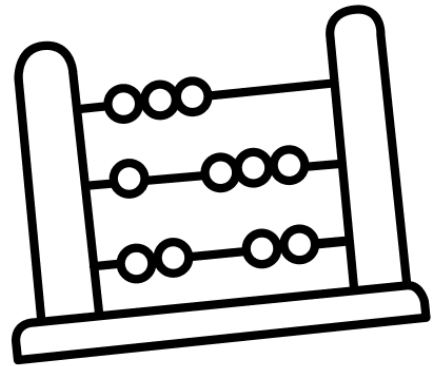


Muujinta aragtida Pythagoras (Pythagoras' theorem)

Maths

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



Natiijo

Waxaan qaddarin karaa inay jirto xiriir u dhexeeya dhererka dhinacyada saddexagalka qumman (right-angled triangle).

Erayada muhiimka ah

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

Qaabka casharka

Muujinta aragtida Pythagoras (Pythagoras' theorem)



Abuurista saddexagallo (triangles) oo ka kooban isku darka labajibbaaranayaasha (squares)



Sifooyin ka yimaada isku darka aagagga labajibbaaranayaasha (squares)

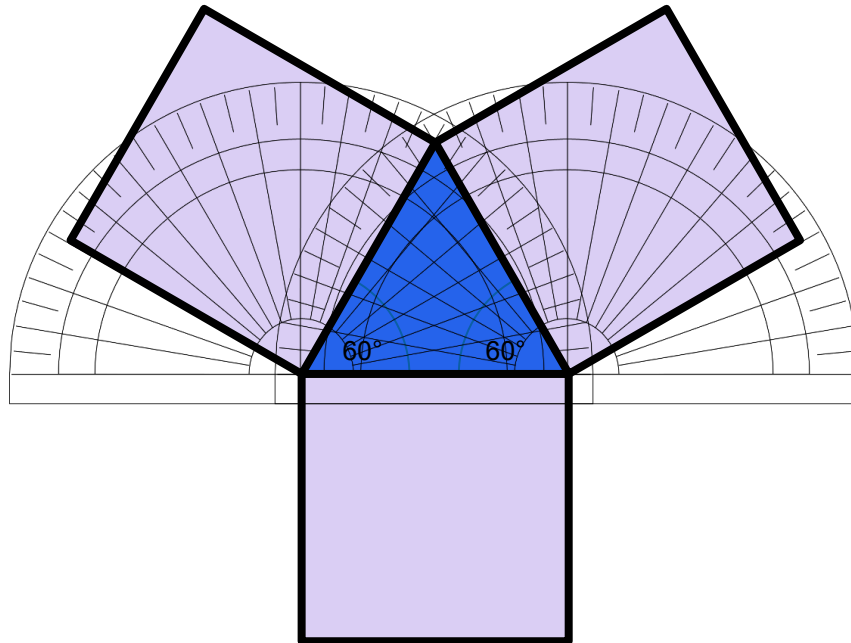


Cabdi

Waxay u egtahay inay tahay saddexagal siman (equilateral triangle) aniga aragtidayda.



Waxaan la yaabanahay nooc ee ah saddexagalka (triangle) uu yahay.





Oh, run! Waxaan la yaabanahay inaad samayn karto saddexagallo (triangles) kala duwan oo leh saddex laba jibbaaran (squares) oo bed (area) kala duwan.

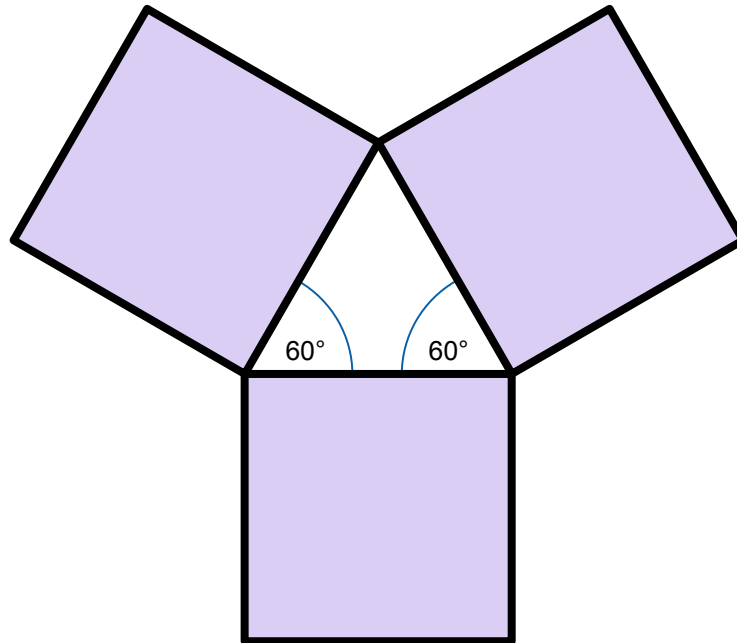


Cabdi

Laakiin ma cada ma aha, maadaama dhammaan saddexda laba jibbaaran (squares) ee aad isticmaashay ay isku mid yihiin (congruent), sidaas darteedna dhammaantood leeyihiin bed (area) isku mid ah!



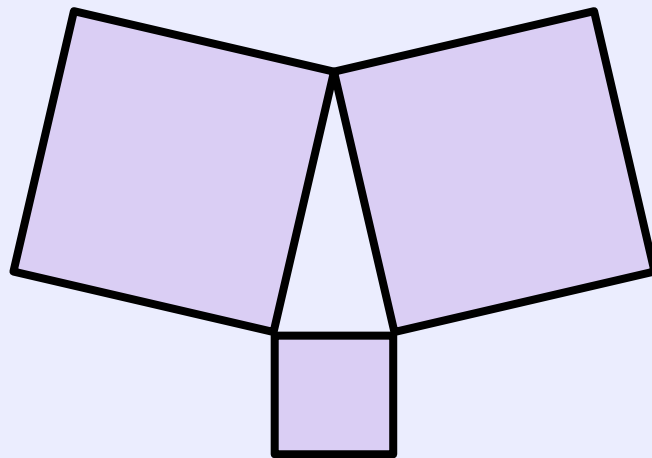
Layla



Saddexagalkan (triangle) wuxuu ka samaysan yahay laba laba jibbaaran (squares) oo bed (area) 20 cm^2 ah, iyo hal laba jibbaaran (square) oo bed (area) 4 cm^2 ah.



Cabdi



Noocce ah saddexagal (triangle) ayuu Cabdi sameeyay?

