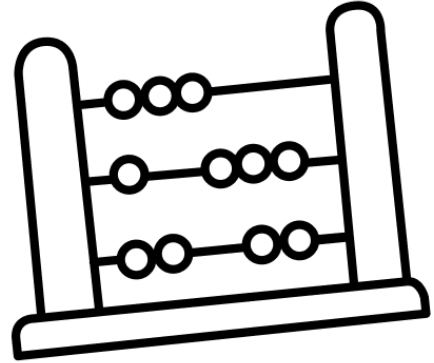


Xallinta dhibaatooyinka isku ekaanshaha (similarity) iyo aragtida Pythagoras (Pythagoras' theorem)

Maths

Cutub: Sifooyinka joomatari: isku ekaanshaha (similarity) iyo aragtida Pythagoras (Pythagoras' theorem)



Natiijo

Waxaan isticmaali karaa aqoontayda isku ekaanshaha (similarity) iyo aragtida Pythagoras (Pythagoras' theorem) si aan u xalliyo dhibaatooyin.

Erayada muhiimka ah

Aragtida Pythagoras (Pythagoras' theorem) waxay sheegaysaa in wadarta labajibbaaranaha labada dhinac ee gaagaaban ee saddexagalka qumman (right-angled triangle) ay la mid tahay labajibbaaranaha hypotenuse-ka.

Qaabka casharka

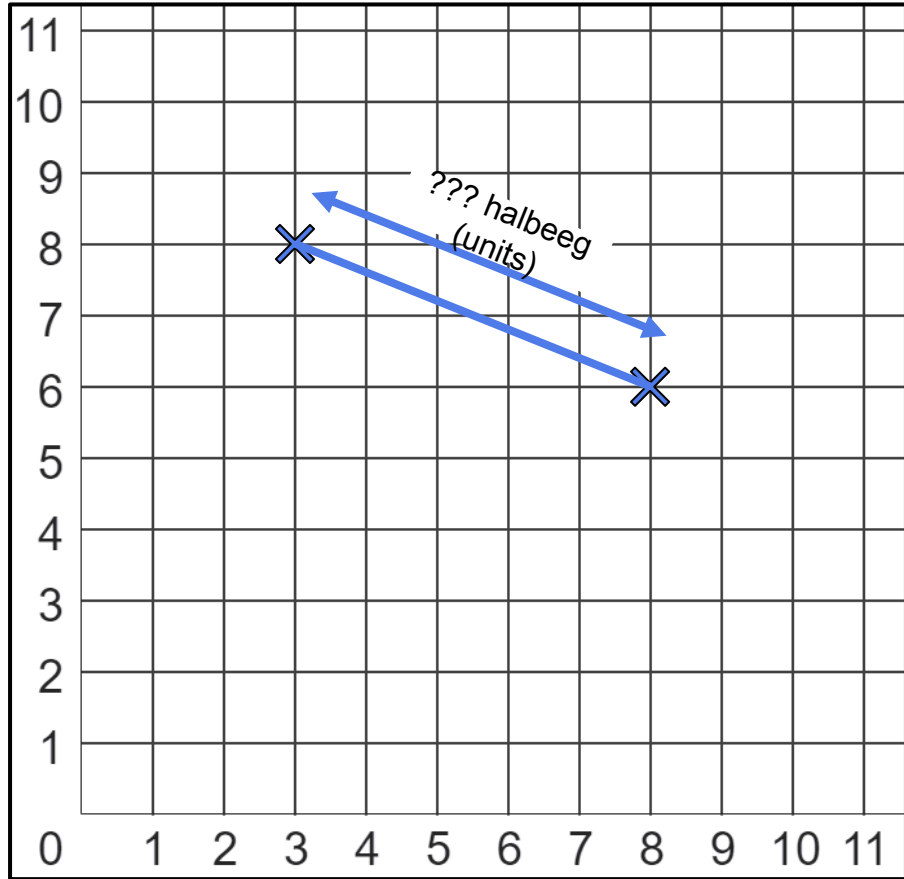
Xallinta dhibaatooyinka isku ekaanshaha (similarity) iyo aragtida
Pythagoras (Pythagoras' theorem)



Aragtida Pythagoras (Pythagoras' theorem) iyo isku-duwayaasha (coordinates)



Aragtida Pythagoras (Pythagoras' theorem) iyo saamiyada (ratios)

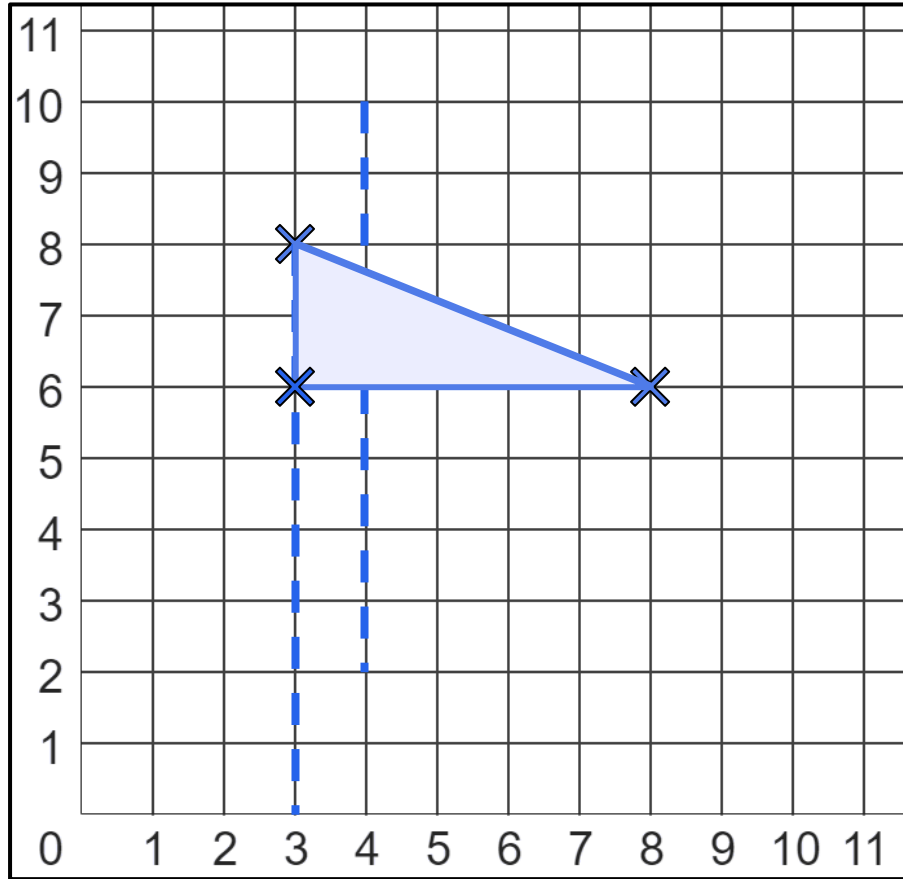


Aragtida Pythagoras (Pythagoras' theorem) waxaa loo isticmaali karaa in lagu xisaabiyo masaafada ugu gaaban ee u dhaxaysa laba dhibcood oo ku yaal shabag isku-duwayaasha (coordinate grid).

Sidee baad uga samayn kartaa saddexagal qumman (right-angled triangle) hal xariiq toosan (straight line segment) oo keliya?



Cali

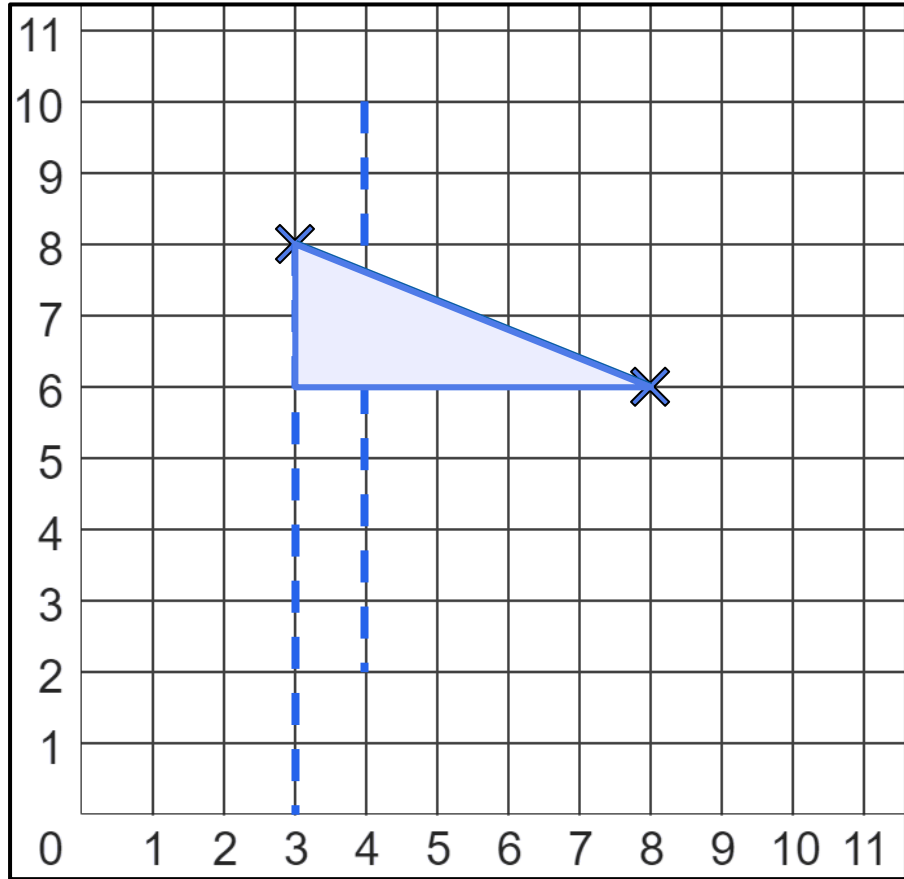


Aragtida Pythagoras (Pythagoras' theorem) waxaa loo isticmaali karaa in lagu xisaabiyo masaafada ugu gaaban ee u dhaxaysa laba dhibcood oo ku yaal shabag isku-duwayaasha (coordinate grid).

Xariiq toosan oo jiifa (horizontal ray) ayaa laga soo bixin karaa mid ka mid ah dhibcaha,

iyo xariiq toosan oo taagan (vertical ray) ayaa laga soo bixin karaa dhibcaha kale.

Dhibcaha ay labada xariiq toosan (rays) isku gooyaan ayaa ah dhibcaha saddexaad ee saddexagalka qumman (right-angled triangle).

