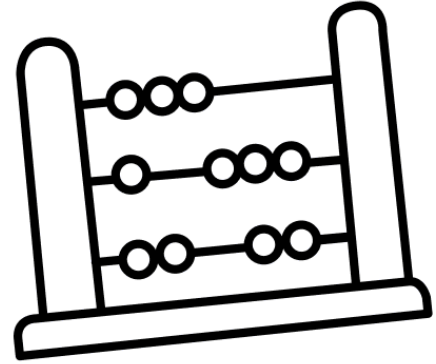


Dhererka dhinaca gaaban (Length of a shorter side)



Maths

Cutub: Sifooyinka joomatari: isku ekaansho iyo aragtida Pythagoras
(Geometrical properties: similarity and Pythagoras' theorem)

Natiijo

Waxaan isticmaali karaa aragtida Pythagoras (Pythagoras' theorem) si aan u helo dhererka mid ka mid ah dhinacyada gaaban.

Erayada muhiimka ah

Saddexagal xagal-qumman (right-angled triangle) wuxuu leeyahay hal xagal 90° oo gudaha ah.

Hypotenuse (hypotenuse) waa dhinaca saddexagalka qumman ee ka soo horjeeda xagasha qumman.

Aragtida Pythagoras (Pythagoras' theorem) waxay tusinaysaa in wadarta labajibbaaranaha (squares) labada dhinac ee gaaban ee saddexagalka xagal-qumman ay la mid tahay labajibbaaranaha dhinaca ugu dheer (hypotenuse).

Qaabka casharka

Dhererka dhinaca gaaban (Length of a shorter side)



Labajibbaaranayaal (Squares) ka yimid dhinacyada saddexagalka



Isticmaalka aragtida Pythagoras (Pythagoras' theorem) si loo helo dhinac gaaban

Oh, waxaan heli karnaa dhererka (length) hypotenuse adoo xidid labo jibaaran (square root) ka qaadaya bedka (area) labo jibaarkaas!



Cali

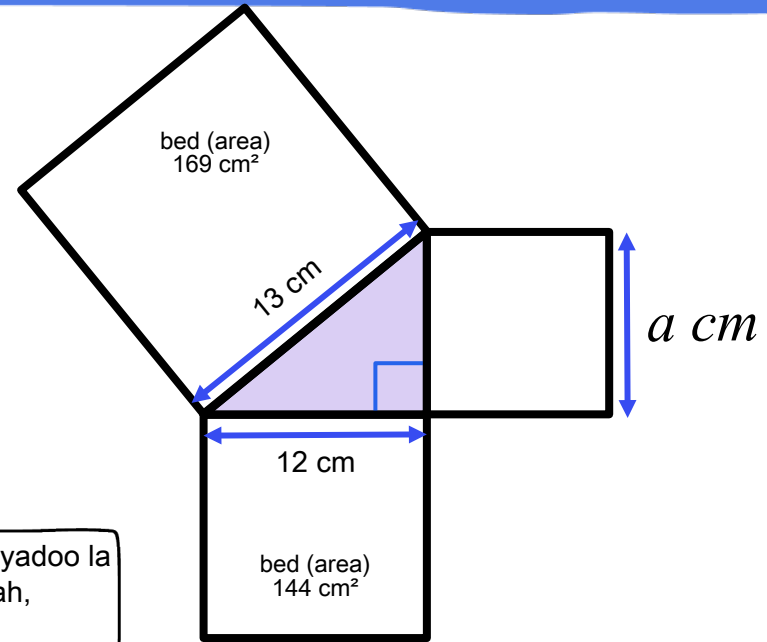
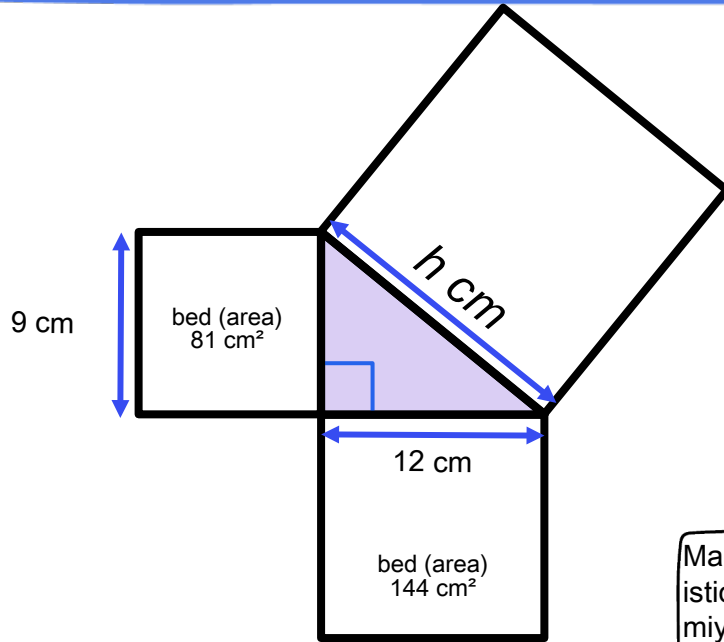
$$\sqrt{100}$$

6 cm

8 cm

h cm

Bedka (area) labo jibaarka (square) ka yimid hypotenuse waa wadarta (sum) labada labo jibaar oo yaryar oo ka yimid labada dhinac ee gaaban ee saddex-xagalka (triangle).



Ma heli karo dhererka a iyadoo la isticmaalayo hab la mid ah, miyaan karaa?

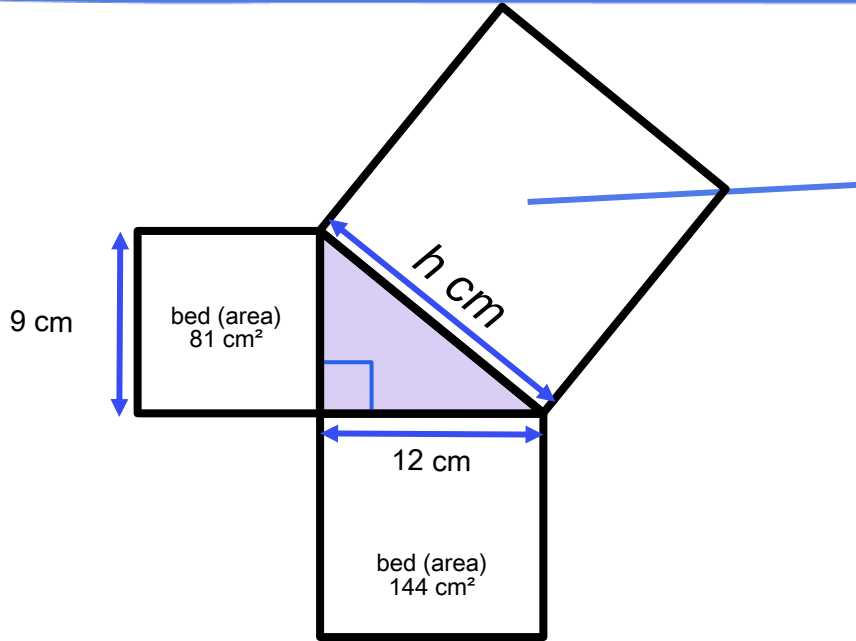


Saciid

Saddexagalka dhinacyadiisa laga sameeyay labajibbaaranayaal (squares)



Sharaxaad



Saddexagalkan, labajibbaaranaha aan la calaamadin beelkiisa (area) waa kan ka yimid hypotenuse-ka.

Sidaa darteed, bedka (area) labajibbaaranahan waa wadarta labada labajibbaaran ee kale.

Dhererka hypotenuse-ka waxaa laga heli karaa iyadoo la xisaabinayo xididka labajibbaaranaha (square root) ee bedka (area) labajibbaaranahan.



Halka, saddex-xagalkan, bedka (area) labajibbaaranaha ka yimid hypotenuse waa la yaqaan.

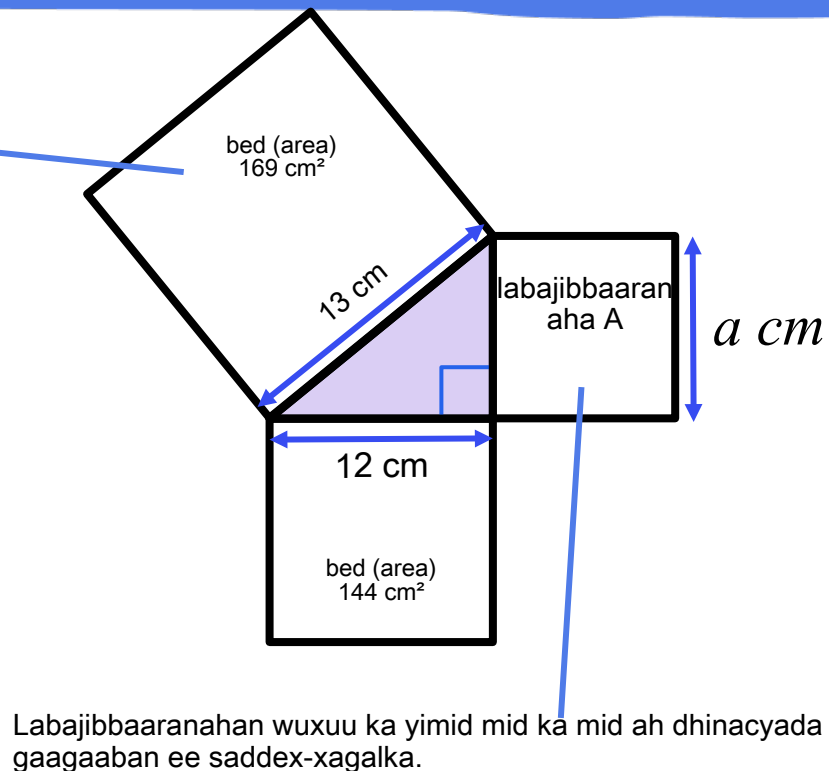
Sidaa darteed, 169 waa wadarta 144 iyo bedka (area) labajibbaaranaha A.

$$169 = 144 + \text{bedka (area) labajibbaaranaha A}$$



Saciid

Marka, sideen u heli karaa bedka (area) labajibbaaranaha A?



