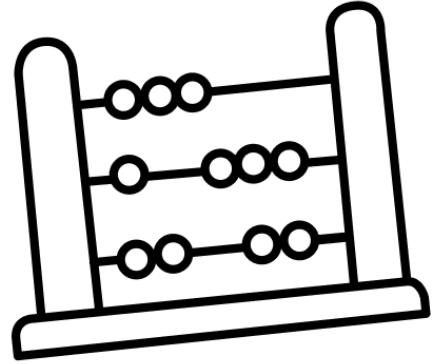


Isticmaalka saamiga taanjanta (tangent ratio)

Maths

Cutub: Trigonometry



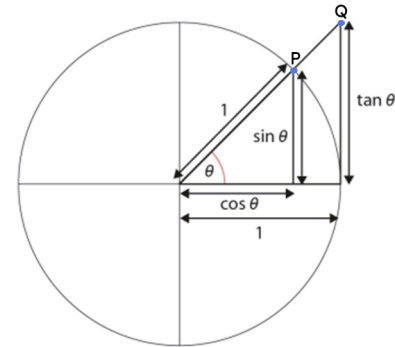
Natiijo

Waxaan isticmaali karaa saamiga taanjanta (tangent ratio) si aan u helo dhinaca ama xagasha maqan ee saddexagalka qumman (right-angled triangle).

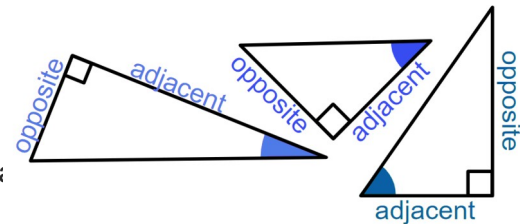
Erayada muhiimka ah

Hawlaha trigonometric waxaa sida caadiga ah lagu qeexaa saamiyada labada dhinac ee saddexagalka qumman (right-angled triangle) ee ka kooban xagasha.

Taanjanta xagal ($\tan(\theta^\circ)$) waa isku-duwayaasha y (y-coordinate) ee barta Q ee saddexagalka ka soo baxa goobada halbeegga (unit circle).



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



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

Isticmaalka saamiga taanjanta (tangent ratio)



Qaabaynta qaacidada taanjanta (tangent formula)

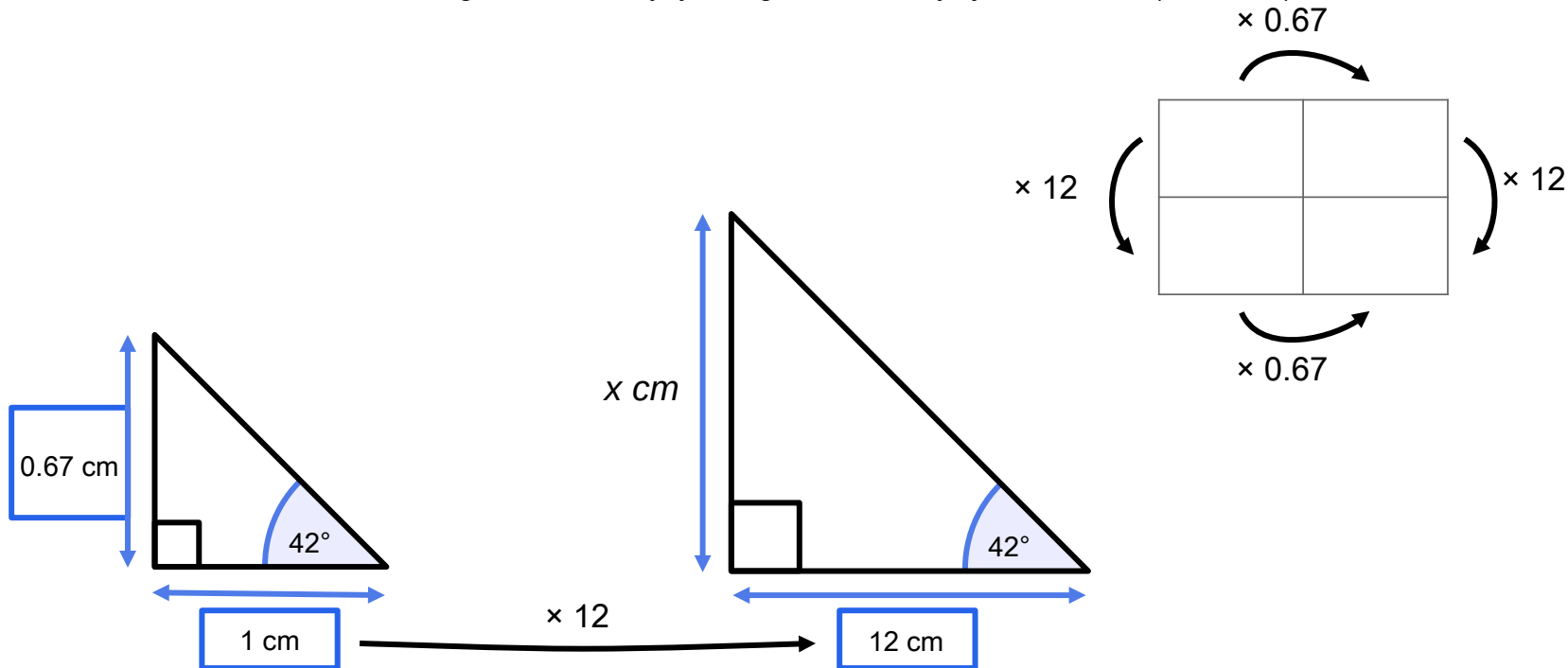


Xisaabinta xagasha

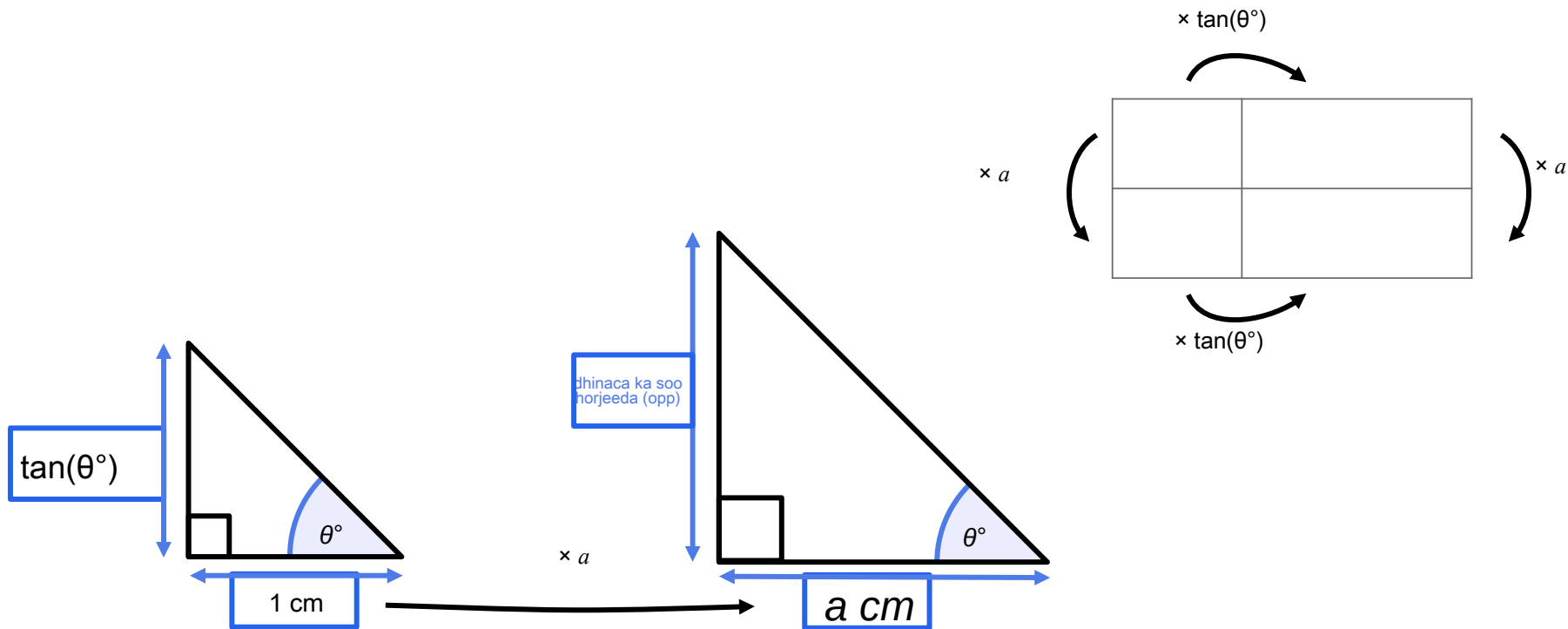
Qaabaynta qaacidada taanjanta (tangent formula)

Waxaan ognahay in labadan saddexagal ay isku mid yihiin (similar), sababtoo ah labada xagal ee hal saddexagal waxay la mid yihiin labada xagal ee kan kale.

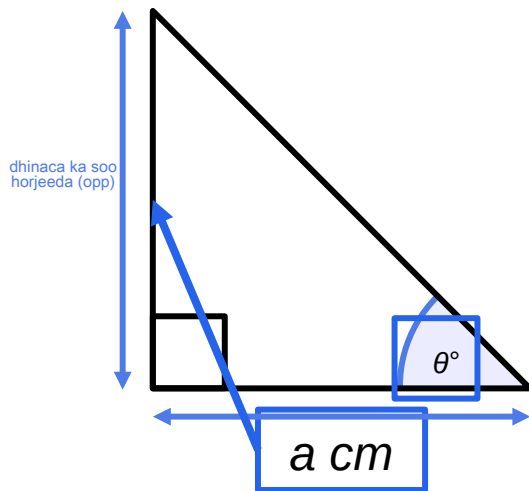
Waxaan heli karnaa dhererka dhinaca lagu calaamadeeyay x adigoo isticmaalaya jaantus saami (ratio table).



Waxaan sidoo kale u soo koobi karnaa habkan saddexagal kasta oo qumman oo leh xagal θ° , halkaas oo dhinaca ka soo horjeeda θ° uu leeyahay dherer $\tan(\theta^\circ)$.



Waxaan sidoo kale u soo koobi karnaa habkan saddexagal kasta oo qumman oo leh xagal θ° , halkaas oo dhinaca ka soo horjeeda θ° uu leeyahay dherer $\tan(\theta^\circ)$.



