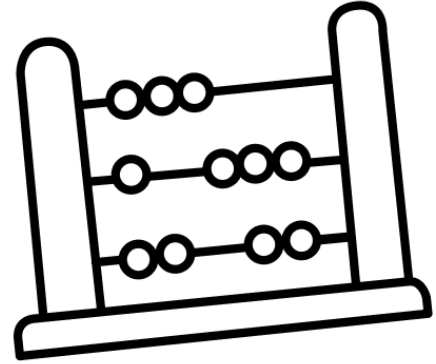


Go'aaminta dhinaca



Maths

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

Natiijo

Waxaan aqoonsan karaa dhinaca dhererkiisa (side length) maqan oo waxaan isticmaali karaa qaabka ku habboon ee aragtida Pythagoras (Pythagoras' theorem) si aan u xisaabiyo.

Erayada muhiimka ah

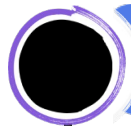
Saddexagalka qumman (right-angled triangle) wuxuu leeyahay hal xagal 90° oo gudaha ah.

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

Aragtida Pythagoras (Pythagoras' theorem) waxay muujinaysaa in wadarta labajibbaaranaha (squares) labada dhinac ee gaagaaban ee saddexagalka qumman (right-angled triangle) ay la mid tahay labajibbaaranaha (square) dhinaca ugu dheer (hypotenuse).

Qaabka casharka

Go'aaminta dhinaca



Aqoonsashada hypotenuse (hypotenuse)



Saddexagalka qumman (right-angled triangles) iyo isku qummanaanta (congruence)



Helista dhererka dhinacyada maqan

Waxaan isticmaali karaa aragtida Pythagoras (Pythagoras' theorem) saddexagalkan sababtoo ah waa saddexagal qumman (right-angled triangle).

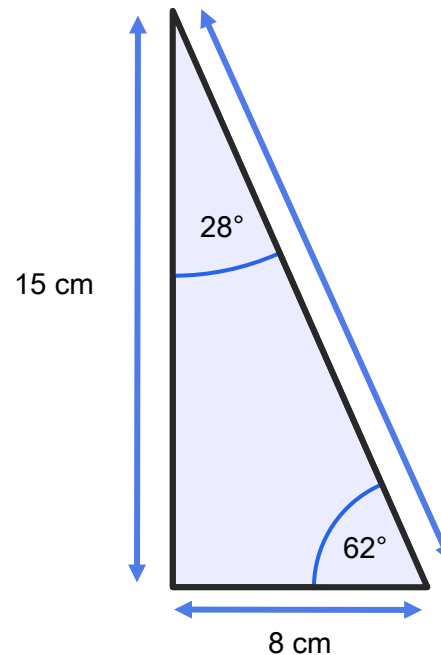


Saciid

Ma isticmaali karo aragtida Pythagoras (Pythagoras' theorem) saddexagalkan sababtoo ah ma laha calaamad xagal qumman (right-angle marker) oo ku qoran.



Cali



Yaa runta ka sheegay saddexagalkan?

Aqoonsashada hypotenuse (hypotenuse)



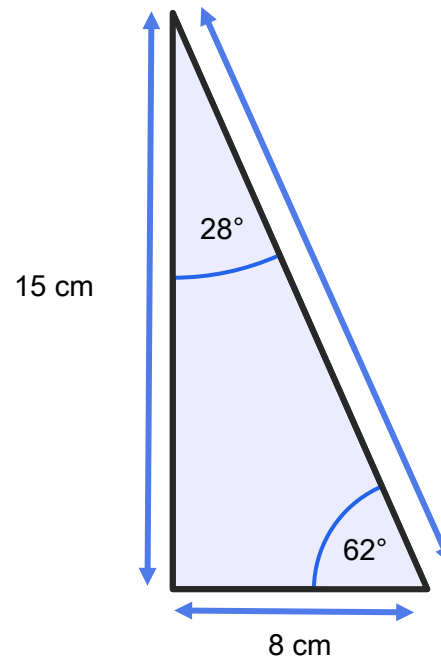
Sharaxaad

Saciid waa sax.

Qiyaasta (theorem) ee Pythagoras waxaa loo isticmaali karaa in lagu helo dhererka dhinaca maqan ee saddex-xagal kasta oo qumman (right-angled triangle), iyadoo aan loo eegin in calaamadda xagasha qumman (right-angle marker) la muujiyey iyo in kale.

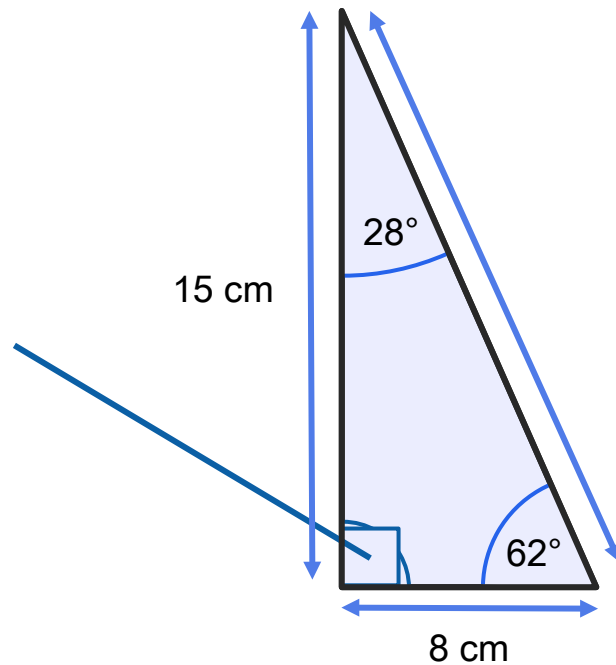
Haddii calaamadda xagasha qumman si cad loo muujin waayo, waxaa faa'iido leh in:

la aqoonsado dhinaca saddex-xagalka ee ah hypotenuse-ga



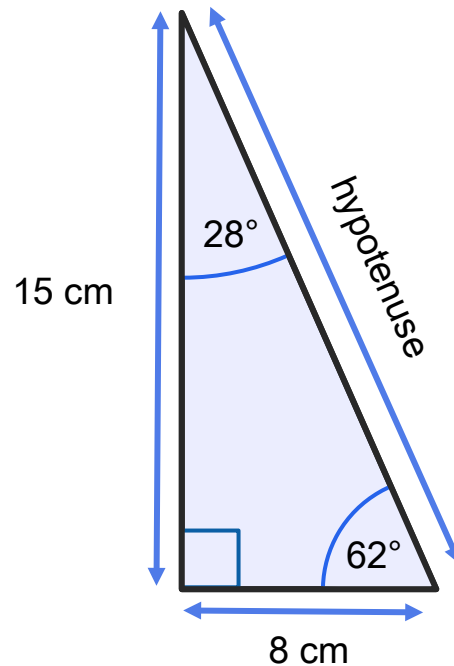
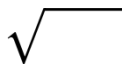
Sababtoo ah waxaan ognahay in xaglaha saddex-xagalku isku yimaadaan 180° , marka waxaan ognahay in cabbirka xagashani yahay:

Oo tan iyo inta ay tahay xagasha qumman (right-angle), hypotenuse-ga waa dhinaca ka soo horjeeda.



Jawaabaha:

Hadda waxaan isticmaali karnaa qiyaasta (theorem) ee Pythagoras si aan u xisaabino dhererka dhinaca maqan - markan waa hypotenuse-ga.