Labajibbaaranahan wuxuu ka yimid mid ka mid ah dhinacyada gaagaaban ee saddex-xagalka.

Labajibbaaranayaal ka yimid dhinacyada saddex-xagalka

Sidaa darteed, 169 waa wadarta 144 iyo bedka (area) labajibbaaranaha A.

$169 = 144 + \text{bedka (area) labajibbaaranaha A}$

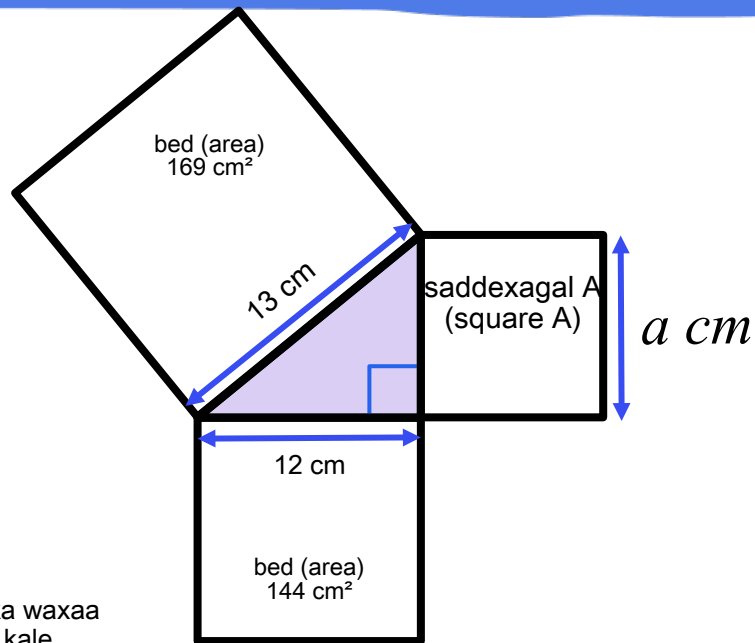
$169 - 144 = 144 + \text{bedka (area) labajibbaaranaha A} - 144$



$- 144 = \text{bedka saddexagalka A (area of square A)}$

$25 = \text{bedka saddexagalka A (area of square A)}$

Bedka mid ka mid ah saddexagallada (squares) ee dhinaca gaaban ee saddexagalka waxaa laga helaa kala-goyn, ama helista farqiga, u dhexeeya bedka labada saddexagal ee kale.



Saddexagallo (Squares) ka yimid dhinacyada saddexagal

Sidaa darteed, 169 waa wadarta 144 iyo bedka saddexagalka A.

$$169 = 144 + \text{bedka saddexagalka A (area of square A)}$$

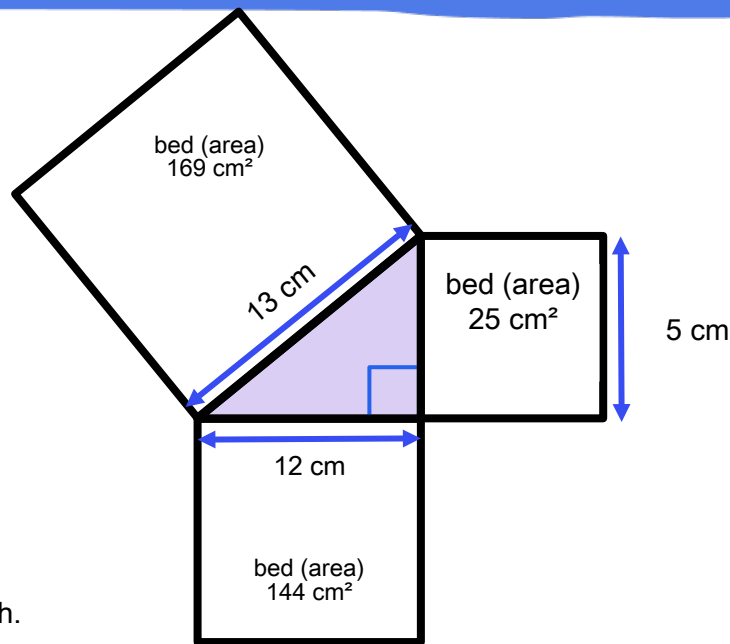
$$\begin{array}{r} - 144 \\ - 144 \end{array}$$

- 144 = bedka (area) laba jibaaran A (square A)

$$25 = \text{bedka (area) laba jibaaran A (square A)}$$

Dhererka dhinacaas gaaban ee saddex-xagalka waxaa loo helaa si la mid ah.

$$\sqrt{25} = 5$$



Xisaabintaas (calculation) kee ayaa helaya bedka (area) laba jibaaran B (square B)?

a

b

c

d

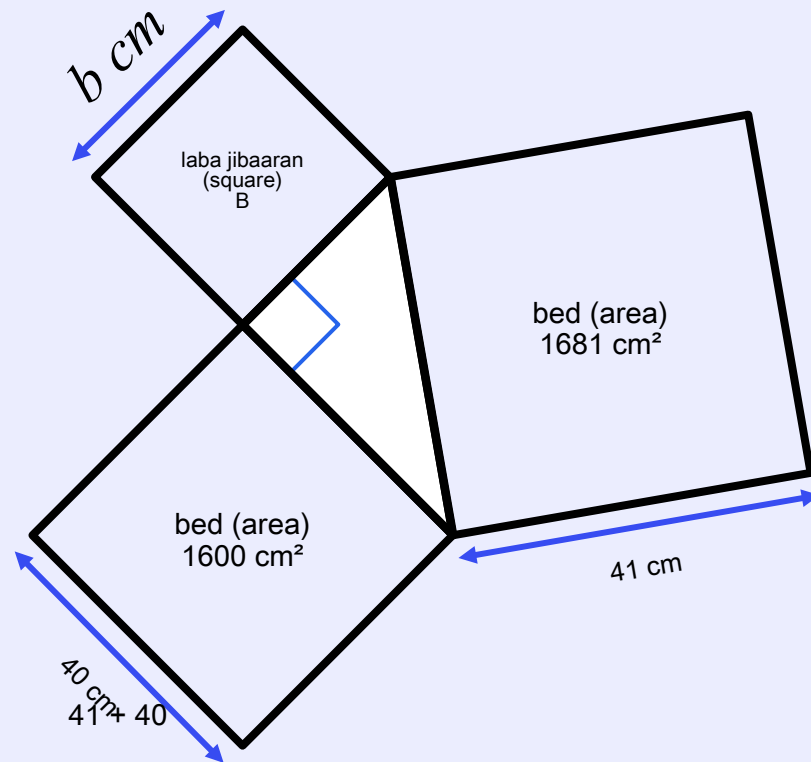


Jawaabaha:

$$1681 + 1600$$

$$1681 - 1600$$

$$41 - 40$$



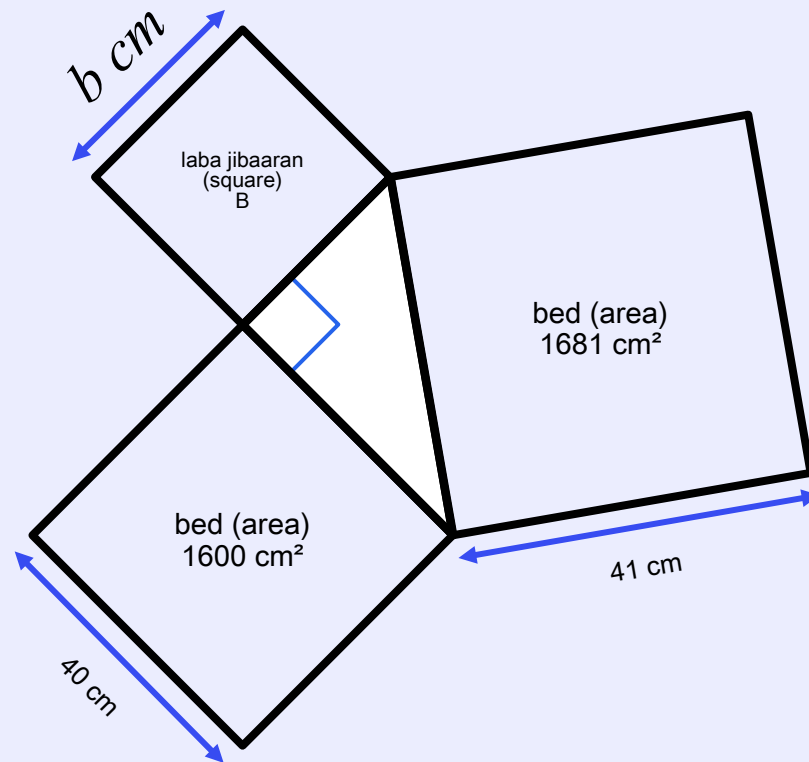
Dee qayb ka mid ah weedhahan ayaa kaa caawinaya in la fahmo sababta 1681 – 1600 ay tahay xisaabta saxda ah?

a

Labajibbaaranaha B waa labajibbaaranaha ka yimid hypotenuse (jifaarka) saddexagalka.

b

Labajibbaaranaha B waa labajibbaaranaha ka yimid dhinac gaaban oo saddexagalka ah.