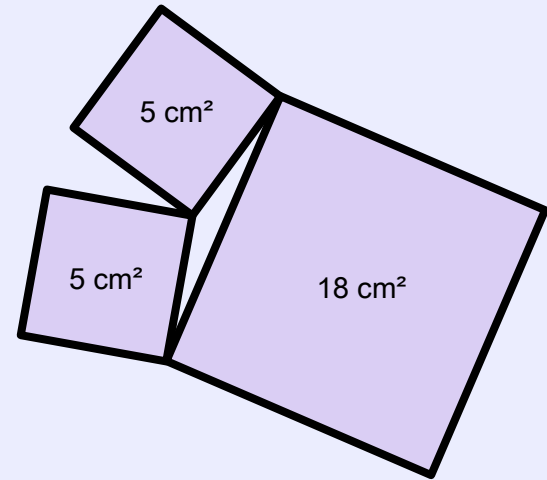
Samaynta saddexagal (triangles) iyadoo la isku darayo laba jibbaaran (squares)



Hubi

Noocee ah saddexagal (triangle) ayaa laga sameeyay saddexdan laba jibbaaran (squares) oo geesahooda (vertices) la isku xidhay?

Sharaxaad (explanation) keebaa caddaynaysa sida aad u ogaatay?



a

laba jibbaaranka (square) leh bedka (area) ugu weyn wuxuu ka weyn yahay laba jibaar (double) mid ka mid ah laba jibbaaranada (squares) yaryar



b

waxaa jira laba laba jibbaaran (squares) oo leh bed (area) isku mid ah

c

laba jibbaaran kasta (square) wuxuu ka samaysan yahay xaglo qumman (right angles)

Samaynta saddexagallo (triangles) iyadoo la isku darayo laba jibbaaran (squares)

Saddexda xagal (angles) ee saddexagalkan (triangle) waa 115° , 30° , iyo 35° .

Waa nooc ee saddexagal (triangle) kan?

saddexagal (triangle) aan simanayn (scalene)

Maxaad ka taqaan saddexda laba jibaaran (squares) macluumaadkan?



a

bedka (area) saddexda laba jibaaran (squares) dhammaantood way kala duwan yihiin

b

saddexda laba jibaaran (squares) waa isku mid (congruent)

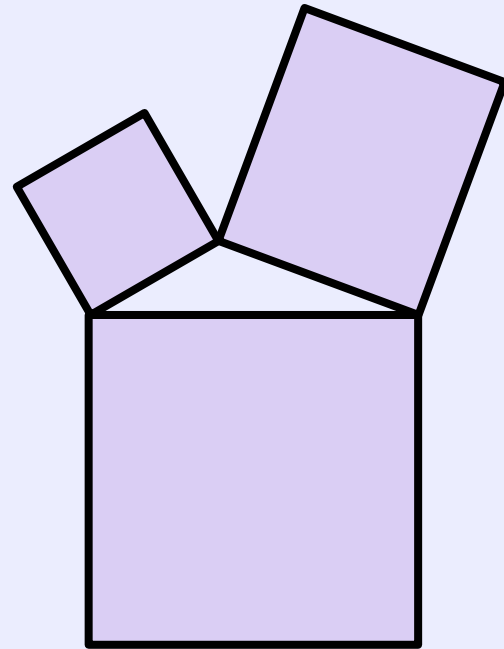


c

laba jibaar (square) kastaa wuxuu leeyahay dherer dhinac (side length) oo kala duwan

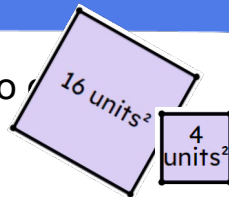
d

laba jibaar (square) kastaa wuxuu leeyahay isku dherer dhinac (side length)



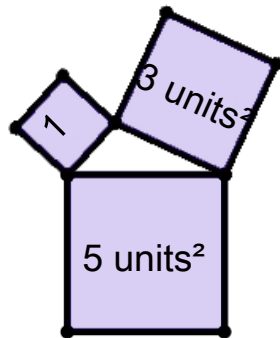


Waxaad u baahan doontaa laba jibaaran (squares) si sax ah loo



1) Samee saddexagal (triangle) adoo ku xira cidhifyada (vertices) laba jibaaran (squares) oo leh bed (area) 1 unit^2 , 3 units^2 , iyo 5 units^2 .

Adigoo isticmaalaya protractor, ku qiyaas cabbirka xagal (angle) kasta oo saddexagalkan (triangle) ku yaal.



2) Sharax sababta aadan ugu samayn karin saddexagal (triangle) siman (equilateral) adigoo isticmaalaya isku darka laba jibaaran (squares) ee lagu siiyay.

3) Laba saddexagal (triangle) ayaa la samayn karaa adoo ku xira cidhifyada (vertices) kuwan soo socda:

- laba jibaaran (squares) oo leh bed (area) 2 units^2 , 5 units^2 , 6 units^2 (saddexagal X)
- laba jibaaran (squares) oo leh bed (area) 4 units^2 , 10 units^2 , 12 units^2 (saddexagal Y)

a) Samee labadan saddexagal (triangle) oo ku qiyaas xagal (angle) kasta oo ka mid ah adigoo isticmaalaya protractor.

b) Qor waxa aad ka ogaatay xagasha (angles) ee u dhexeysa saddexagalladan (triangles). Ma sharxi kartaa waxa aad aragtay?

4) Samee saddexagal (triangle) la mid ah (similar), laakiin aan isku mid ahayn (congruent), saddexagal (triangle) laga sameeyay laba jibaaran (squares) oo leh bed (area) 21 units^2 , 27 units^2 , 39 units^2 .

5) Samee 3 saddexagal (triangle) laba siman (isosceles) oo ka mid ah kuwan soo socda:

- labajibbaaran (squares) oo leh bed (area) 4 units^2 , 4 units^2 , 12 units^2 (saddexagal (triangle) A)
- labajibbaaran (squares) oo leh bed (area) 6 units^2 , 6 units^2 , 12 units^2 (saddexagal (triangle) B)
- labajibbaaran (squares) oo leh bed (area) 1 units^2 , 8 units^2 , 8 units^2 (saddexagal (triangle) C)

a) Ku qiyaas (measure) xagasha (angle) ugu weyn ee saddexagal (triangle) kasta adigoo isticmaalaya protractor.

b) Saddexagal (triangle) kee ayaa leh xagasha (angle) ugu weyn:

- xagal (angle) af (acute)
- xagal (angle) qumman (right)
- xagal (angle) fidsan (obtuse)

bedka (area) saddexda labajibbaaran (squares)	xagasha (angle) ugu weyn
7, 10, 13	af (acute)
4, 5, 11	
4, 9, 13	

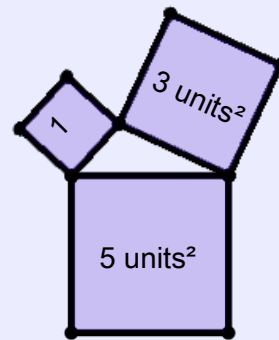
6) Buuxi jaantuska (table) adigoo isku xira saddex labajibbaaran (squares) oo qor in xagasha (angle) ugu weyn tahay: af (acute), fidsan (obtuse), ama qumman (right).

Kadib markaad doorato saddex labajibbaaran (squares), ma saadaalin kartaa nooca xagasha (angle) aad heli doontid ka hor intaadan ku xirin labajibbaaranada (squares)?

1) Abuur saddexagal (triangle) adigoo isku xira cidhifyada (vertices) labajibbaaranada (squares) oo leh bed (area) 1 unit², 3 units², iyo 5 units².