1	$\tan(\theta^\circ)$
a	$a \times \tan(\theta^\circ)$

$\times \tan(\theta^\circ)$

wuxuu la mid yahay dhererka dhinaca ka soo horjeeda xagashaas.

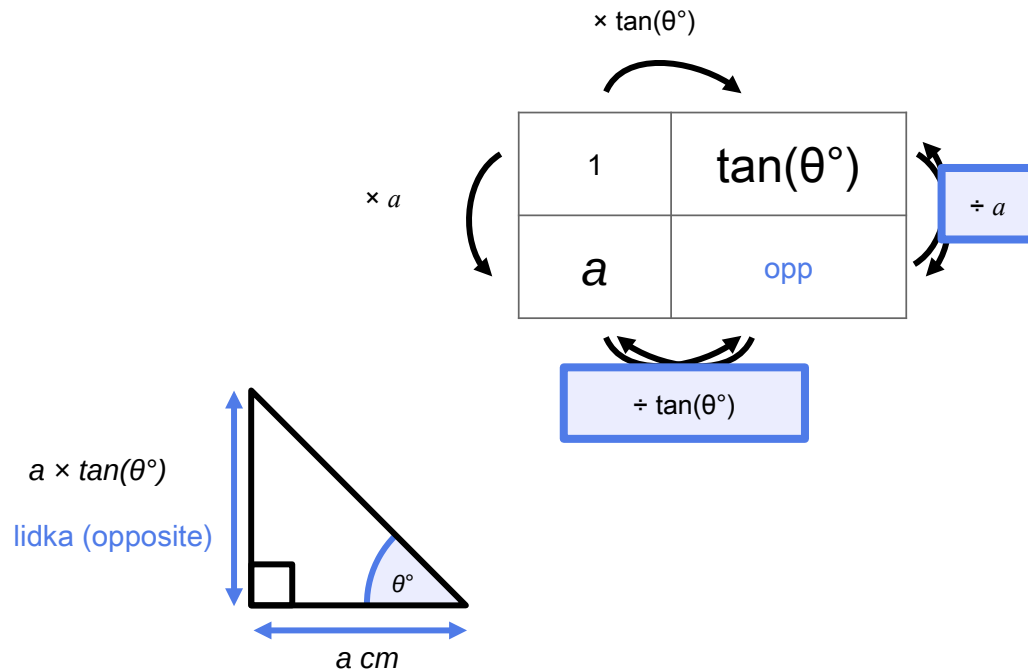
Qaabaynta qaacidada tangent (Formalising the tangent formula)



Sharaxaad

Waxaan u isticmaali karnaa jaantuskan saamiga (ratio table) si aan u soo saarno qaacidada (formula) oo muujinaysa xiriirka ka dhexeeya dhinaca ka soo horjeeda xagasha θ° iyo dhinaca ku xiga (adjacent), waxaana u matali karnaa qaacidada saddex siyaabood.

Qaacidada tangent (The tangent formula)



Qaabaynta qaacidada tangent (Formalising the tangent formula)

Waxaan kaloo ka soo qaadan karnaa laba nooc oo ka mid ah qaacidada marka la eego mid ka mid ah kuwa kale iyadoo la sameeyo qaybin (division).

$$\cancel{a} \times \tan(\theta^\circ) = \frac{\text{opp}}{\cancel{a}}$$

$$\boxed{\tan(\theta^\circ) = \frac{\text{opp}}{a}}$$

$$a \times \frac{\cancel{\tan(\theta^\circ)}}{\cancel{\tan(\theta^\circ)}} = \frac{\text{opp}}{\tan(\theta^\circ)}$$

$$\boxed{a = \frac{\text{opp}}{\tan(\theta^\circ)}}$$

Qaabaynta qaacidada tangent (Formalising the tangent formula)

Waxaan ku beddeli karnaa qiimayaasha (values) saddexagal qumman (right-angled triangle) nooc kasta oo ka mid ah qaacidada tangent si aan u matallo xiriirka ka dhexeeya dhinaca ka soo horjeeda xagasha iyo dhinaca ku xiga siyaabo kala duwan.

$$a \times \tan(\theta^\circ) = \text{opp}$$

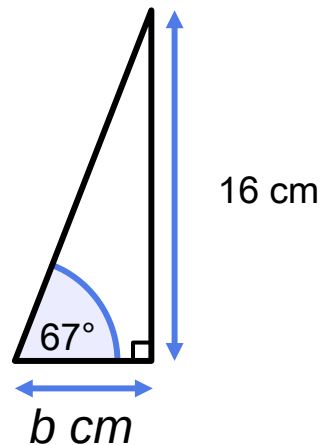
$$\frac{\text{opp}}{\tan(\theta^\circ)} = a$$

$$\frac{\text{opp}}{a} = \tan(\theta^\circ)$$

$$b \times \tan(67^\circ) = 16$$

$$\frac{16}{\tan(67^\circ)} = b$$

$$\frac{16}{b} = \tan(67^\circ)$$



Qaabaynta qaacidada taanjanta (tangent formula)



Hubi

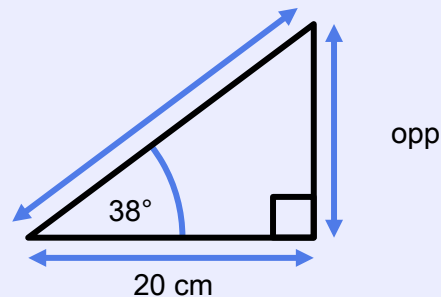
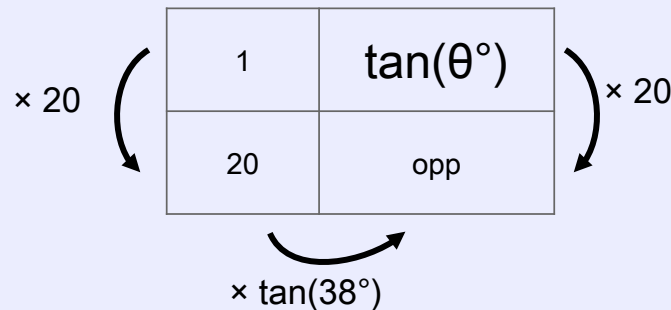
Hal isle'eg oo sax ah oo muujinaysa xiriirka ka dhexeeya dhinaca ku xiga (adjacent) iyo dhinaca ka soo horjeeda (opposite) xagasha 38° waa:

$$\frac{20}{20} \times \tan(38^\circ) = \frac{\text{opp}}{20}$$

Kee ka mid ah kuwani sidoo kale wuxuu si sax ah u muujinayaa xiriirka ka dhexeeya dhinaca ku xiga (adjacent) iyo dhinaca ka soo horjeeda (opposite) ee saddex-xagalkan?

a $\tan(38^\circ) = \frac{\text{opp}}{20}$ ✓

b $\tan(38^\circ) = \frac{20}{\text{opp}}$ ✗



Kee ka mid ah kuwani wuxuu si sax ah u muujinayaa xiriirka ka dhexeeya dhinaca ku xiga (adjacent) iyo dhinaca ka soo horjeeda (opposite) xagasha 82° ee saddex-xagalkan (oo lagu soo koobay tirada ugu dhow)?

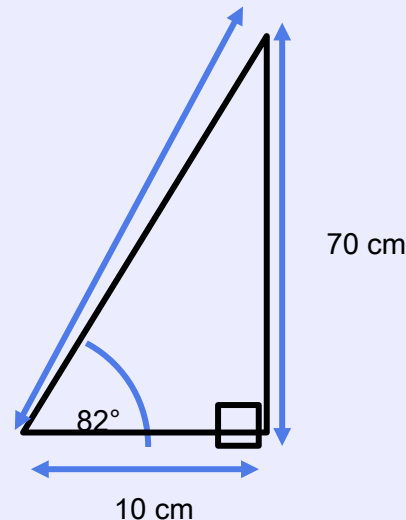
a $\frac{70}{10} = \tan(82^\circ)$ ✓

b $\tan(82^\circ \times 10) = 70$ ✗

c $10 \times \tan(82^\circ) = 70$ ✓

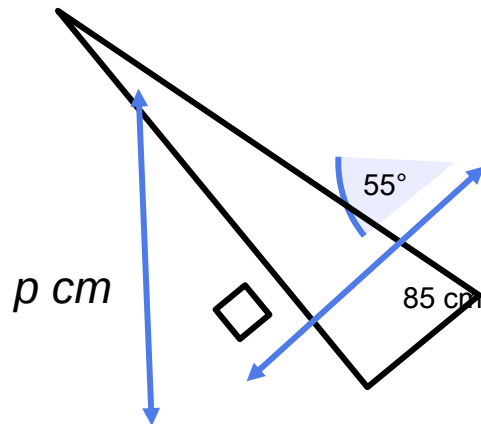
d $\frac{70}{\tan(82^\circ)} = 10$ ✓

e $\tan\left(\frac{82^\circ}{70}\right) = 10$ ✗



Nooc kasta oo ka mid ah qaacidada, qayb ka duwan oo saddex-xagalka ah ayaa loo qoray mawduuc (subject). Waxaa faa'iido leh in la isticmaalo nooca qaacidada uu mawduuciisu (subject) u dhigma qaybta saddex-xagalka ee aad isku dayeyso inaad qiimeheeda (value) hesho.

$$a \times \tan(\theta^\circ) = \text{opp}$$



Waxaan dooneynaa inaan helno qiimaha (value) p , oo ah dhererka dhinaca ka soo horjeeda (opposite) xagasha 55° .

Qaabaynta qaacidada tangent (tangent formula)

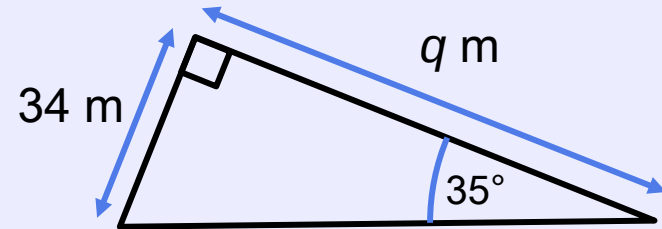
Kee ka mid ah isle'egyadan ayaa ugu waxtar badan helista qiimaha (value) q ?

Sidaa awgeed, hel dhererka dhinaca lagu calaamadeeyay q (2 d.p.)

$$\mathbf{a} \quad \tan(35^\circ) = \frac{34}{q}$$

$$\mathbf{b} \quad \frac{34}{\tan(35^\circ)} = q \checkmark$$

$$\mathbf{c} \quad q \times \tan(35^\circ) = 34$$



1) Ku beddel dhinacyada iyo xagasha calaamadeysan ee saddexagal kasta labadan nooc ee qaacidada tangent (tangent formula).