Waa maxay dhererka dhinaca b , cm ahaan?

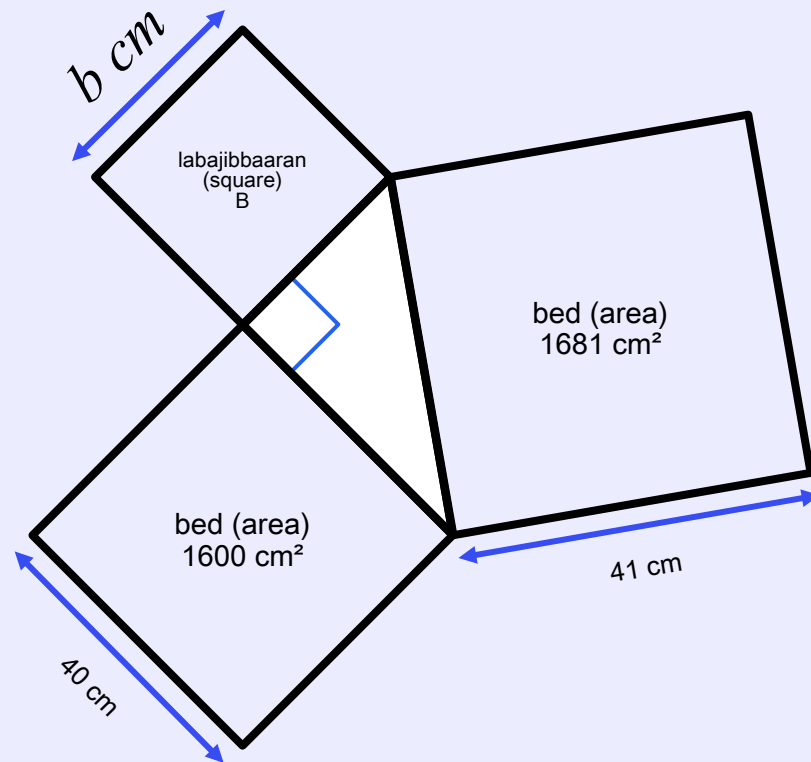
$$1681 - 1600 = 81$$

Bedka labajibbaaranaha B waa 81 cm^2



b waa 9 cm dherer.

Waa dhererka dhinaca ugu gaaban ee saddexagalka.



Squares (Squares) oo ka yimid dhinacyada saddex-xagal (triangle)



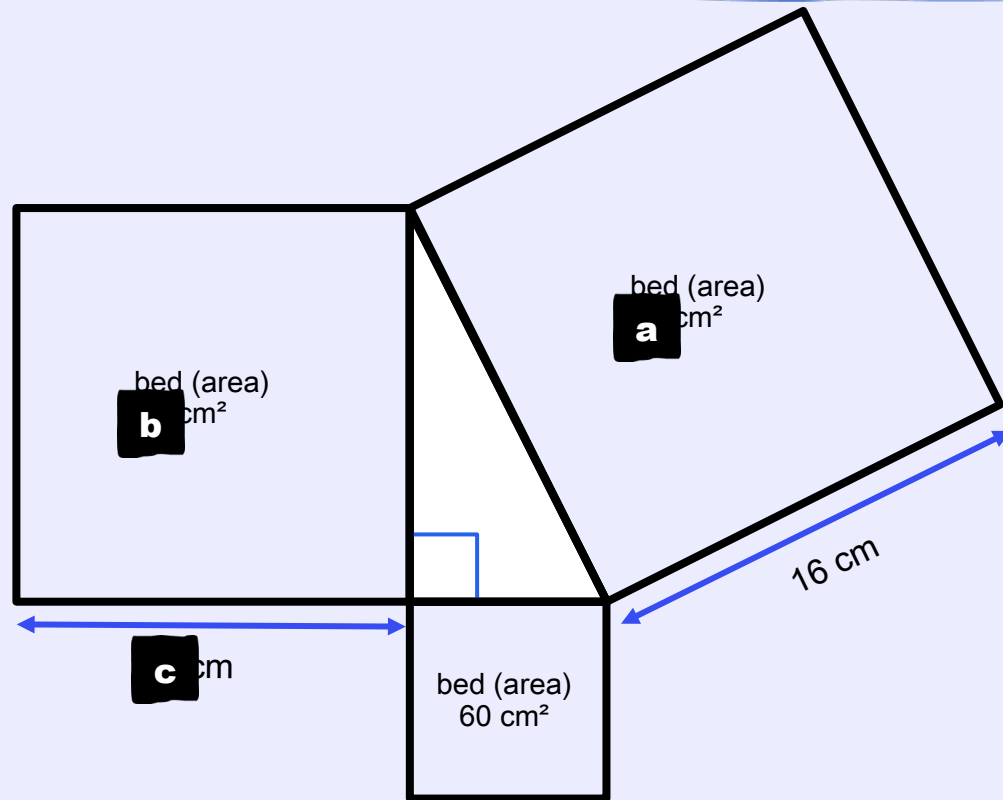
Hubi

Ku dheji dhererka (length) ama bedka (area)
maqan qiimihiisa (value) saxda ah.

a

b

c



Jawaabaha:

316

32

256

17.8

14

196

Squares (Squares) oo ka yimid dhinacyada saddex-xagal (triangle)



Hubi

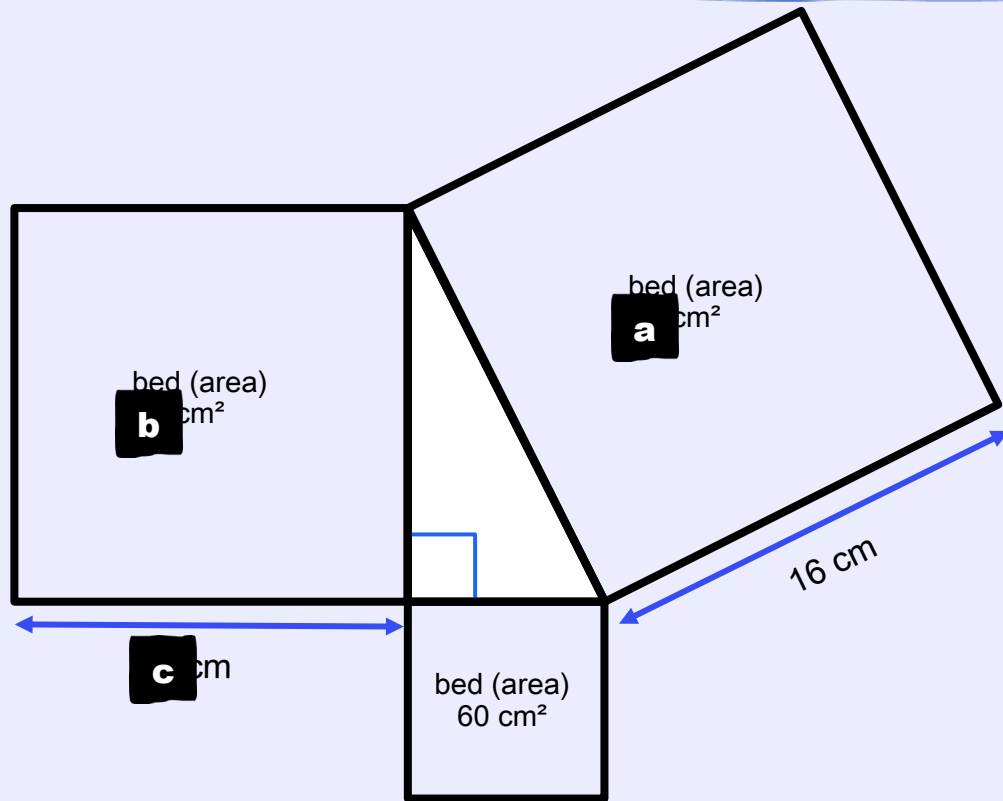
Ku dheji dhererka (length) ama bedka (area)
maqan qiimihiisa (value) saxda ah.