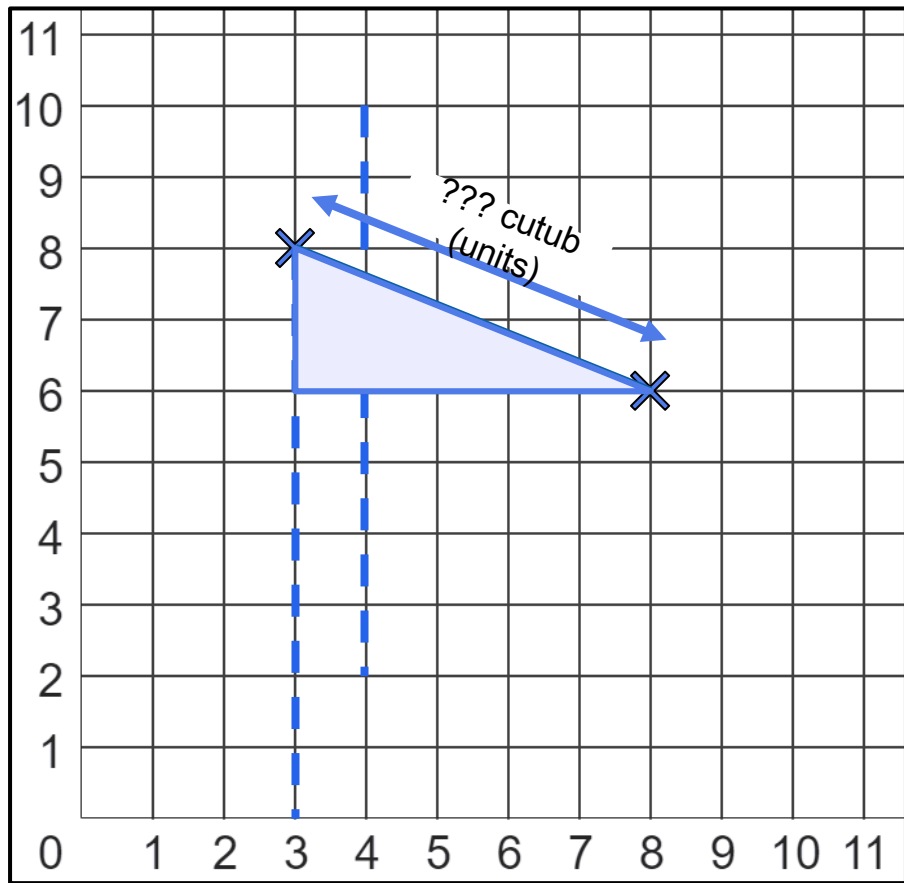


Dhab ahaantii, dhibcaha ay labada xariiq toosan (rays) isku gooyaan had iyo jeer waa cidhifka xagasha qumman (right angle), laftiisa.

Oh, taas waa fududahay marka.
Waan ogahay dhinaca had iyo jeer ah
hypotenuse-ka (hypotenuse) saddex-
xagashaas!



Cali

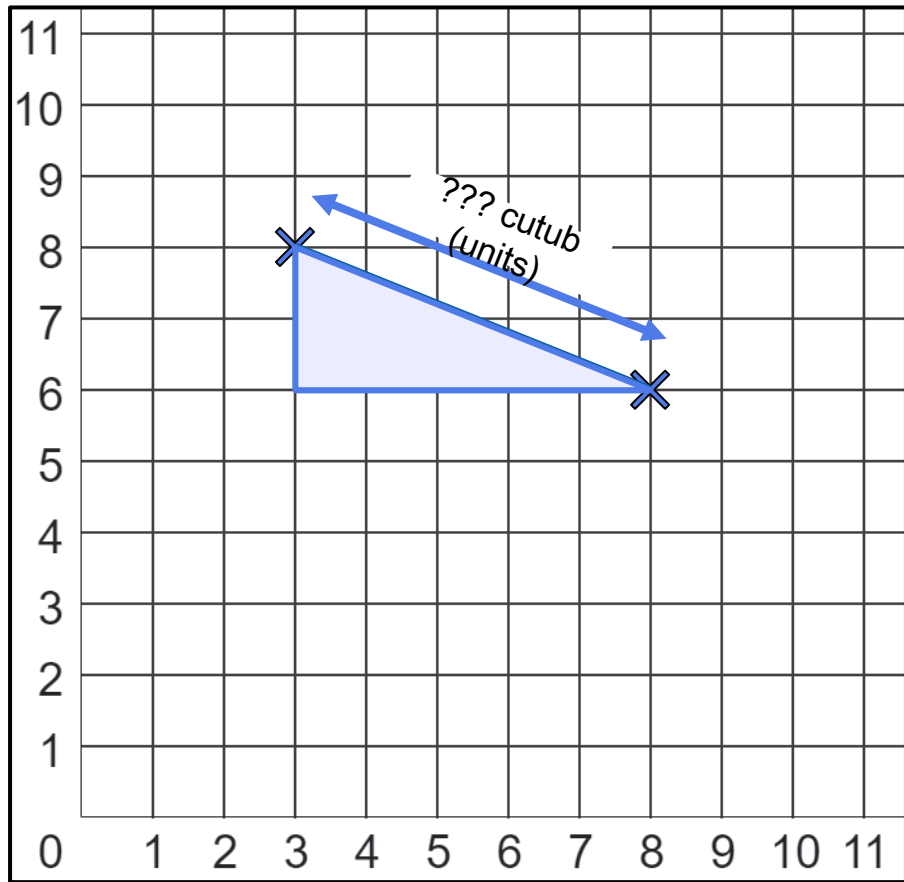


Xaqiiqdii, barta ay labada shucaac (rays) isku gooyaan had iyo jeer waa cidhifka (vertex) xagasha qumman (right angle), lafteeda.

Fogaanta (distance) u dhaxaysa labada bari ee asalka ah sidoo kale had iyo jeer waa dhererka hypotenuse-ka (hypotenuse), sababtoo ah waxay ka soo horjeedaa xagasha qumman (right angle) ee laga sameeyay labada shucaac (rays)!



Cali



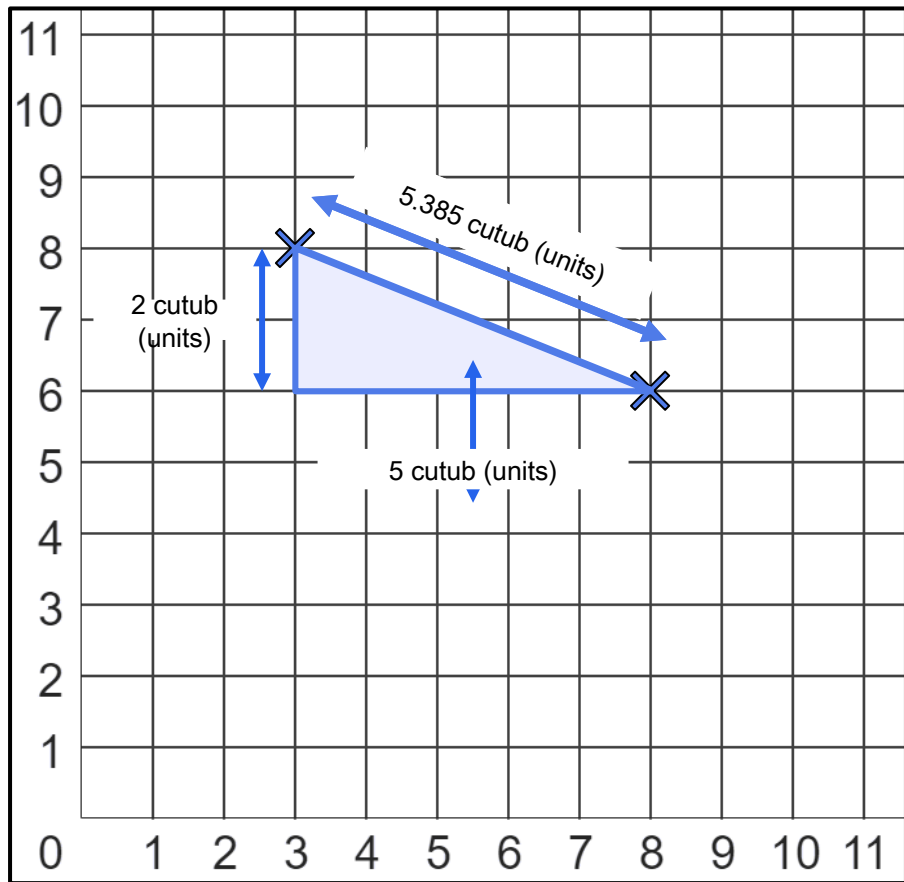
Xaqiiqdii, barta ay labada shucaac (rays) isku gooyaan had iyo jeer waa cidhifka (vertex) xagasha qumman (right angle), lafteeda.

Laakiin weli ma aqaano dhererka (lengths) dhinacyada saddex-xagasha (triangle) midkoodna!

Ma isticmaali karo aragtida Pythagoras (Pythagoras' theorem) laba ka mid ah la'aan.



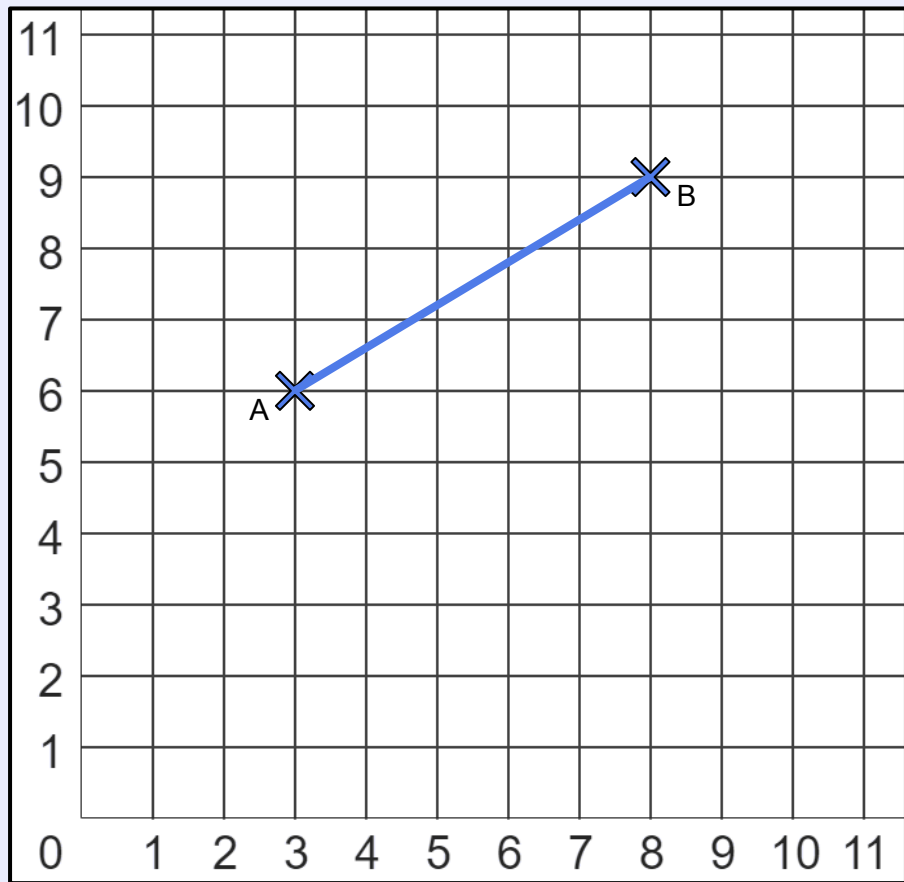
Cali



Waxaan heli karnaa dhererka (lengths) labada dhinac ee gaaban (shorter sides) anagoo tirinayna tirada labajibbaaranayaasha (squares) kor iyo guud.