Adigoo isticmaalaya protractor, qiyaas (measure) cabbirka xagal (angle) kasta ee saddexagalkan (triangle).

xaglo (angles) qiyaastii
25°, 48°, iyo 107°



2) Iyadoo la eegayo labajibbaaranada (squares) la siiyay, sharax sababta aadan u abuur karin saddexagal (triangle) siman (equilateral).

Waxaa jira ugu badnaan laba nuqul oo ka mid ah labajibbaaran (squares) isku bed (area) ah, waxaadna u baahan tahay saddex labajibbaaran (squares) isku mid ah si aad u abuurto saddexagal (triangle) siman (equilateral).

3) Laba saddexagal ayaa la abuuri karaa isku xirka geesaha kuwa soo socda:

- labajibbaaranayaal (squares) oo leh bed (area) 2 units², 5 units², 6 units² (saddexagal X)

- labajibbaaranayaal (squares) oo leh bed (area) 4 units², 10 units², 12 units² (saddexagal Y)

a) Abuur labadan saddexagal oo ku qiyaas xagal kasta oo ka mid ah iyadoo la isticmaalayo protractor.

b) Qor waxa aad ogaatay ee ku saabsan xaglaha u dhexeeya saddexagalladan. Ma sharxi kartaa indha-indheyntaada?

xaglaha qiyaastii 35°, 64°, iyo 81° labada saddexagal

Saddexagalladu waxay isku mid yihiin (similar) sababtoo ah xaglahoodu waa isku mid. (Farqi yar oo qiyaas ah ayaa dhici kara sababtoo ah saxnaanta qalabka.) Ma ogaatay in labajibbaaranayaasha (squares) ee ka kooban saddexagalka Y ay yihiin laba jibaar bedka (area) kuwa saddexagalka X?



4) Abuur saddexagal la mid ah (similar) saddexagal laga sameeyay labajibbaaranayaal (squares) oo leh bed (area) 21 units^2 , 27 units^2 , 39 units^2 . Kumaas labajibbaaranayaal (squares) ayaad adeegsatay?

7 units^2 , 9 units^2 , iyo 13 units^2 .

5) Abuur 3 saddexagal oo isleeg (isosceles) oo ka sameysan labajibbaaranayaasha (squares) soo socda:

- 4 units², 4 units², 12 units² (saddexagal A)
- 6 units², 6 units², 12 units² (saddexagal B)
- 1 units², 8 units², 8 units² (saddexagal C)

a) Ku qiyaas xagasha ugu weyn ee saddexagal kasta iyadoo la isticmaalayo protractor.

A: 120°

B: 90°

b) Saddexagal kee ayaa xagashiisa ugu weyn tahay:

- xagal af (acute angle)?
- xagal qumman (right angle)?
- xagal fidsan (obtuse angle)?

C: 80°

C

B

A

bedka (areas) saddexda labajibbaaran (squares)	xagasha ugu weyn (largest angle)
7, 10, 13	xagal fiiqan (acute)
4, 5, 11	xagal madhan (obtuse)
4, 9, 13	xagal qumman (right angle)
3, 10, 13	xagal qumman (right angle)
5, 6, 7	xagal fiiqan (acute)

Waxaa jira saddexagallo badan oo laga samayn karo isku-dhisyada kala duwan ee labajibbaaranayaasha (squares).

6) Buuxi shaxda (table) adigoo isku daraya saddex labajibbaaran (squares) oo qoraya in xagasha ugu weyn (largest angle) tahay: xagal fiiqan (acute), xagal madhan (obtuse), ama xagal qumman (right).

Kadib markaad doorato saddex labajibbaaran (squares), ma saadaalin kartaa nooca xagasha (angle) aad heli doontid ka hor intaadan ku biirin labajibbaaranayaasha (squares)?

Ma la timaadday aragti (theory) ku saabsan xiriirka ka dhexeeya bedka (areas) iyo cabbirka xagasha ugu weyn (largest angle)?

Aynu ogaanno haddii aragtidaadu (theory) sax tahay...

Qaabka casharka

Muujinta aragtida (theorem) Pythagoras



Samaynta saddexagalka iyadoo la isku darayo labajibbaaranayaal (squares)



Guryaha (Properties) laga helo isku-darka bedka (areas) labajibbaaranayaasha (squares)

Marka, iyadoo ku xiran labajibbaaranayaasha (squares) aan doorano, waxaan samayn karnaa saddexagallo kala duwan oo leh noocyo kala duwan oo xaglo (angles) ah.

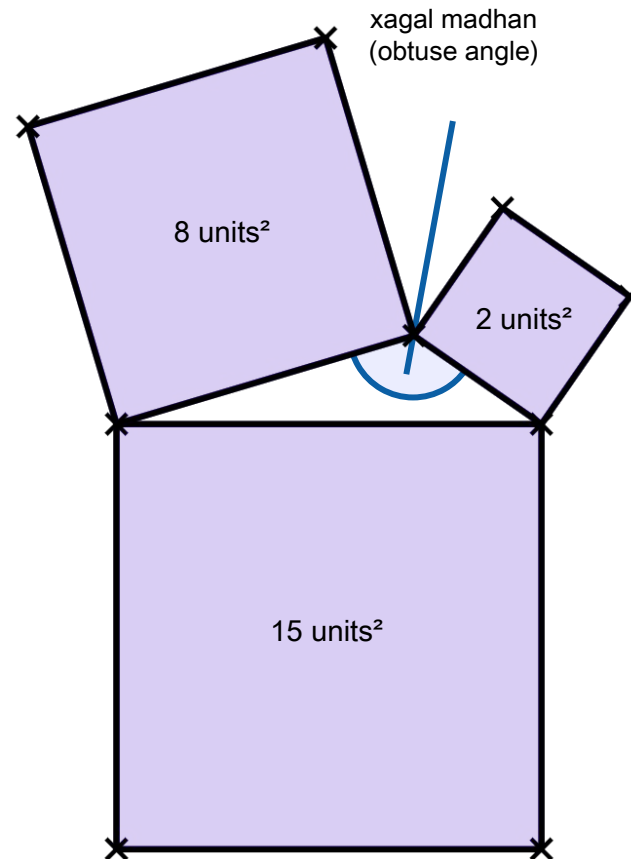


Cabdi

Waxaan la yaabanahay inuu jiro qaab (pattern) ku jira labajibbaaranayaasha (squares) aan doorano iyo nooca xagasha (angle) ugu weyn saddexagalka!



Axmed





Layla

Waxaa laga yaabaa inuu jiro qaab. (Maybe there is a pattern.)
Waa kuwan qaar ka mid ah jawaabahayga hawshii hore. (Here are some of my answers to a previous task.)