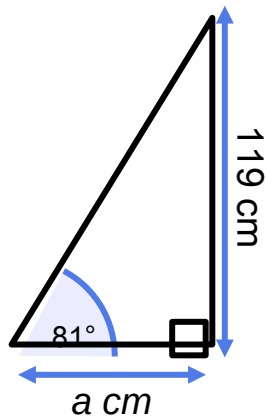
Saddexagal kasta, dooro nooca ugu habboon ee qaacidada tangent (tangent formula) si aad u hesho dhererka dhinaca maqan.

$$a \times \tan(\theta^\circ) = \text{opp}$$

$$\boxed{} \times \tan(\boxed{}) = \boxed{} \quad \boxed{}$$

$$\frac{\text{opp}}{\tan(\theta^\circ)} = a$$

$$\frac{\boxed{}}{\tan(\boxed{})} = \boxed{}$$

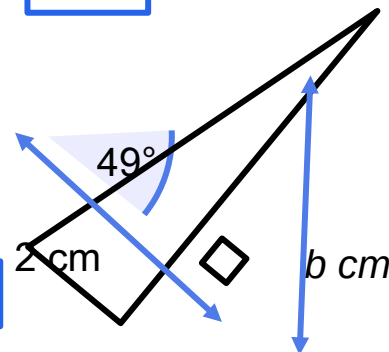


$$a \times \tan(\theta^\circ) = \text{opp}$$

$$\boxed{} \times \tan(\boxed{}) = \boxed{} \quad \boxed{}$$

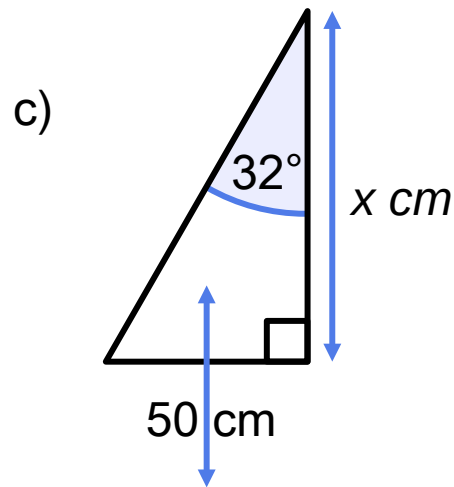
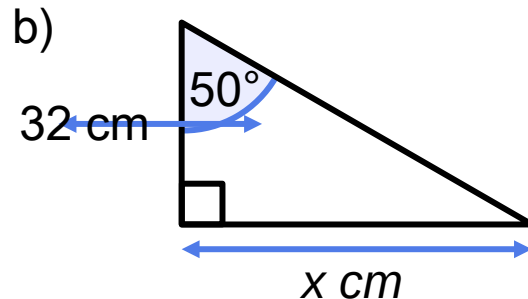
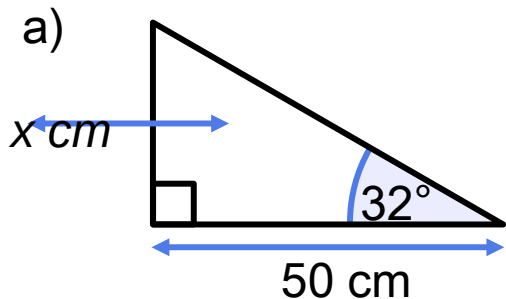
$$\frac{\text{opp}}{\tan(\theta^\circ)} = a$$

$$\frac{\boxed{}}{\tan(\boxed{})} = \boxed{}$$



2) Isku dhig saddexagalka iyo isla'egta muujinaysa xiriirka ka dhexeeya dhinaca ku xiga (adjacent) iyo dhinaca ka soo horjeeda (opposite).

Isticmaal isla'egta si aad u hesho dhererka dhinaca maqan ee calaamadeysan x ee saddexagal kasta (2 d.p.)



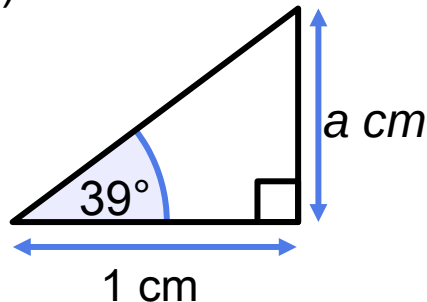
d) $x \times \tan(32^\circ) = 50$

e) $50 \times \tan(32^\circ) = x$

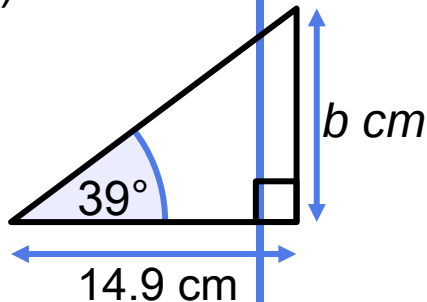
f) $32 \times \tan(50^\circ) = x$

3) Adigoo isticmaalaya qaacidada taanjanta (tangent), hel dhererka dhinaca maqan ee calaamadeysan xaraf ujeedo saddexagal kasta (2 d.p.)

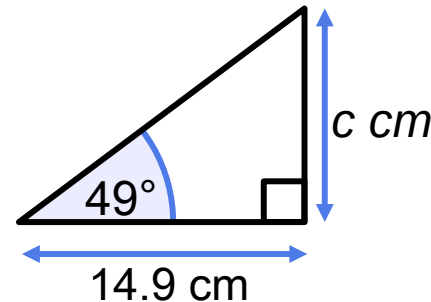
a)



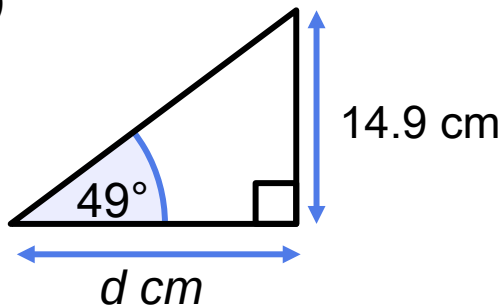
b)



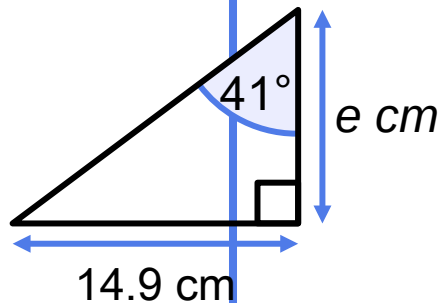
c)



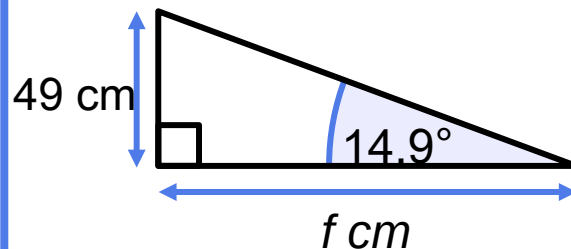
d)



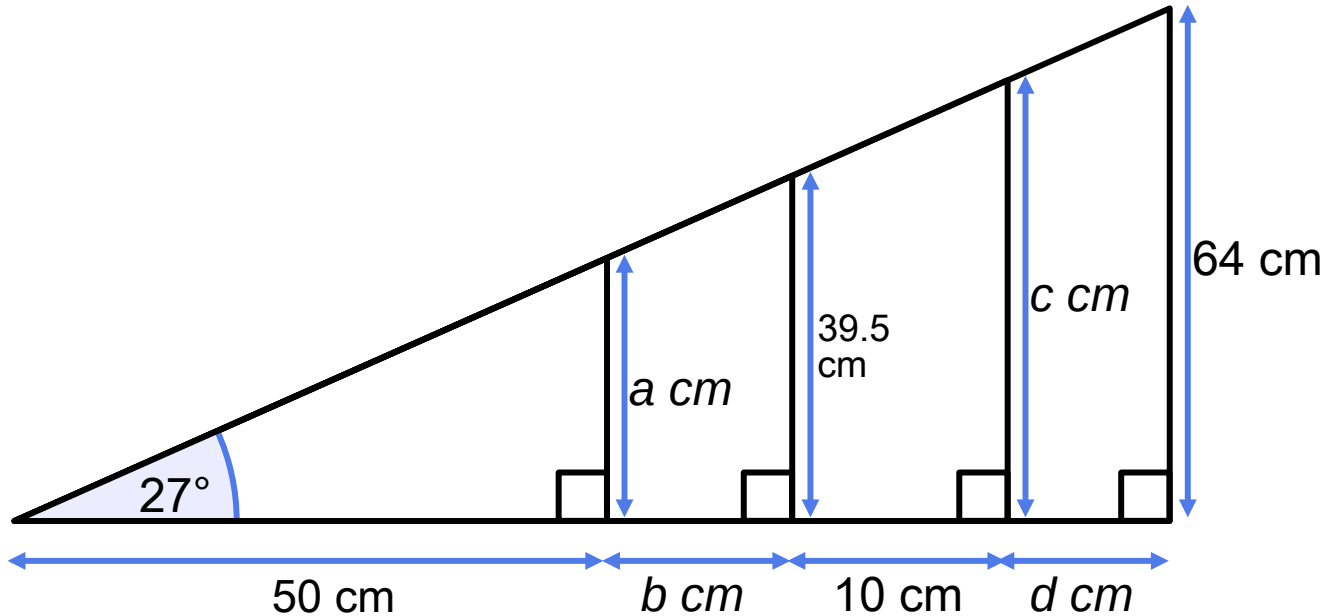
e)



f)



4) Hel dhererka masaafada a , b , c , iyo d (ku soo koob tirada ugu dhow).



1) Ku beddel dhinacyada iyo xagasha la calaamadeeyay saddexagal kasta labadan nooc ee qaacidada tangent.

Saddexagal kasta, dooro nooca ugu habboon ee qaacidada tangent si aad u hesho dhererka dhinaca maqan.