Hadda waxaan isticmaali karnaa aragtida Pythagoras (Pythagoras' theorem) si aan u helno fogaanta (distance) ugu gaaban (shortest) ee u dhaxaysa labada bari ee asalka ah:

Fogaanta (distance) ugu gaaban (shortest) ee u dhaxaysa labadan bari waa 5.385 cutub (units) dherer.



Saddex xagal qumman (right-angled triangle) ayaa la sameeyay iyadoo hypotenuse (hypotenuse) uu yahay AB.

Waa maxay dhererka (halbeeg) saldhigga tooska ah iyo joogga toosan ee saddexagalkan?

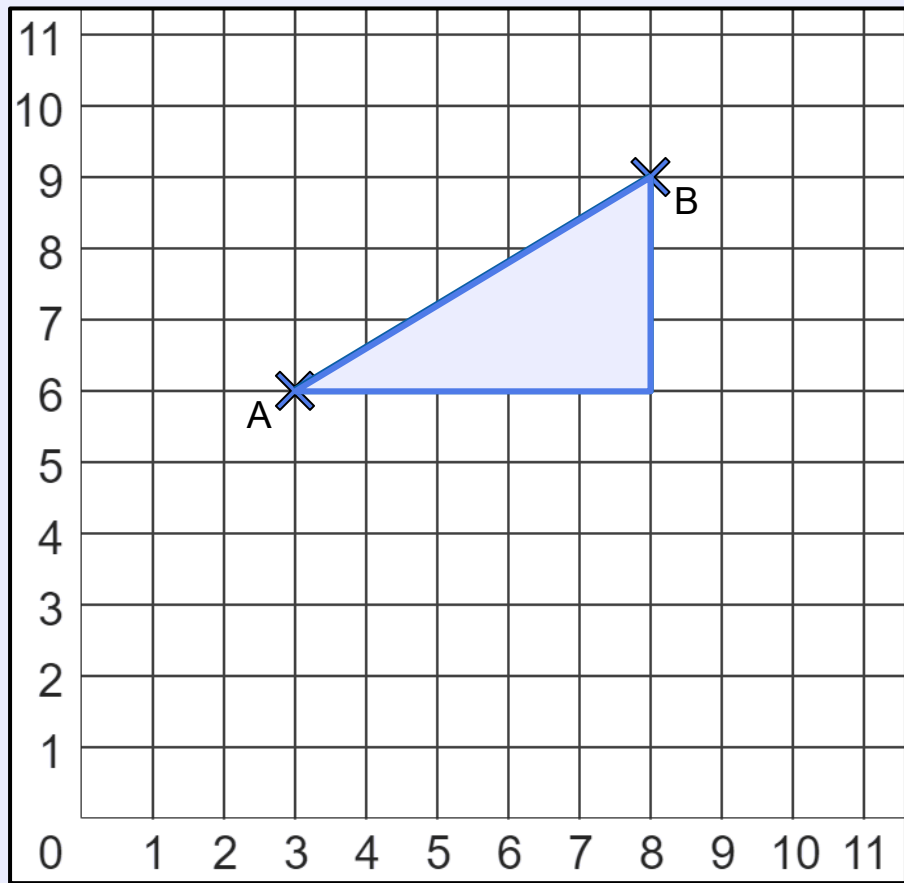
saldhig: _____ **a** _____ halbeeg

joog: _____ hal **b** _____

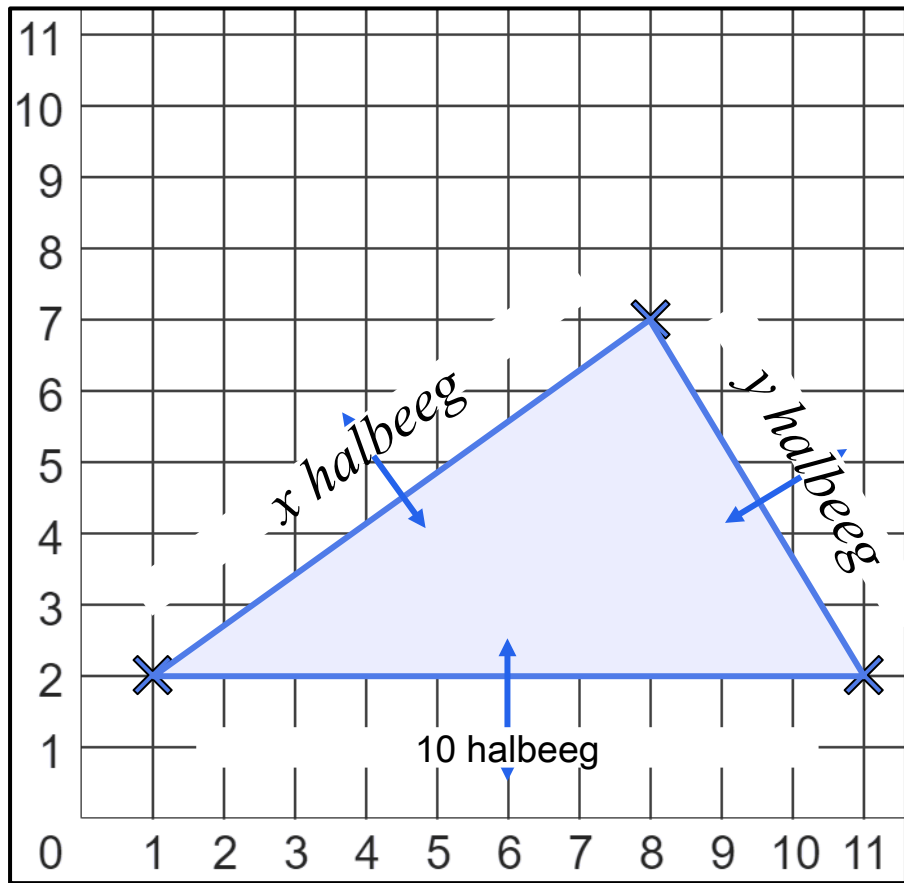
Aragtida Pythagoras (Pythagoras' theorem) iyo isku-duwayaasha (coordinates)



Hubi



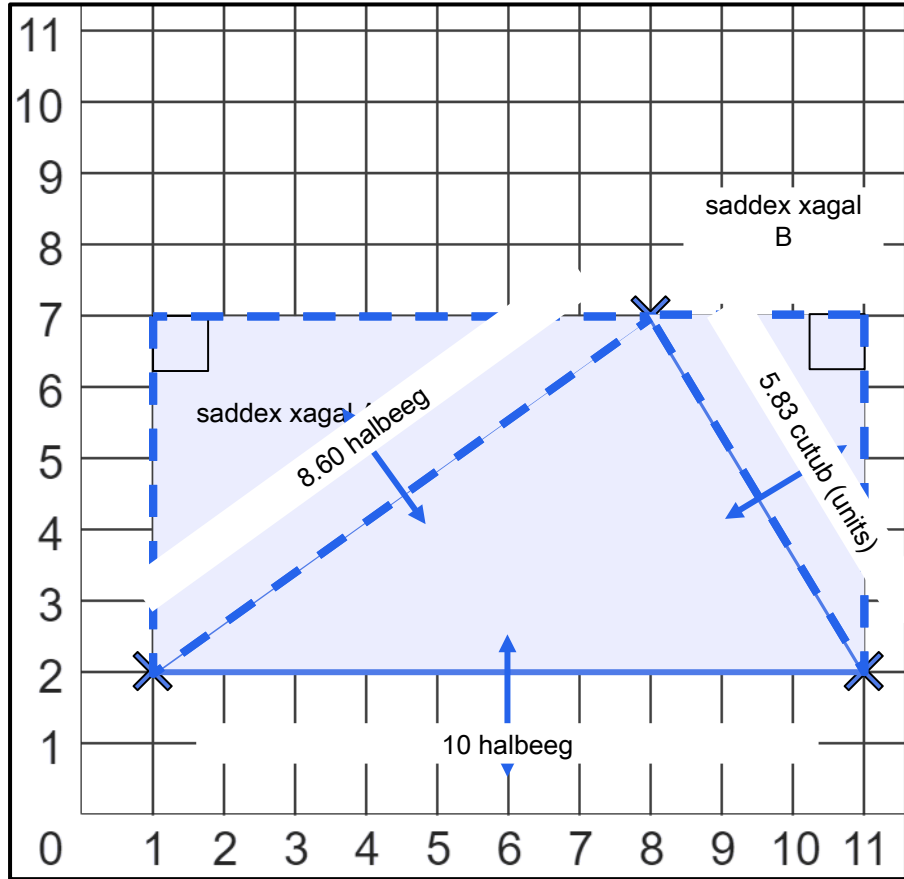
Waa maxay masaafada ugu gaaban (shortest distance) ee u dhaxaysa dhibcaha A iyo B?



Su'aal: xisaabi wareega (perimeter) saddexagalkan.

Si aad u xisaabiso wareega (perimeter), waxaad u baahan doontaa inaad xisaabiso dhererka dhinac kasta.

Dherer kasta oo aan la garanayn, waxaan u baahanahay inaan dhisno saddex xagal qumman (right-angled triangle) oo dhinaciisa uu yahay hypotenuse (hypotenuse).



Su'aal: xisaabi wareega (perimeter) saddexagalkan.