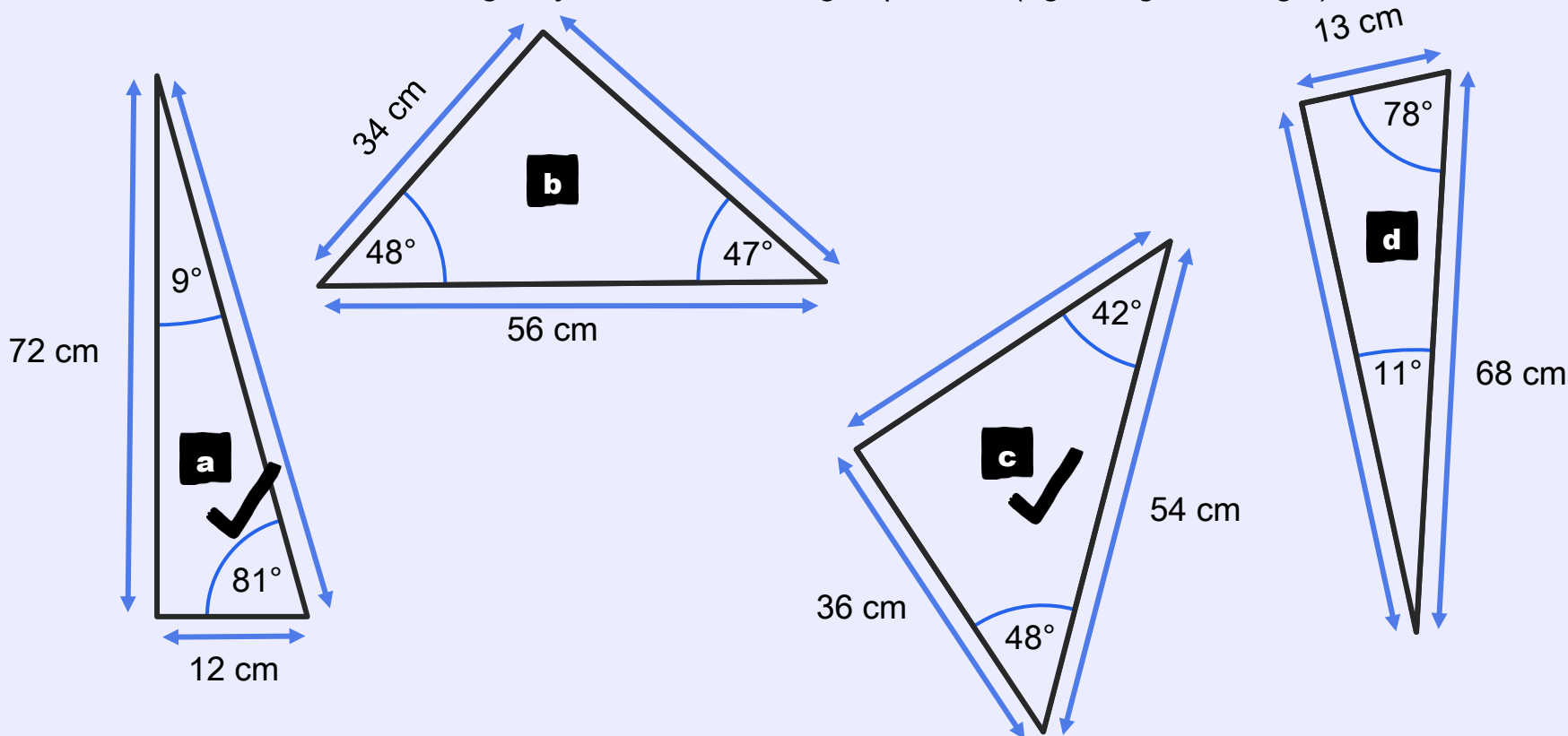


Aqoonsashada hypotenuse-ga



Hubi

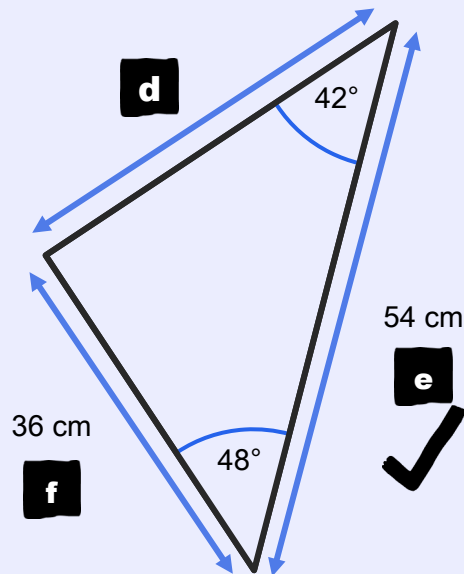
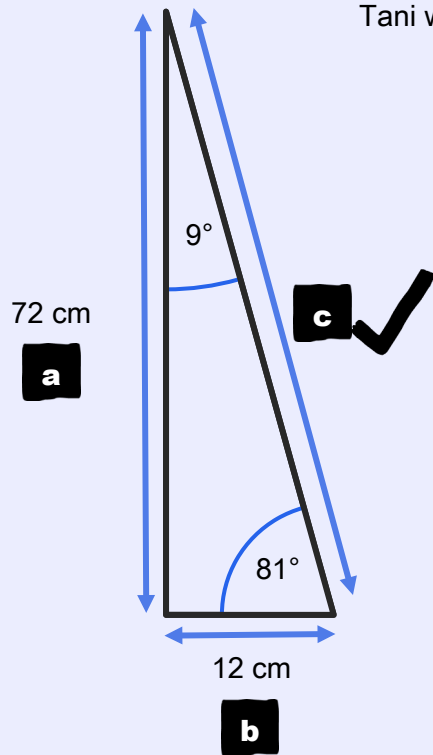
Kee ka mid ah afartan saddex-xagal ayaa ah saddex-xagal qumman (right-angled triangle)?



Aqoonsiga hypotenuse-ga (hypotenuse)

Dhinac ee saddexagalka xagal-qumman ee hypotenuse-ga (hypotenuse) yahay?

Hypotenuse-ga (hypotenuse) had iyo jeer waa dhinaca ka soo horjeeda xagasha qumman.
Tani waxay ka dhigan tahay inuu yahay dhinaca kaliya ee saddexagalka ee aan ahayn lugta xagasha 90° .



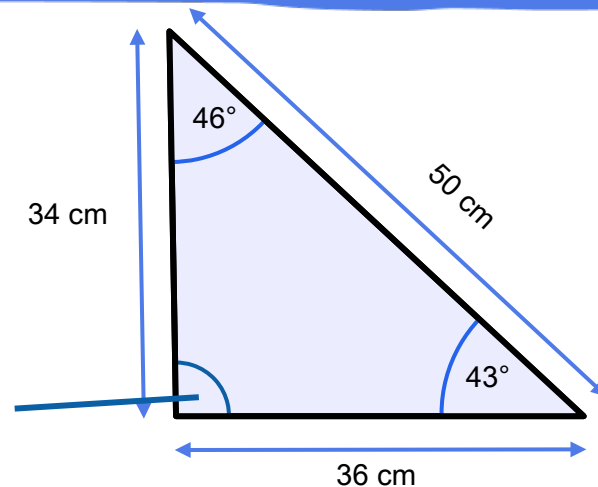
Maxaan looma oggolaan inaan u isticmaalno aragtida Pythagoras (Pythagoras' theorem) saddexagalkan?

Xagashani waxay ka dhintay 1° inay noqoto xagal-qumman (right-angle)!



Saciid

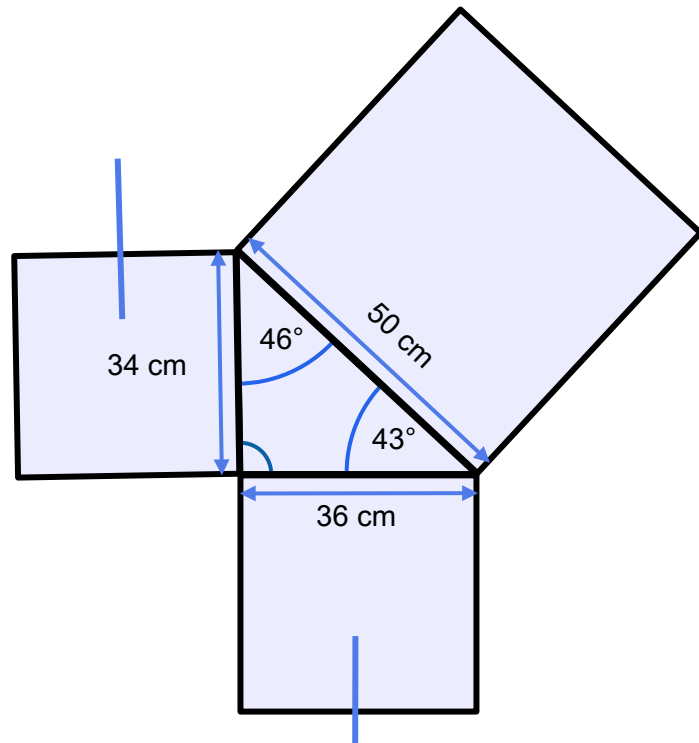
Oo waa laba jibaaranka hypotenuse (hypotenuse) oo la mid ah laba jibaaranka labada dhinac ee kale oo la isku daray.



Wadarta (sum) bedka (area) labada laba jibaaran ee yaryar waa:

Maadaama aysan tani la mid ahayn 2500, kani ma aha saddex-xagal xagal-qumman (right-angled triangle), sidaas darteed aragtida Pythagoras (Pythagoras' theorem) ma shaqeyso.

Maadaama saddex-xagalkani uusan ahayn xagal-qumman (right-angled), ma laha hypotenuse (hypotenuse).

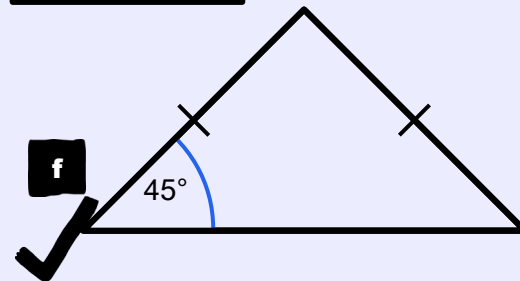
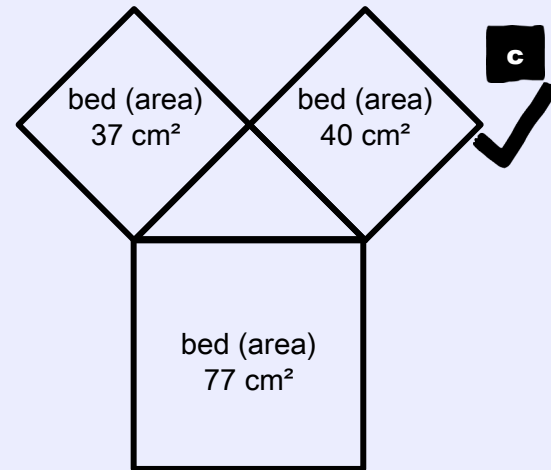
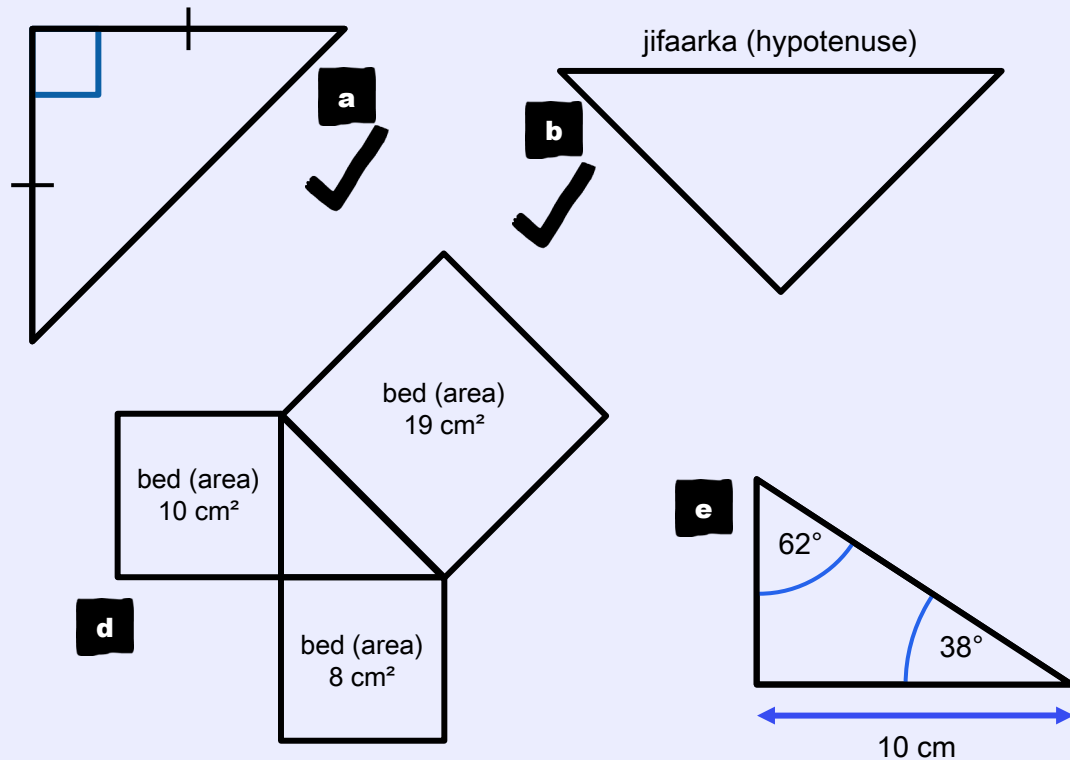


Aqoonsiga hypotenuse (hypotenuse)



Hubi

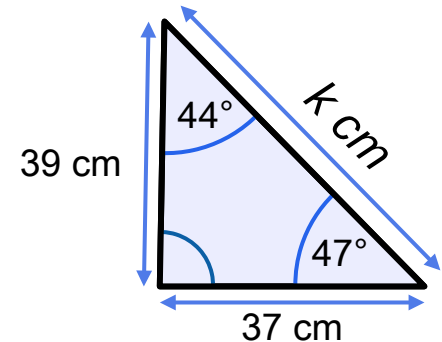
Saddex-xagalahaas ayaa aragtida Pythagoras (Pythagoras' theorem) run ku tahay?