a 256

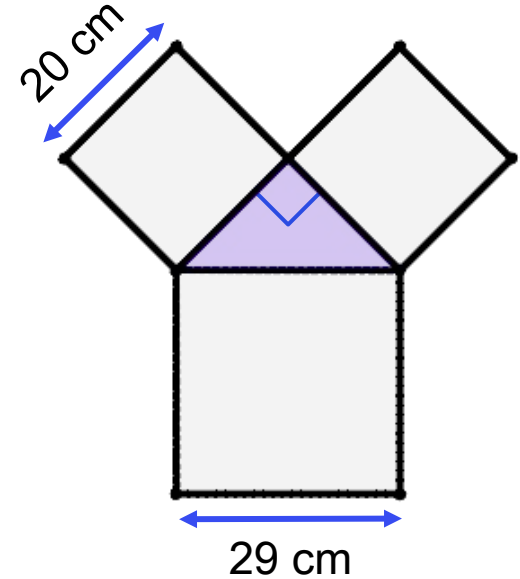
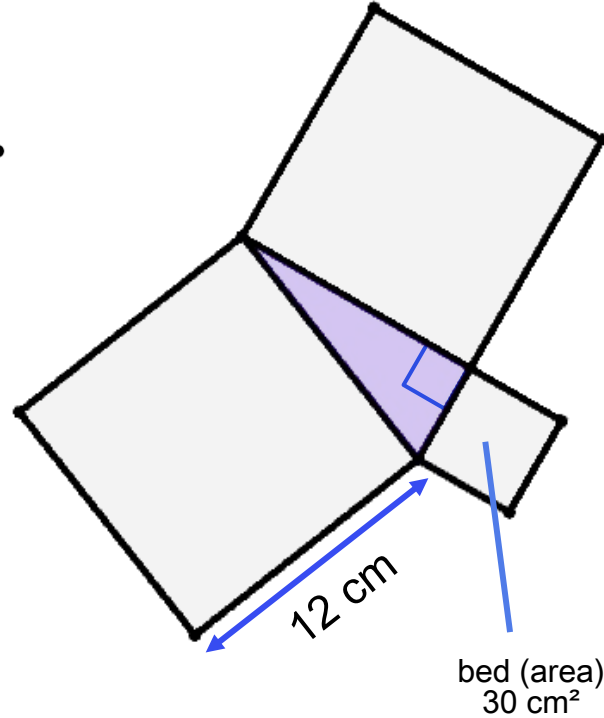
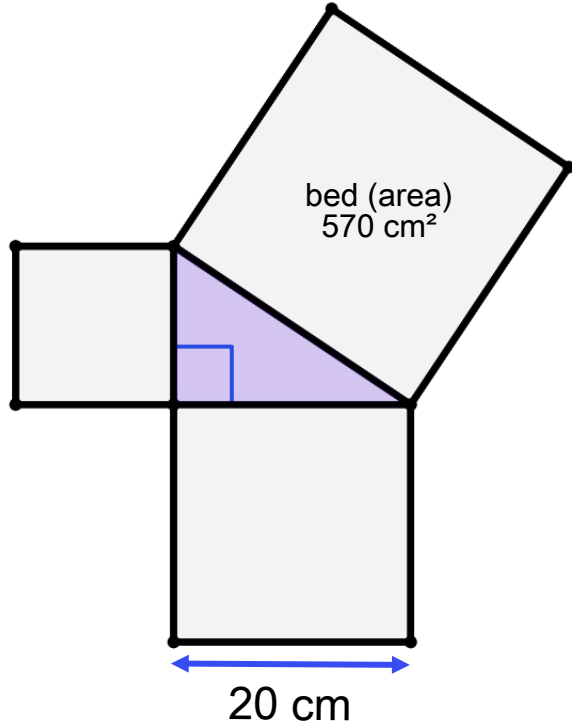
b 196

c 14

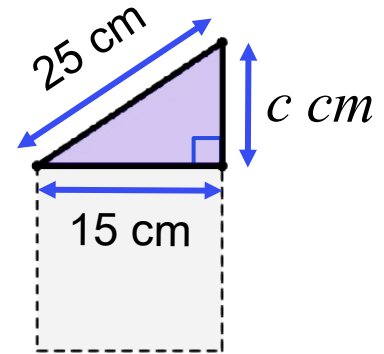
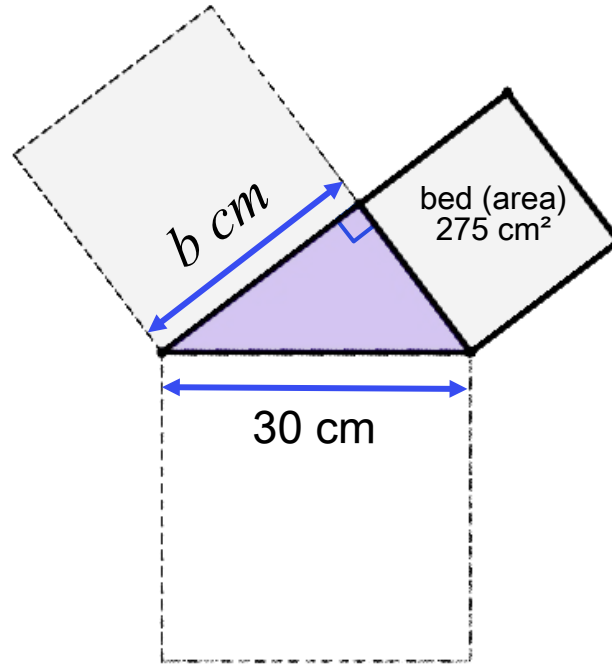
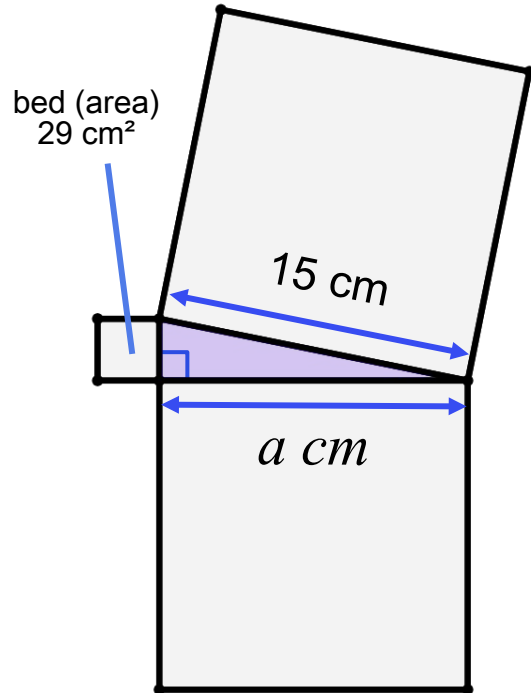
316 32 17.8



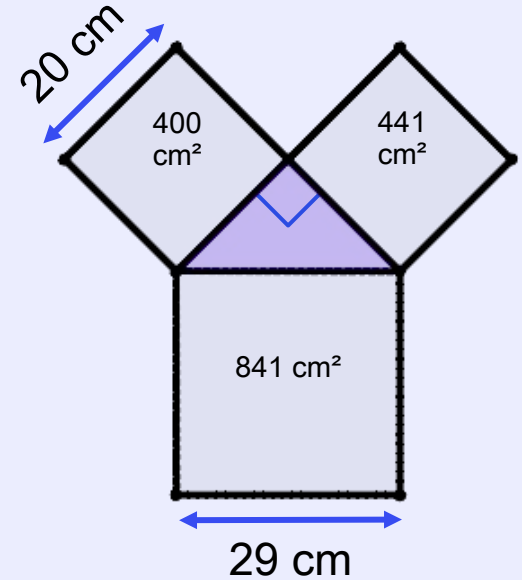
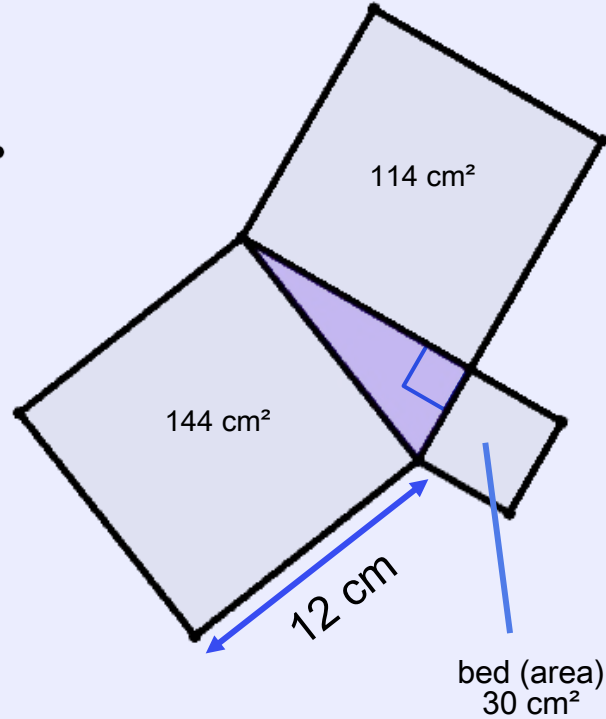
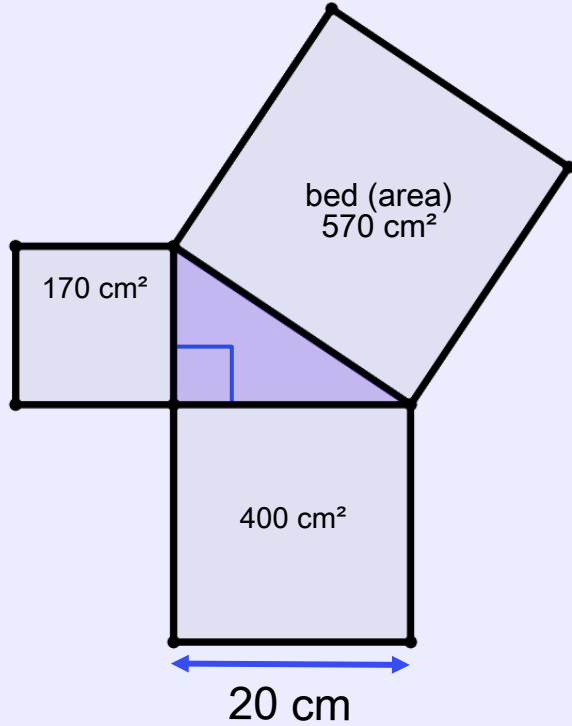
1) Soo hel bedka (area) square (square) kasta oo aan la calaamadayn.