Hypotenuse (hypotenuse) saddexagalka A waa:

$$x^2 = 5^2 + 7^2$$

$$x^2 = 74$$

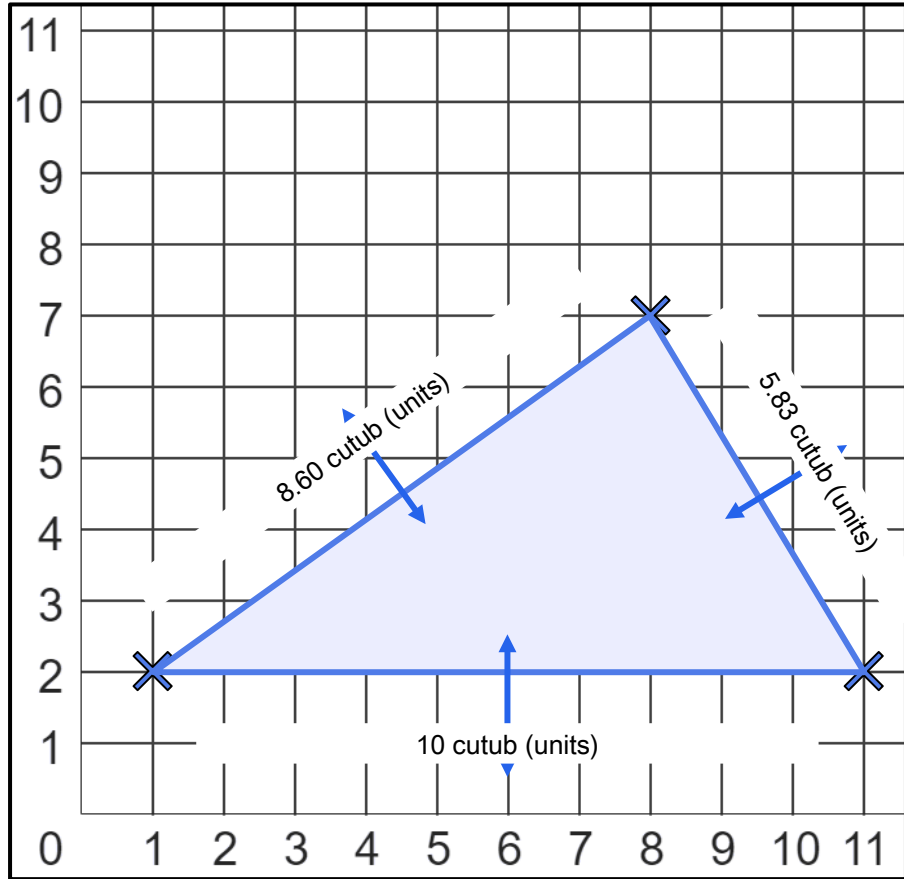
$$x = 8.60$$

Jibbaarta (hypotenuse) ee saddex-xagalka B waa:

$$y^2 = 5^2 + 3^2$$

$$y^2 = 34$$

$$y = 5.83$$



Su'aal: xisaabi wareega (perimeter) saddex-xagalkan.

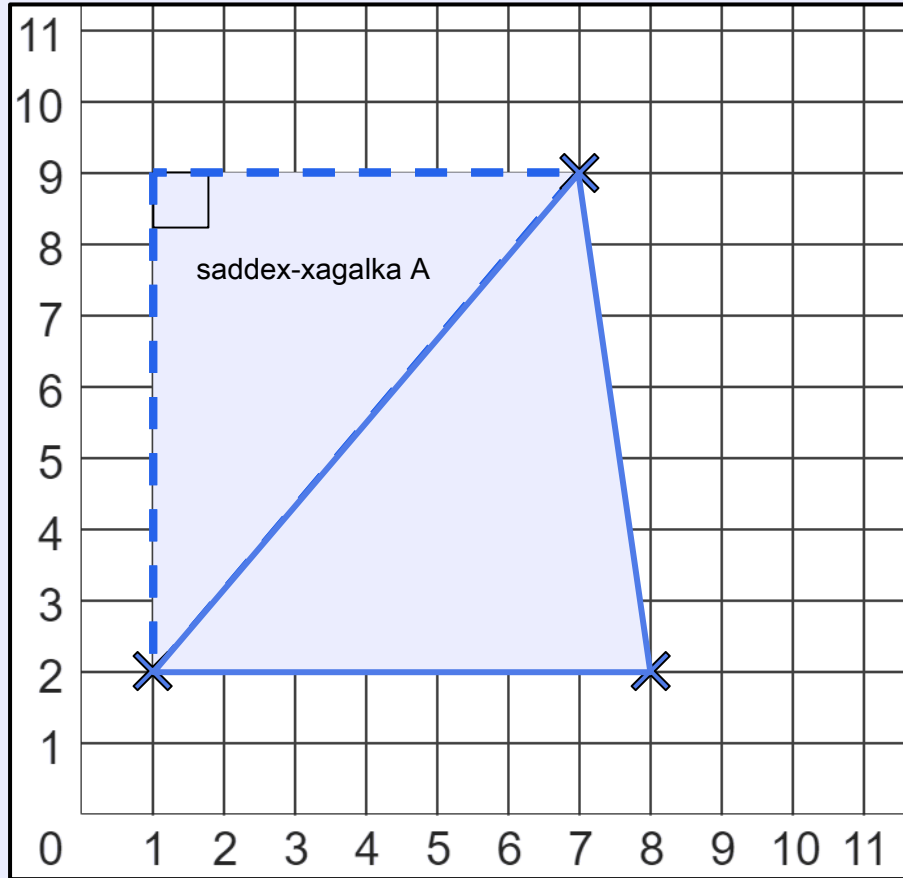
$$8.60 + 5.83 + 10$$

Sidaa darteed, wareega (perimeter) saddex-xagalkan waa:
24.43 cutub (units)

Aragtida (theorem) ee Pythagoras iyo isku-duwayaasha (coordinates)



Hubi



Mid ka mid ah kuwani waa isla'eg (equation) ku habboon xisaabinta jibbaarta (hypotenuse) saddex-xagalka A?

a $a^2 = 7^2 + 9^2$

b $b^2 = 1^2 + 9^2$

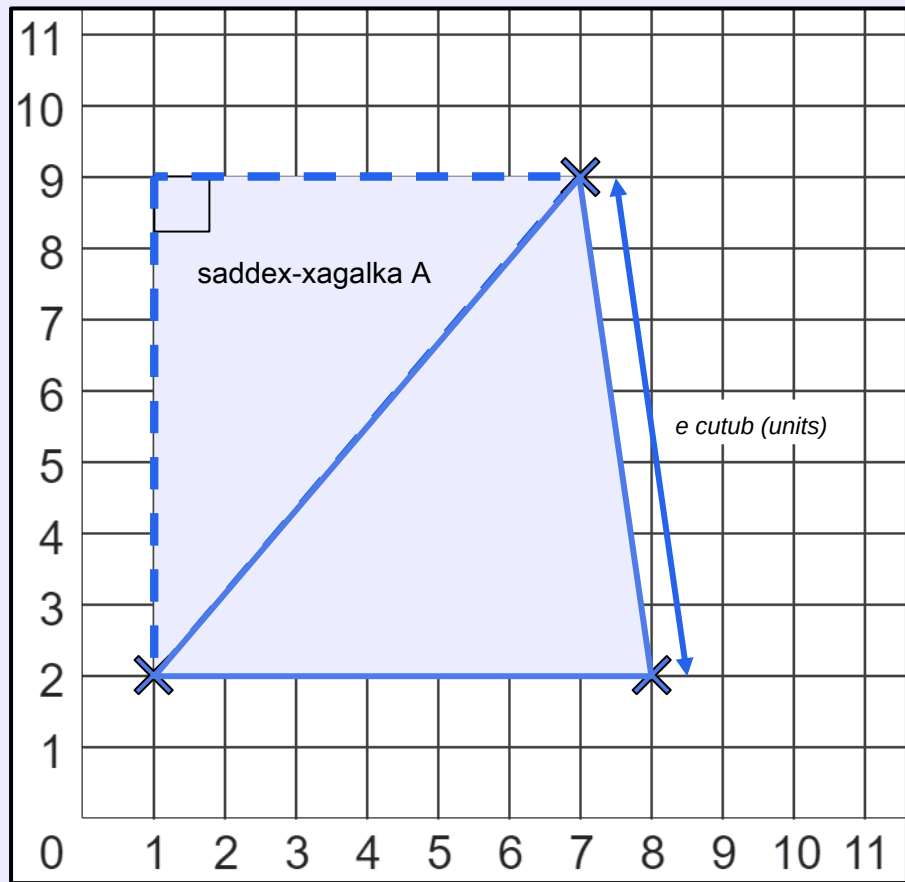
c $c^2 = 6^2 + 7^2$ ✓

d $d^2 = 1^2 + 2^2$

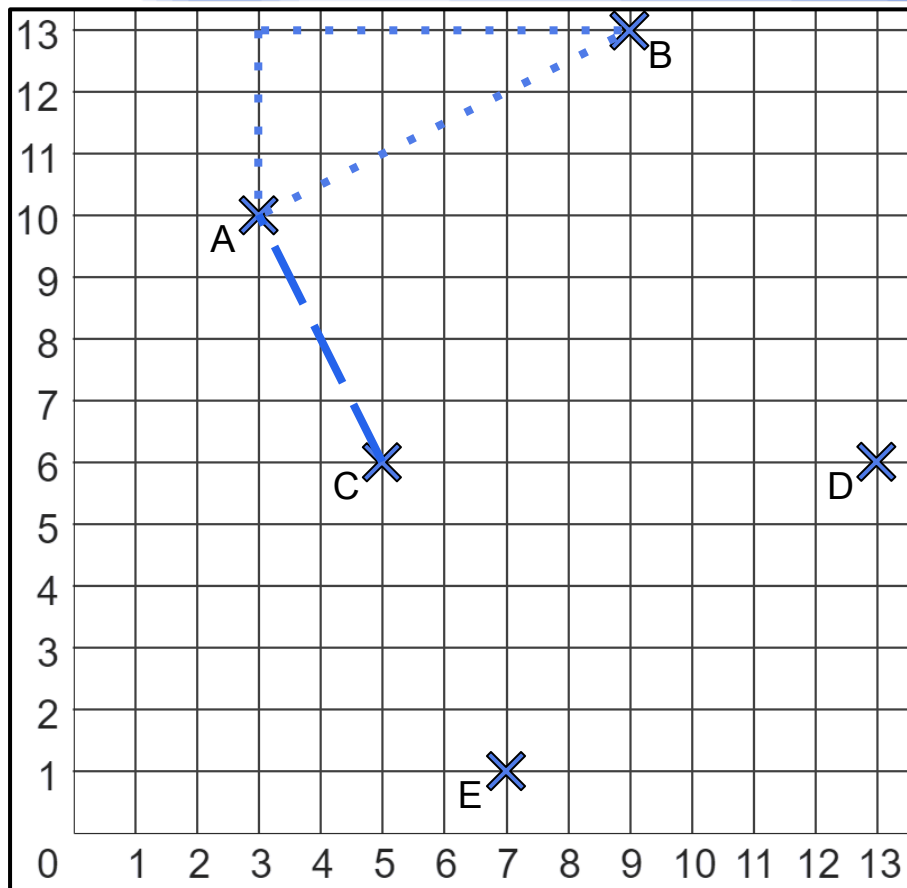
Aragtida (theorem) ee Pythagoras iyo isku-duwayaasha (coordinates)



