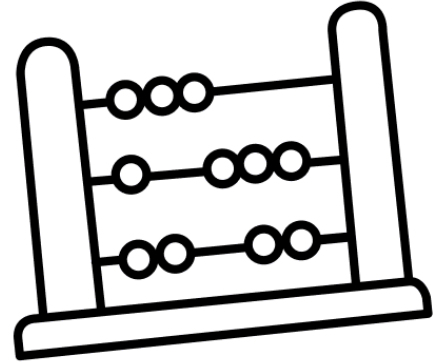


Isku ekaanshaha qaababka (Similarity in shapes)



Maths

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

Natiijo

Waxaan garan karaa in qaababka isku midka ah ay leeyihiin dhinacyo isku saami ah, laakiin cabbirka xagluhu waa ilaashan yahay.

Erayada muhiimka ah

Shayga (object) waa jaantuska bilowga ah ka hor inta aan la isticmaalin isbeddel (transformation).

Sawirka (image) waa jaantuska ka soo baxa ka dib marka isbeddel (transformation) la isticmaalo.

Laba qaab waa isku mid haddii kala duwanaanshaha kaliya ee u dhexeeya ay tahay cabbirkooda. Dhererka dhinacyadoodu waa isku saami.

Qiyaasta weyneynta (Scale factor) waa tirada lagu dhufto ee u dhaxaysa qaababka isku midka ah, oo qeexaysa sida uu u weyn yahay qaabka kale marka loo eego kan kale.

Sifo (property) ee qaabku waa mid aan isbeddelin (invariant) haddii sifooyinkaas aysan isbeddelin ka dib marka qaabka la beddelo.

Isku ekaanshaha qaababka (Similarity in shapes)



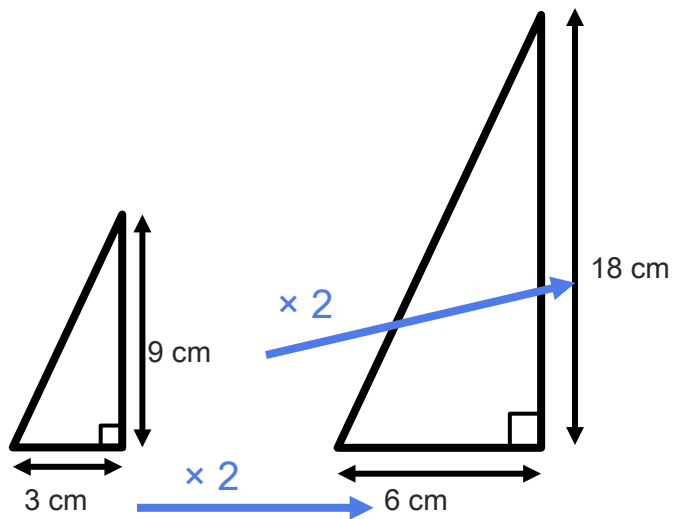
Aqoonsashada in qaababku yihiin kuwo isku mid ah



Helista qaababka isku midka ah ee jaantusyada adag

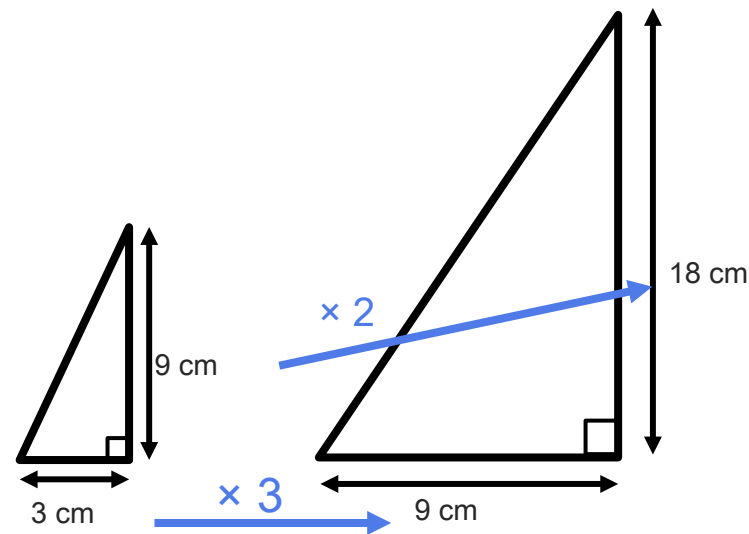
Marka qaabka uu yahay weyneynta (enlargement) qaab kale, waxay isku mid yihiin.

tusaale:



Saddexagallada waa isku mid (similar).

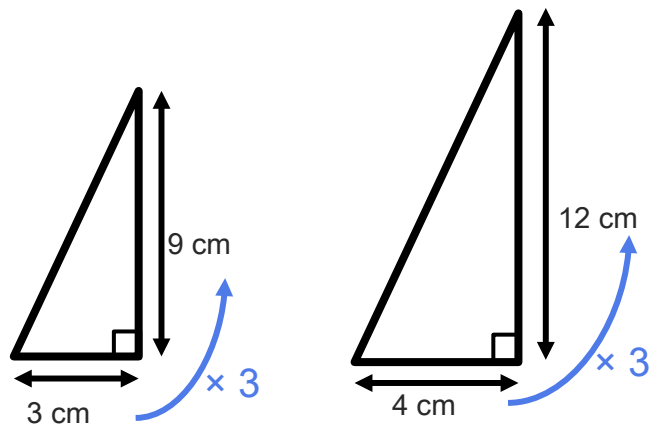
aan tusaale ahayn:



Saddexagallada ma aha isku mid (similar).