Ma arki kartaa qaab ku jira bedka labajibbaaranada ee sameeya nooc kasta oo xagal ah? (Can you spot a pattern in the areas of the squares that make each type of angle?)

bedka saddexda labajibbaaran (areas of the three squares)	xagasha ugu weyn (largest angle)
7, 10, 13	af-fiiqan (acute)
4, 7, 9	af-fiiqan (acute)
4, 4, 7	af-fiiqan (acute)
3, 5, 10	af-balaadhan (obtuse)
5, 7, 14	af-balaadhan (obtuse)
1, 3, 7	af-balaadhan (obtuse)
3, 8, 11	xagal-qumman (right-angle)
2, 5, 7	xagal-qumman (right-angle)
4, 8, 12	xagal-qumman (right-angle)



Haddii aad qaaddo labada bed (area) ee yaryar,

labajibbaaranaha (square) ugu weyn wuxuu leeyahay bed (area) ka yar wadarta (sum) tan.



Axmed

bedka saddexda labajibbaaran (areas of the three squares)	xagasha ugu weyn (largest angle)
 1, 10, 13	af-fiigan (acute)
 4, 7, 9	xagal-af (acute)
4, 4, 7	xagal-af (acute)
3, 5, 10	xagal-weyn (obtuse)
5, 7, 14	xagal-weyn (obtuse)
1, 3, 7	xagal-weyn (obtuse)
3, 8, 11	xagal-qumman (right-angle)
2, 5, 7	xagal-qumman (right-angle)
4, 8, 12	xagal-qumman (right-angle)

$$7 + 10 = 17 \quad 13 \text{ waa ka yar yahay } 17.$$

$$4 + 7 = 11 \quad 9 \text{ waa ka yar yahay } 11.$$

Oh waa! Si fiican ayaad u aragtay.
Waxaan la yaabanahay in jiro qaab (pattern) la mid ah haddii xagasha ugu weyn tahay mid fiiqan (obtuse) ama xagal qumman (right-angle).
Ma arki kartaa qaab (pattern)?



Layla

beddedka (areas) saddexda labajibbaaranayaal (squares)	xagasha (angle) ugu weyn
 1, 10, 13	xagal-af (acute)
 4, 7, 9	xagal-af (acute)
4, 4, 7	xagal-af (acute)
3, 5, 10	xagal-weyn (obtuse)
5, 7, 14	xagal-weyn (obtuse)
1, 3, 7	xagal-weyn (obtuse)
3, 8, 11	xagal qumman (right-angle)
2, 5, 7	xagal qumman (right-angle)
4, 8, 12	xagal qumman (right-angle)

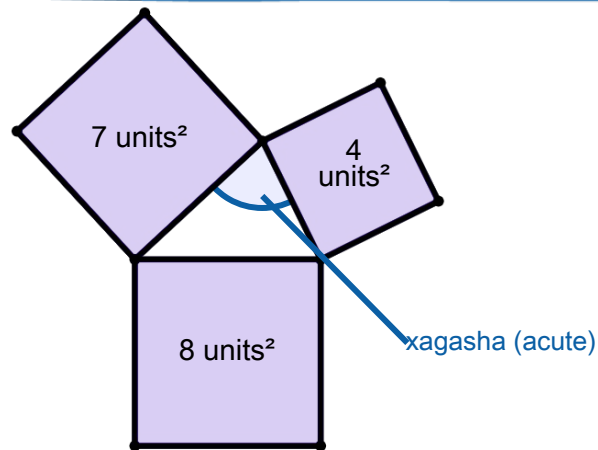
Sahmin (Exploration)

Ma arki kartaa waxa ku dhaca xagasha ugu weyn markaad barbardhigto cabbirka labada bed ee yar iyo cabbirka bedka ugu weyn?



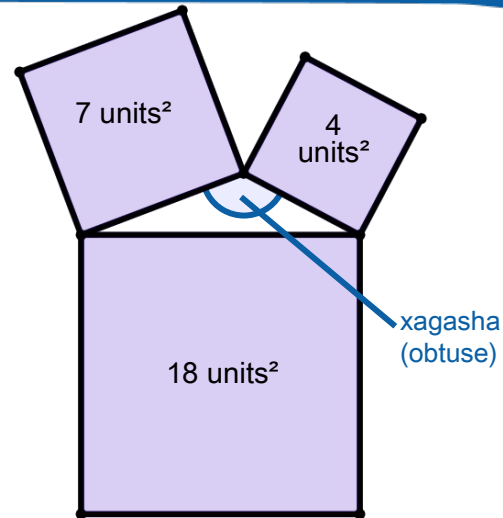
Axmed

Astaamaha ka yimaada isku darka bedka (areas) ee labajibbaaranayaasha (squares)



Haddii bedka labajibbaaranaha ugu weyn uu ka yar yahay wadarta labada bed ee yar...

Xagasha ugu weyn had iyo jeer waa xagasha (acute).



Haddii bedka (area) labajibbaaranaha ugu weyn uu ka weyn yahay wadarta (sum) labada bedood ee yaryar...

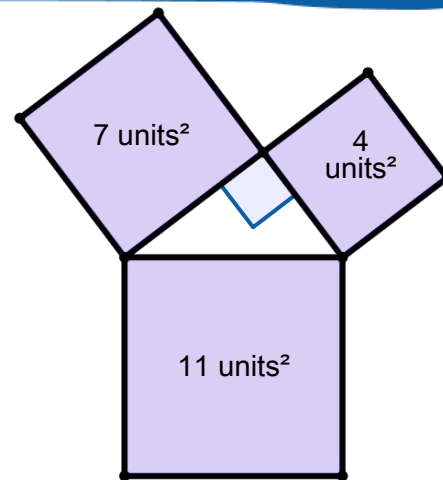
Xagasha ugu weyn had iyo jeer waa xagasha (obtuse).

Laakiin ka warran saddex-xagal qumman (right-angled triangle)?

Waa maxay xiriirka (relationship) u dhexeeya:
bedka (areas) labada labajibbaaran ee yaryar
bedka (area) labajibbaaranaha weyn?