Hubi

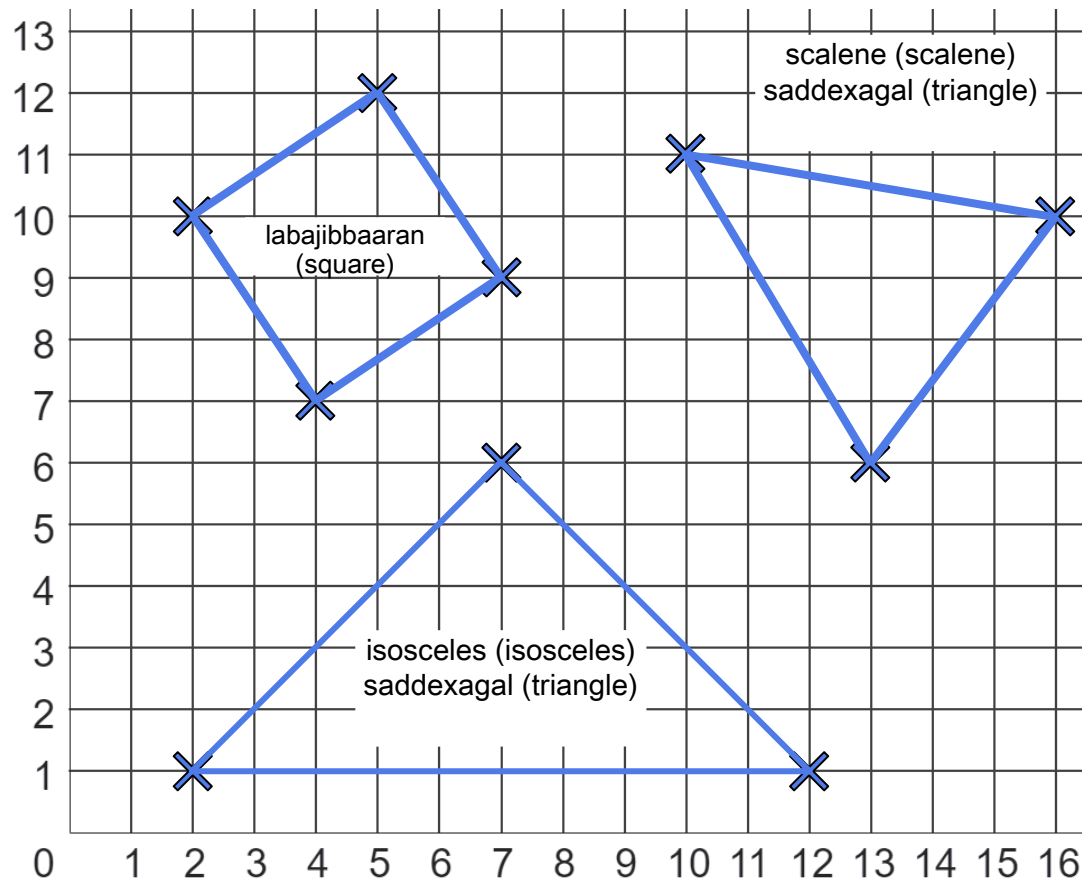


Xisaabi dhererka (length) dhinaca lagu calaamadeeyay e, ilaa 2 d.p.



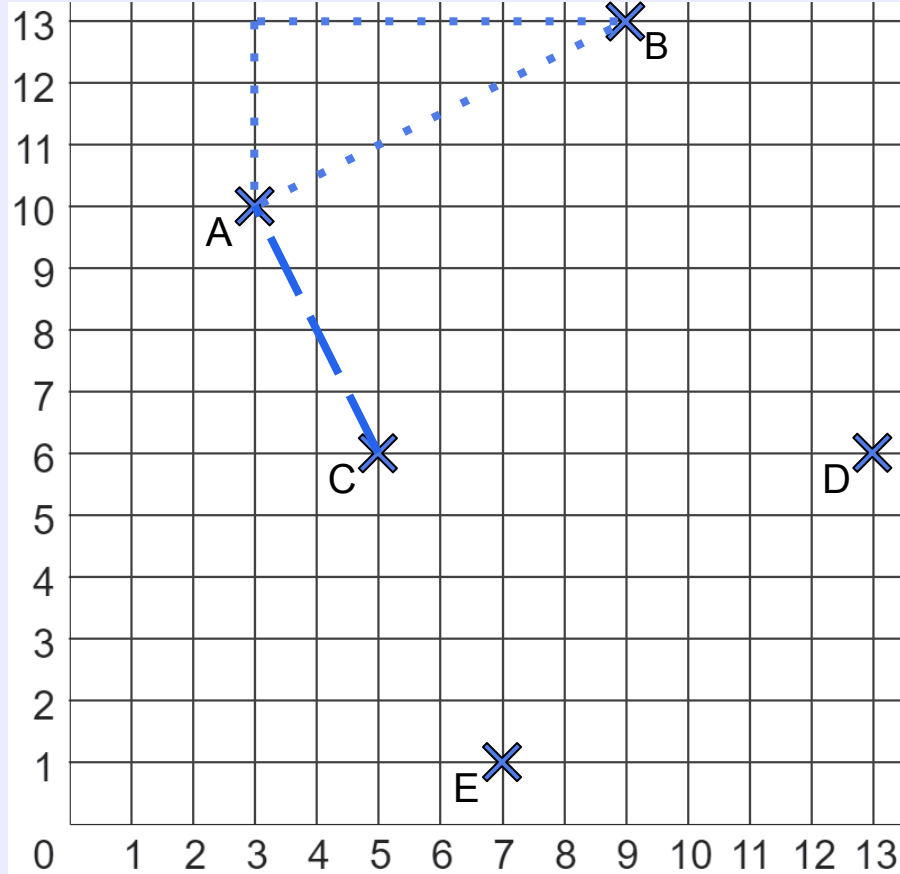
1) Isticmaal aragtida (theorem) ee Pythagoras si aad u hesho masaafada (distance) ugu gaaban (ilaa 1 d.p) inta u dhaxaysa dhibcaha (points):

- a) A iyo B
- b) A iyo C
- c) B iyo D
- d) C iyo D
- e) B iyo E



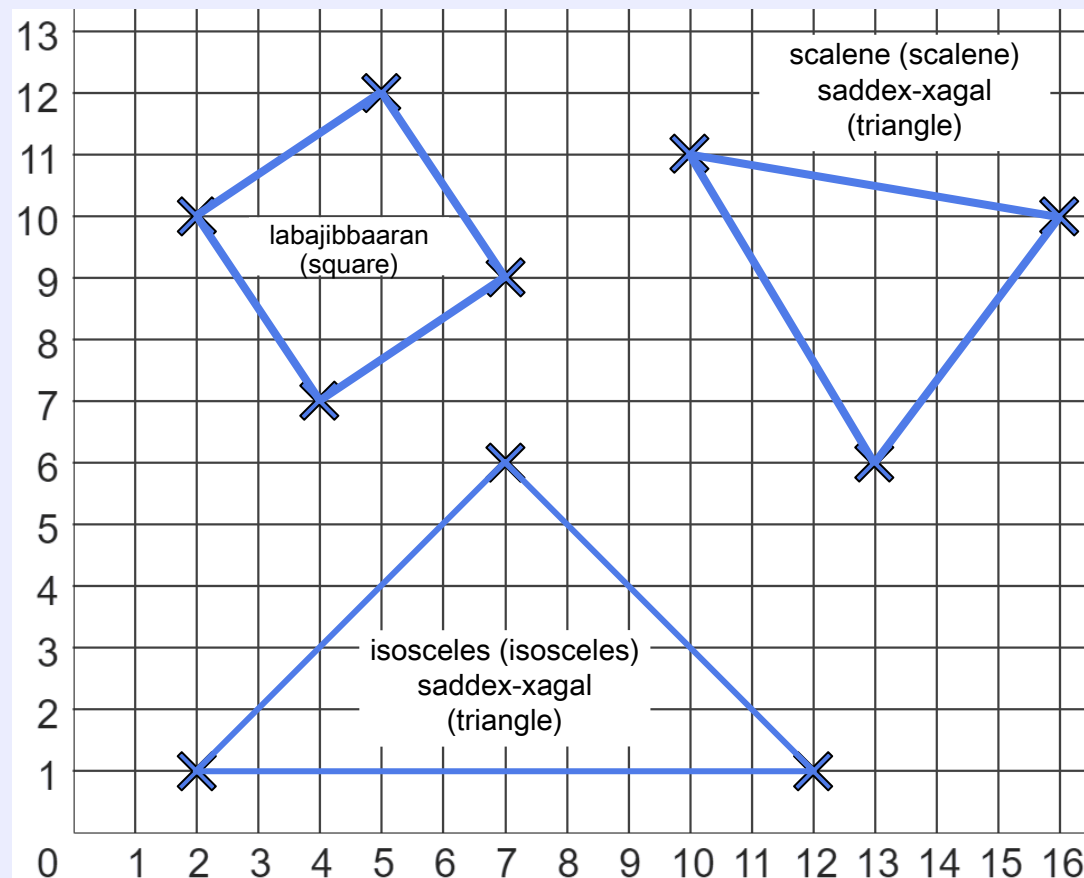
2) Xisaab wareegga (perimeter) qaab kasta (ilaa 2 d.p.).

3) Qor saddex isku-duway (coordinates) oo geesahoodu sameeyaan saddexagal (triangle) leh wareeg (perimeter) u dhexeeya 20 iyo 22 halbeeg (units) dherer. Muuji tani waa sax iyadoo la adeegsanayo aragtida Pythagoras (Pythagoras' theorem).