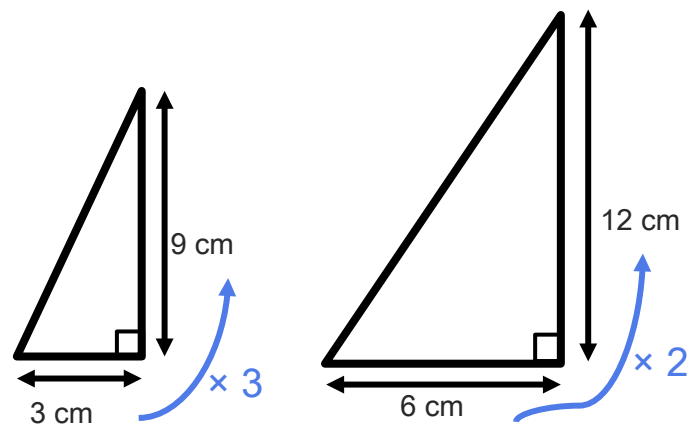
Marka laba qaab ay isku mid (similar) yihiin, dhererkoodu wuxuu ku jiraa isla saami (proportion).

tusaale (example):



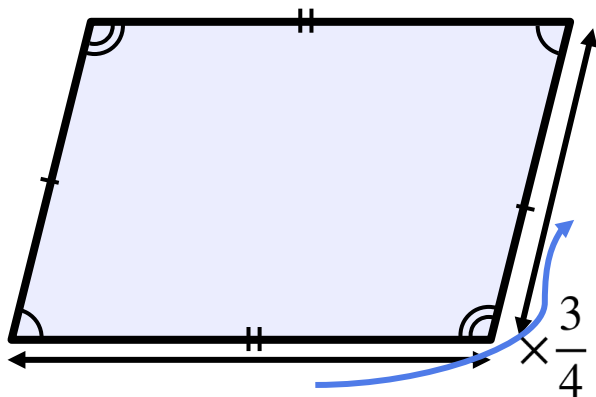
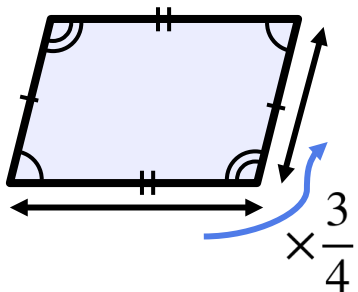
Saddexagallada waa isku mid (similar).

aan tusaale ahayn (non-example):



Saddexagallada ma aha isku mid (similar).

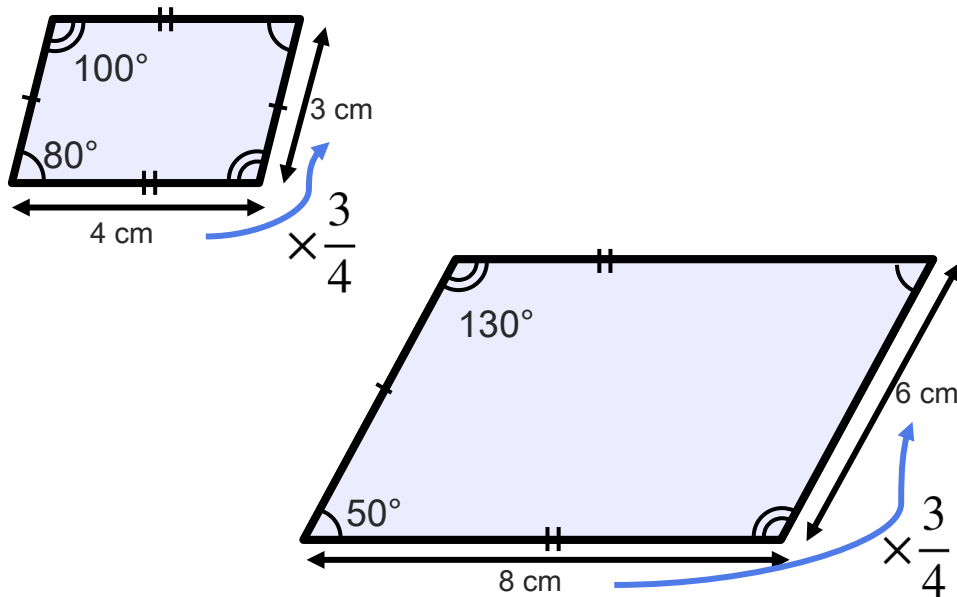
Marka laba qaab ay isku mid (similar) yihiin, xagluhu (angles) waa isku mid qaab kasta, dhererkooduna wuxuu ku jiraa isla saami (proportion).



isku saami (proportions) dhexdooda dhererka

Marka laba qaab ay isku mid (similar) yihiin, xagluhu waa isku mid qaab kasta, dhererkooduna waa isku saami (proportion).

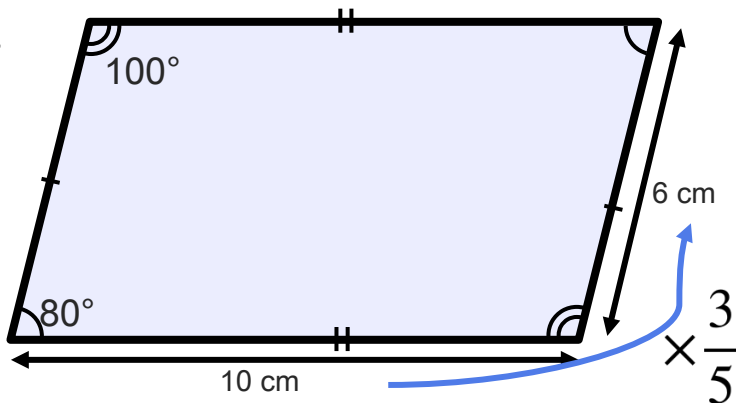
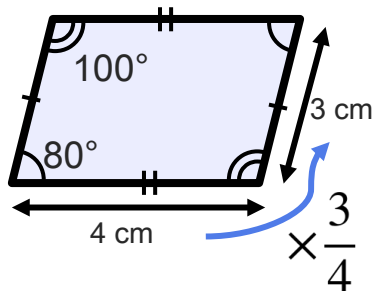
tusaale aan ahayn (non-example):



✓ isku saami (proportions) dhexdooda dhererka

Marka laba qaab ay isku mid (similar) yihiin, xagluhu waa isku mid qaab kasta, dhererkooduna waa isku saami (proportion).