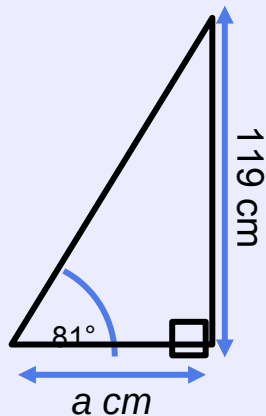
$$a \times \tan(\theta^\circ) = \text{opp}$$

$$\boxed{\times} \tan() = \boxed{81^\circ} \quad \boxed{119}$$

$$\frac{\text{opp}}{\tan(\theta^\circ)} = a$$

$$\frac{\boxed{119}}{\tan(\boxed{) 81^\circ}} = \boxed{a}$$

$$a \text{ cm} = 18.85 \text{ cm}$$



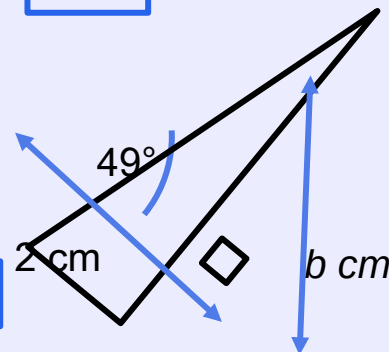
$$a \times \tan(\theta^\circ) = \text{opp}$$

$$\boxed{\times} \tan() = \boxed{49^\circ} \quad \boxed{b}$$

$$\frac{\text{opp}}{\tan(\theta^\circ)} = a$$

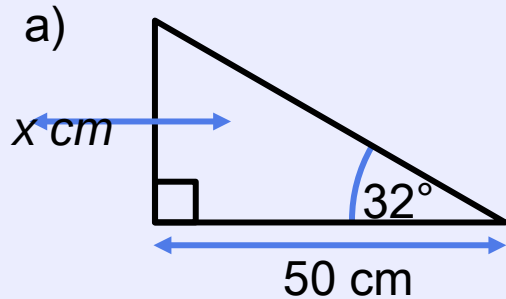
$$\frac{\boxed{b}}{\tan(\boxed{) 49^\circ}} = \boxed{2}$$

$$b \text{ cm} = 2.30 \text{ cm}$$



2) Isku dhig saddexagalka iyo isla'egta tusaysa xiriirka ka dhexeeya dhinaca ku xiga (adjacent) iyo dhinaca ka soo horjeeda (opposite).

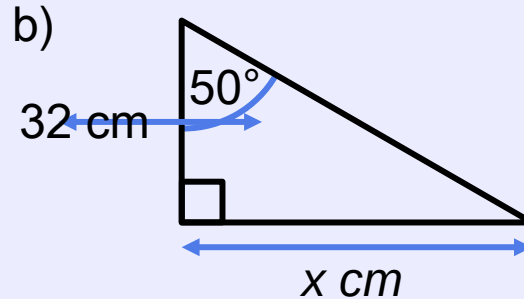
Isticmaal isla'egta si aad u hesho dhererka dhinaca maqan ee lagu calaamadeeyay x ee saddexagal kasta (2 d.p.)



e) $50 \times \tan(32^\circ) = x$

$X = 31.24$

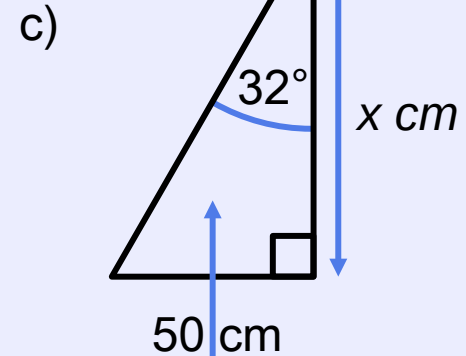
Dhinaca ka soo horjeeda 32° wuxuu leeyahay dherer dhan 31.24 cm



f) $32 \times \tan(50^\circ) = x$

$X = 38.14$

Dhinaca ka soo horjeeda 50° wuxuu leeyahay dherer dhan 38.14 cm



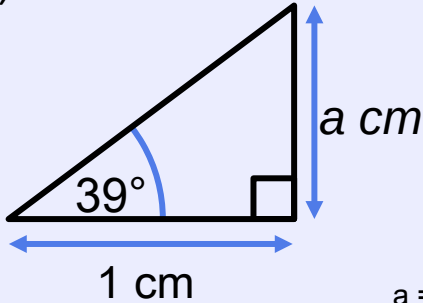
d) $x \times \tan(32^\circ) = 50$

$X = 80.02$

Dhinaca ku xiga (adjacent) wuxuu leeyahay dherer dhan 80.02 cm

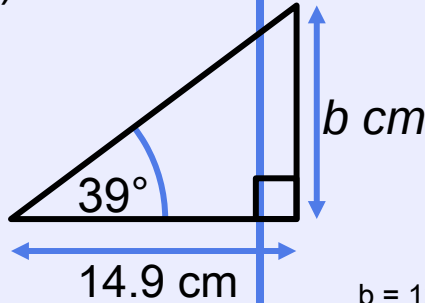
3) Adigoo isticmaalaya qaacidada taanjanta (tangent formula), soo hel dhererka dhinaca maqan ee lagu calaamadeeyay xaraf ee saddexagal kasta (2 d.p.)

a)



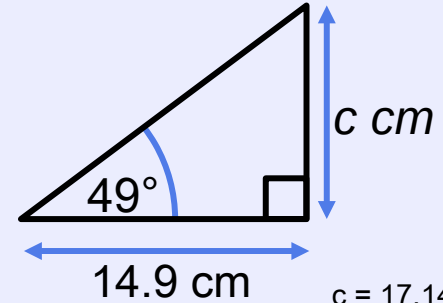
$$a = 0.81$$

b)



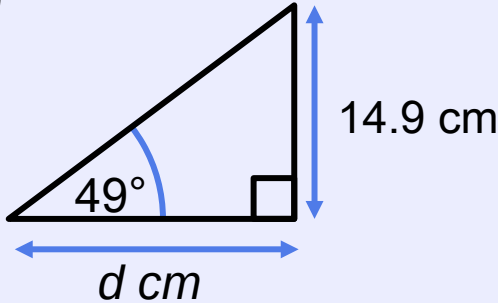
$$b = 12.07$$

c)



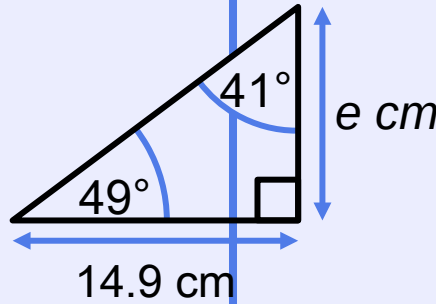
$$c = 17.14$$

d)



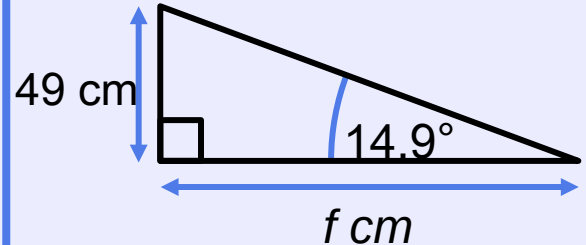
$$d = 12.95$$

e)



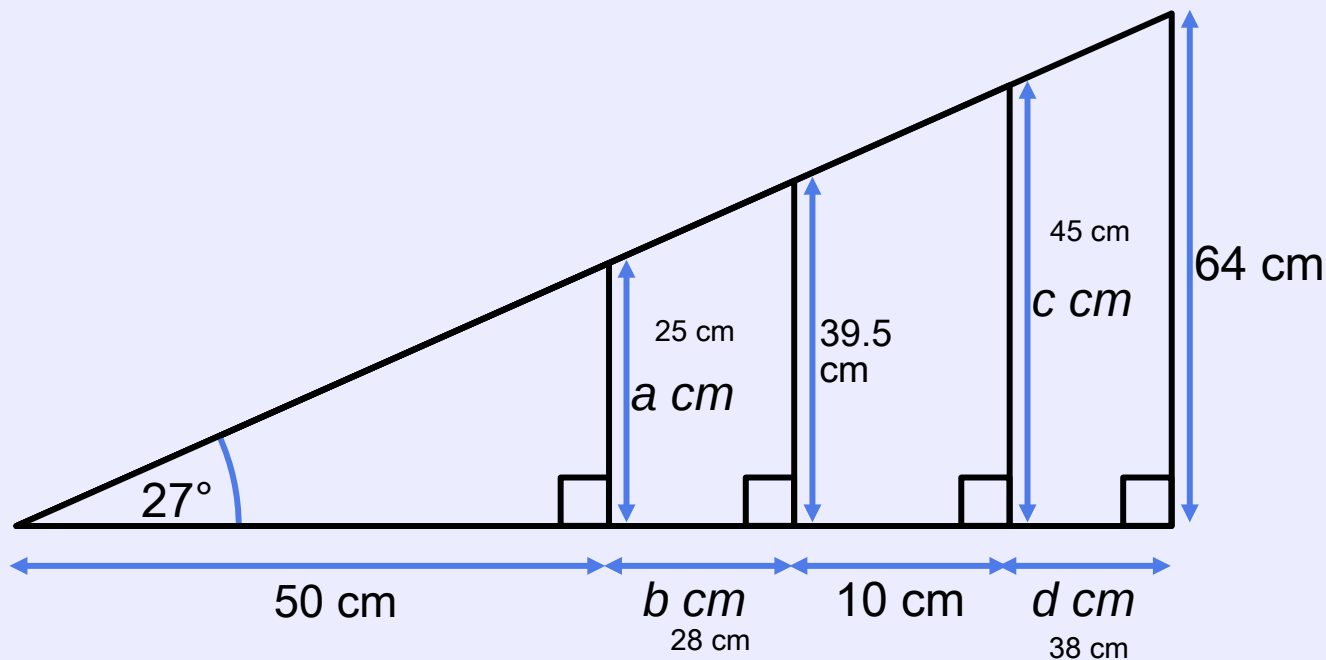
$$e = 17.14$$

f)



$$f = 184.16$$

4) Raadi dhererka masaafada a , b , c , iyo d (ku soo wareeji tirada ugu dhow).