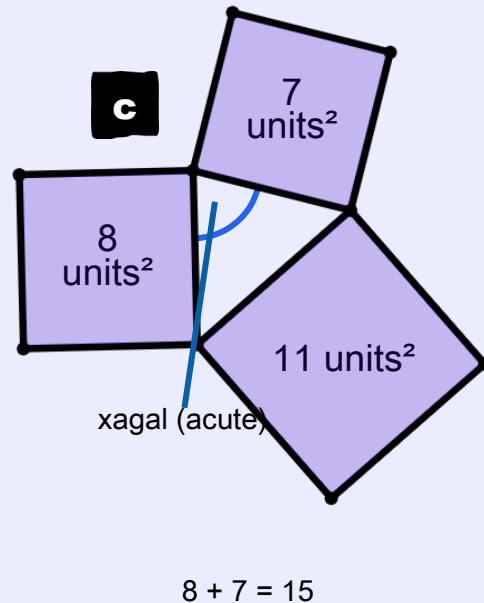
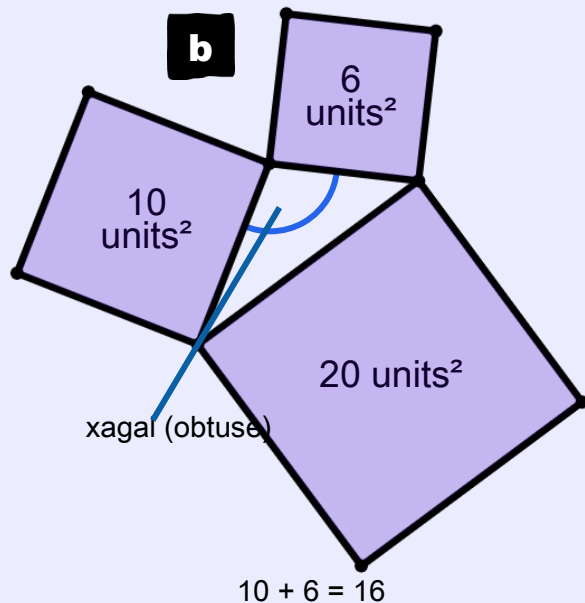
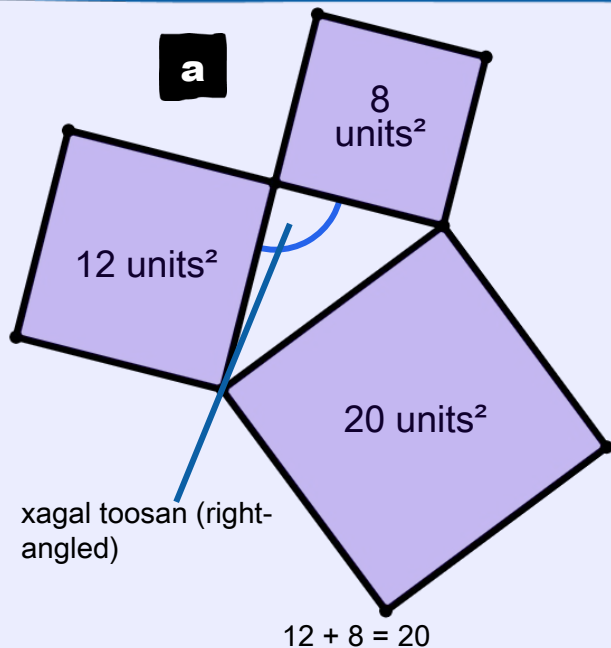
Haddii bedka (area) labajibbaaranaha ugu weyn uu la mid yahay
wadarta (sum) labada bedood ee yaryar...

Xagasha ugu weyn had iyo jeer waa xagasha qumman (right-angled).

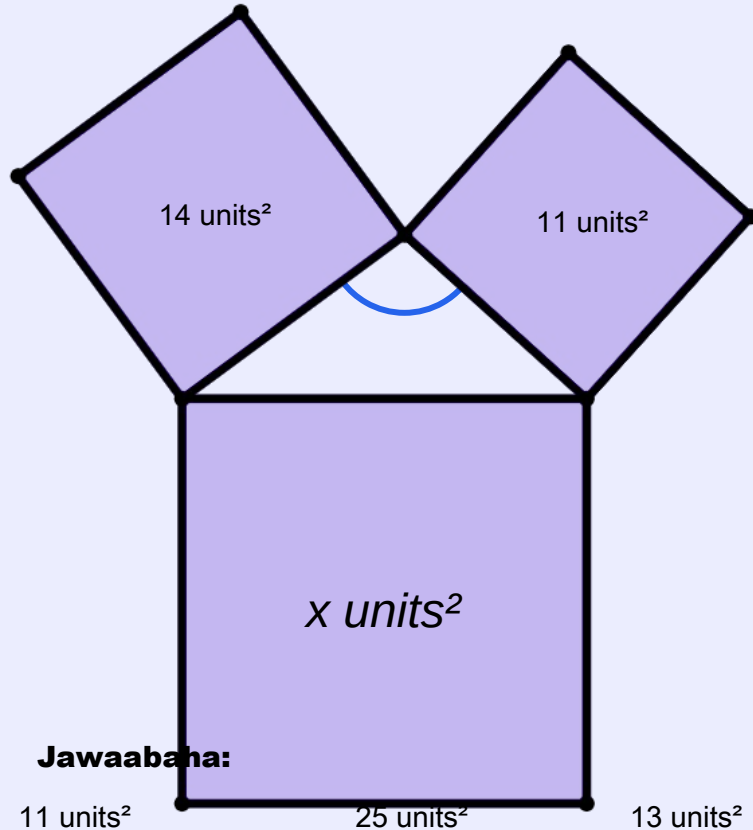


11 units² waa bedka (area) labajibbaaranaha ugu weyn.

Guryaha (Properties) ka soo baxa isugeynta (summing) bedka (areas) labajibbaaranayaasha



Saddexagalkee xaggiisa ugu weyn (lagu calaamadeeyay calaamadda xagasha) waa: xagasha (acute), xagasha (obtuse), ama xagasha toosan (right-angled)?



Xagasha ugu weyn ee saddexagalkani waa xagal (obtuse).

Kuwee ka mid ah kuwan ayaa ah qiimayaal (values) suurtagal ah oo x units², bedka (area) labajibbaaranaha ugu weyn?

a

b

c

d

e

f



11 units²

25 units²

13 units²

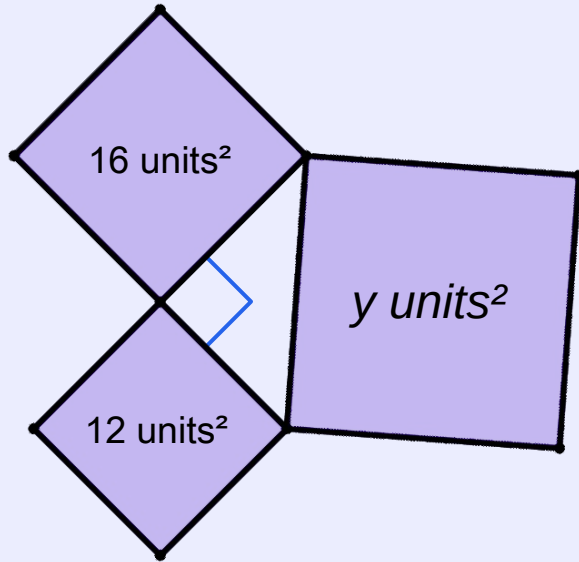
30 units²

14 units²

36 units²

x units²

Jawaabaha:



Xagasha ugu weyn ee saddexagalkaan waa xagal qumman (right angle).

Waa maxay qiimaha (value) y , halkaas oo $y \text{ units}^2$ uu yahay bedka (area) labajibbaaranaha ugu weyn?