1) Dhammeystir weedh kasta.

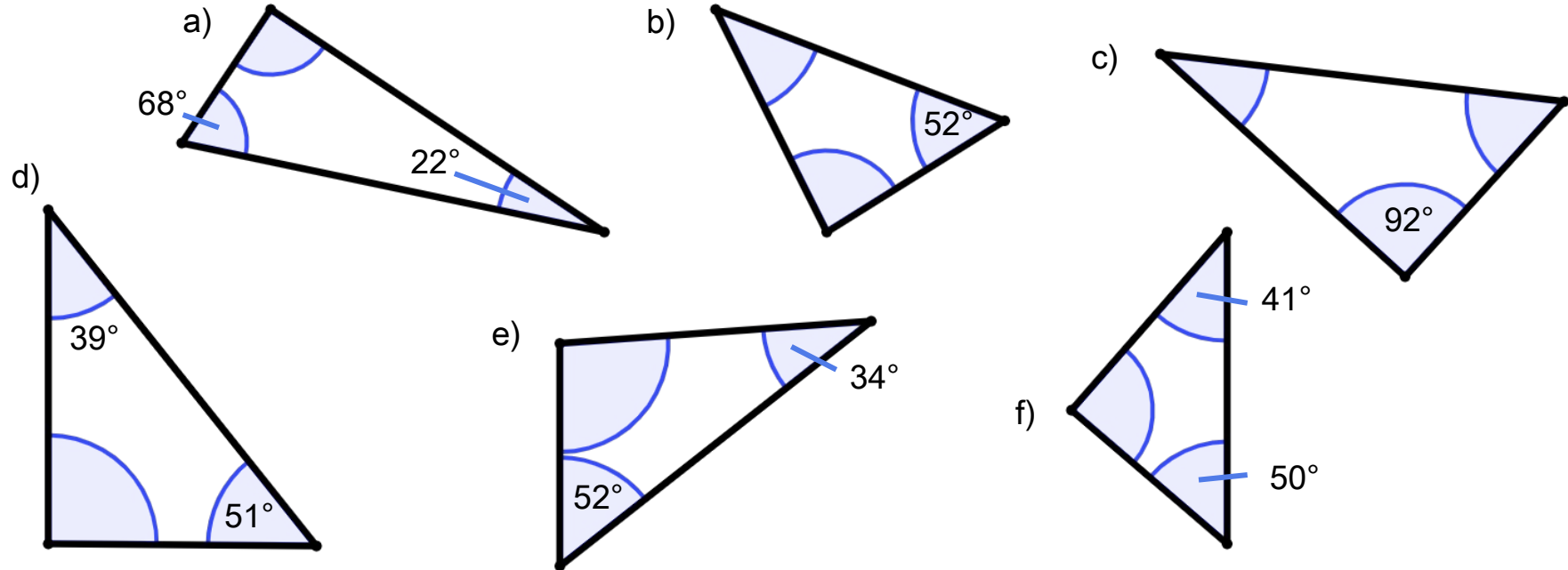
- a) Aragtida Pythagoras waxaa kaliya loo isticmaali karaa in lagu xisaabiyo dhererka dhinaca maqan ee saddexagalka haddii mid ka mid ah dhinacyadiisu yahay _____.
- b) Kaliya saddexagalka _____ ayaa leh jifaar (hypotenuse).
- c) Jifaarku (hypotenuse) had iyo jeer wuxuu ka soo horjeedaa _____.

2) Qor jumlad sharraxaysa sababta aragtida Pythagoras looma isticmaali karo in lagu helo qiimaha (value) k.



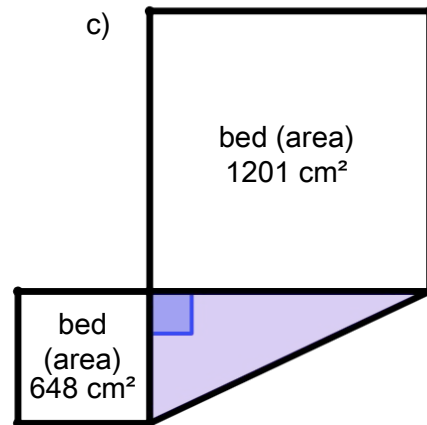
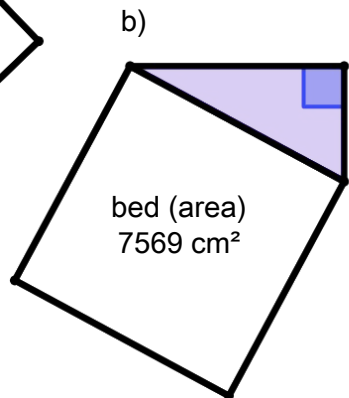
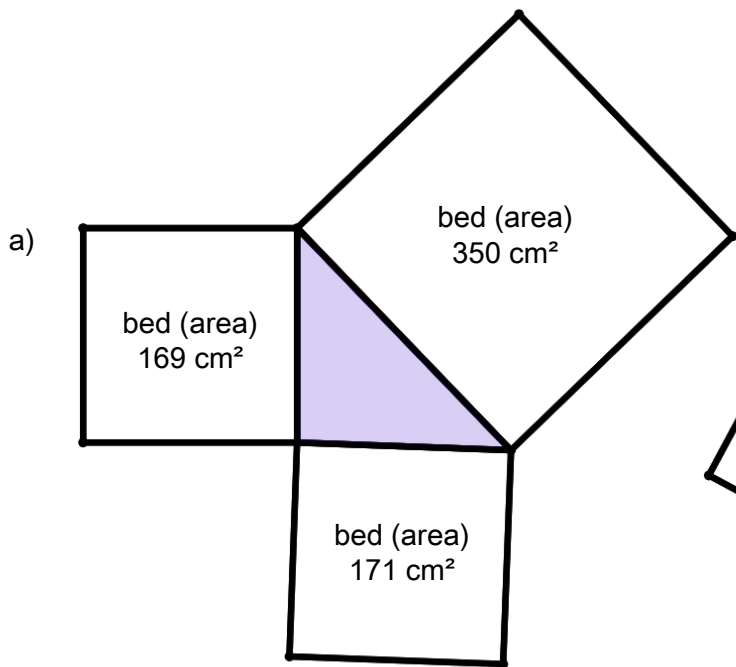
3) Saddex-xagal kasta oo ka mid ah kuwan, calaamadee (✓) saddex-xagal qumman (right-angled triangle), iskutallaab (✗) saddex-xagal aan qummanayn (non-right-angled triangle), su'aal calaamad (?) dhig mid kasta oo aadan garan karin.

Saddex-xagal qumman (right-angled triangle) kasta, goobo ama iftiimi hypotenuse-kiisa.



4) Saddex-xagal (triangle) yaase aad u isticmaali kartaa aragtida (theorem) Pythagoras?

Halkii suurtagal ah, xisaabi dhererka hypotenuse-ka (hypotenuse) oo calaamadee dhererkiisa.





1) Dhammeysti weedh kasta.

a) Aragtida (theorem) Pythagoras waxaa loo isticmaali karaa oo kaliya in lagu xisaabiyo dhererka dhinaca maqan ee saddex-xagal (triangle) haddii mid ka mid ah dhinacyadiisu yahay _____.

b) Kaliya saddex-xagal (triangle) _____ ayaa leh hypotenuse (hypotenuse).

c) Hypotenuse-ku (hypotenuse) had iyo jeer waa ka soo horjeedaa _____.

Jawaabaha:

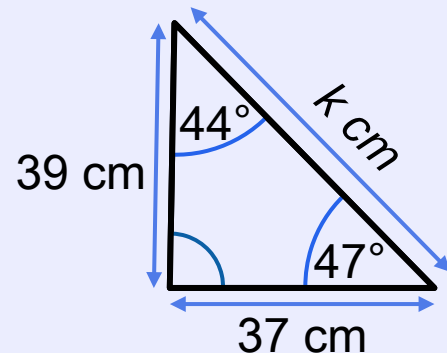
hypotenuse

xagal-qumman (right-angled)

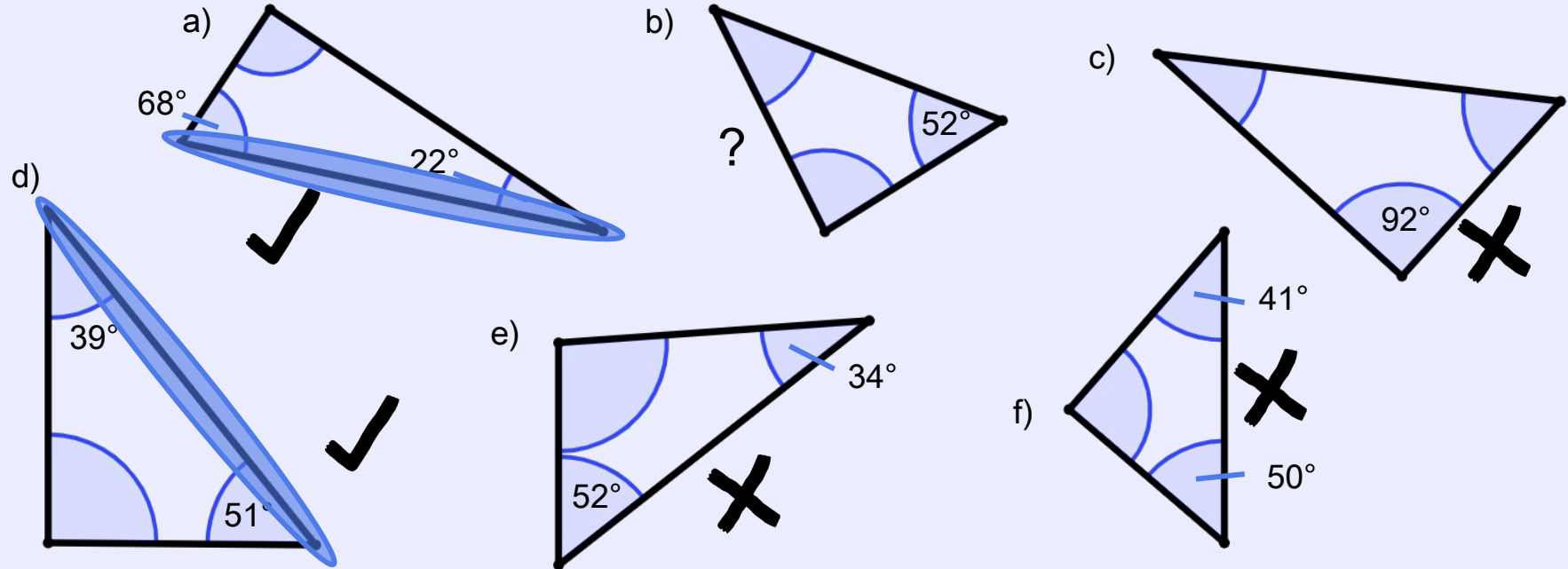
xagal qumman (right angle)

2) Qor jumlad sharraxaysa sababta aan loo isticmaali karin aragtida Pythagoras si loo helo qiimaha (value) k.