1) Adeegso aragtida Pythagoras (Pythagoras' theorem) si aad u hesho masaafada ugu gaaban (ilaa 1 d.p) ee u dhaxaysa dhibcaha:

- a) A iyo B
6.7 units
- b) A iyo C 4.5 units
- c) B iyo D
8.1 units
8 units
- d) C iyo D 12.2 cutub (units)
- e) B iyo E

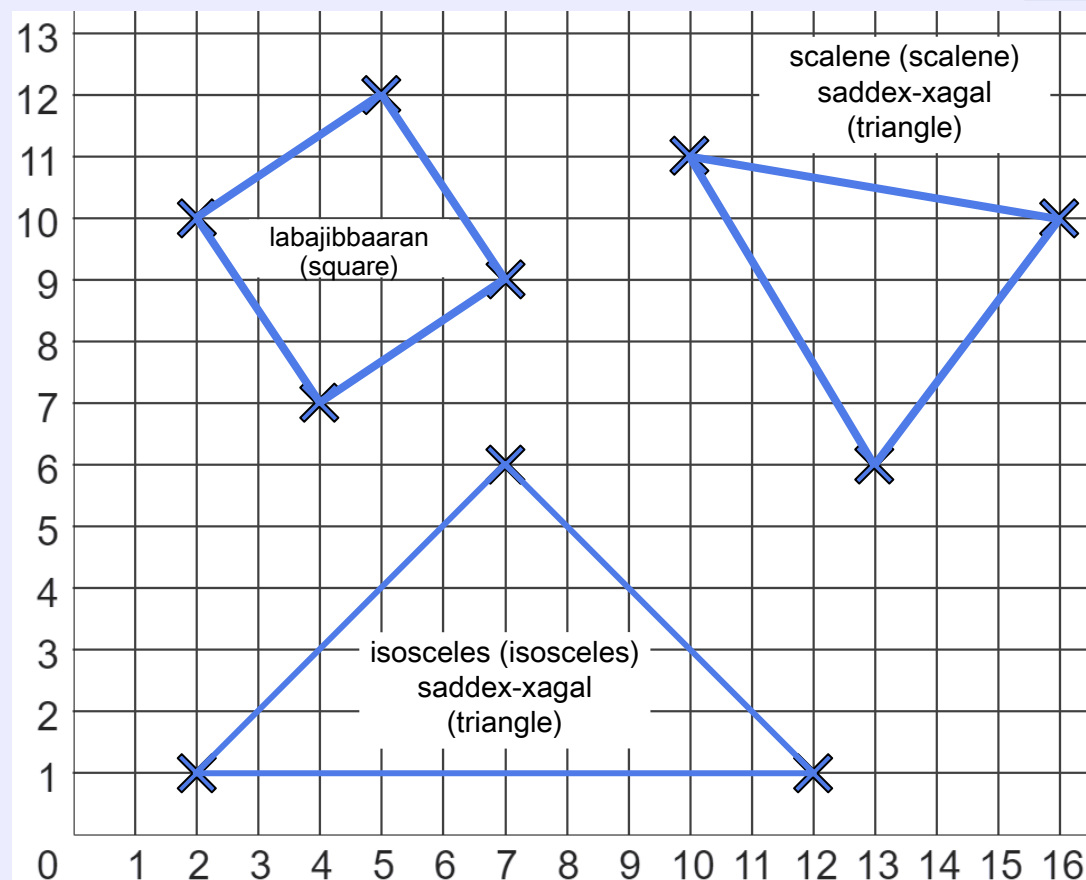


2) Xisaabi wareegga (perimeter) qaab kasta (ilaa 2 d.p.).

labajibbaaran (square)
 4×3.60555
 14.42 cutub (units)

saddex-xagal isosceles (isosceles triangle)
 $2 \times 7.071 + 10$
 24.14 cutub (units)

saddex-xagal scalene (scalene triangle)
 $5.83095 + 5 + 6.08276$
 16.91 cutub (units)



3) Qor saddex isku-duwayaal (coordinates) oo geesahoodu (vertices) sameeyaan saddex-xagal leh wareeg (perimeter) u dhexeeya 20 iyo 22 cutub (units) dherer.

Muuji tani waa sax iyadoo la adeegsanayo aragtida Pythagoras (Pythagoras' theorem).

Waxaa jira xalal badan oo suurtagal ah, sida saddex-xagal leh geeso (vertices) (4, 6), (3, 12) iyo (10, 8)

Qaabka casharka

Xallinta dhibaatooyinka isku ekaanshaha (similarity) iyo aragtida
Pythagoras (Pythagoras' theorem)



Aragtida Pythagoras (Pythagoras' theorem) iyo isku-duwayaasha (coordinates)



Aragtida Pythagoras (Pythagoras' theorem) iyo saamiyada (ratios)

Aragtida Pythagoras (Pythagoras' theorem) iyo saamiyada (ratios)

Waxaa laga yaabaa inaad maalin kasta aragto qaabab isku eg (similar shapes) oo ay ku jiraan saddexagallo qumman (right-angled triangles) iyada oo aanad xitaa garanayn!

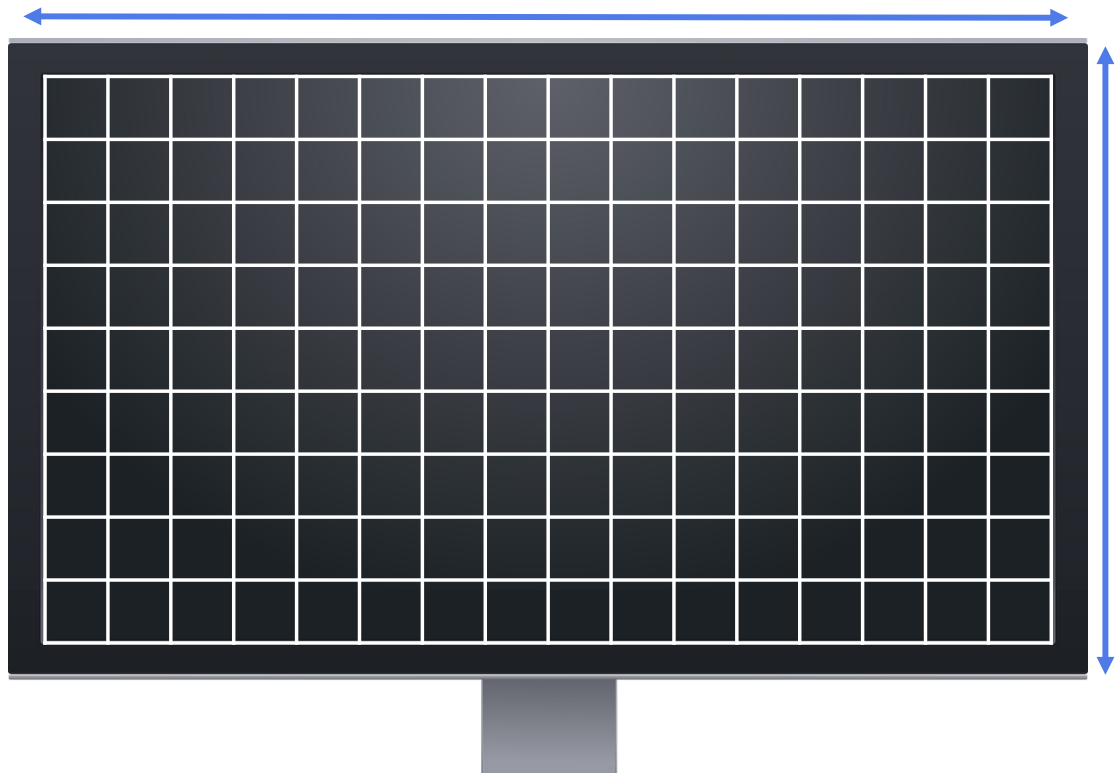


Tani waxay u tahay si filim loo ciyaari karo si caadi ah hal shaashad iyada oo aan u ekaan...

qalloocan ama la fidsan shaashad kale oo ka ballaadhan marka loo eego dhererkeeda.

Waxaan dhahnaa mid kasta oo ka mid ah shaashadahan ballaadhan (widescreen) wuxuu ku jiraa saamiga (aspect ratio) 16 : 9.

Macneheedu waa 16 halbeeg (units) oo xagga dhinaca ah,



Aragtida Pythagoras (Pythagoras' theorem) iyo saamiyada (ratios)

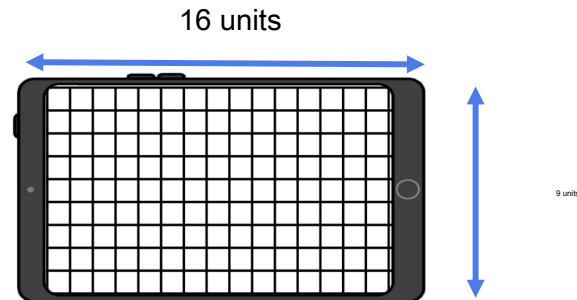
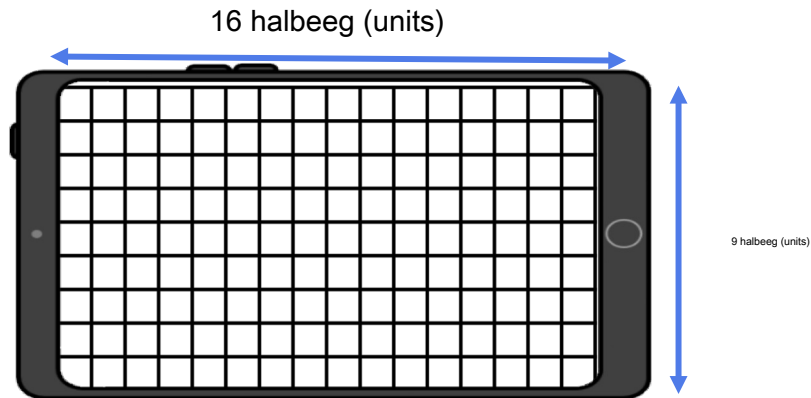
Dhererka hal “halbeeg” (unit) ayaa ah waxa isbeddelaya inta u dhaxaysa shaashad kasta.

That's really cool...

Laakiin maxay tani xiriir la leedahay aragtida Pythagoras?



Andeep

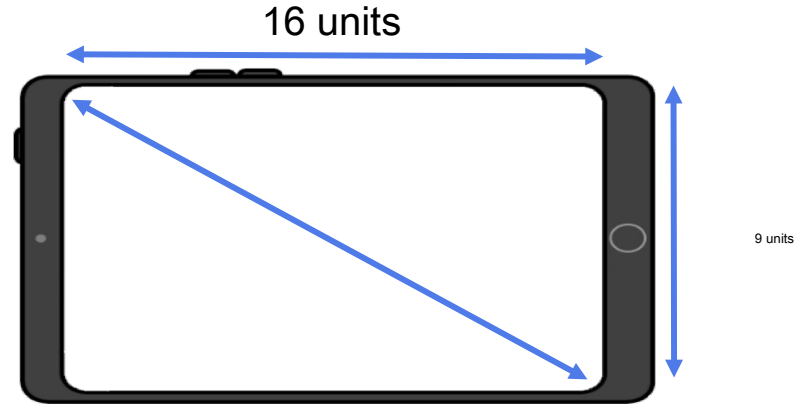


Pythagoras' theorem with ratios

Marka cabbirka shaashadda TV-ga, kormeeraha, ama taleefanka la qeexo, kaliya hal dherer ayaa la bixiyaa.