Isticmaalka saamiga tangent (Using the tangent ratio)



Qaabaynta qaacidada tangent (Formalising the tangent formula)



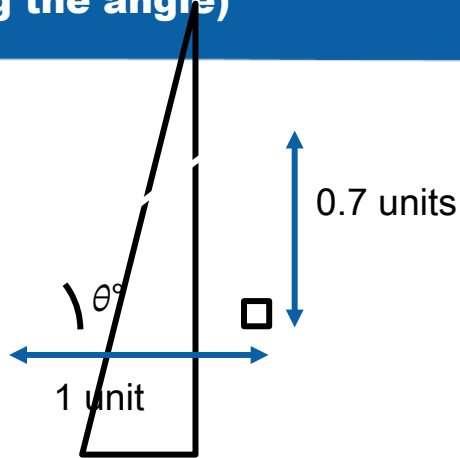
Xisaabinta xagasha (Calculating the angle)

Xisaabinta xagasha (Calculating the angle)



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	∞



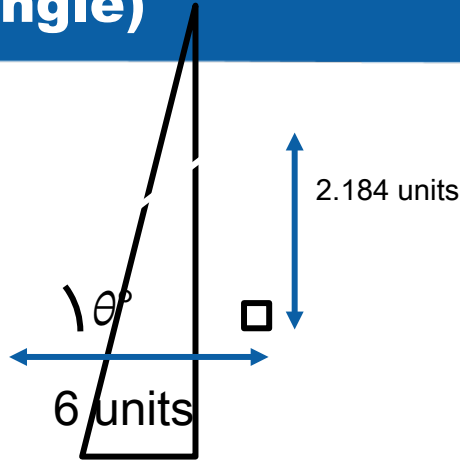
$$\tan (\theta^{\circ}) = \frac{\text{opp}}{\text{adj}}$$

$$\tan (\theta^{\circ}) = \text{---}$$

Waa immisa xagasha θ° marka saamiga u dhexeeya ka soo horjeeda iyo kuwa ku xiga uu yahay 0.7 : 1?

Xisaabinta xagasha (angle)

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
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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	∞



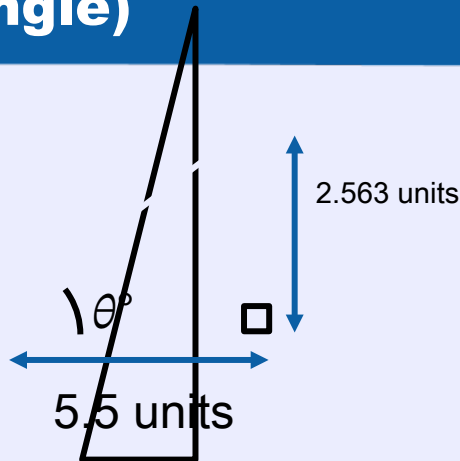
$$\tan (\theta^{\circ}) = \frac{\text{opp}}{\text{adj}}$$

$$\tan (\theta^{\circ}) = \frac{\quad}{\quad}$$

Xagal (angle) kee baa qiime (value) 0.364 u siin doona $\tan (\theta^{\circ})$?

Xisaabinta xaglaha (angle)

xagal (angle)	sine	cosine	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	∞



$$\tan(\theta^\circ) = \frac{\text{opp}}{\text{adj}}$$

$$\tan(\theta^\circ) = \frac{2.563}{5.5}$$

$$\tan(\theta^\circ) = 0.466$$

Xaglaha (angle) kee baa siin doona qiime (value)
0.466 ee $\tan(\theta^\circ)$?

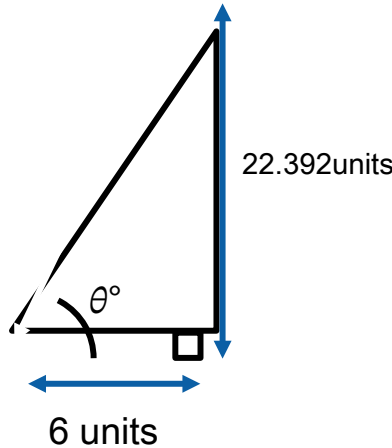
$$\theta^\circ =$$

Xisaabinta xaglaha (angle)



Sharaxaad

xagal (angle)	sine	cosine	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
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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	∞

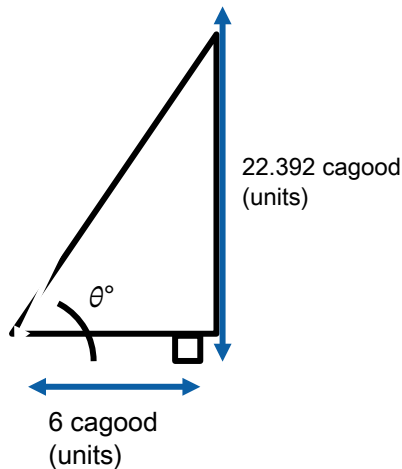


$$\tan(\theta^\circ) = \frac{\text{soohor (opp)}}{\text{ku xiga (adj)}}$$

$$\tan(\theta^\circ) = \underline{\hspace{2cm}}$$

Xaggee ayaa bixin doonta qiime (value) 3.732 oo ah $\tan(\theta^\circ)$?

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
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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	∞



Sideen u helaynaa xaglo (angles) aan ku jirin shaxdaas?



Caasha

Xaggee ayaa bixin doonta qiime (value) 3.732 oo ah $\tan(\theta^\circ)$?

$$\theta^\circ = 75^\circ$$

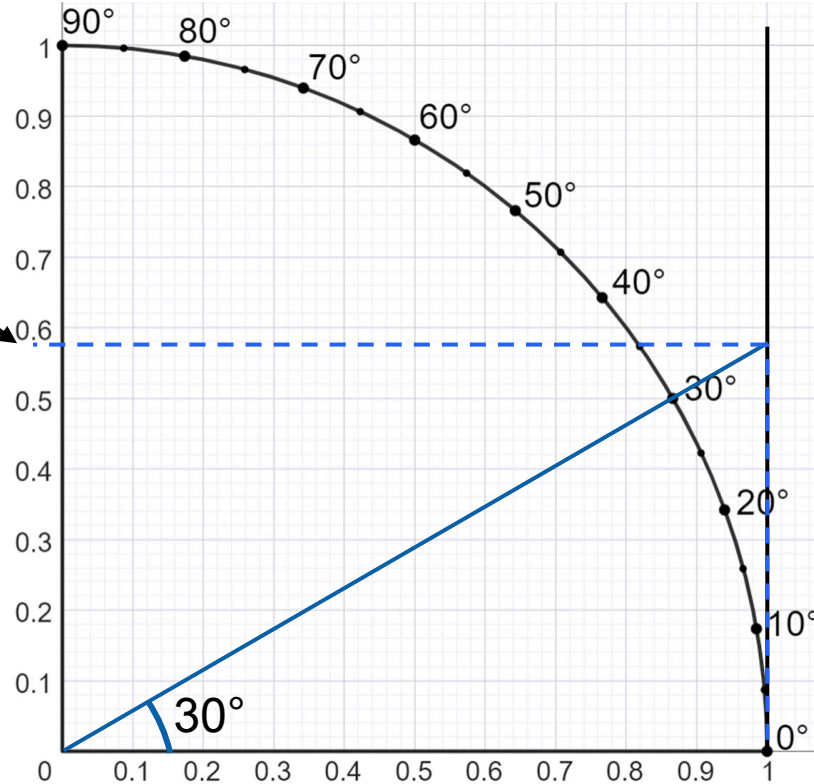
Waxaan isticmaali karnaa goobta (unit circle) si aan u helno xaglo (angles) dheeri ah.

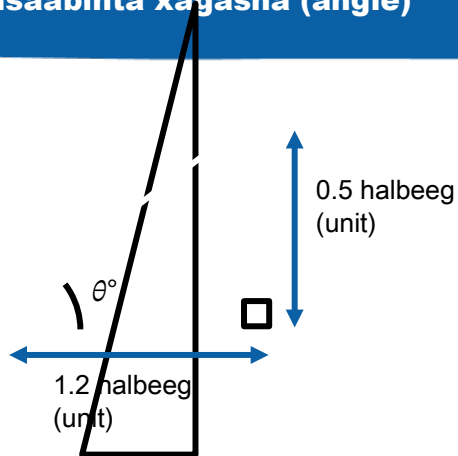
Xisaabinta xagasha (angle)



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
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90	1	0	∞