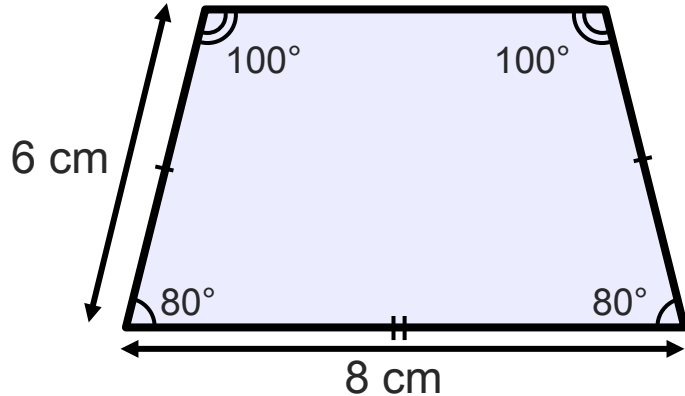
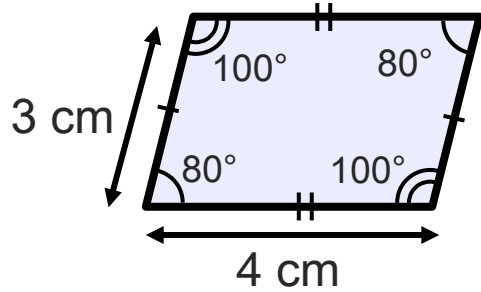
tusaale aan ahayn (non-example):



ma aha isku saami (proportion) u dhexeeya dhererrada

Garashada in qaababku yihiin kuwa isku mid (similar)

Suad waxay isku dayaysaa inay caddayso sababta labada qaab ee hoose aanay isku mid (similar) ahayn.



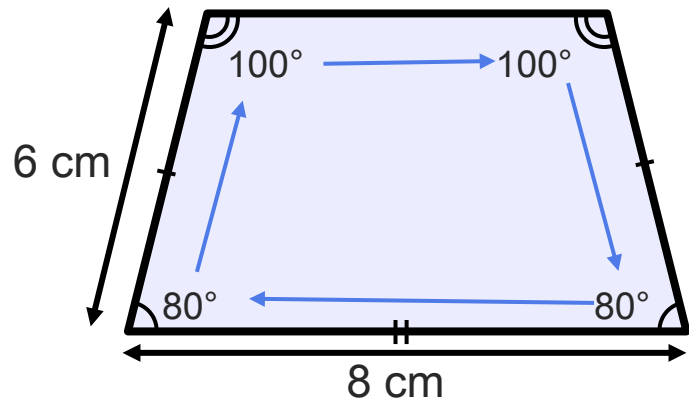
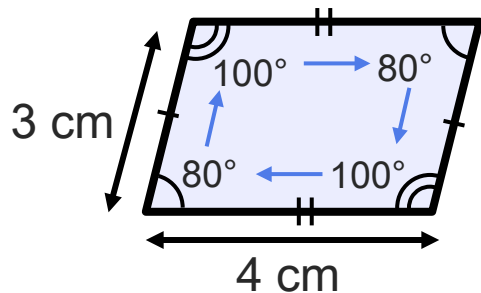
Waan arki karaa inay isku mid (similar) ahayn, laakiin waxay leeyihiin isku xaglo (angles). Sidoo kale dhererrada la muujiyey waxay ku jiraan isku saami (proportion).



Maxay qaababku u isku mid (similar) ma aha?

Garashada in qaababku yihiin kuwa isku mid (similar)

Suad waxay isku dayaysaa inay caddayso sababta labada qaab ee hoose aanay isku mid (similar) ahayn.



Inkasta oo labada qaab ay leeyihiin isku xaglo (angles), kuma jiraan isku nidaam (order).

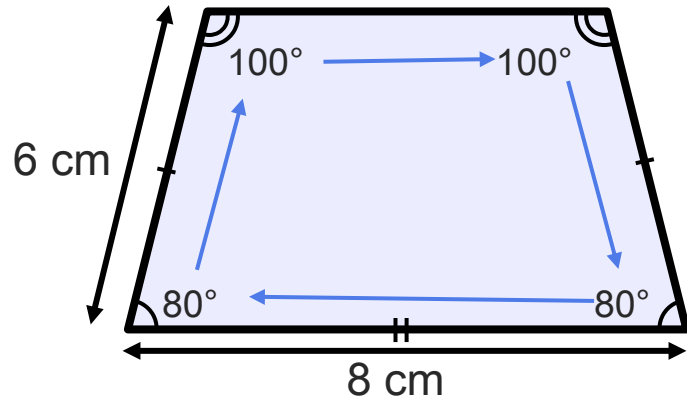
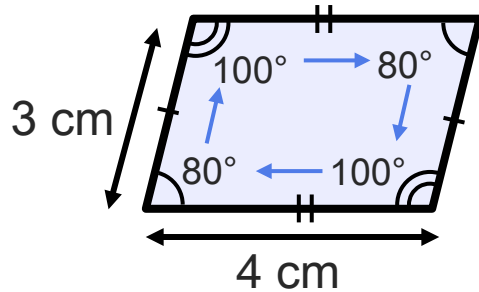
Qaab A: $100^\circ, 80^\circ, 100^\circ, 80^\circ$

Qaab B: $100^\circ, 100^\circ, 80^\circ, 80^\circ$



Garashada in qaababku yihiin kuwa isku mid (similar)

Suad waxay isku dayaysaa inay caddayso sababta labada qaab ee hoose aanay isku mid ahayn (similar).



Qaab B wuxuu leeyahay laba xagal oo isku xiga oo ah 100° , laakiin Qaab A ma leh.

Qaab A: $100^\circ, 80^\circ, 100^\circ, 80^\circ$

Qaab B: $100^\circ, 100^\circ, 80^\circ, 80^\circ$

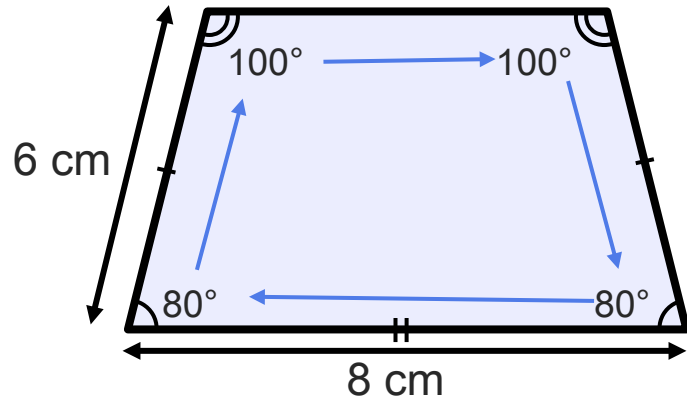
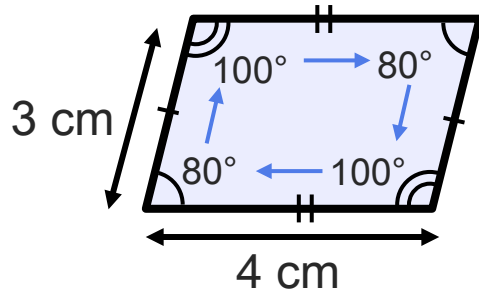


Aqoonsashada in qaababku yihiin kuwo isku mid ah (similar)



Sharaxaad

Suad waxay isku dayaysaa inay caddayso sababta labada qaab ee hoose aanay isku mid ahayn (similar).