Xagasha maqan waa 89° , sidaas darteed saddexagalkani ma aha mid xagal-qumman (right-angled). Ma isticmaali kartid aragtida Pythagoras saddexagallo aan xagal-qumman (right-angled) ahayn.

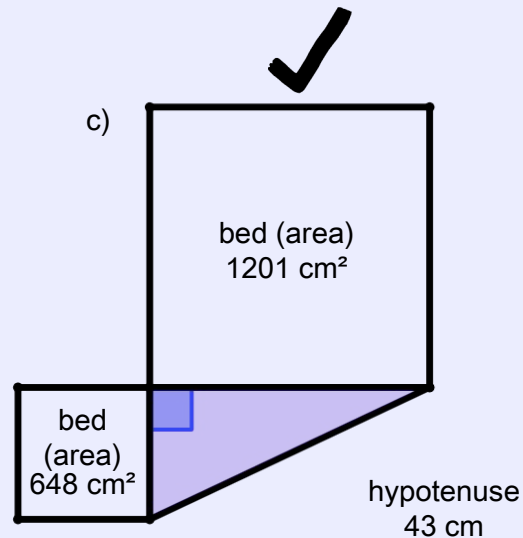
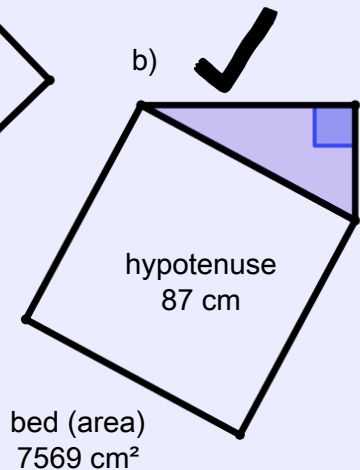
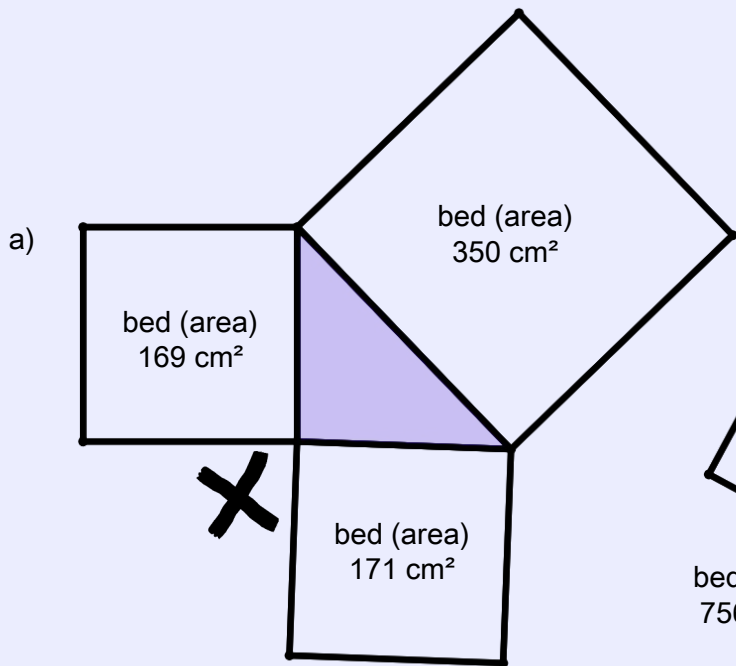


3) Saddexagal kasta, calaamadee (✓) saddexagal xagal-qumman (right-angled) kasta, calaamadee (X) kuwa aan xagal-qumman ahayn, dhig su'aal (?) meesha aadan garan karin. Saddexagal xagal-qumman (right-angled) kasta, ku wareeji ama iftiimi hypotenuse-kiisa.



4) Saddexagalkee ayaad u isticmaali kartaa aragtida (theorem) Pythagoras?

Halkii suurtagal ah, xisaabi dhererka hypotenuse (hypotenuse) oo ku qor dhererkiisa.



Qaabka casharka

Go'aaminta dhinaca



Aqoonsiga hypotenuse (hypotenuse)



Saddexagalka xagal-qumman (right-angled triangles) iyo isku-ekaanshaha (congruence)



Helista dhererka dhinacyada maqan

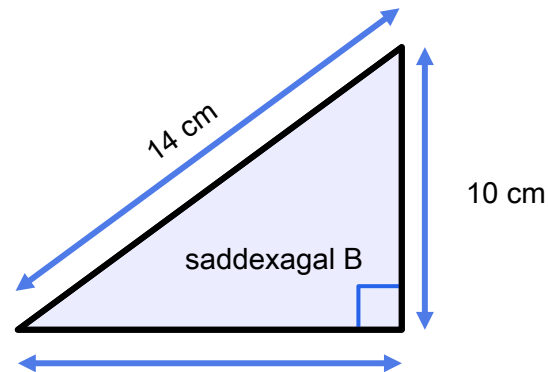
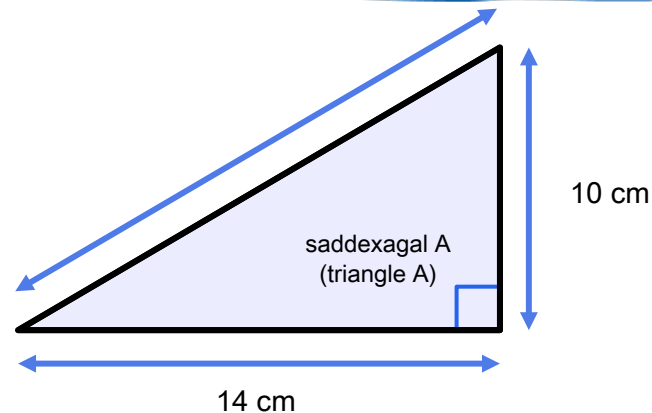


Cali

Haa, waan fahmay.
Laakiin maxay taasi uga dhigan tahay
inay si cad isku mid ahayn
(congruent)?

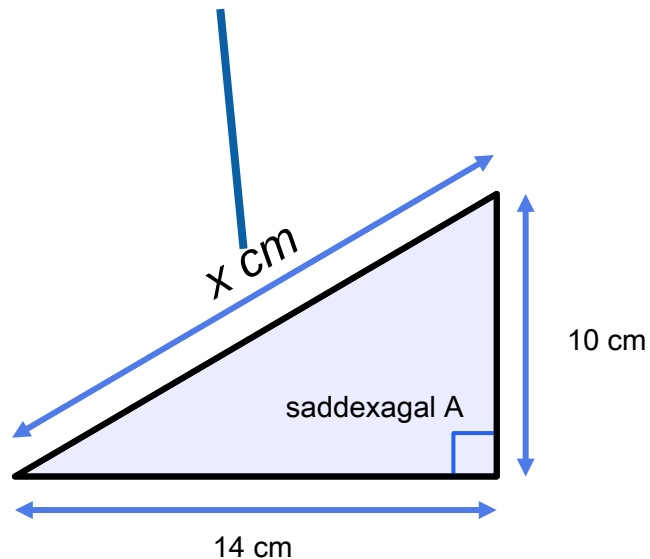


Oh maya, waxaan u malaynayaa inay si cad isku mid
ahayn (incongruent).
Maxaa yeelay 14 cm waa hypotenuse (hypotenuse)
saddexagalka B, laakiin ma aha saddexagalka A.

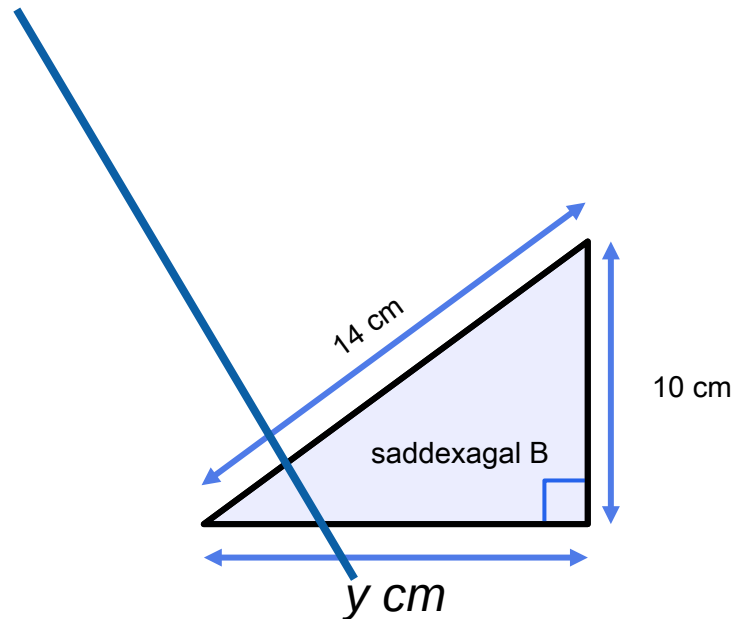


Hypotenuse (hypotenuse) waa dhinaca ugu dheer ee saddexagalka qumman (right-angled triangle).

Sidaa darteed hypotenuse (hypotenuse)-kan waa inuu ka weyn yahay 14 cm.



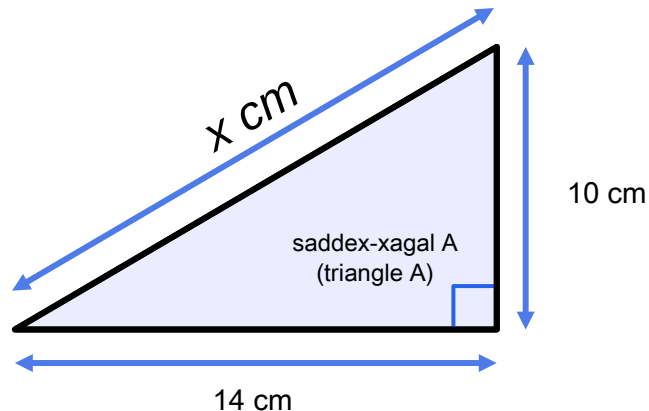
Sidaa darteed dhinacan gaaban waa inuu ka yar yahay 14 cm.