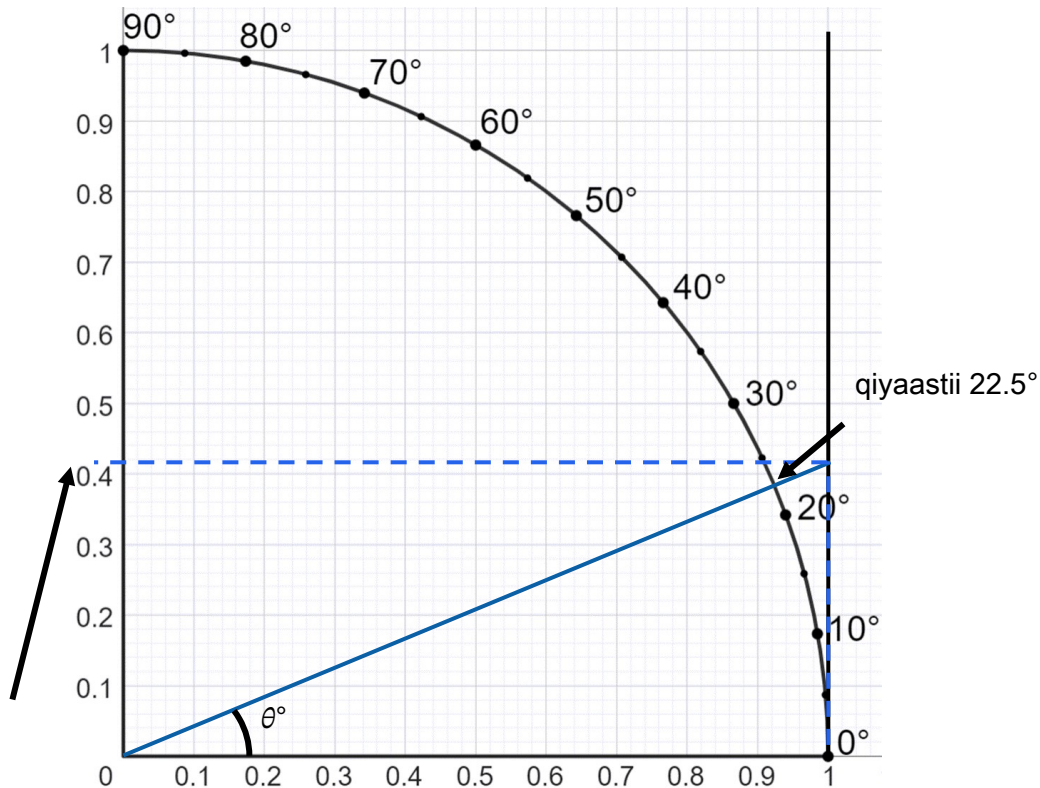


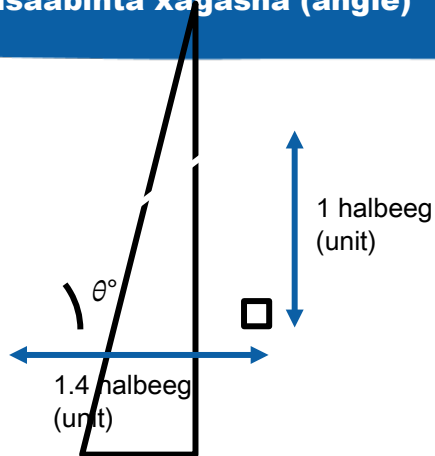


$$\tan(\theta^\circ) = \frac{\text{opp}}{\text{adj}}$$

$$\tan(\theta^\circ) = \frac{0.5}{1.2}$$

$$\tan(\theta^\circ) = 0.417$$

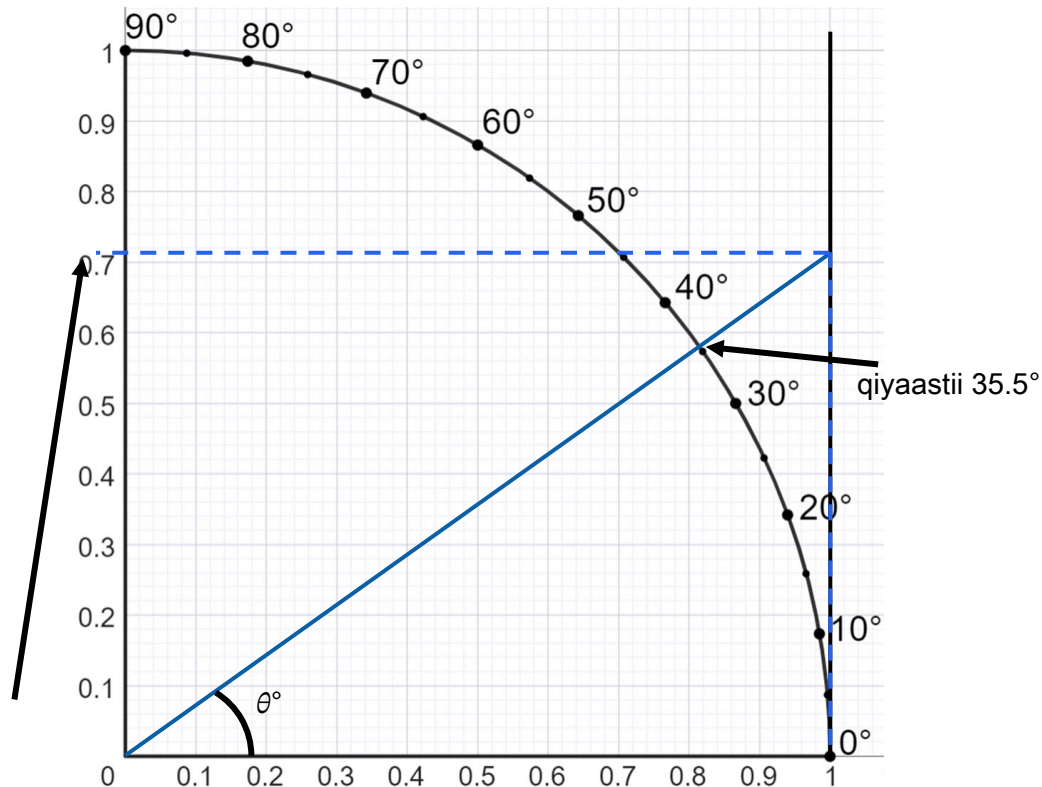




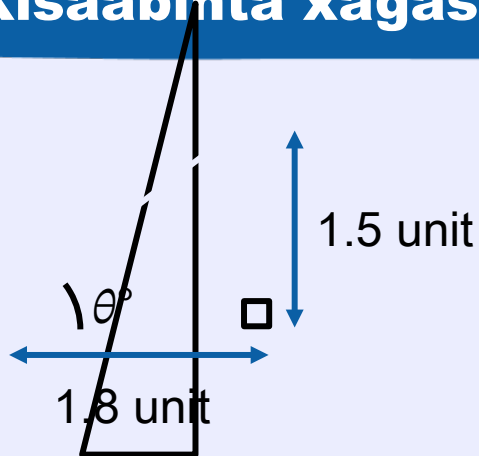
$$\tan(\theta^\circ) = \frac{\text{opp}}{\text{adj}}$$

$$\tan(\theta^\circ) = \frac{1}{1.4}$$

$$\tan(\theta^\circ) = 0.714$$



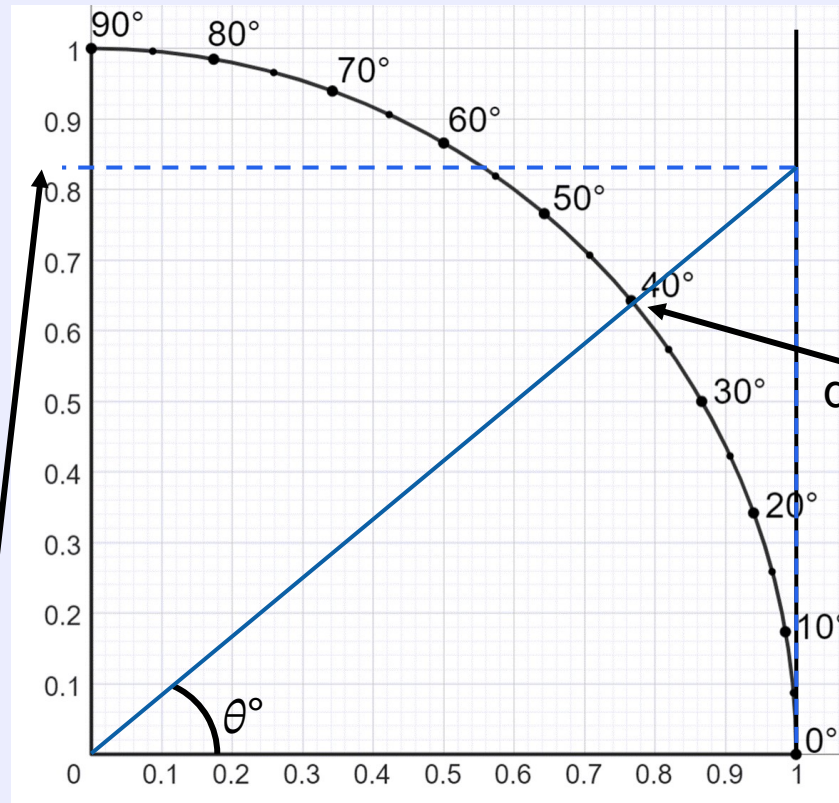
Xisaabinta xagasha (angle)



$$\tan(\theta^\circ) = \frac{\text{opp}}{\text{adj}}$$

$$\tan(\theta^\circ) = \frac{1.5}{1.8}$$

$$\tan(\theta^\circ) = 0.833$$

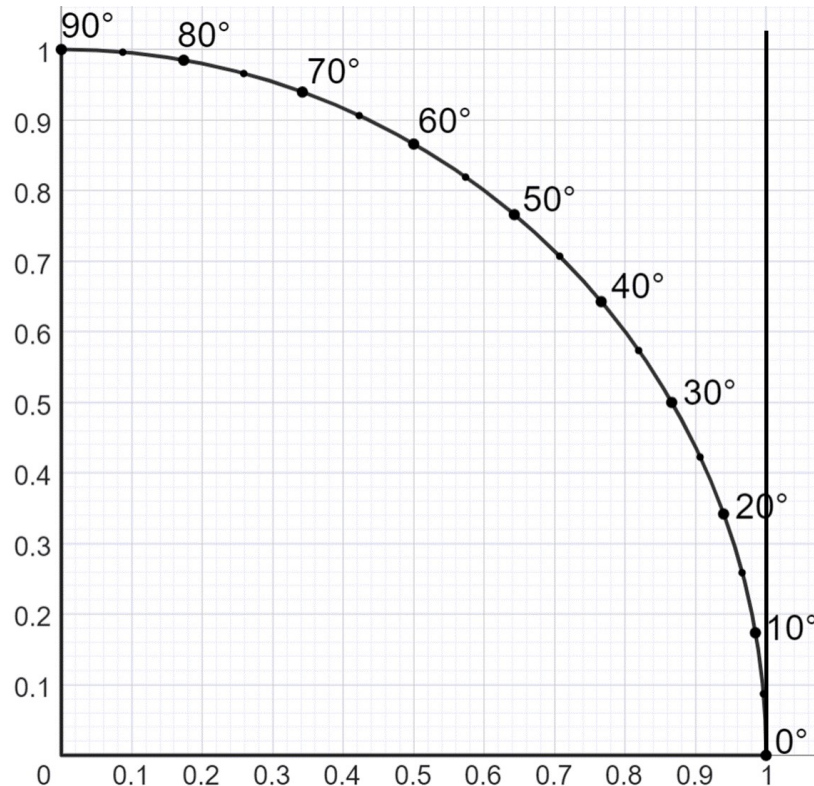


39.8 °

Xisaabinta xagasha (Calculating the angle)



Sharaxaad



Haa, laakiin habkani ma aha mid sax ah.

Waa inay jirtaa hab kale, oo aan ku tiirsanayn shax (table) ama garaaf (graph) oo ka sax badan.



Caasha

Shaqada taanjanta (tangent function), $\tan(\theta^\circ)$, waxay soo celisaa saamiga (ratio) ee inverse ka soo horjeeda opposite la siiyay θ° .
ku xiga (adjacent)

Haddii aad ka heli karto saamiga (ratio) xagasha, waxaa suurtoagal ah inaad isticmaasho rogaal-celinta (inverse) si aad uga hesho xagasha saamiga (ratio) la siiyay. Xisaabiyahaagu (calculator) wuxuu kaa caawinayaa inaad tan si degdeg ah oo sax ah u samayso.