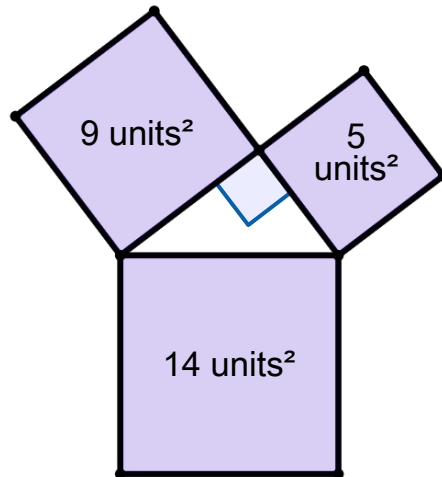
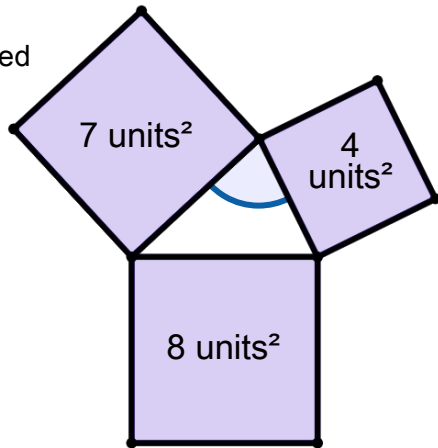


Waxaan qabaa inaad sax tahay!
Runtii waa run saddexagalkan oo dhan!

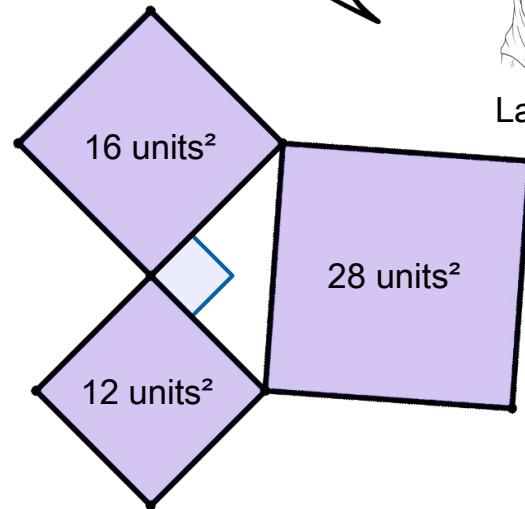
Xagasha ugu weyn weligeed uma eka inay taabato labajibbaaranaha ugu weyn.
Waxaa laga yaabaa in xagasha ugu weyn ay had iyo jeer ka soo horjeedo labajibbaaranaha ugu weyn.



Axmed



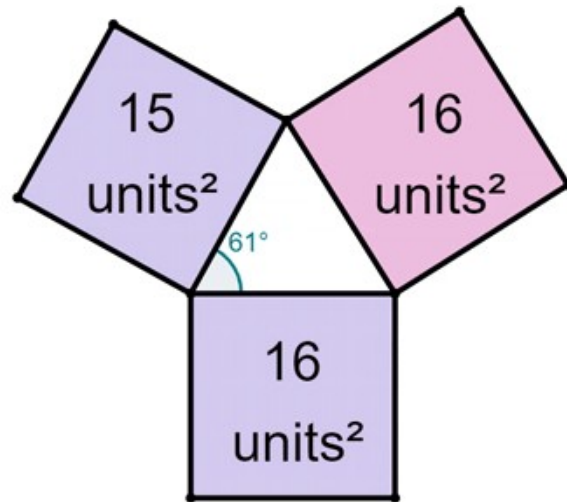
Layla

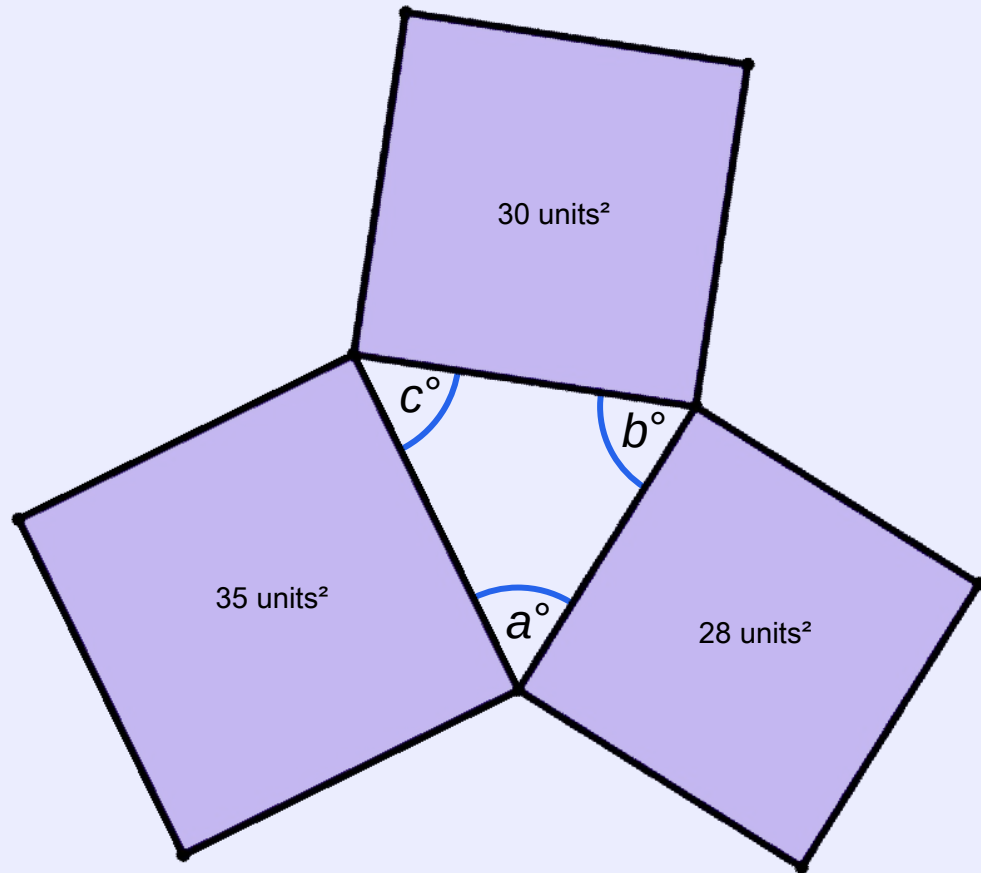


Marka labajibbaaranaha ugu weyn uu weynaado, xagasha ugu weyn ee ka soo horjeeda ayaa sidoo kale weynaata!