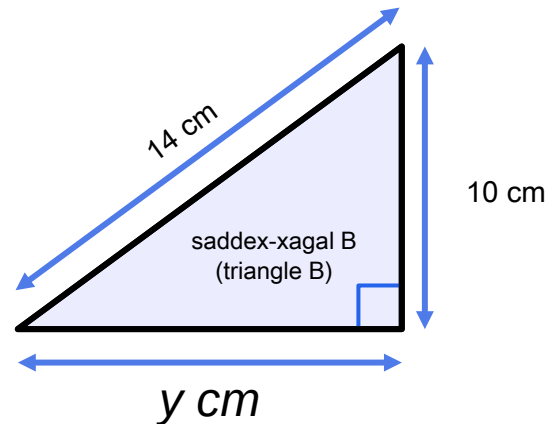
Dhinaca x iyo dhinaca y ma lahaan karaan isku dherer.

Labadan saddex-xagal qumman (right-angled triangles) ma aha kuwo isku mid ah (congruent), sababtoo ah kama qancayaan qaanuunka SSS (SSS rule) ee isku midnimada (congruence).

dhererka dhinacyada (side lengths of)
10 cm, 14 cm, x cm



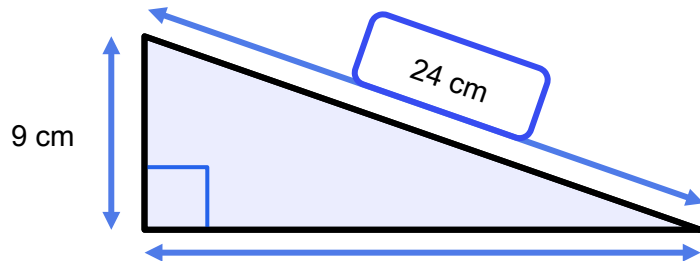
dhererka dhinacyada (side lengths of)
10 cm, 14 cm, y cm



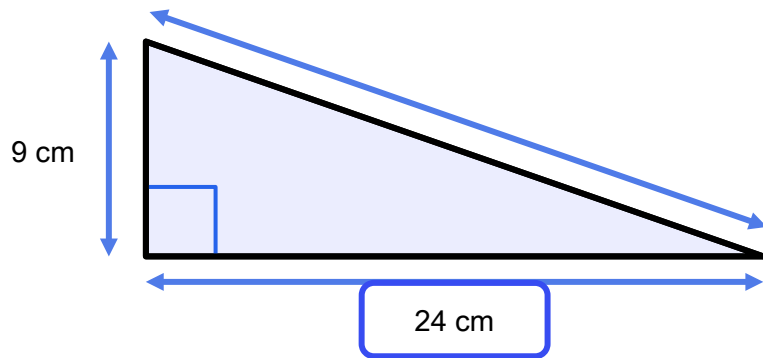


Cali

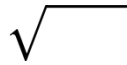
Oh, waan ogahay! Sababtoo ah isla'eg kasta oo aad ka dhisatid aragtida Pythagoras waxay noqon doontaa mid xoogaa ka duwan, sidaas darteed xallinta mid kasta waxay ku siin doontaa laba dherer oo kala duwan!



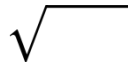
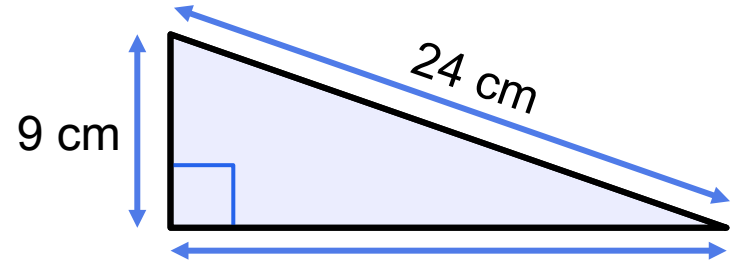
Laakiin maxay tani muhiim u tahay? Waxaan isticmaali karnaa aragtida Pythagoras (Pythagoras' theorem) labada saddexagalba, haddii ay yihiin kuwa xagasha qumman leh?



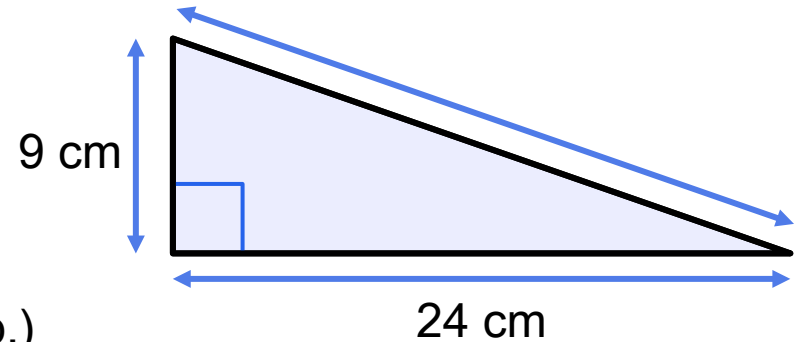
Helista dhererka dhinacyada maqan



Dhererka dhinacan gaaban waa 22.25 cm (2 d.p.)

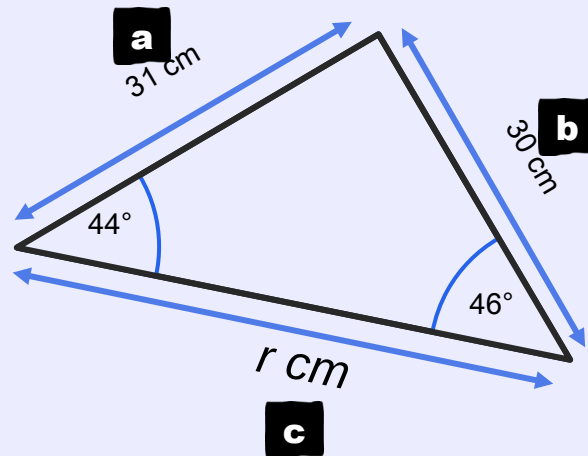


Dhererka hypotenuse-ka waa 25.63 cm (2 d.p.)



Dhinac (side) kee (a, b ama c) ayaa ah hypotenuse (hypotenuse) saddex-xagalkan (triangle)?

Midkee ka mid ah isleegyadan (equations) ayaa sax u ah saddex-xagalkan (triangle)?



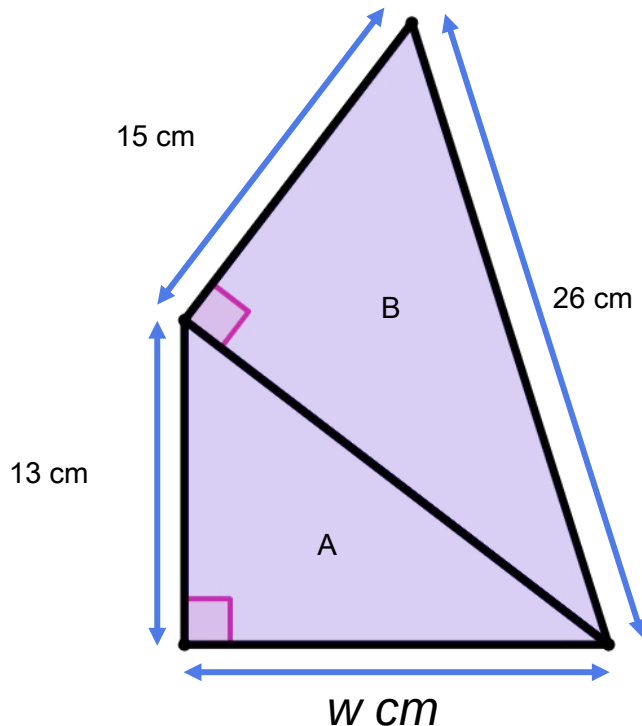
Sidaa awgeed, xisaabi dhererka (length) hypotenuse (hypotenuse) saddex-xagalkan (triangle), oo ku soo koob 1 meel jajab tobanle (decimal place).

Helista dhererka (length) dhinacyada (sides) maqan

Aragtida (theorem) Pythagoras waxaa loo isticmaali karaa marar badan qaababka (shapes) isku dhafan (composite) ee ka samaysan saddex-xagal quman (right-angled triangles).

Waxaan u isticmaalnaa aragtida (theorem) Pythagoras si aan u xisaabino dhinac (side) ay wadaagaan saddex-xagallo quman (right-angled triangles) badan.

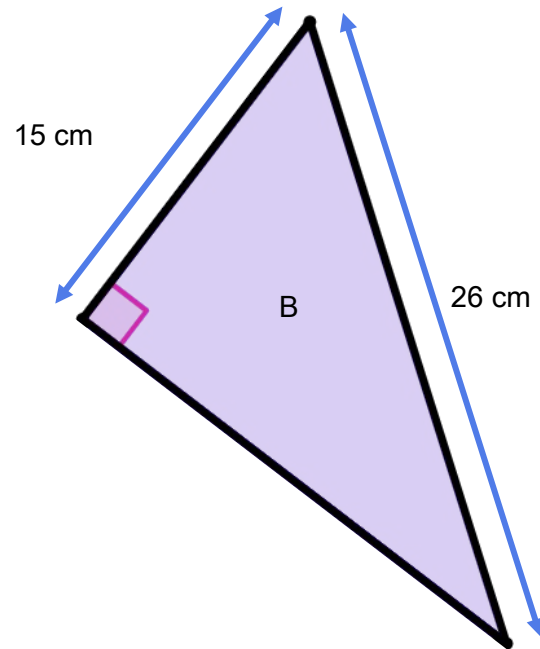
Waa wax badan oo la eego!
Saddex-xagal (triangle) kee ayaan marka hore diirada saaraa si aan u helo dhererka (length) w?
Mise kuma kala duwana?



Haddii aan isku dayno inaan ka bilowno saddex-xagalka (triangle) A, waxaan haysannaa hal dherer (side length) oo la yaqaan (13 cm). Tani waxay ka dhigan tahay inaanan isticmaali karin aragtida (theorem) Pythagoras si aan u xisaabino dhererka (length) dhinaca (side) aan la aqoon ee loo yaqaan w cm.

Si kastaba ha ahaatee, waxaan naqaan laba dherer oo dhinacyada (side lengths) saddex-xagalka (triangle) B (hypotenuse (hypotenuse) 26 cm ah iyo dhinac gaaban (shorter side) 15 cm ah).

Sidaa darteed waxaan isticmaali karnaa aragtida Pythagoras (Pythagoras' theorem) si aan u xisaabino dhererka dhinaca saddexaad.