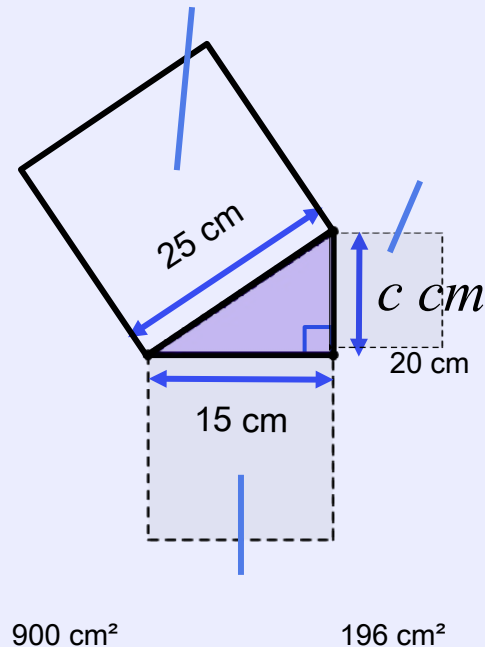
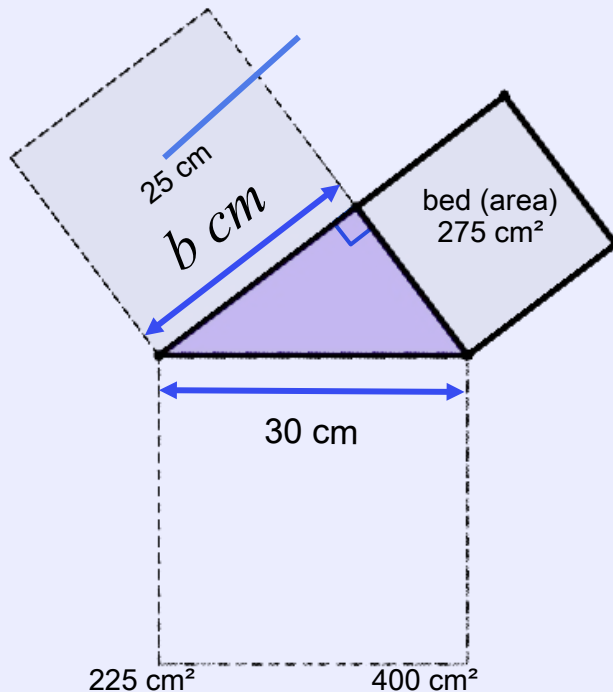
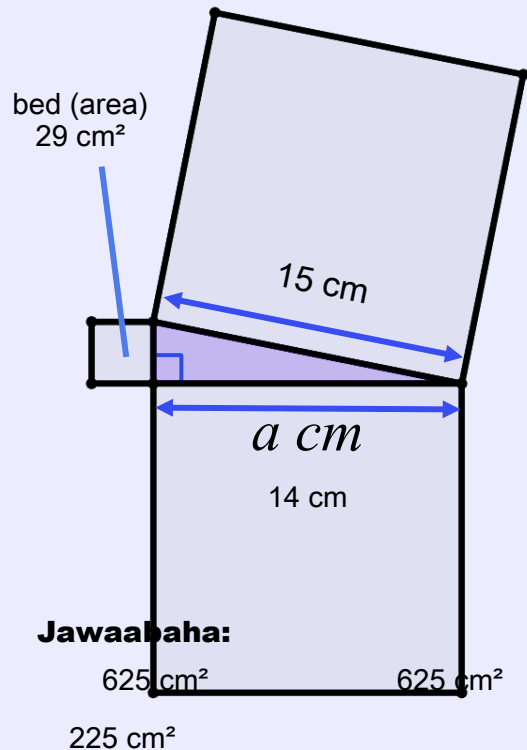
2) Adigoo marka hore sawiraya squares (squares) kasta oo maqan oo xisaabinaya beddooda (area), raadi dhererka dhinac kasta oo lagu calaamadeeyay xaraf.



1) Raadi bedka (area) square (square) kasta oo aan la calaamadayn.



2) Adoo marka hore sawiraya labajibbaaran kasta oo maqan, xisaabiyana bed (area) kooda, hel dhererka dhinac kasta oo xaraf ku calaamadsan.



Qaabka casharka

Dhererka dhinaca gaaban (Length of a shorter side)



Labajibbaaranayaasha (Squares) ka imanaya dhinacyada saddexagalka

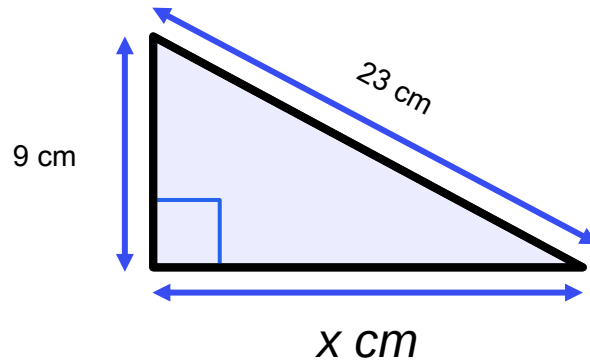


Isticmaalka aragtida Pythagoras (Pythagoras' theorem) si loo helo dhinac gaaban



Saciid

Qaaciddada (Pythagoras' theorem) waxaa loo isticmaali karaa xisaabinta jilib-jilib (hypotenuse) ee saddex-xagal (triangle).
Laakiin ma loo isticmaali karaa in laga helo dhererka dhinaca gaaban?



Layla

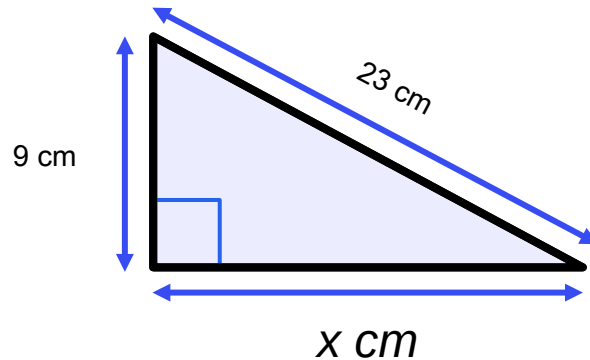
Ma hubo, aan ku beddelno dhererka dhinacyada qaaciddada (Pythagoras' theorem) oo aan soo ogaano.

Qaaciddada (Pythagoras' theorem): $a^2 + b^2 = c^2$



Saciid

Haa, markaa xarafka x ma uu socdaa dhinaca midig ee qaabka (formula) qaaciddada (Pythagoras' theorem), maadaama uu yahay dhinaca aan la garanayn?



Layla

Maya, hubaal maya!
Xusuusnow, waa inay marwaliba la mid noqotaa laba-jibaar (square) ee jilib-jilib (hypotenuse)!
Haddii jilib-jilib (hypotenuse) yahay dherer la yaqaan iyo haddii kale!

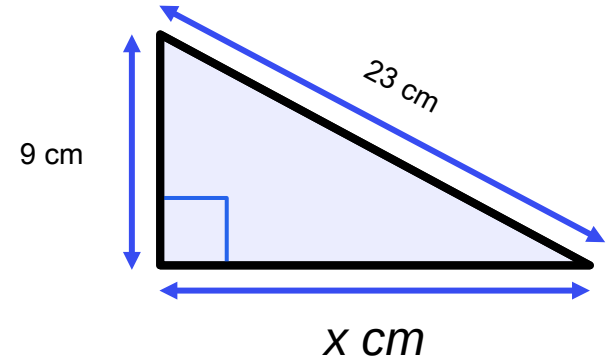
Qaaciddada (Pythagoras' theorem): $a^2 + b^2 = c^2$

Qaaciddada (Pythagoras' theorem): $a^2 + b^2 = c^2$

$$\boxed{}^2 + \boxed{}^2 = \boxed{}^2$$

Labo-jibaar (Square) labada dhinac ee gaaban, mid kasta si gooni ah.