Axmed

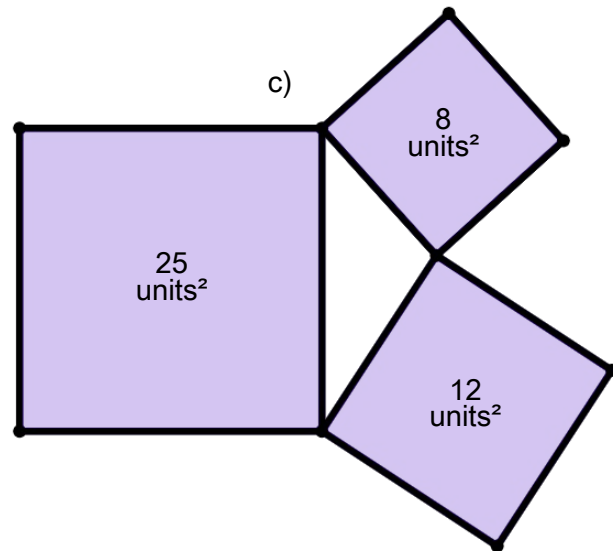
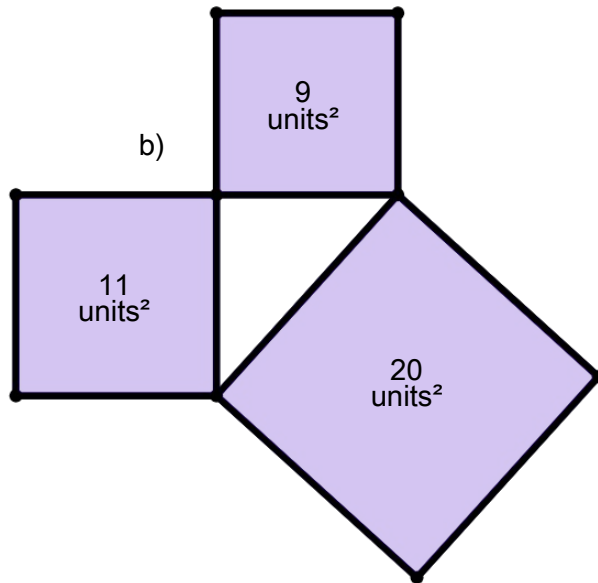
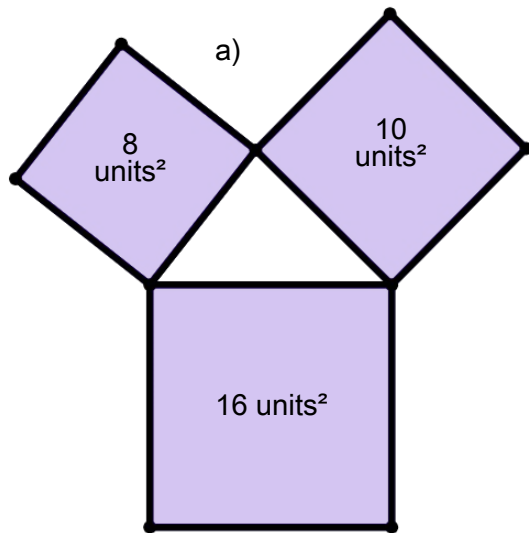




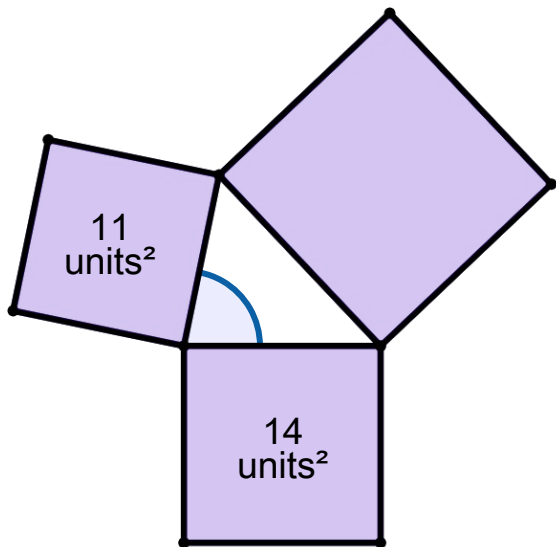
Saddexagalkan, kee ka mid ah saddexda xagal ayaa ugu weyn?

b°

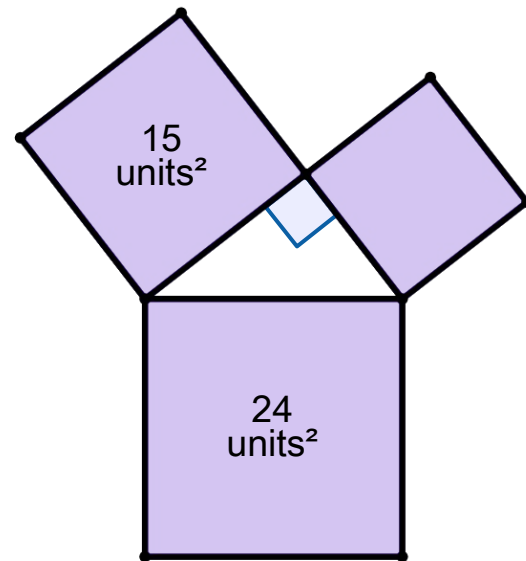
1) Saddexagal kasta, ku calaamadee xagal uu yahay xagasha ugu weyn ee gudaha saddexagalka.
Xagal kasta oo la calaamadeeyay, qor inay tahay mid degdeg ah (acute), qumman (right), ama fiiqan (obtuse).



2) Xagasha ugu weyn ee saddex-xagalkan waxaa lagu calaamadeeyay calaamad xagal (angle marker) waana xagal fiican (acute).
Qor bed (area) suurtagal ah oo labajibbaaranaha ugu weyn.



3) Xagasha ugu weyn ee saddex-xagalkan waa xagal qumman (right angle).
Qor bedka (area) labajibbaaranaha aan la calaamadayn.



4) Koox kastaa waxay tusaysaa bedka (area) saddex labajibbaaran oo geesahooda (vertices) lagu xidhay si ay u sameeyaan saddex-xagal.

Dhig koox kasta qaybta saxda ah ee shaxda (table) qeexaysa cabbirka xagasha ugu weyn.

3, 3, 5

8, 17, 25

xagasha ugu weyn waa xagal fiiqan (acute)	xagasha ugu weyn waa xagal fiiqan (obtuse)	xagasha ugu weyn waa xagal qumman (right)
16, 18, 20	9, 13, 26	8, 13, 21

Jawaabaha:

1, 1, 3
14a, 19a, 44a

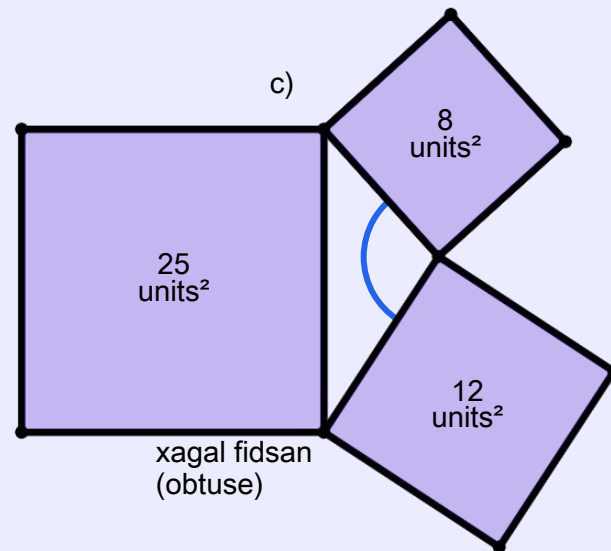
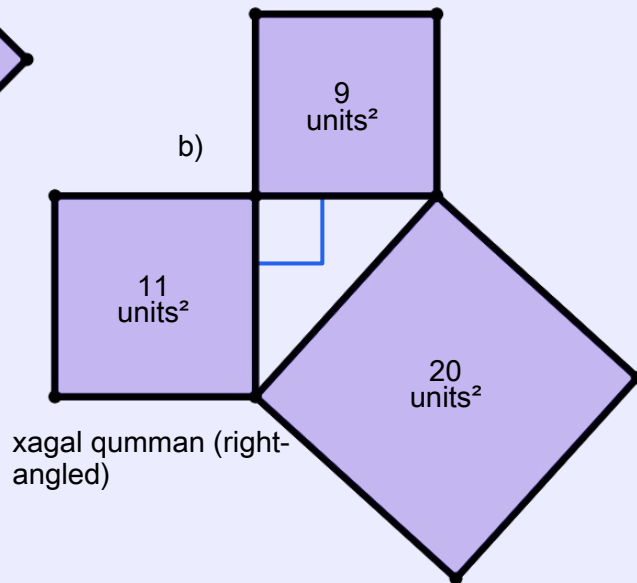
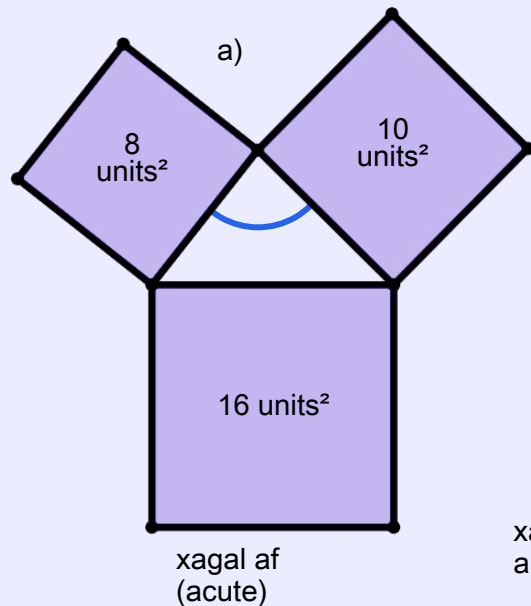
4, 7, 10

16, 17, 40

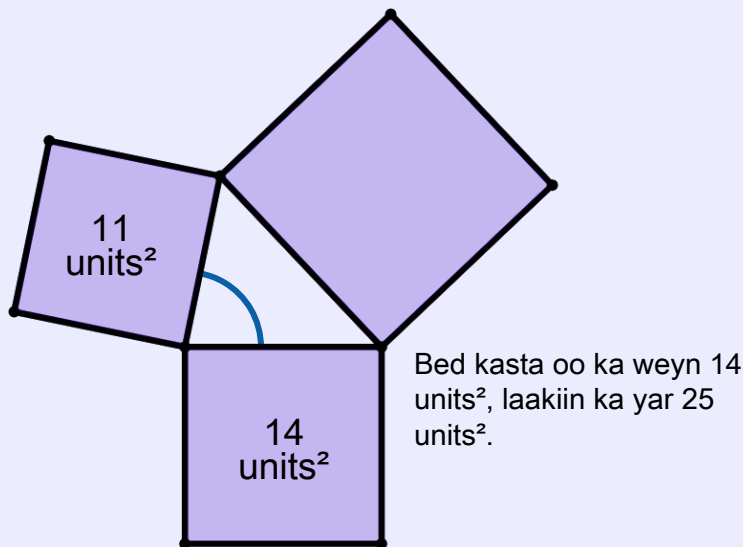
9, 16, 25

5x, 7x, 12x

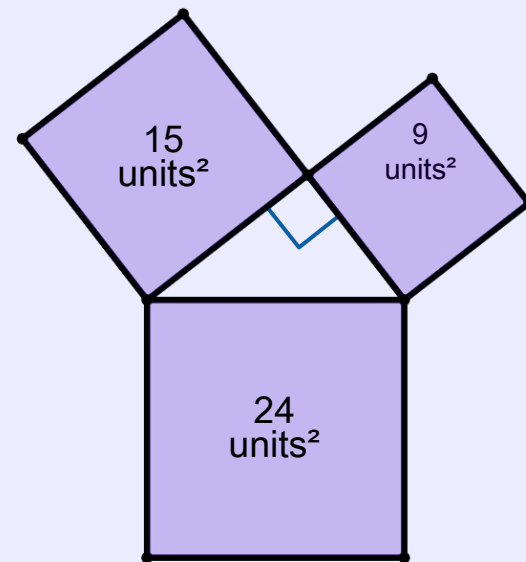
1) Saddex-xagal kasta, ku sawir calaamad xagal (angle marker) xagasha ugu weyn ee gudaha (interior angle) saddex-xagalka. Xagal kasta oo la calaamadeeyay, qor inay tahay xagal fiqan (acute), xagal qumman (right), ama xagal fiqan (obtuse).



2) Xagasha ugu weyn saddexagalkaan waxaa lagu calaamadeeyay calaamad xagal (angle marker) waana xagal af (acute).
Qor bed (area) suurtagal ah oo labajibbaaranaha ugu weyn.



3) Xagasha ugu weyn saddexagalkaan waa xagal qumman (right angle).
Qor bedka (area) labajibbaaranaha aan la calaamadin.



4) Koox kastaa waxay tusaysaa bedka (areas) saddex labajibbaaran oo geesahooda lagu xiro si ay u sameeyaan saddexagal.

Geli koox kasta meeshii ku habboon ee shaxda qeexaysa cabbirka xagasha ugu weyn.

xagasha ugu weyn waa xagasha (acute)	xagasha ugu weyn waa xagasha (obtuse)	xagasha ugu weyn waa xagasha (right)
16, 18, 20	9, 13, 26	8, 13, 21
3, 3, 5	1, 1, 3	8, 17, 25
4, 7, 10	16, 17, 40	9, 16, 25
	14a, 19a, 44a	5x, 7x, 12x

Soo koobid

Muujinta aragtida (Pythagoras' theorem)

Saddex labajibaaran (squares) ayaa lagu xiri karaa meelaha ay ku kulmaan (vertices) si loo sameeyo saddex xagal (triangle).
Haddi saddex labajibaaran oo isku mid ah (congruent squares) la isku xiro, saddex xagalku waa isman (equilateral).
Haddi laba labajibaaran oo isku mid ah la isku xiro, saddex xagalku waa laba-gesood (isosceles).
Haddi dhamaan labajibaaranayaashu iseyhiin bed (areas) kalla duwan, saddex xagalku waa kala-dheer (scalene).

Xagasha ugu weyn ee saddex-xagalka waxay noqon kartaa xagasha (acute), xagasha (right), ama xagasha (obtuse), iyadoo ku xiran in wadarta bedka labada labajibaaran ee yaryar ay ka weyn tahay, la mid tahay, ama ka yar tahay bedka labajibaaranaha ugu weyn, siday u kala horreeyaan.

Marka wadarta bedka labada labajibaaran ee yaryar ay la mid tahay bedka labajibaaranaha ugu weyn, saddex-xagalku had iyo jeer waa saddex-xagal xagasha (right-angled triangle). Tani waa muujin (visual demonstration) aragtida (Pythagoras' theorem).