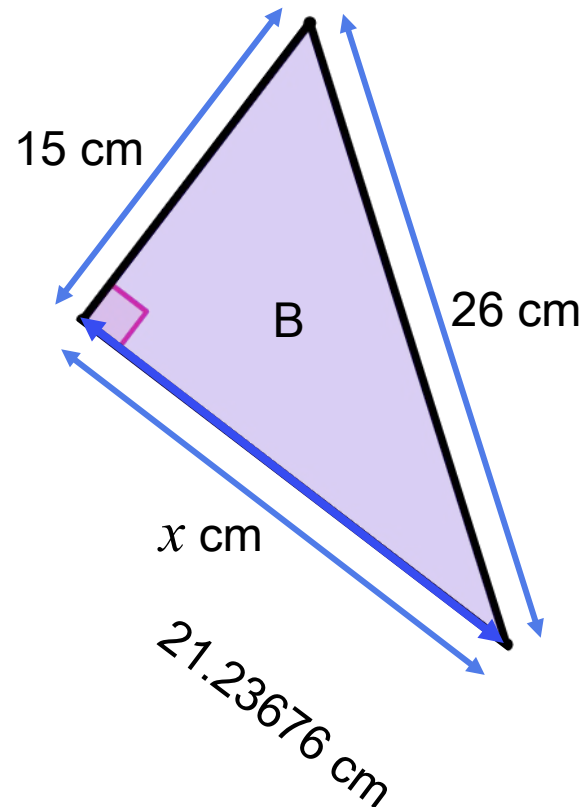
Helista dhererka dhinacyada maqan

Isla'egta aragtida Pythagoras ee saddexagalka B waa:

$$\sqrt{\quad}$$

Dhererka dhinaca gaaban ee saddexagalka B waa 21.23676 cm.

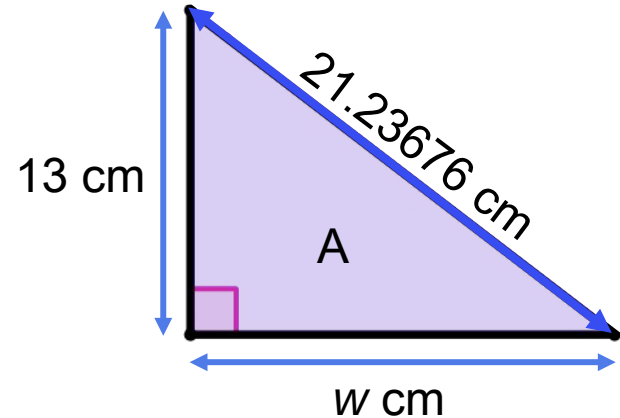
Waa habboon in la bixiyo dhererkan tiro jajab badan si looga fogaado qaladka wareega marka aan mar kale isticmaalno dhererkan.



Helista dhererka dhinacyada maqan

Dhinaca dhererkiisu yahay 21.23676
cm waa dhinac wadaag ah oo ah:
a shorter side of triangle B
hypotenuse-ka saddexagalka A

Hadda oo aan ognahay dhererka
dhinaca labaad ee saddexagalka A,
waxaan hadda isticmaali karnaa
aragtida Pythagoras si aan u xisaabino
dhererka dhinaca aan la aqoon ee lagu
calaamadeeyay w cm.

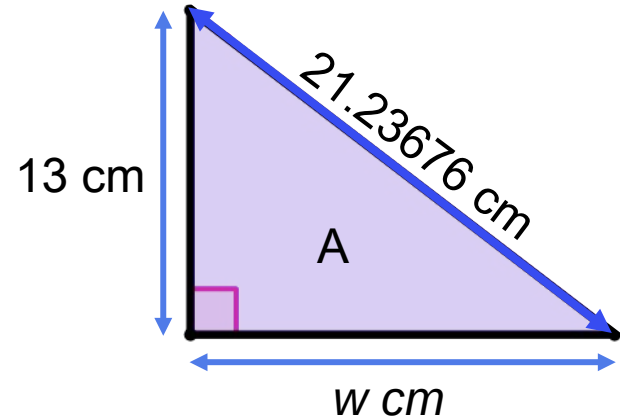


Helista dhererka dhinacyada maqan

Isla'egta aragtida Pythagoras ee
saddexagalka A waa:

$\sqrt{\quad}$

Dhererka dhinaca lagu calaamadeeyay w
cm waa 16.79 cm.



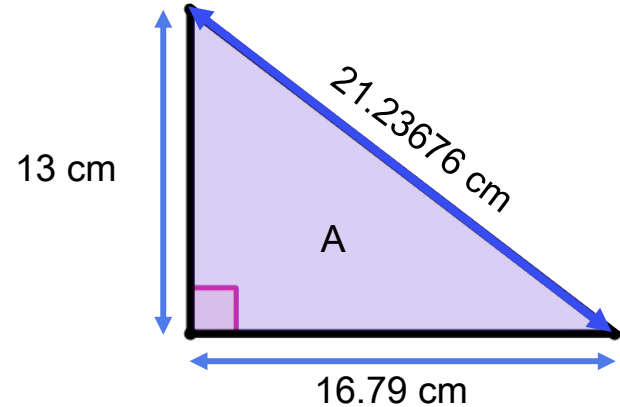
Isla'egta aragtida Pythagoras ee saddexagalka A waa:

$\sqrt{\quad}$

Wow, taasi waa qurux badan laakiin waxay u egtahay mid qasan oo leh jajab tobanle dheer! Ma jirtaa hab looga fogaado?



Cabdi



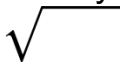
Isla'egta aragtida Pythagoras (Pythagoras' theorem) ee saddexagalka A waa:

$$w^2 + 13^2 = (\sqrt{451})^2$$

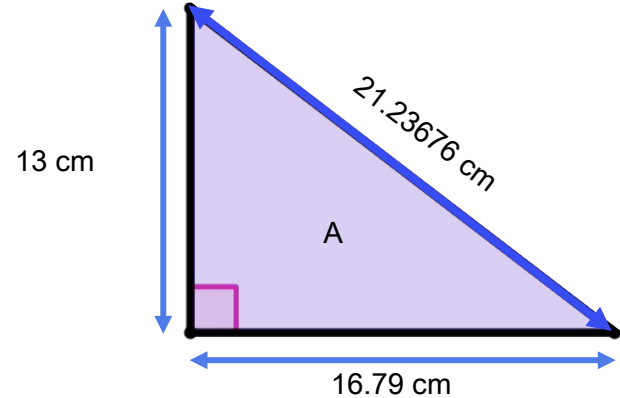
Halkii aan u beddeli lahayn 451 jajab tobanle (decimal), waxaan ku hayn karnaa qaabka surd (surd form).

Sidee tani caawinaysaa?

Maxaa dhacaya haddii aan ku qoro $(451)^2$ xisaabiyaha (calculator)?



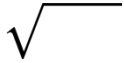
Oh, waxaan helay 451. Taasi ma aha mid qasan!



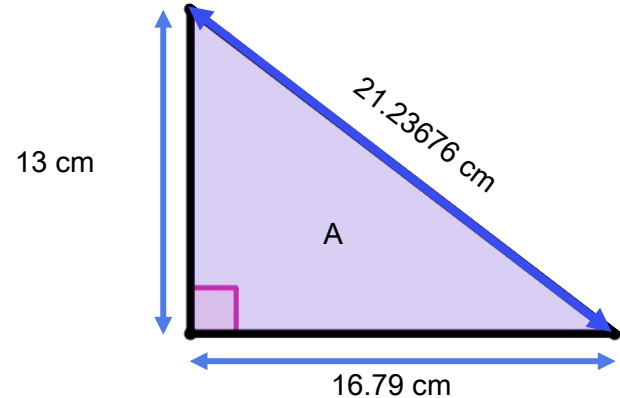
Isla'egta aragtida Pythagoras (Pythagoras' theorem) ee saddexagalka A waa:

$$w^2 + 13^2 = (\sqrt{451})^2$$

Maaddaama labajibbaaran (squaring) iyo xidid labajibbaaran (square rooting) ay yihiin hawlo iska soo horjeeda (inverse operations), $(\sqrt{451})^2 = 451$.



Jawaabtan waxay la mid tahay 16.79 cm ee aan ku xisaabinay habka jajab tobanle (decimal method).



Kee ka mid ah kuwan ayaa ah dhererka saxda ah ee dhinaca wadaagga ah ee lagu calaamadeeyay k cm?