Wadarta labajibbaaranaha (squares) ayaa had iyo jeer la eg labajibbaaranaha (square) hypotenuse-ka.

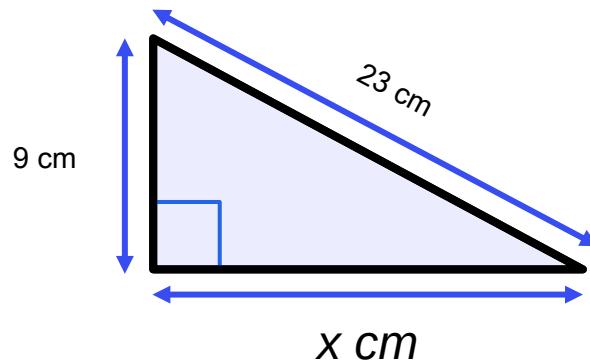


Aragtida Pythagoras (Pythagoras' theorem): $a^2 + b^2 = c^2$

$$\boxed{9}^2 + \boxed{x}^2 = \boxed{23}^2$$

$$\boxed{} + \boxed{} = \boxed{}$$

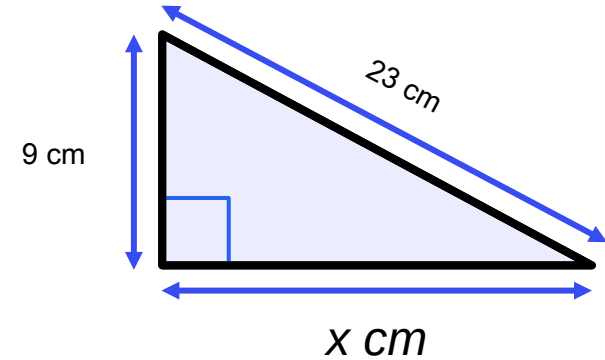
$$\boxed{x^2} = \boxed{529} - \boxed{81}$$



Labajibbaaranaha (square) dhinaca gaaban ee saddexagalka waxaa lagu helaa kala-goynta, ama helista farqiga, u dhexeeya labajibbaaranaha (square) hypotenuse-ka iyo labajibbaaranaha (square) dhinaca kale ee gaaban.

$$\boxed{9}^2 + \boxed{x}^2 = \boxed{23}^2$$

$$x^2 = 529 - 81$$



Isticmaalka aragtida Pythagoras (Pythagoras' theorem) si loo helo dhinac gaaban

Yaa talaabada koowaad u saxan si loo xisaabiyo dhererka r?



Suad

$$r^2 + 10^2 = 18^2$$



Nuur

$$18^2 + 10^2 = r^2$$



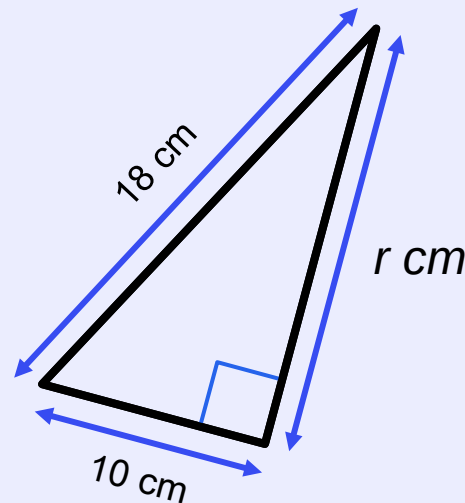
Axmed

$$10^2 + r^2 = 18^2$$



Isra

$$10^2 = 18^2 + r^2$$



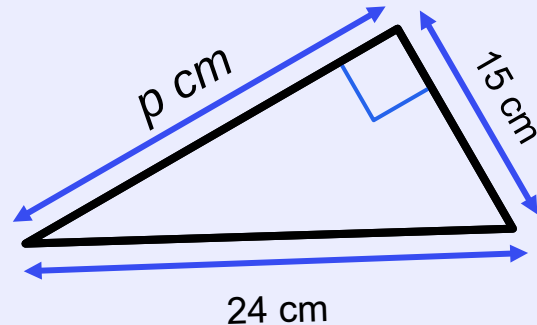
Ma ka soo bixi kartaa qaabab kale oo sax ah oo loo qoro tillaabadaan koowaad?

Isticmaalka aragtida Pythagoras (Pythagoras' theorem) si loo helo dhinac gaaban



Hubi

Kuwee ka mid ah kuwanu waa xisaabinta saxda ah iyo qiimaha (value) p^2 ?



a

f

b



g



c

h

Jawaabaha:

d



$$24^2 + 15^2$$

$$801$$

$$24^2 - 15^2$$

$$351$$

$$24 - 15$$

9

e

$$576 - 225$$

$$576 + 225$$

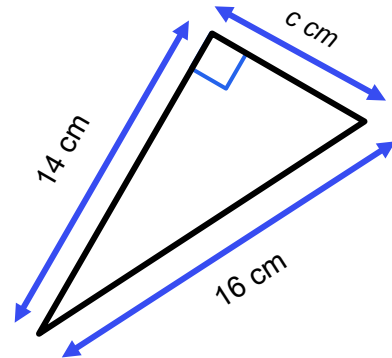
Waxaan hubaa in tani tahay xisaabinta saxda ah si loo helo dhererka maqan, c.

Sababtoo ah dhererka maqan waxaa lagu calaamadeeyay xarafka c, marka waa inuu yahay hypotenuse (hypotenuse).



Cali

Ma lahan xiriir c ee saddex-xagalka ku jira, kaas oo si cad aan u ahayn hypotenuse (hypotenuse), sababtoo ah si muuqata ugama horjeedo xagasha qumman (right angle).



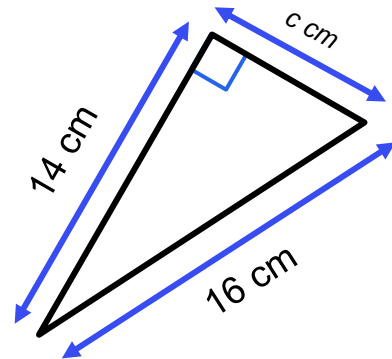
Aragtida Pythagoras (Pythagoras' theorem): $a^2 + b^2 = c^2$

$$16^2 + 14^2 = c^2$$

Isticmaalka aragtida Pythagoras (Pythagoras' theorem) si loo helo dhinac gaaban



Yikes, waxay u egtahay qalad sahlan oo la sameyn karo.
Si aan isaga ilaaliyo jahawareerka xarfaha, waxaa laga yaabaa inaan xusuusto aragtida Pythagoras sidan oo kale...



Cali

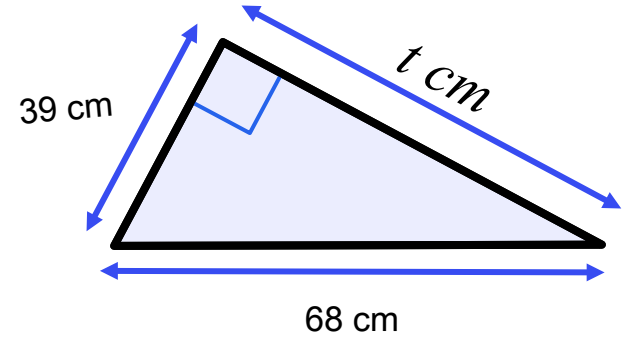
$$\begin{array}{ccccc} \boxed{\text{dhinaca gaaban}}^2 & + & \boxed{\text{dhinaca kale ee gaaban (other shorter)}}^2 & = & \boxed{\text{hypotenuse (hypotenuse)}}^2 \\ \text{(shorter side)} & & \text{side)} & & \\ \\ \boxed{c}^2 & + & \boxed{14}^2 & = & \boxed{16}^2 \end{array}$$

Isticmaalka aragtida Pythagoras si loo helo dhinac gaaban (Using Pythagoras' theorem to find a shorter side)



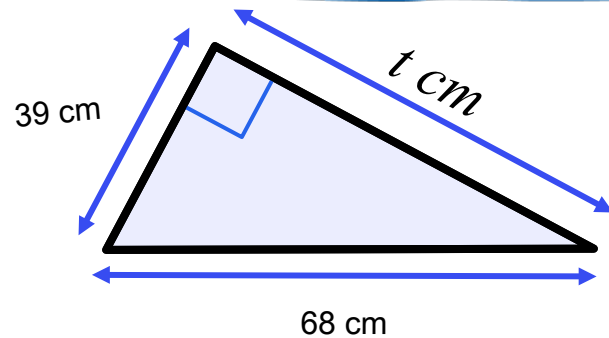
Sharaxaad

Hab wax ku ool ah oo lagu helo dhererka dhinaca gaaban ee saddexagal qumman (right-angled triangle) wuxuu ku lug leeyahay isku darka habaynta isla'egta (equation) iyo isticmaalka saxda ah ee xisaabiyaha (calculator).