For example:

“Shaashaddan taleefanku waa 7 inji”

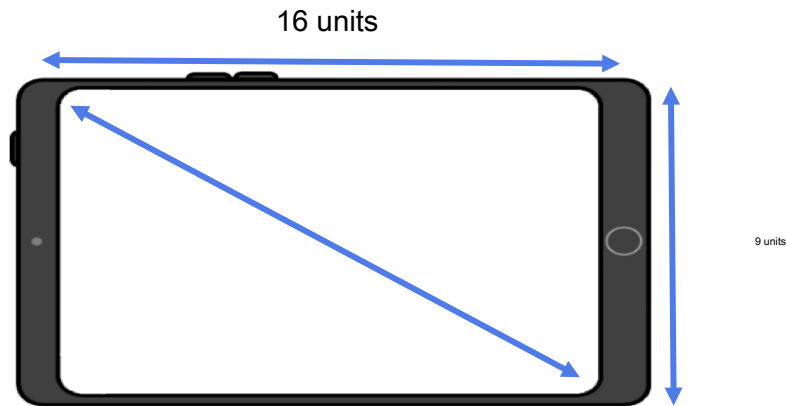


Dhererkani wuxuu qeexayaa jaantuska shaashadda.

And so we can find the width and length of a screen by using Pythagoras' theorem and ratios, since we know the screen will be in proportion to 16 units and 9 units.

To find the diagonal of a screen in **units**, we can use Pythagoras' theorem:

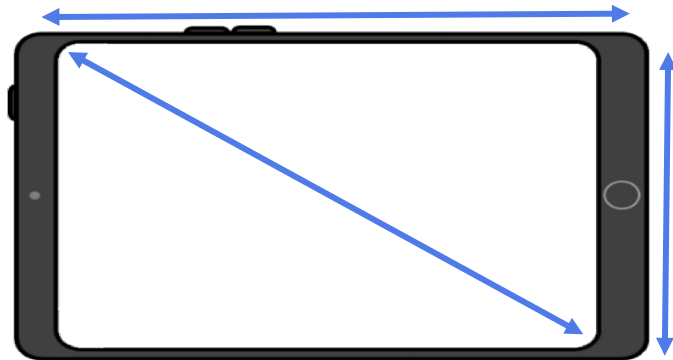
Shaashaddu waa 18.36
halbeeg oo ku xagasha
jaantuskeeda.



We can then represent this information in a ratio table.

16	9	18.36
width of screen	joogga shaashadda (height of screen)	jaantuska shaashadda (diagonal of screen)

Haddii aan ognahay in shaashadda talefoonku tahay 7 inji oo ku xagasha jaantuskeeda, waxaan heli karnaa ballaca iyo jooggeeda inji ahaan.



Waxaan markaa ku matali karnaa macluumaadkan jaantus saami (ratio table).

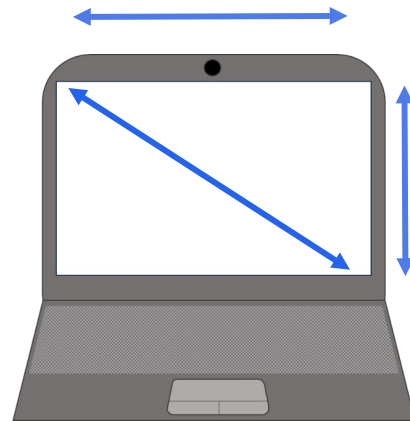
$\frac{7}{18.36}$	16	9	18.36	
$\times$	$16 \times \frac{7}{18.36}$	$9 \times \frac{7}{18.36}$		$\div$

halbeegyo ahaan
(in units)

Shaashadda talefoonku waa 6.1 inji ballac iyo 3.4 inji joog.

Shaashadaha retro waxay lahaayeen ballac iyo joog oo saami ahaan 4 : 3

Adigoo isticmaalaya aragtida Pythagoras (Pythagoras' theorem), soo hel inta halbeeg ee jaantuska shaashaddani dhererkiisu yahay.



Jawaabaha:

4 halbeeg (units)

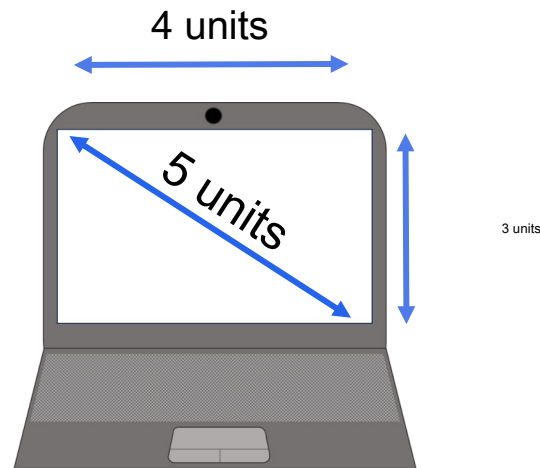
3 halbeeg (units)

Qiyaasta (theorem) ee Pythagoras oo leh saamiyada (ratios)

Sanduuqa shaashadda retro waxaa ku qoran “18 inch screen”.

Xaggee shaxdan saamiyada (ratio table) ayuu tiro 18 ku dhacayaa?

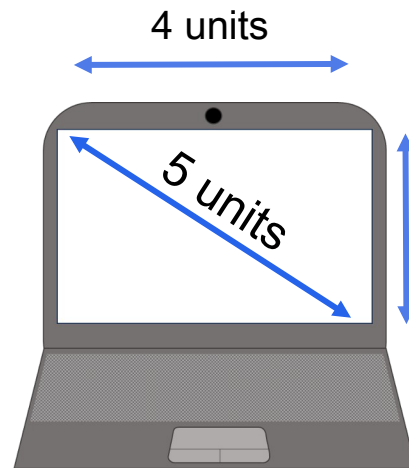
	ballac (width)	joog (height)	xagal (diagonal)
units	4	3	5
inches	a	b	c ✓



Qiyaasta (theorem) ee Pythagoras oo leh saamiyada (ratios)

Sanduuqa shaashadda retro waxaa ku qoran “18 inch screen”.

Waa maxay isku-dhufashadan (multiplier), k ?



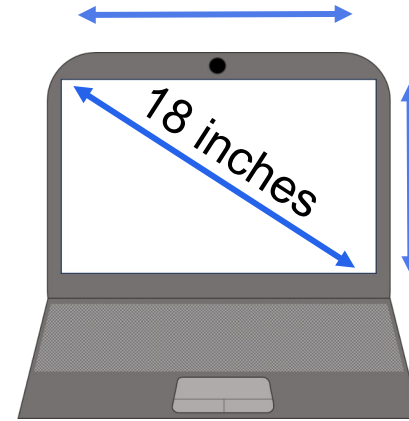
	ballac (width)	joog (height)	xagal (diagonal)
$\times k$	4	3	5
$k = 3.6$			18

$\div$

Aragtida Pythagoras (Pythagoras' theorem) iyo saamiyada (ratios)

Sanduuqa shaashadda retro waxaa ku qoran “18 inch screen”.

Waa maxay ballaca (width) iyo jooga (height) shaashaddan, oo ku qoran inches?

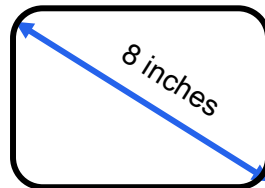


	ballac (width)	joog (height)	jaantus (diagonal)
×	4	3	5
3.6	14	10.8	18
	inches	inches	

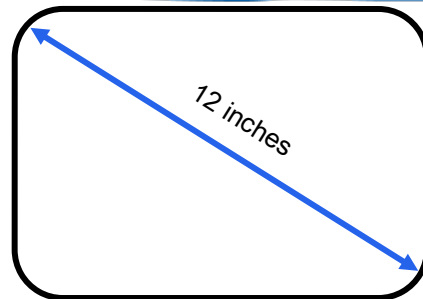
Curved blue arrows indicate the calculation: $4 \times 3.6 = 14$ and $3 \times 3.6 = 10.8$. A division symbol $\div$ is shown next to the diagonal value 18.

1) Mid kasta oo ka mid ah saddexdan TV-ga ballaaran (widescreen) wuxuu leeyahay ballac (width) iyo joog (height) oo saami (ratio) 16 : 9 ah.

a) Dhammaystir jumlada kasta adoo dooranaya erayga ku habboon hoose.



shaashadda A
(screen A)

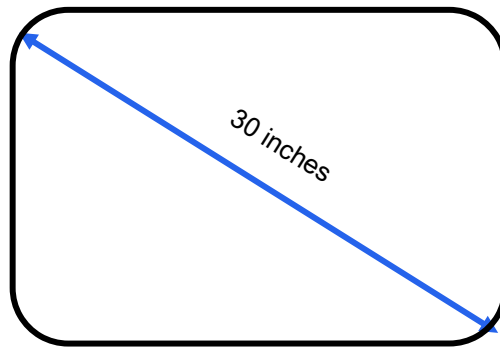


shaashadda B

Mid kasta oo ka mid ah TV-yada waa _____ midka kale.

Tani waa sababta oo ah _____ iyo _____ waxay ku jiraan _____ midba midka kale.

_____ shaashadda A ilaa B waa 1.5.



shaashadda C

saami (proportion)

qiyaasta weyneyn
(scale factor)

ballaca (width)

isku qaab (congruent)

joogga (height)

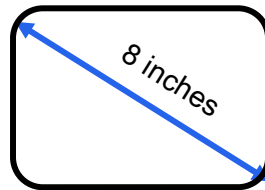
isku mid (similar)

1) Mid kasta oo ka mid ah saddexdan TV oo ballaadhan ayaa leh ballaca (width) iyo joogga (height) saami (ratio) 16 : 9.