Haddii shaqada taanjanta (tangent function) ay tahay sida hawlgalka (operation) lagu helo saamiga (ratio) xagasha, markaas rogaal-celinta shaqada taanjanta (inverse of the tangent function) waxay ka heshaa xagasha saamiga (ratio).

shaqada rogaal-celinta taanjanta
(inverse tangent function)

$$\tan(\theta^\circ) = 0.714$$

shaqada rogaal-celinta taanjanta
(inverse tangent function)

$$\theta^\circ = \text{shaqada rogaal-celinta taanjanta (inverse tangent function) (0.714)}$$

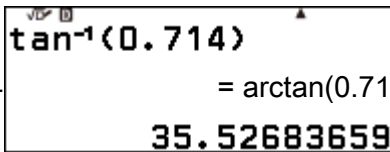
Ku qoran xisaabiyahaaga sayniska (scientific calculator)

Shaqada tangent-ka rogaal celiska ah waxaa loo yaqaan arctangent (arctangent).

Jawaabaha:

$$\theta^\circ = \tan^{-1}(0.714)$$

$$\theta^\circ = 35.5^\circ \text{ (1 dp)}$$



tan⁻¹(0.714)
= arctan(0.714)
35.52683659

$$\theta^\circ = 35.52683659^\circ$$

Xisaabinta xagasha (angle)

Kee ka mid ah kuwan soo socdaa waxay u dhigmaan $\theta^\circ = \tan^{-1}(0.382)$?

a

$$\theta^\circ = 20.9^\circ$$



b

$$\theta^\circ = \arctan(0.382)$$



c

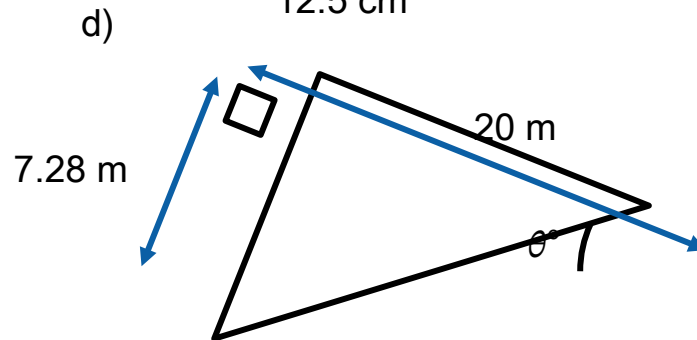
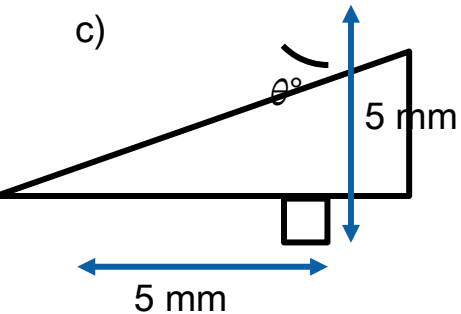
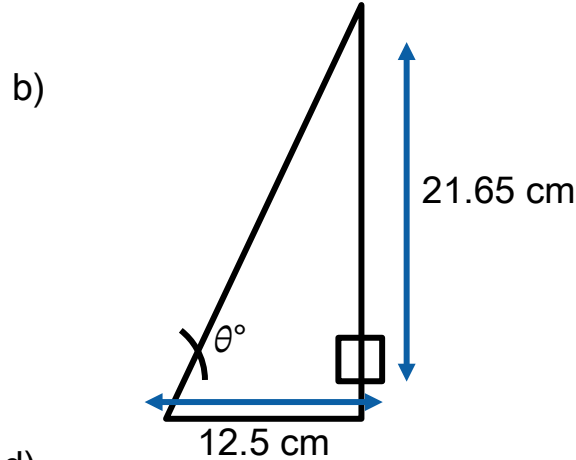
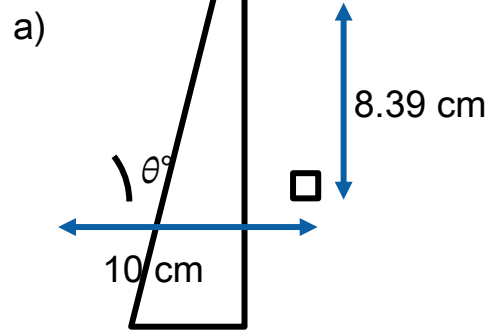
$$\tan(\theta^\circ) = 0.382$$



d

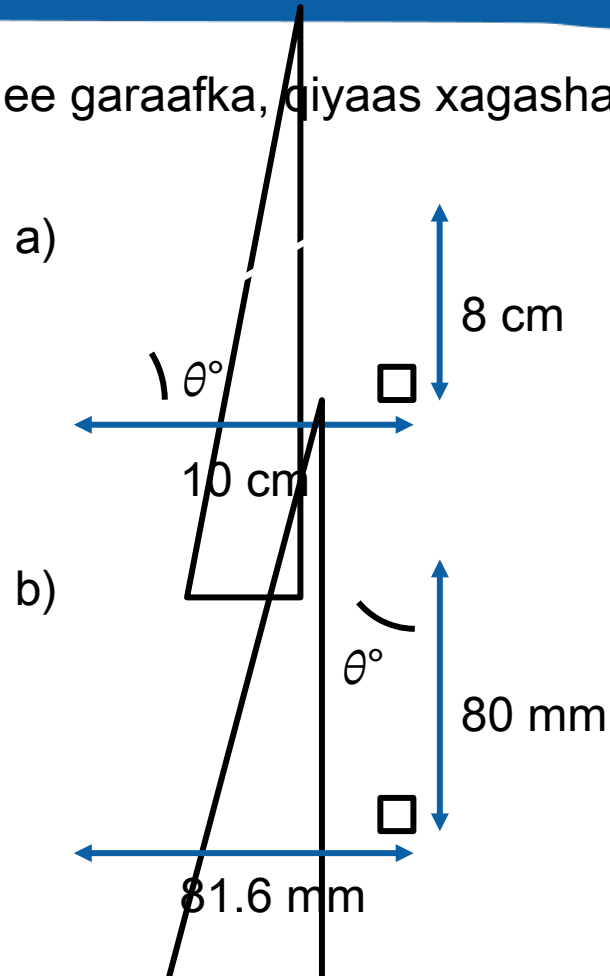
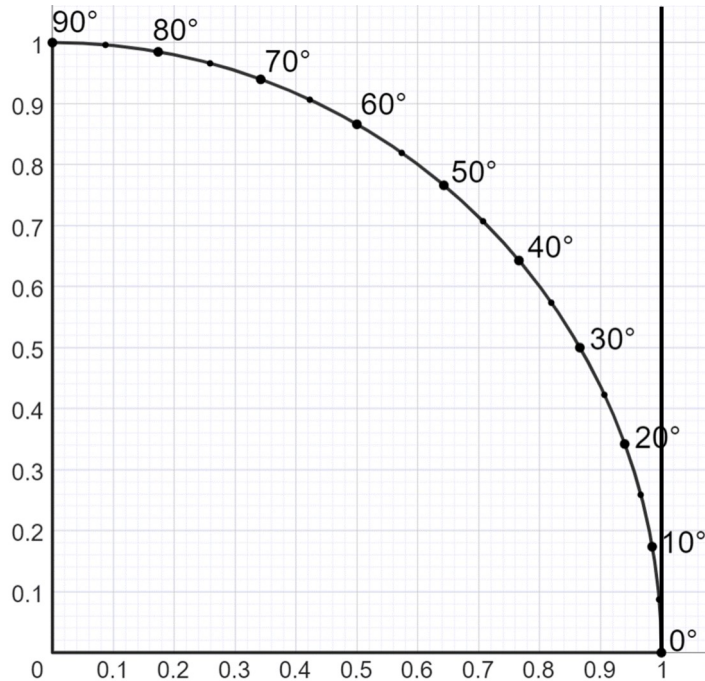
$$\theta^\circ = \tan(0.382)$$

1) Isticmaal jaantuska qiimaha (value) si aad u ogaato xagasha (angle) maqar ee saddexagal kasta.



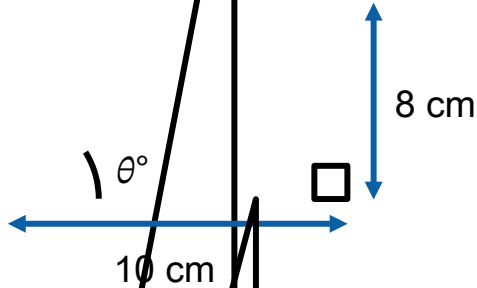
xagal (angle)	sine (sine)	cosine (cosine)	tangent (tangent)
0	0	1	0
5	0.087	0.996	0.087
10	0.174	0.985	0.176
15	0.259	0.966	0.268
20	0.342	0.94	0.364
25	0.423	0.906	0.466
30	0.5	0.866	0.577
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70	0.94	0.342	2.747
75	0.966	0.259	3.732
80	0.985	0.174	5.671
85	0.996	0.087	11.43
90	1	0	∞

2) Adoo sawiraya khadadka ku habboon ee garaafka, qiyaas xagasha (angle) ee saddexagal kasta.

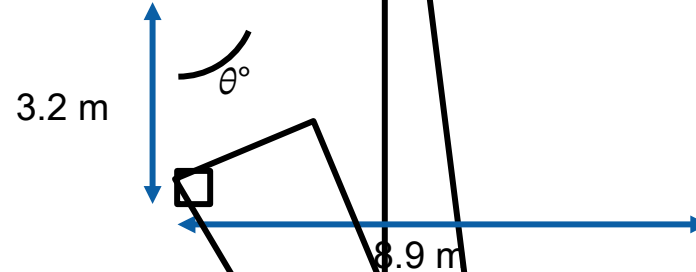


3) Isticmaal xisaabiyahaaga (calculator) si aad u ogaato xagasha (angle) ka maqan saddexagal kasta, adigoo ku jawaabaya 1 meel jajib tobanle (1 decimal place).

