ka soo horjeeda xagal kasta (θ°) oo ku jira saddex-xagal quman (right-angled triangle) wuxuu la mid yahay $h \times \sin(\theta^\circ)$.

Dhererka dhinaca ku xiga xagal kasta (θ°) iyo xagasha quman (right-angle) ee saddex-xagal (triangle) wuxuu la mid yahay $h \times \cos(\theta^\circ)$.

Dhererka $\sin(\theta^\circ)$ iyo $\cos(\theta^\circ)$ (xagal kasta θ°) waxaa laga heli karaa iyadoo la isticmaalayo xisaabiyaha (calculator).