a $\sqrt{39^2 + 20^2}$

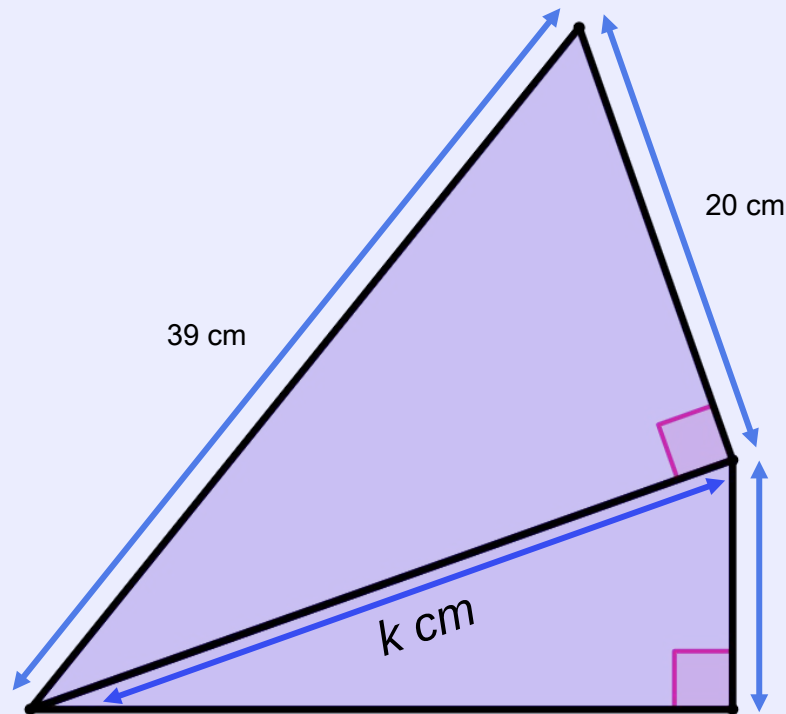
b $\sqrt{39^2 - 20^2}$ ✓

c $\sqrt{1921}$

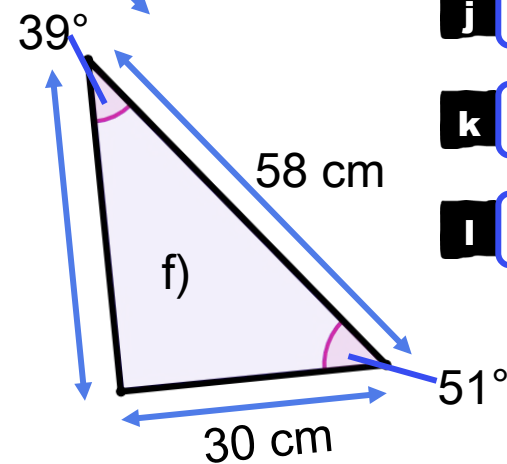
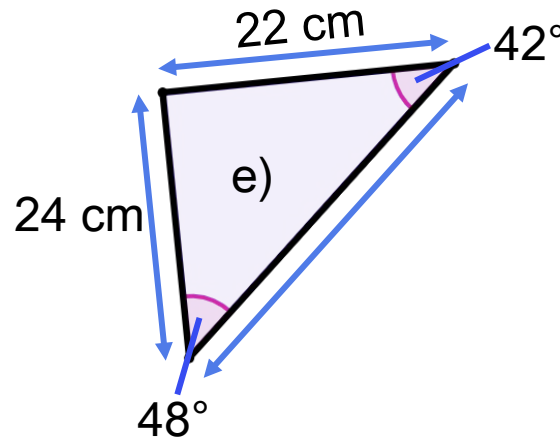
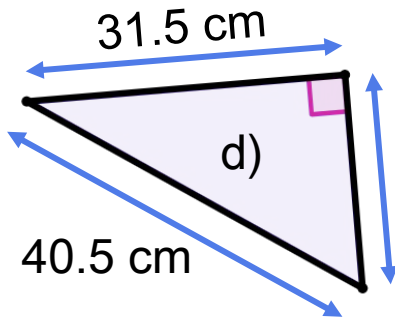
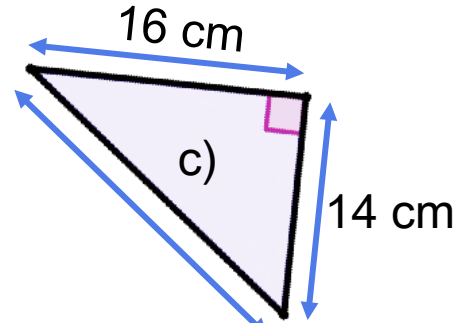
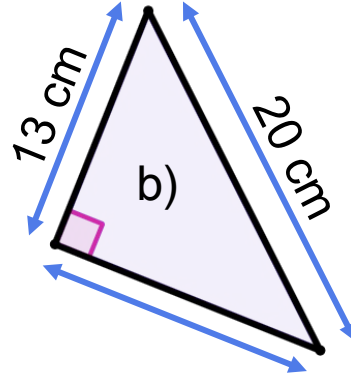
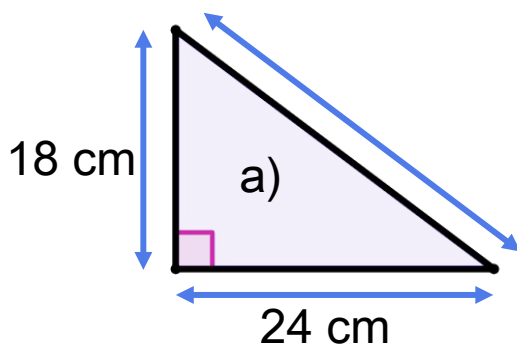
d $\sqrt{1121}$ ✓

e 33.48133809 ✓

f 33.4



1) Isku xidh saddexagalka iyo dhererka dhinaciisa maqan.



g 21.26 cm

h 25.46 cm

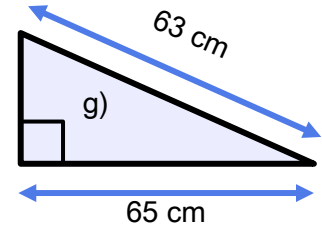
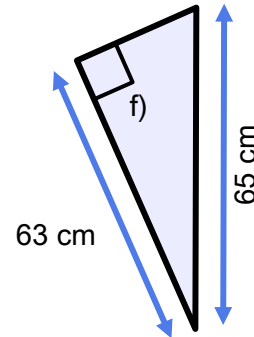
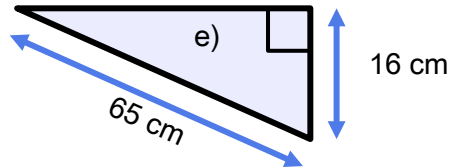
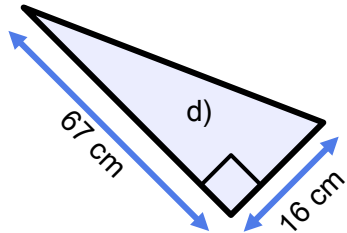
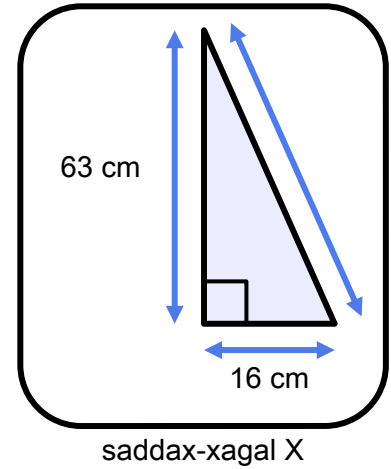
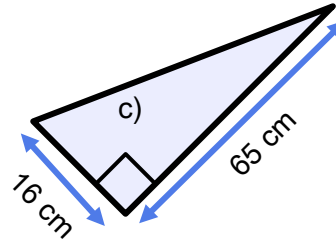
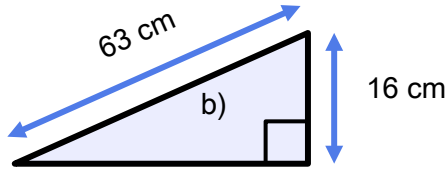
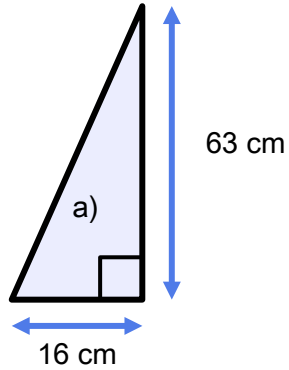
i 30 cm