Xataa haddii aan ku wareego si ka soo horjeeda (anti-clockwise) Qaab B, xagluhu weli waxay ahaan doonaan nidaam ka duwan Qaab A.

Qaab A: $100^\circ, 80^\circ, 100^\circ, 80^\circ$

Qaab B: $100^\circ, 100^\circ, 80^\circ, 80^\circ$

Marka qaababku yihiin kuwo isku mid ah (similar), xagluhu waa la ilaaliyaa oo waxay ku jiraan isku nidaam.



Aqoonsashada in qaababku yihiin kuwo isku mid ah (similar)

Run mise been?

Haddii laba qaab ay leeyihiin isku xaglo, markaas waa inay ahaadaan kuwo isku mid ah (similar).



Run



Been



Sabab u sheeg jawaabtaada

a

Haddii xagluhu isku mid yihiin, waxay ka dhigan tahay in dhererka (lengths) ay sidoo kale ku jiraan isku saami (proportion).

b

Haddii qaabku leeyahay afar ama in ka badan oo geesood (vertices) xagluhu waxaa laga yaabaa inaanay ku jirin isku nidaam.



Aqoonsashada in qaababku (shapes) isku mid yihiin (similar)



Run mise been?

Haddii laba qaab (shapes) aysan lahayn xaglo (angles) isku mid ah, markaas isku mid ma aha (similar).



Run



Been

Sabab u sheeg jawaabtaada

a

Ma suurto galna in dhammaan dhererka (lengths) ay isku saami (proportion) ahaadaan haddii xaglaha (angles) aan isku mid ahayn.



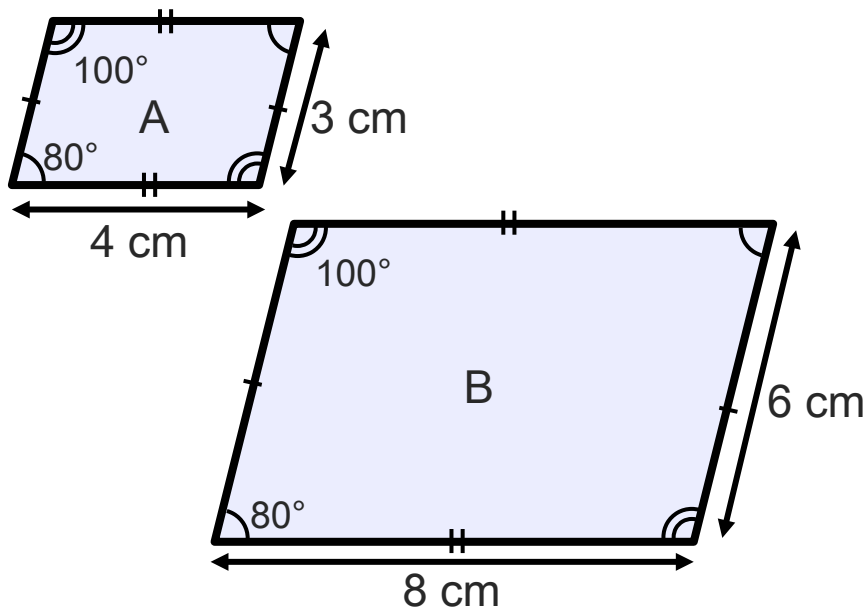
b

Qaar ka mid ah dhererka (lengths) wali waxay isku saami (proportion) ahaan karaan inkastoo xaglaha (angles) aan isku mid ahayn.

Aqoonsashada in qaababku (shapes) isku mid yihiin (similar)

Miiska saamiga (ratio table) wuxuu kaa caawin karaa helista saamiyada (proportions) ee dhererka (lengths) gudaha qaababka iyo helista qiyaasta (scale factors) ee u dhexeeya qaababka isku midka ah (similar shapes).

tusaale:



Qaabka A	4	$\times 2$	3	$\times 2$
	8		6	
Qaabka B				

$\times \frac{3}{4}$

$\times \frac{3}{4}$

Tani waxaa laga yaabaa inaysan had iyo jeer lagama maarmaan ahayn, laakiin waxay caawin kartaa kiisaska adag.

Aqoonsashada in qaababku (shapes) isku mid yihiin (similar)



Layla waxay sawirtaa saddex leydi (rectangles) oo isku mid ah (similar). Waxay cabbirtaa qaar ka mid ah dhererka (lengths) iyo ballaca (widths) waxayna ku buuxisaa miiska saamiga (ratio table).

Waa maxay dhererka (length) ee leydiga B?

24 cm

leydi (rectangle)	dherer (length) (cm)	ballac (width) (cm)
A	6	2
B	24	8
C	15	



Layla waxay sawirtaa saddex leydi (rectangles) oo isku mid ah (similar). Waxay cabbirtaa qaar ka mid ah dhererka (lengths) iyo ballaca (widths) waxayna ku buuxisaa miiska saamiga (ratio table).

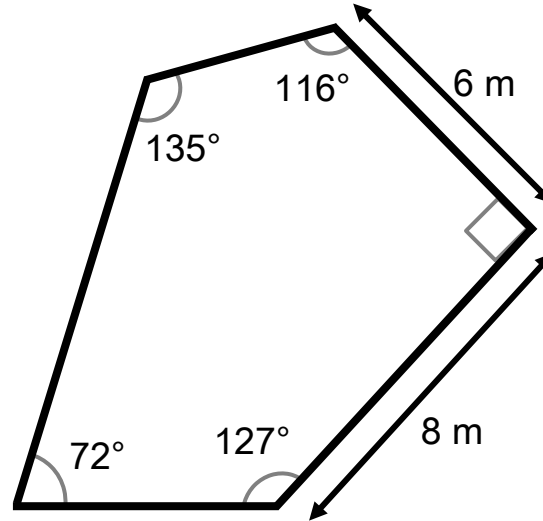
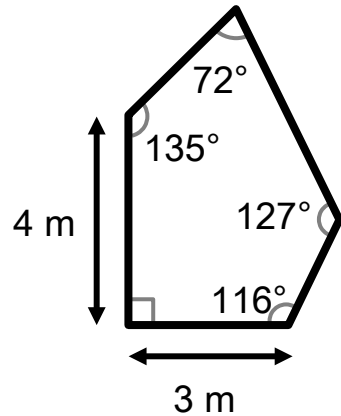
Waa maxay ballaca (width) leydiga C?