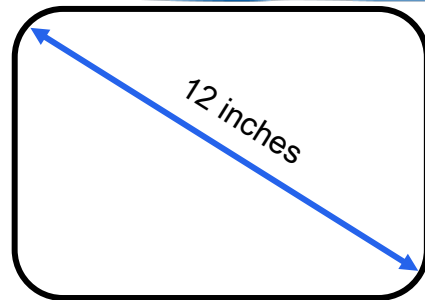
b) Adoo adeegsanaya aragtida Pythagoras (Pythagoras' theorem), dhammaystir shaxda saamiyada (ratio table) ee shaashadda B (3 d.p.)

ballaci (width)	joogga (height)	jaantus (diagonal)
16	9	
		12

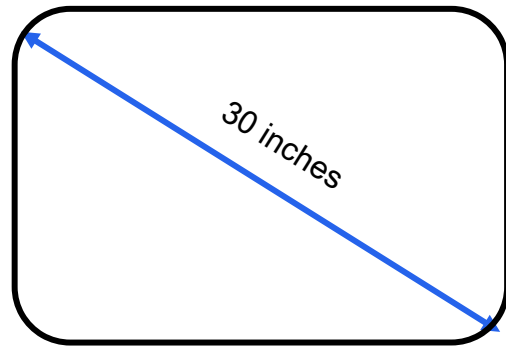
c) Sidaas awgeed, xisaabi ballaca (width) shaashadaha A iyo C (2 d.p.)



shaashadda A



shaashadda B



shaashadda C

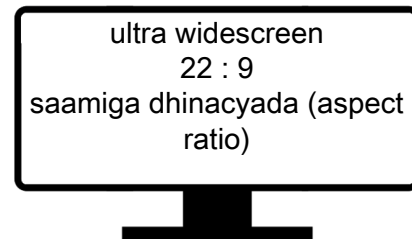
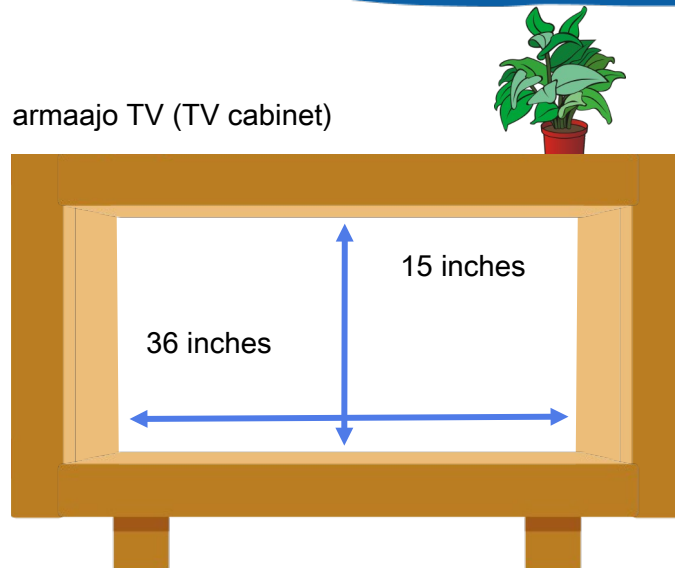
2) Isra waxay rabtaa inay iibsato TV-ga ultra widescreen, kaas oo ballaciisa iyo jooggiisu yihiin saami 22 : 9.

TV-gu wuxuu leeyahay shaashad 35 inch, iyo saldhig dhererkiisu yahay 2 inch.

Ma ku habboonaa TV-ga gudaha armaajo TV-ga?

ballaci (width)	joogga (height)	jaantus (diagonal)

armaajo TV (TV cabinet)



3) Yacquub wuxuu arkayaa saddex TV oo iib ah, mid kastaa wuxuu leeyahay shaashad 28 inch.

TV retro (saami 4 : 3)

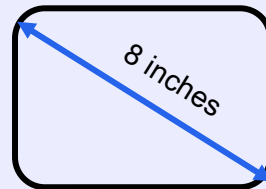
TV widescreen (saami 16 : 9)

TV ultra widescreen (saami 22 : 9)

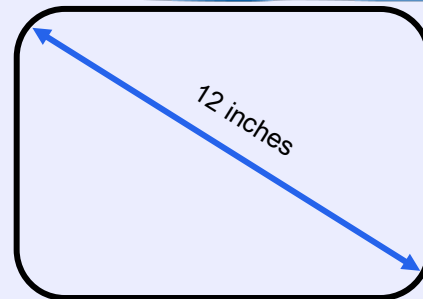
Yacquub wuxuu rabaa inuu iibsado TV-ga shaashadiisu leedahay bedka ugu weyn.
Kee ayuu iibsanayaa?

1) Mid kasta oo ka mid ah saddexdan TV-ga ballaadhan (widescreen) wuxuu leeyahay ballac (width) iyo joog (height) oo ku jira saamiga (ratio) 16 : 9.

a) Dhammaystir jumlad kasta adoo dooranaya erayga ku habboon ee hoos ku qoran.



shaashadda A
(screen A)

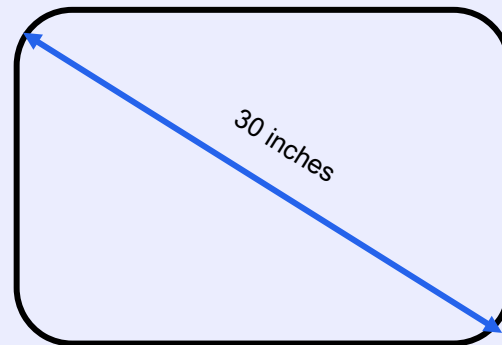


shaashadda B
(screen B)

Mid kasta oo ka mid ah TV-yada (TVs) wuxuu isku mid (similar) yahay kuwa kale.

Tani waa sababta oo ah _____ iyo _____ waxay ku jiraan _____
midba midka kale. ballac (width) joog (height)
saami (proportion)

_____ ka laga bilaabo shaashadda A (screen A) ilaa B (screen B) waa 1.5.
qiyaasta weyn (scale factor)



shaashadda C
(screen C)

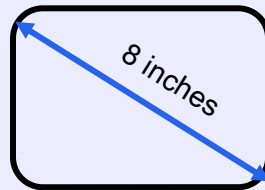
1) Mid kasta oo ka mid ah saddexdan TV-ga ballaadhan (widescreen) wuxuu leeyahay ballac (width) iyo joog (height) oo ku jira saamiga (ratio) 16 : 9.

b) Adigoo isticmaalaya aragtida Pythagoras, buuxi jaantuska saamiga ee shaashadda B (3 d.p.)

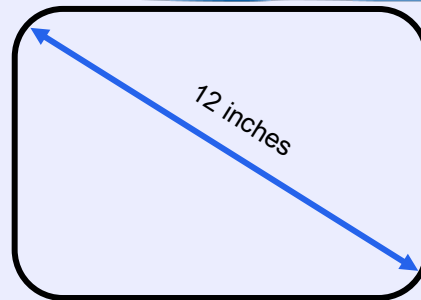
ballaca (width)	joogga (height)	jaantuska (diagonal)
16	9	18.358
10.459	5.883	12

c) Sidaa awgeed, xisaabi ballaca (width) shaashadaha A (screen A) iyo C (screen C) (2 d.p.)

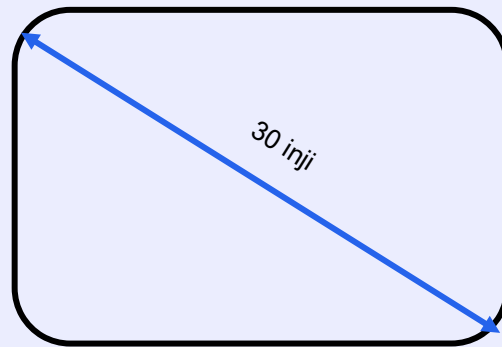
shaashadda A: $10.459 \div 1.5 = 6.97$ inji
shaashadda C: $10.459 \times 2.5 = 26.15$ inji



shaashadda A



shaashadda B



shaashadda C

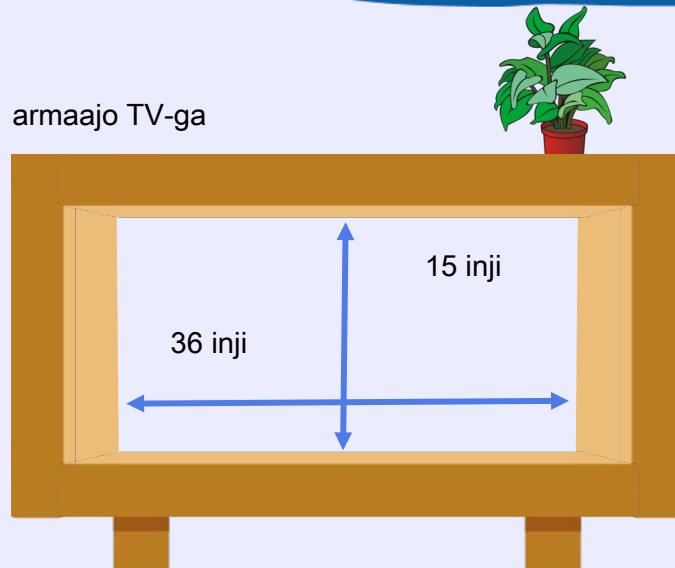
2) Isra waxay rabta inay iibsato TV-ga ultra widescreen, kaas oo ballaca iyo jooggiisu yihiin saami 22 : 9.

TV-ga wuxuu leeyahay shaashad 35 inji, iyo saldhig 2 inji oo dheer.

Ma ku habboona TV-ga gudaha armaajooyinkeeda TV-ga?

ballaca (width)	joogga (height)	jaantuska (diagonal)
22	9	23.77
32.39	13.25	35

armaajo TV-ga



Maya, TV-ga kuma habboona armaajada.

In kasta oo shaashadu ka yar tahay ballaca iyo joogga armaajada, saldhigga 2 inji ee TV-ga ayaa ka dhigaya TV-ga mid aad u dheer.

3) Yacquub wuxuu arkayaa saddex TV oo la iibinayo, mid walbana leh shaashad 28 inch.

TV retro (4 : 3 saamiga (aspect ratio))

TV ballaadhan (widescreen) (16 : 9 saamiga (aspect ratio))

TV aad u ballaadhan (ultra widescreen) (22 : 9 saamiga (aspect ratio))

jadwalka soo koobida xalalka (summary table of solutions)

TV	ballaca (width)	joogga (height)	bedka (area)
retro	22.4	16.8	376 inches ²
ballaadhan (widescreen)	24.4	13.7	335 inches ²
aad u ballaadhan (ultra widescreen)	25.9	10.6	275 inches ²

Inkasta oo saddexda TV ay dhererka geeska (diagonal) yihiin 28 inches, TV-ga retro ayaa leh shaashadda bedka (area) ugu weyn.

Inkasta oo aragtida Pythagoras (Pythagoras' theorem) ay caawin karto helista dhererka dhinaca saddex-xagalka qumman (right-angled triangle) marka la bixiyo dhererka labada dhinac ee kale, waxaa laga yaabaa inaysan lagama maarmaan ahayn in la isticmaalo, iyadoo ku xiran haddii qiimaha (value) aan raadinayno uu yahay xagal (angle), bed (area), ama wareeg (perimeter).

Aragtida Pythagoras (Pythagoras' theorem) waxaa loo isticmaali karaa in lagu helo dhererka dhinaca marka la isbarbardhigayo laba saddex-xagal oo qumman (right-angled) oo isku mid ah (similar).

Waxaad isticmaali kartaa aragtida Pythagoras (Pythagoras' theorem) si aad u hesho masaafada ugu gaaban (shortest distance) ee u dhaxaysa laba isku-duwayaal (coordinates), ama wareegga (perimeter) qaababka (shapes) geesahoodu ku yaalliin shabkada isku-duwayaasha (coordinate grid).

Aragtida Pythagoras (Pythagoras' theorem) waxaa loo isticmaali karaa iyadoo lala shaqeeynayo saamiga (aspect ratio) ee TV-yada si loo xisaabiyo ballaca (width) iyo joogga (height) shaashadda TV-ga, marka la bixiyo dhererka geeska (diagonal).