Isticmaalka aragtida Pythagoras si loo helo dhinac gaaban (Using Pythagoras' theorem to find a shorter side)

$$\begin{aligned} t^2 + 39^2 &= 68^2 \\ t^2 &= 68^2 - 39^2 \\ t^2 &= 3103 \end{aligned}$$



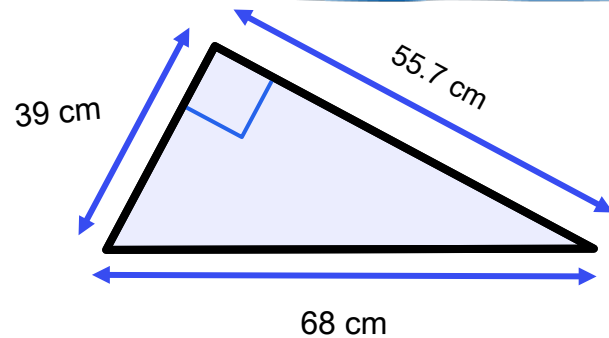
shaashadda xisaabiyaha (calculator screen)



badhamada la riixo (buttons to press)

Isticmaalka aragtida Pythagoras si loo helo dhinac gaaban (Using Pythagoras' theorem to find a shorter side)

$$\begin{aligned} t^2 + 39^2 &= 68^2 \\ t^2 &= 68^2 - 39^2 \\ t^2 &= 3103 \\ t &= 55.7 \end{aligned}$$



shaashadda xisaabiyaha (calculator screen)



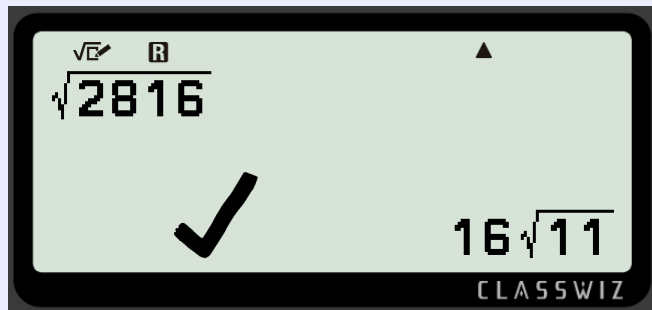
badhamada la riixo (buttons to press)

Isticmaalka aragtida (theorem) Pythagoras si loo helo dhinac gaaban (shorter side)

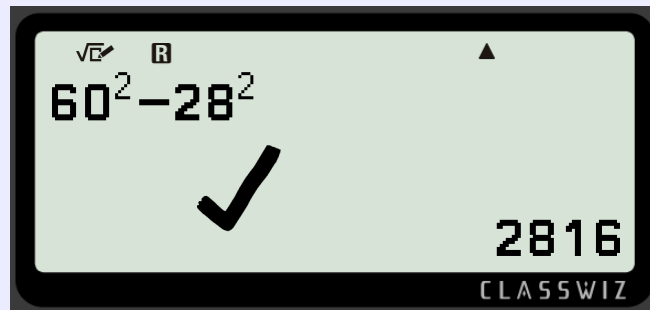


Hubi

Saddex-xagal (triangle) ayaa leh laba dhinac oo gaaban oo dhererkoodu yahay 28 cm iyo w cm, iyo hypotenuse (hypotenuse) dhererkeedu yahay 60 cm. Yaa shaashadda xisaabiyihiisa (calculator display) muujinaysa tillaabo sax ah oo lagu xisaabinayo qiimaha (value) w?



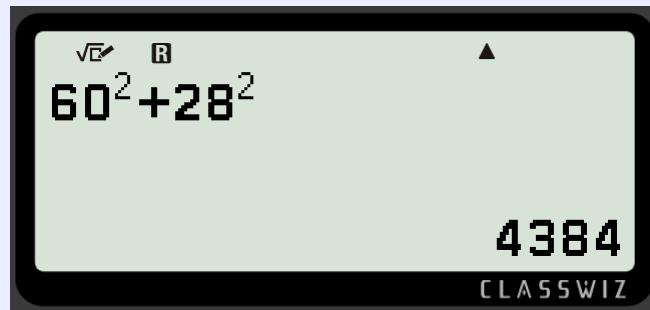
Suad



Nuur



Axmed



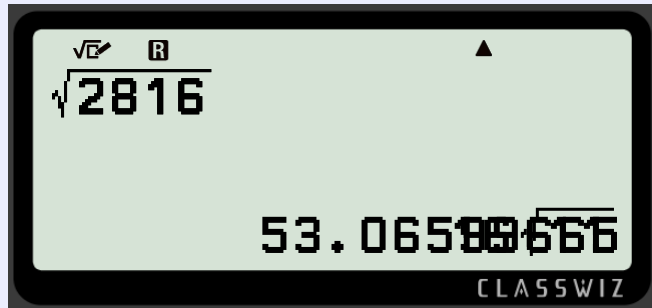
Isra

Isticmaalka aragtida (theorem) Pythagoras si loo helo dhinac gaaban (shorter side)



Hubi

Saddex-xagal (triangle) ayaa leh laba dhinac oo gaaban oo dhererkoodu yahay 28 cm iyo w cm, iyo hypotenuse (hypotenuse) dhererkeedu yahay 60 cm. Yaa shaashadda xisaabiyihiisa (calculator display) muujinaysa tillaabo sax ah oo lagu xisaabinayo qiimaha (value) w?



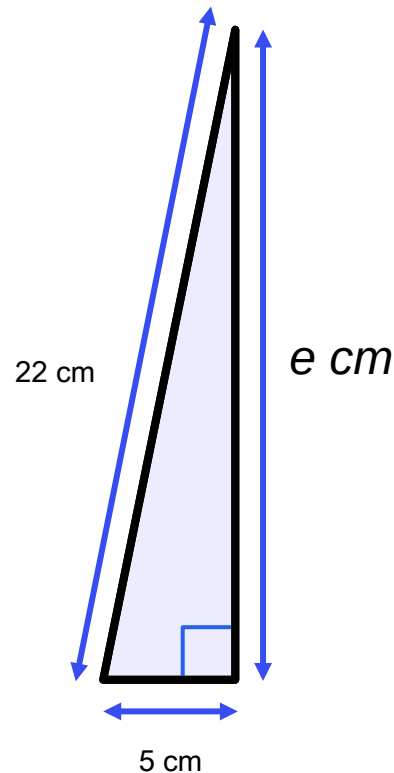
Suad

Waxaan u beddeli karnaa qaabkan surd (surd form) ee jawaabta qaab tobanle (decimal form) iyadoo la beddelayo qaabka muujinta (format display) jawaabta.

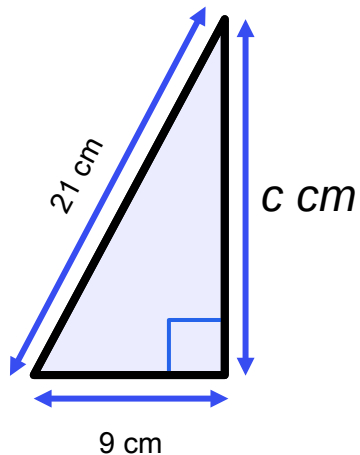


1) Buuxi dhammaan meelaha bannaan si aad u dhamaystirto habka lagu xisaabinayo dhererka dhinaca e, oo lagu soo koobay (rounded) 1 meel tobanle (decimal place).

$$\begin{array}{rclcl}
 \boxed{}^2 & + & \boxed{}^2 & = & \boxed{}^2 \\
 \boxed{} & + & \boxed{} & = & \boxed{} \\
 \boxed{} & & & = & \boxed{} - \boxed{} \\
 \boxed{} & & & = & \boxed{459} \\
 \boxed{} & & & = & \boxed{\sqrt{}} = \boxed{}
 \end{array}$$



2) Midkee ka mid ah kuwani waa matalaado (representations) sax ah oo aragtida (theorem) Pythagoras ah si loo helo dhererka dhinaca c?