j 49.64 cm

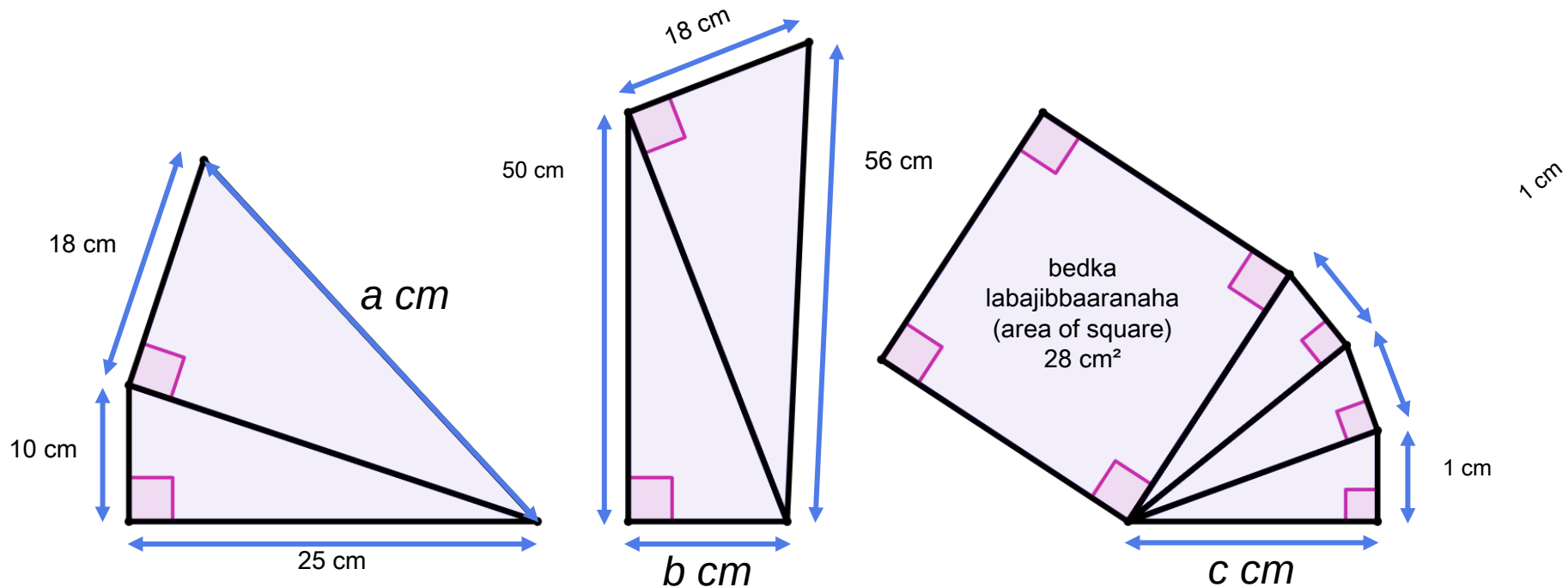
k 15.20 cm

l 32.56 cm

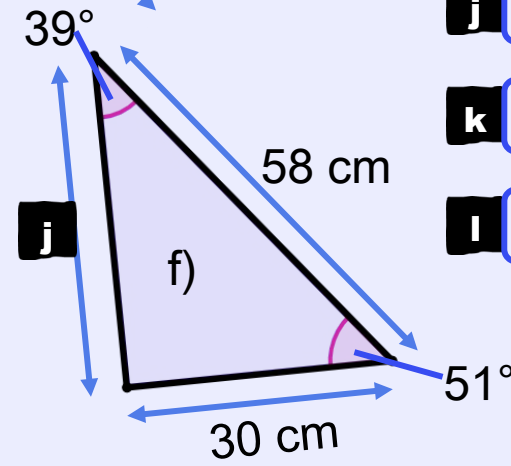
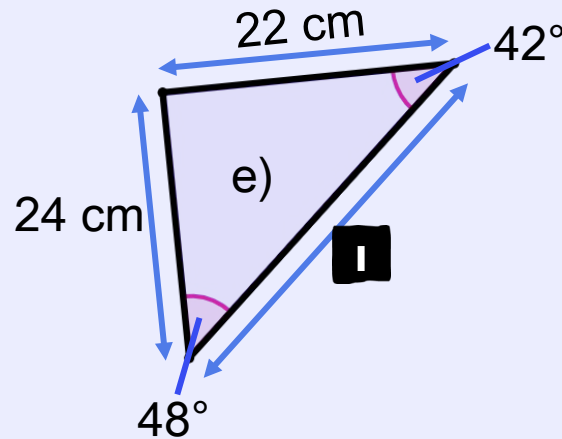
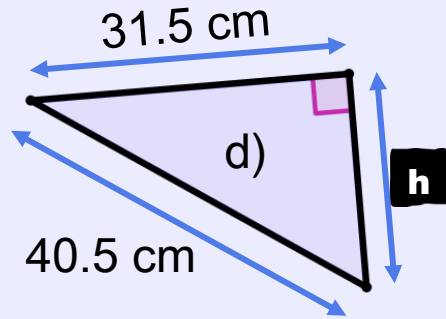
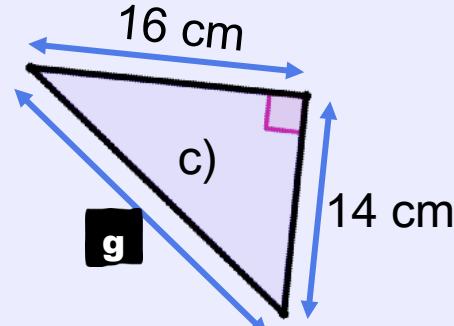
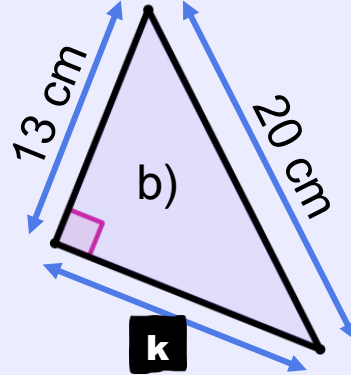
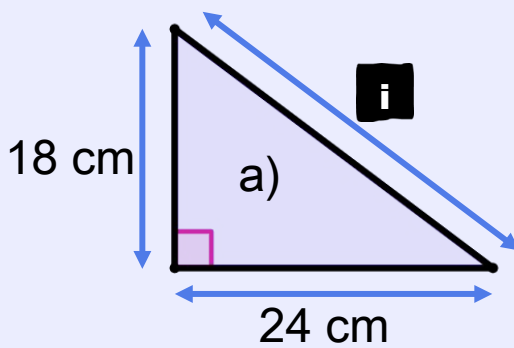
2) Kee ka mid ah saddax-xagalladan ayaa la siman (congruent) saddax-xagalka X?



3) Xisaabi dhererka dhinac kasta oo aan la garanayn oo ku calaamadsan xaraf, ku soo koob jawaabtaada 2 meelood oo jajab tobanle (decimal places).



1) Isku dhig saddax-xagalka (triangle) iyo dhererka dhinaciisa maqan.



g 21.26 cm

h 25.46 cm

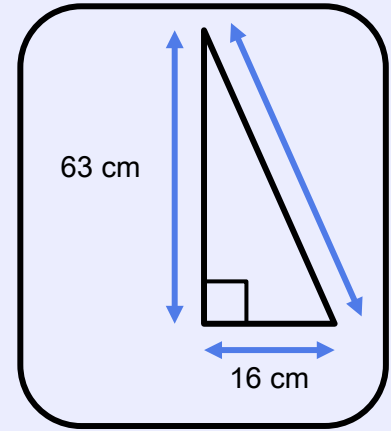
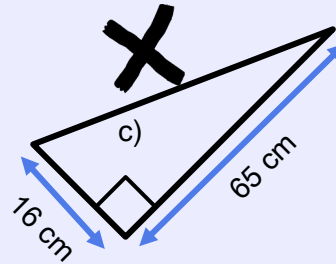
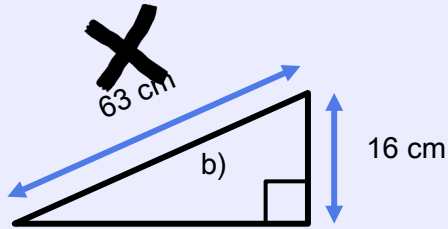
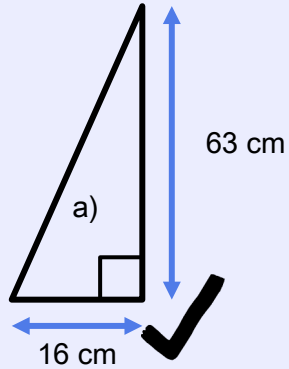
i 30 cm

j 49.64 cm

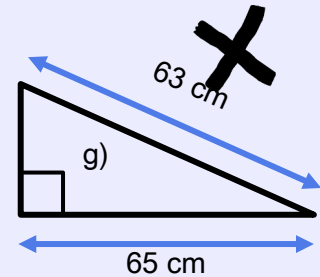
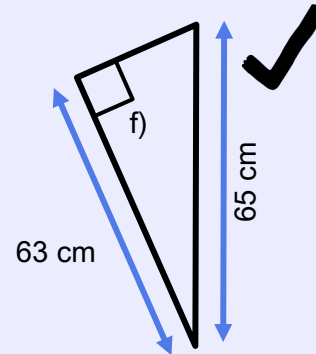
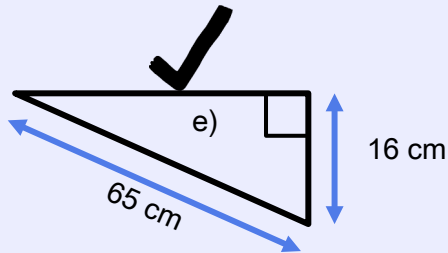
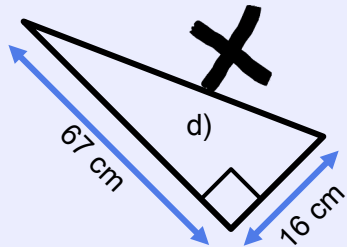
k 15.20 cm

l 32.56 cm

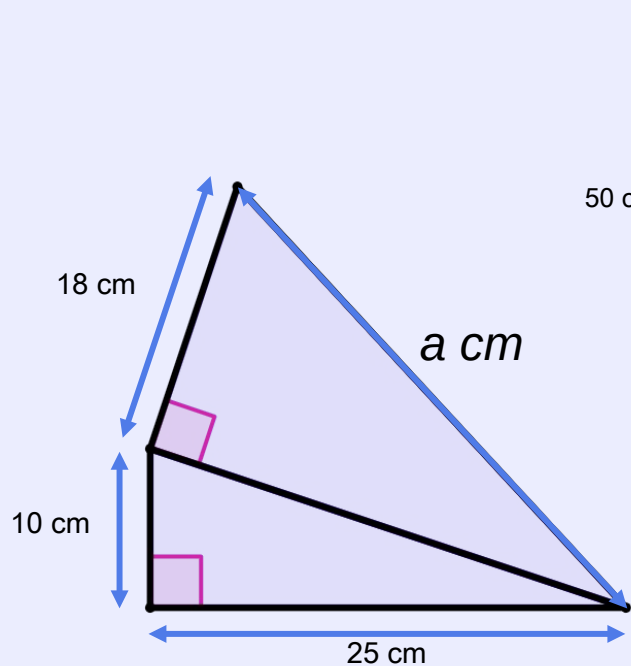
2) Kee ka mid ah saddexagalladan ayaa la mid ah (congruent) saddexagalka X?



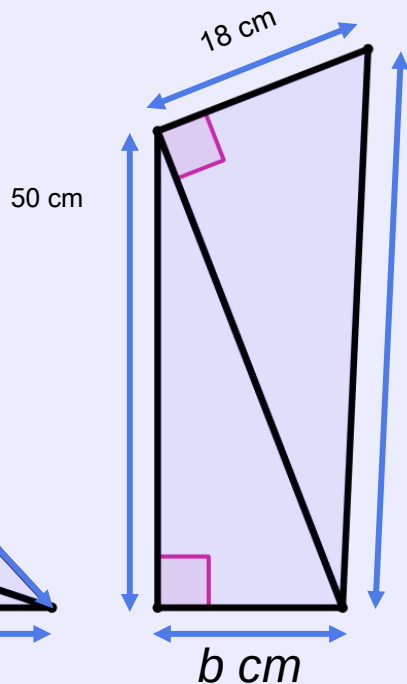
saddexagal X



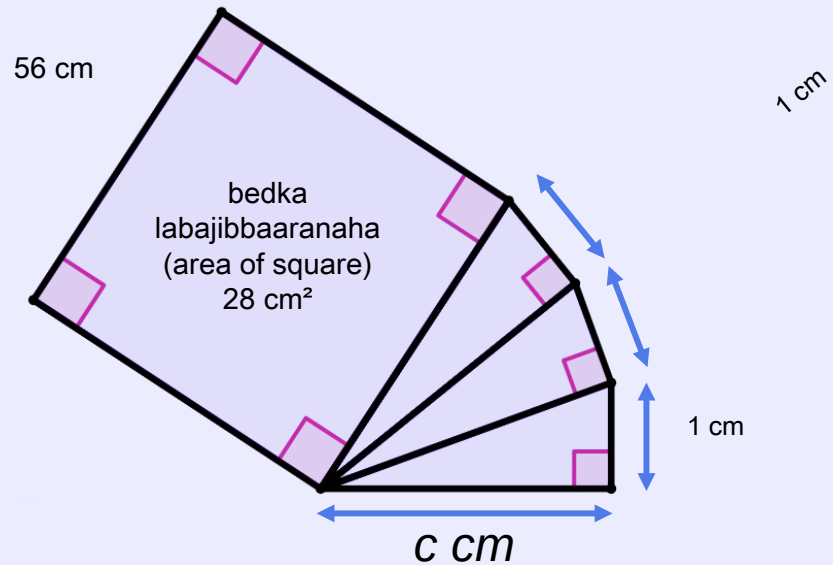
3) Xisaabi dhererka dhinac kasta oo aan la garanayn oo ku calaamaysan xaraf, adoo ku soo celinaya jawaabtaada 2 meelood oo jajab tobanle ah.



$$a \text{ cm} = 32.39 \text{ cm}$$



$$b \text{ cm} = 17.66 \text{ cm}$$



$$c \text{ cm} = 5 \text{ cm}$$

Hypotenuse-ga saddexagalka qumman (right-angled triangle) waxaa loo aqoonsan karaa sida:
dhinaca ka soo horjeeda calaamadda xagasha qumman (right angle marker)
dhinaca ku xiga laba xagal oo isku darkoodu yahay 90°

Maadaama isku darka (addition) uu yahay mid is-beddelaya (commutative), wadarta laba jibaaranka (squares) ee labada dhinac ee gaagaaban waxaa loo qori karaa hab kasta, taasoo la macno ah in ay jiraan matallo (representations) badan oo isla'egta (equation) aragtida Pythagoras (Pythagoras' theorem) ah saddexagal kasta.

Aragtida Pythagoras (Pythagoras' theorem) waxaa lagu dabaqi karaa si isdaba joog ah (repeatedly) qaababka (shapes) isku dhisan (composite) oo ka samaysan saddexagallo qumman (right-angled triangles).