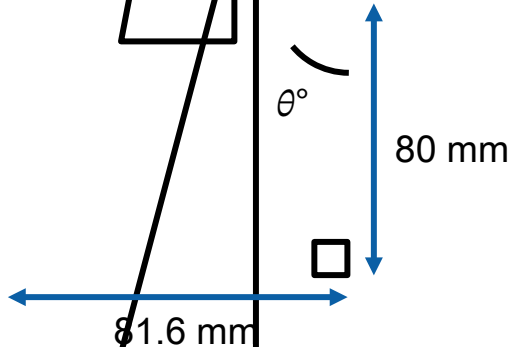
a)



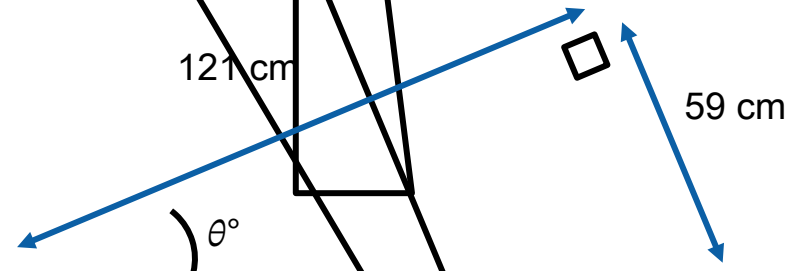
b)



c)



d)

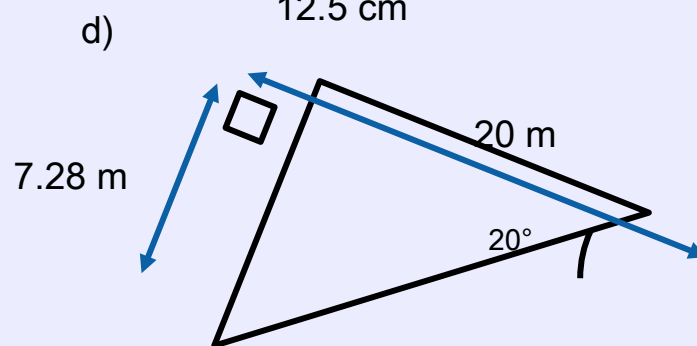
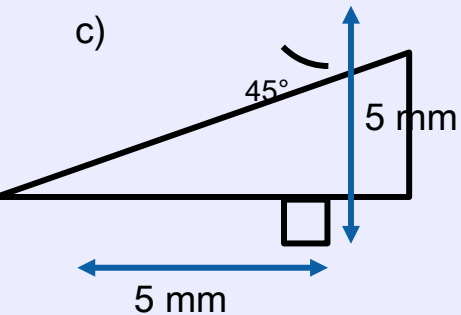
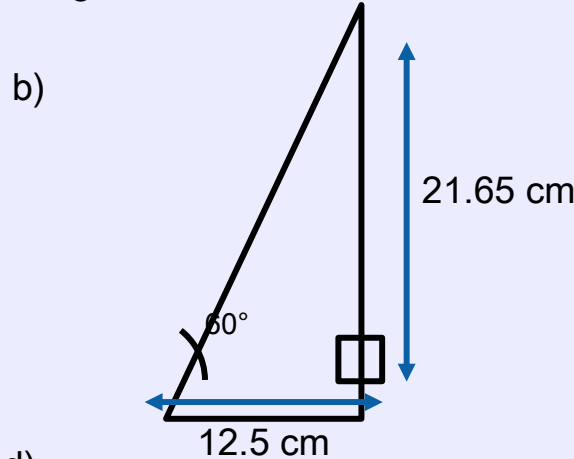
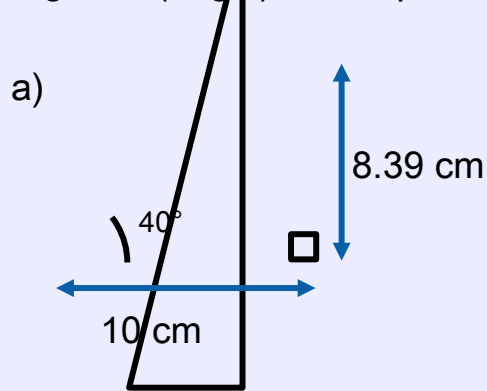


Hawsha B Xisaabinta xagasha (Calculating the angle)



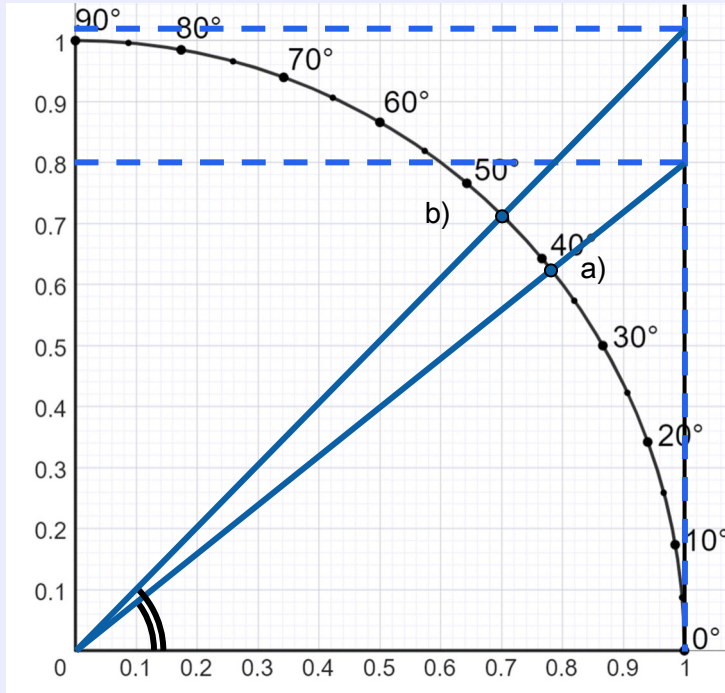
Jawaab

1) Isticmaal shaxda qiimaha (table of values) si aad u ogaato xagasha (angle) ka maqan saddexagal kasta.

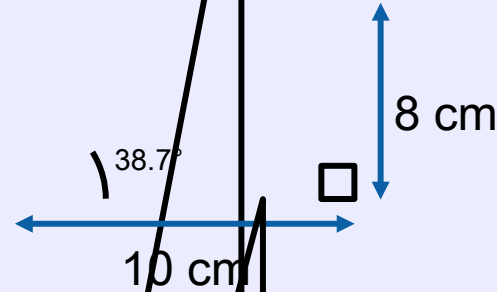


xagal (angle)	sine (sine)	cosine (cosine)	tangent (tangent)
0	0	1	0
5	0.087	0.996	0.087
10	0.174	0.985	0.176
15	0.259	0.966	0.268
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90	1	0	∞

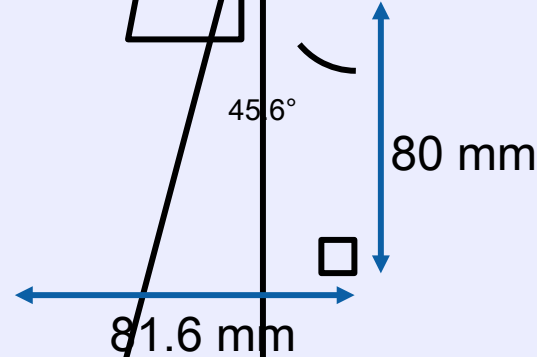
2) Adigoo ku sawiraya xariiqo ku habboon garaafka, qiyaas xagasha (angle) saddexagal kasta.



a)



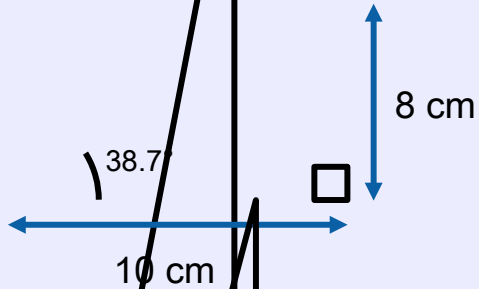
b)



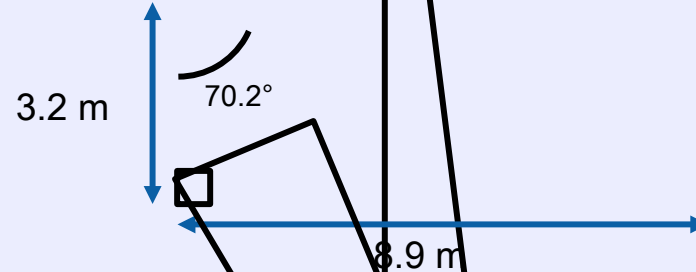
Jawaabaha qiyaasta ah waa la aqbali karaa.

3) Isticmaal xisaabiyahaaga (calculator) si aad u ogaato xagasha (angle) maqan saddexagal kasta, adigoo ku siinaya jawaabtaada hal meel jajab tobanle (1 decimal place).

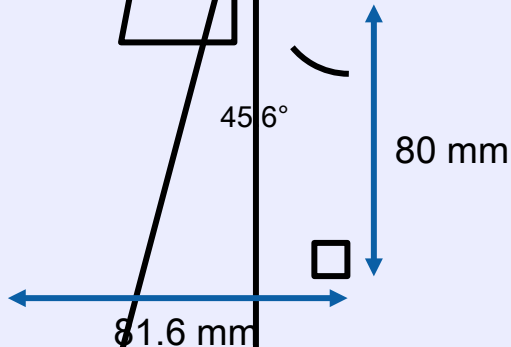
a)



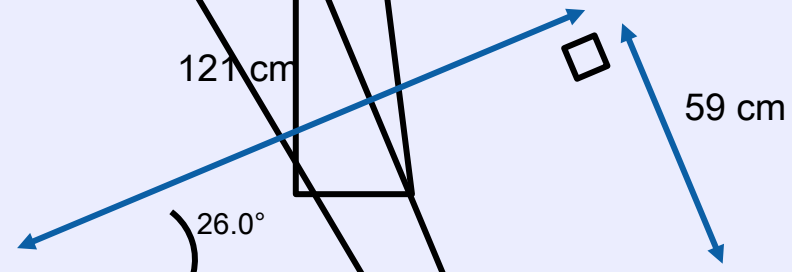
b)



c)



d)



Saamiga taanjanta (tangent ratio) wuxuu ku lug leeyahay dhinaca ka soo horjeeda (opposite), dhinaca ku xiga (adjacent), iyo xagasha (angle).

Xiriirka ka dhexeeya kuwan waxaa lagu muujin karaa saddex siyaabood oo kala duwan:

$$a \times \tan(\theta^\circ) = \text{opp} \qquad \frac{\text{opp}}{\tan(\theta^\circ)} = a \qquad \frac{\text{opp}}{a} = \tan(\theta^\circ)$$

Qaacidada taanjanta (tangent formula) waxaa loo isticmaali karaa in lagu helo dhererka dhinaca ka soo horjeeda (opposite), dhererka dhinaca ku xiga xagasha θ° , ama cabbirka xagasha θ° lafteeda.

Si loo helo cabbirka xagasha, waa in la isticmaalaa shaqada ka soo horjeeda shaqada taanjanta (tangent function): shaqada arctanjanta (arctangent function).

Xisaabiyaha (calculator), shaqada arctanjanta (arctangent function) badanaa waxaa loo qoraa tan-1.