a $c^2 = 21^2 + 9^2$

b $c^2 = 21^2 - 9^2$

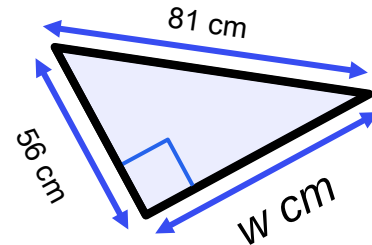
c $21^2 = 9^2 + c^2$

d $21^2 = c^2 + 9^2$

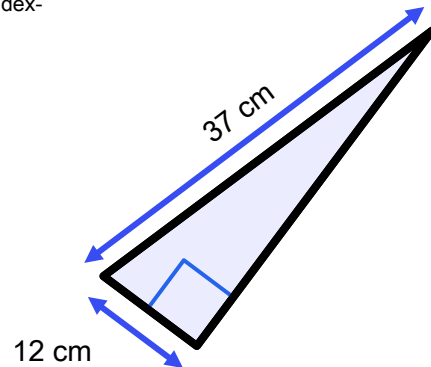
e $21^2 = 9^2 - c^2$

f $21^2 = c^2 - 9^2$

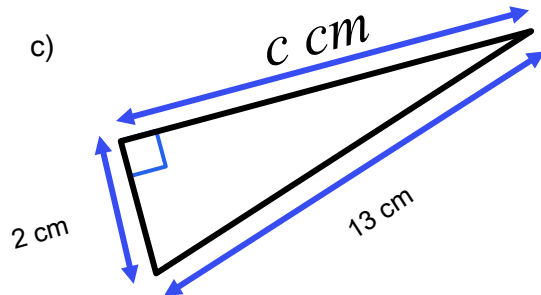
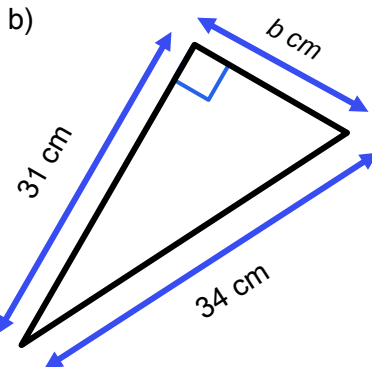
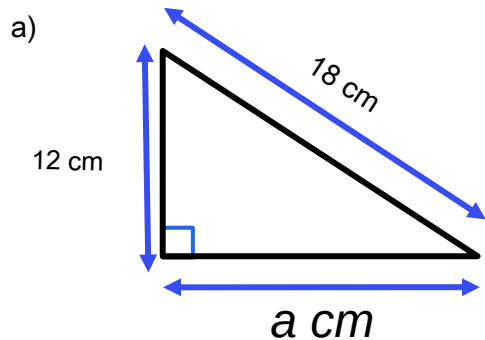
3) Isticmaalka aragtida Pythagoras, si buuxda u muuji in qiimaha (value) w cm uu yahay 58.52 cm marka lagu soo koobo 2 meelood oo jajab tobanle (decimal places).



4) Tus (Show) in wareegga (perimeter) saddex-xagalkan (triangle) uu yahay 84 cm.



5) Isku dhig mid kasta oo ka mid ah saddexagalka (triangle) xisaabinta (calculation) iyo jawaabta si loo helo dhererka dhinaciisa maqan (missing side).



xisaabinta (calculation)

d

$$18^2 - 12^2$$

e

$$34^2 - 31^2$$

f

$$65$$

g

$$144 - 2^2$$

dhererka dhinaca maqan (missing side)

h

$$6 \text{ cm}$$

i

$$2 \text{ cm}$$

j

$$17 \text{ cm}$$

1) Buuxi meelaha bannaan si aad u dhamaystirto habka xisaabinta dhererka dhinaca e, oo lagu soo koobay 1 meel tobanle.

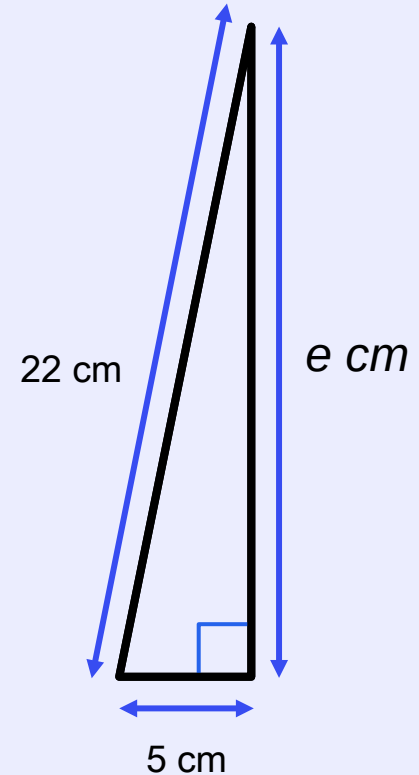
$$e^2 + 5^2 = 22^2$$

$$e^2 + 25 = 484$$

$$e^2 = 484 - 25$$

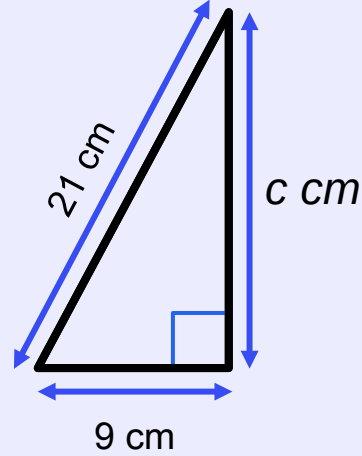
$$e^2 = 459$$

$$e = \sqrt{459} = 21.4 \text{ (1 d.p.)}$$



Hawsha B Isticmaalka Aragtida Pythagorean-ga si loo helo dhinac gaaban

2) Kee ka mid ah kuwani waa matalaad sax ah oo Aragtida Pythagorean-ga ah si loo helo dhererka dhinaca c ?



Jawaabaha:

a

b

$c^2 = 21^2 + 9^2$

$21^2 = 9^2 + c^2$

$21^2 = c^2 - 9^2$

$c^2 = 21^2 - 9^2$

e

f

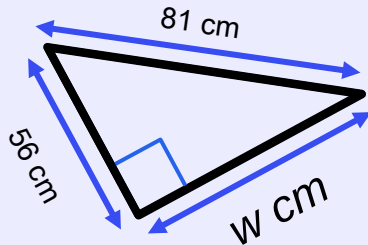
$21^2 = c^2 + 9^2$

c

d

$21^2 = 9^2 - c^2$

3) Isticmaalka Aragtida Pythagorean-ga, si buuxda u muuji in qiimaha (value) w cm uu yahay 58.52 cm marka lagu soo koobayo 2 meelood oo tobanle.



$$56^2 + w^2 = 81^2$$

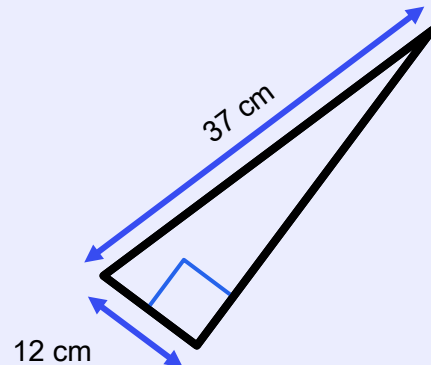
$$W^2 = 81^2 - 56^2$$

$$W^2 = 3425$$

$$W = \sqrt{3425} = 58.5234996$$

$w = 58.52$, ka dib soo koobidda.

4) Muuji in wareega (perimeter) saddexagalkaasi yahay 84 cm.



Dhererka maqan ha la yiraahdo x.

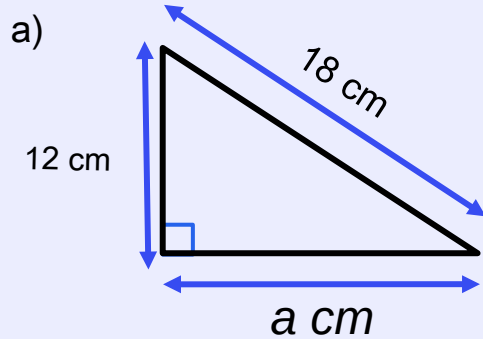
$$x^2 = 37^2 - 12^2 = 1225$$

$$x = \sqrt{1225} = 35$$

Wareegga (Perimeter) = 12 cm + 37 cm + 35 cm

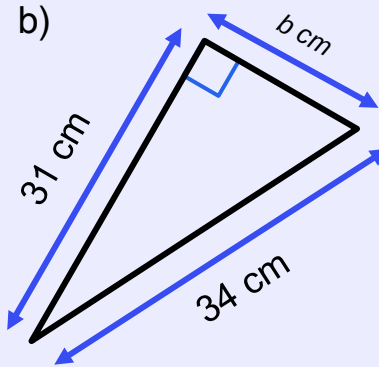
Wareegga (Perimeter) = 84 cm

5) Ku xidh saddexagal kasta xisaab iyo jawaab si aad u hesho dhererka dhinaciisa maqan.



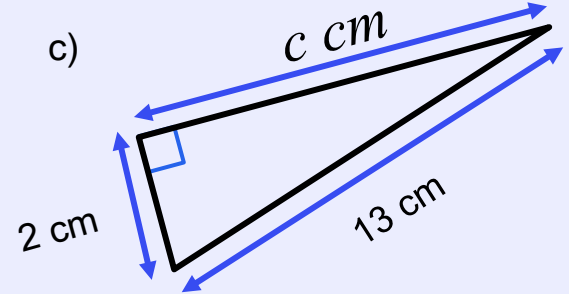
g $324 - 144$

i 42 cm



d $34^2 - 31^2$

h 96 cm



e $169 - 2^2$

f 165

j 85 cm

Labo jibbaaran (square) dhinac gaaban oo ka mid ah saddexagal qumman (right-angled triangle) waxay la eg tahay bedka (area) farqiga u dhexeeya labo jibbaaran ee hypotenuse iyo labo jibbaaran ee dhinaca kale ee gaaban.

Aragtida Pythagoras (Pythagoras' theorem) waxaa loo isticmaali karaa in lagu xisaabiyo dhererka dhinaca gaaban ee saddexagal ka dib marka isla'egta (equation) dib loo habeeyo.