5 cm

leydi (rectangle)	dhererka (length) (cm)	ballaca (width) (cm)
A	6	2
B	24	8
C	15	5



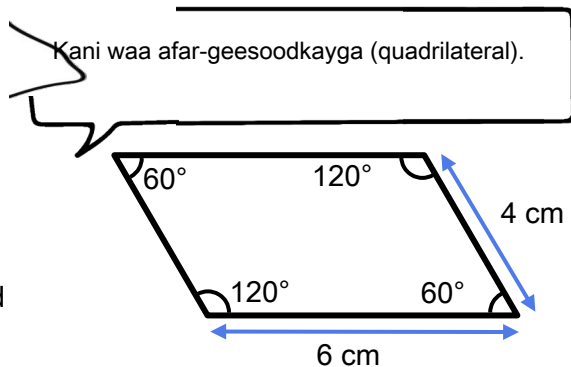
1) Ma labada qaab ee hoose waa isku mid (similar)? Ku caddey jawaabtaada sababaynta.



2) Axmed, Isra, Nuur iyo Saciid waxay sawireen qaar ka mid ah afar-geesoodyada (quadrilaterals).



Axmed



Isra

Afar-geesoodkaygu (quadrilateral) wuxuu la mid yahay Axmed oo dhammaan cidhifyadu (edges) waa laba jeer dhererka.



Nuur

Afar-geesoodkaygu (quadrilateral) kuma eka Axmed, inkastoo dhammaan cidhifyadu (edges) ay yihiin laba jeer dhererka.



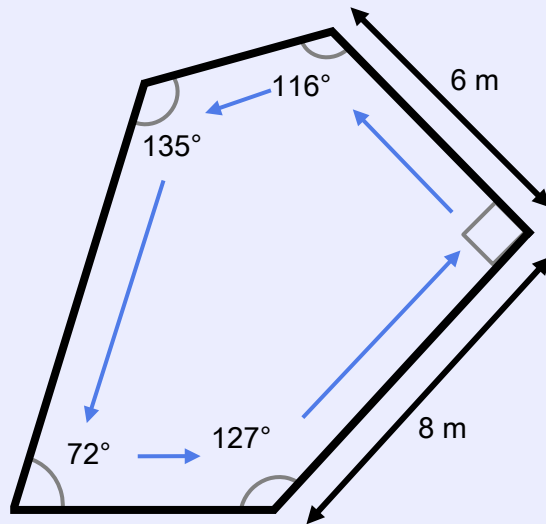
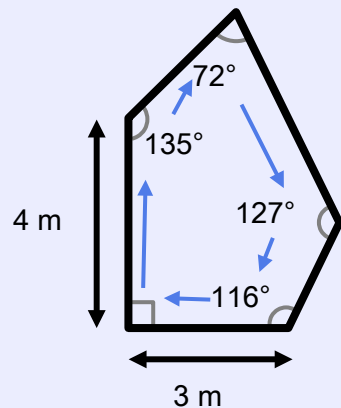
Saciid

Afar-geesoodkaygu (quadrilateral) kuma eka Axmed, inkastoo dhammaan xagluhu (angles) ay isku mid yihiin.

Sawir afar-geesood (quadrilateral) suurtagal ah oo loogu talagalay Isra, Nuur iyo Saciid.

Hawsha A Aqoonsashada in qaababku ay yihiin kuwo isku mid ah (similar)

1) Labada qaab ee hoose ma isku mid (similar) baa? Ku caddey jawaabtaada sabab (reasoning).



Xaglaha (angles) Qaab A: 72°, 127°, 116°, 90°, 135°

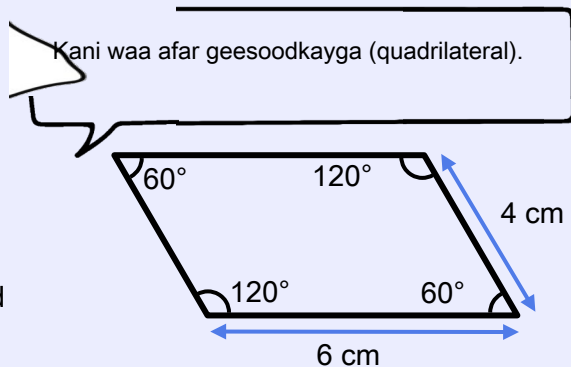
Xaglaha (angles) Qaab B: 72°, 127°, 90°, 116°, 135°

Xaglaha (angles) isku nidaam (order) ma aha, marka qaababku isku mid (similar) ma aha.

2) Axmed, Isra, Nuur iyo Saciid waxay sawireen afar geesoodyo (quadrilaterals) qaar.



Axmed



Isra

Afar geesoodkaygu (quadrilateral) wuxuu la mid (similar) yahay kan Axmed oo dhammaan cidhifyada (edges) waa laba jeer dhererka (length)



Nuur

Afar geesoodkaygu (quadrilateral) kuma la mid (similar) kan Axmed, in kasta oo dhammaan cidhifyada (edges) yihiin laba jeer dhererka (length).



Saciid

Afar geesoodkaygu (quadrilateral) kuma la mid (similar) kan Axmed, in kasta oo dhammaan xaglaha (angles) isku mid (same) yihiin.

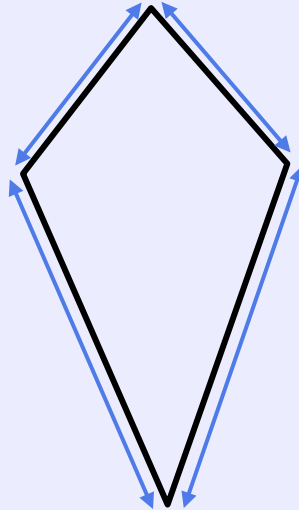
Sawir qaab afar geesood (quadrilateral) suurtagal ah oo Isra, Nuur iyo Saciid leeyihiin.

Hawsha A Aqoonsashada in qaababku isku mid (similar) yihiin

Afar-geesoodkaygu wuxuu la mid yahay Axmed, dhammaan geesihisuna waa laba jeer dhererkiisa.



Afar-geesoodkaygu kuma eka Axmed, in kastoo dhammaan geesihisu yihiin laba jeer dhererkiisa.



Afar-geesoodkaygu kuma eka Axmed, in kastoo dhammaan xaglaha isku mid yihiin.



Isku ekaanshaha qaababka (similarity)



Aqoonsashada in qaababku isku mid yihiin (similar)



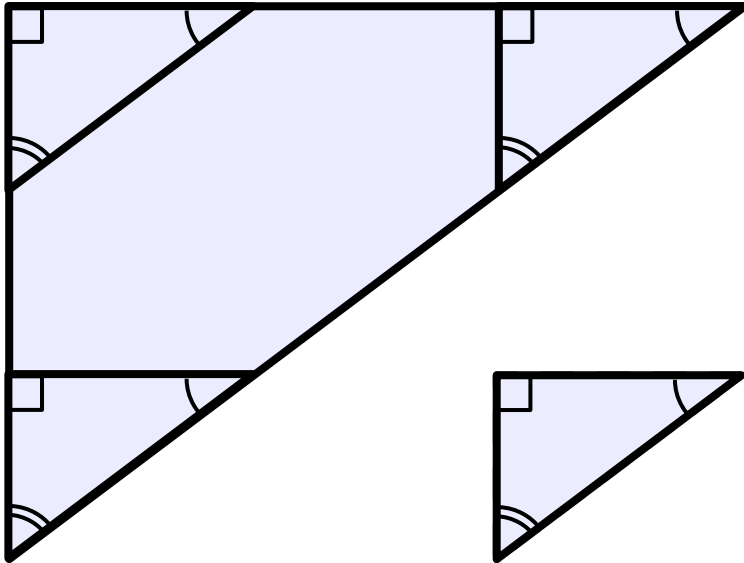
Helista qaabab isku mid ah (similar) oo ku jira jaantusyo adag

Helista qaabab isku mid ah (similar) oo ku jira jaantusyo adag



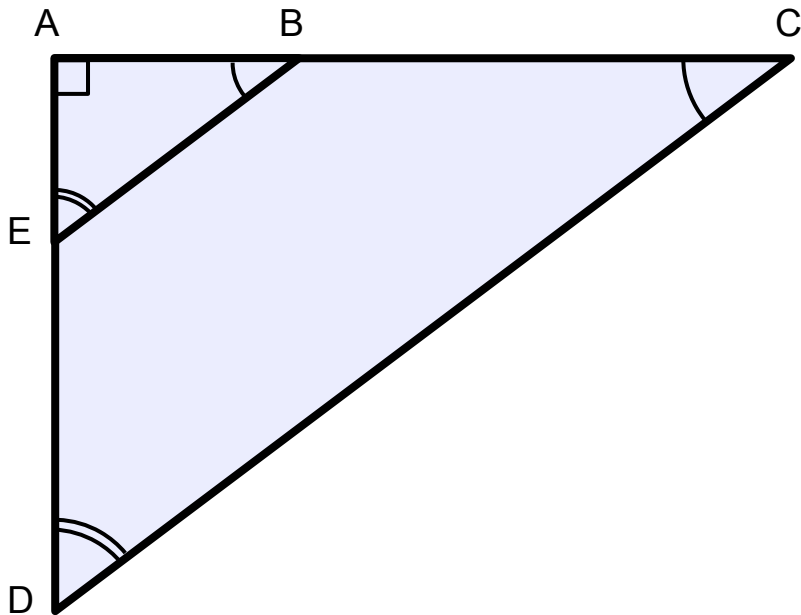
Sharaxaad

Qaababka isku midka ah (similar) waxay leeyihiin xaglo isku mid ah. Saddexagallo leh xaglo isku mid ah waa isku mid (similar).



$\triangle ABE$ iyo $\triangle ACD$ waa isku mid (similar) waxayna ku jiraan jiho isku mid ah.

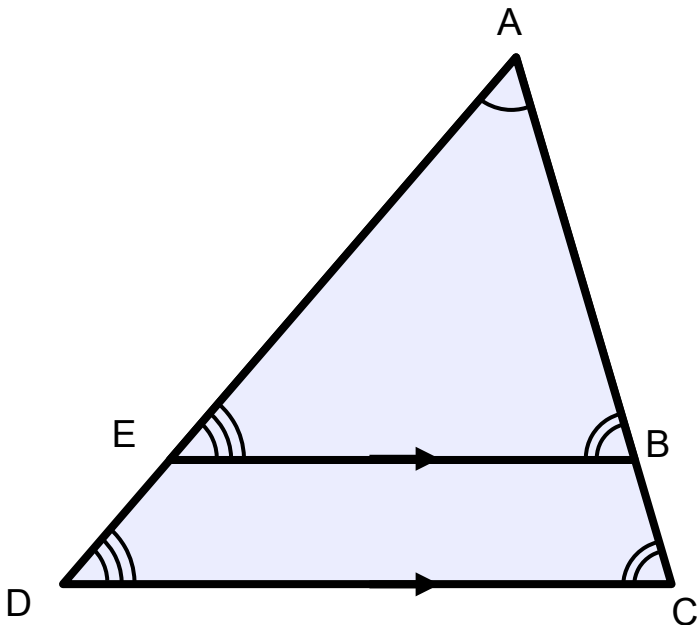
Sidee xaqiiqdan loo isticmaali karaa in la tuso in BE iyo CD ay yihiin kuwa barbarro (parallel)?



Xaglaha u dhigma (corresponding angles) waa isku mid markay ku yaalliin khadadka barbarro (parallel).

Sidaa darteed BE iyo CD waa barbarro (parallel).

Xaqiiqooyinka ku saabsan xaglaha khadadka barbarro (parallel) waxaa loo isticmaali karaa in la tuso in laba saddexagal ay yihiin kuwa isku mid ah (similar).



$\triangle ABE$ iyo $\triangle ACD$ labaduba waxay ka kooban yihiin $\angle EAB$.

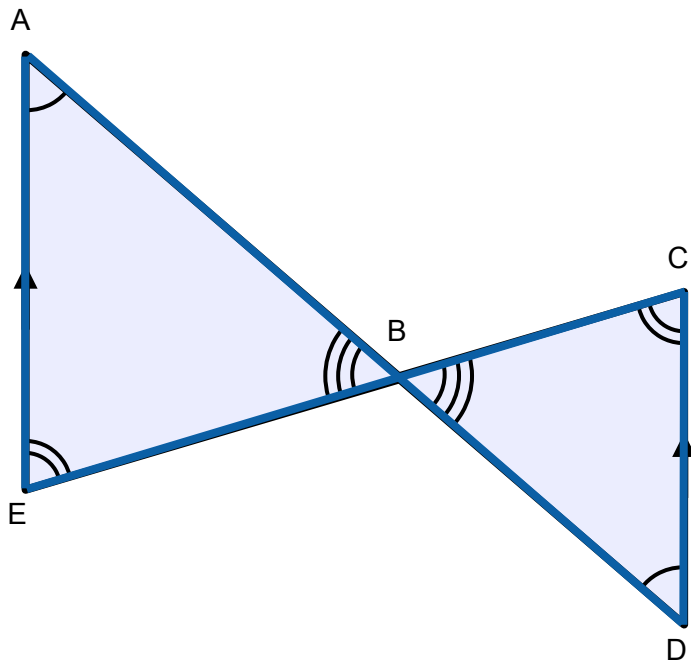
$\angle ABE = \angle BCD$ sababtoo ah xaglaha u dhigma (corresponding angles) ee khadadka barbar socda (parallel lines) waa siman yihiin.

$\angle CDE = \angle BEA$ sababtoo ah xaglaha u dhigma (corresponding angles) ee khadadka barbar socda (parallel lines) waa siman yihiin.

$\triangle ABE$ iyo $\triangle ACD$ waxay leeyihiin xaglo isku mid ah, marka waa isku qaab (similar).

Helista qaababka isku midka ah (similar shapes) ee jaantusyada adag (complex diagrams)

Caddee in $\triangle ABE$ iyo $\triangle BCD$ ay yihiin isku qaab (similar).



$\angle EAB = \angle CDB$ sababtoo ah xaglaha beddelka ah (alternate angles) ee khadadka barbar socda (parallel lines) waa siman yihiin.

$\angle BCD = \angle BEA$ sababtoo ah xaglaha beddelka ah (alternate angles) ee khadadka barbar socda (parallel lines) waa siman yihiin.

$\angle ABE = \angle DBC$ sababtoo ah xaglaha si toos ah uga soo horjeeda (vertically opposite angles) waa siman yihiin.

$\triangle ABE$ iyo $\triangle BCD$ waxay leeyihiin xaglo isku mid ah, marka waa isku qaab (similar).

Helista qaababka isku midka ah (similar shapes) ee jaantusyada adag (complex diagrams)

Xaggee (angle) ayaa la mid ah $\angle CAB$?

a

$\angle CDE$



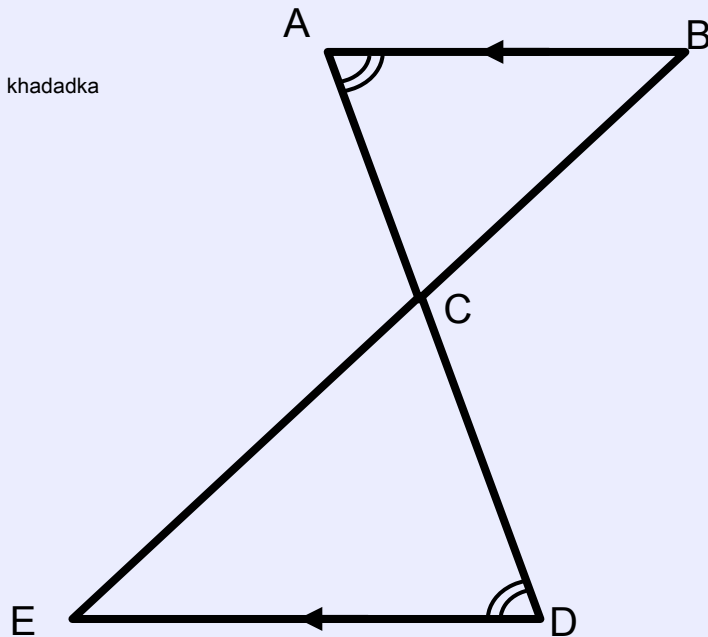
xaglaha beddelka ah (alternate angles) ee khadadka barbar socda (parallel lines)

b

$\angle DEC$

c

$\angle ECD$



Helista qaababka isku midka ah (similar shapes) ee jaantusyada adag (complex diagrams)

Xaggee (angle) ayaa la mid ah $\angle BCD$?

a

$\angle ABE$



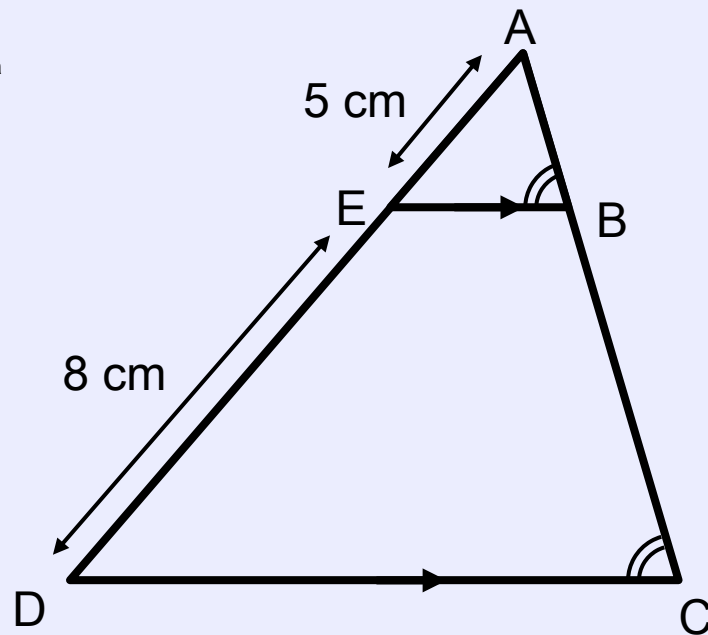
xaglaha u dhigma ee sadarrada barbar socda
(corresponding angles on parallel lines)

b

$\angle BEA$

c

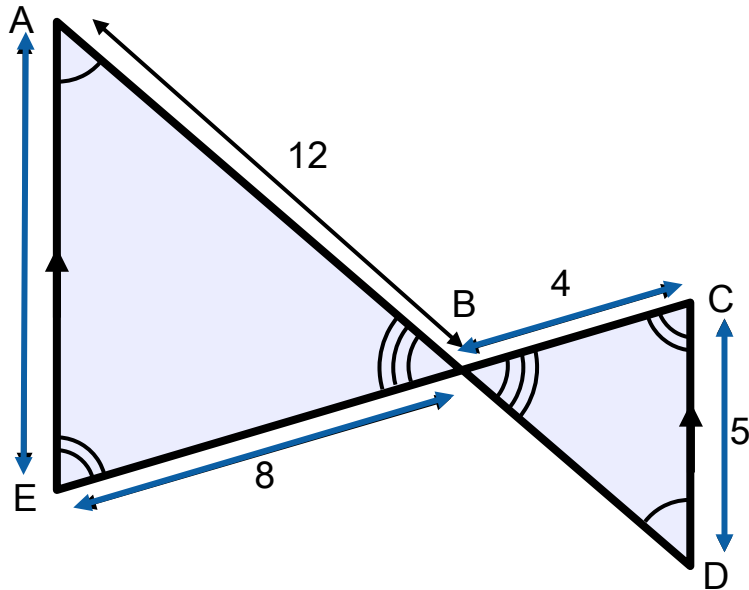
$\angle EAB$



Helista qaababka isku midka ah (similar shapes) ee jaantusyada adag

Ogaanshaha xaglaha isku midka ah wuxuu kaa caawin karaa inaad aqoonsato dhererka u dhigma ee saddexagallada isku midka ah (similar triangles).

Raadi dhererka AE. Dhererka oo dhan waxaa lagu siiyay cm.



AE waxay u dhaxaysaa xagal hal qaanso leh iyo xagal laba qaanso leh,

marka waa weyneyn (enlargement) CD.

EB waxay u dhaxaysaa xagal saddex qaanso leh iyo xagal laba qaanso leh,

marka waa weyneyn (enlargement) BC.

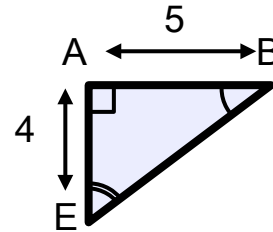
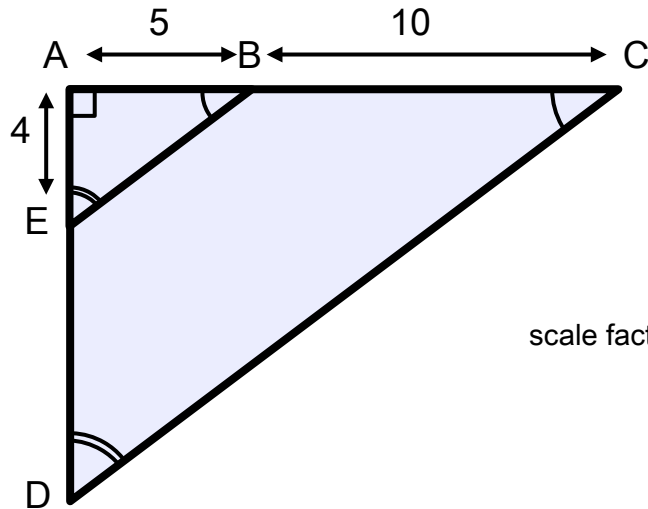
$$\text{scale factor} = 8 \div 4 = 2$$

$$AE = 5 \times 2 = 10 \text{ cm}$$

Helista qaababka isku midka ah (similar shapes) ee jaantusyada adag

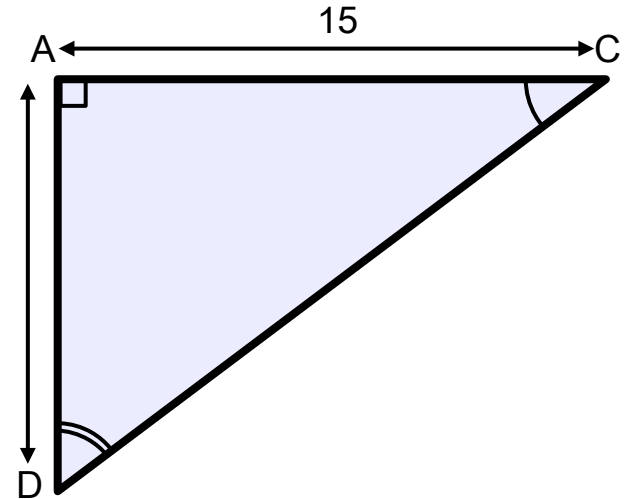
Markaad xallinayso masalooyinka ku lug leh saddexagallada isku midka ah ee is-dul-saaran (nested similar triangles), waxaa caawin kara inaad sawirto labada saddexagal si gooni ah.

Raadi dhererka AD. Dhererka oo dhan waxaa lagu siiyay cm.



$$\text{scale factor} = 15 \div 5 = 3$$

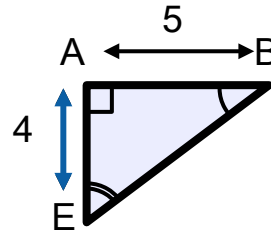
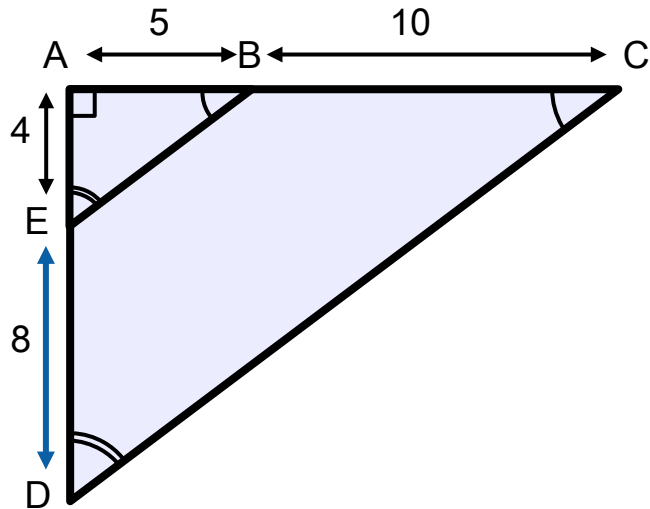
$$AD = 4 \times 3 = 12 \text{ cm}$$



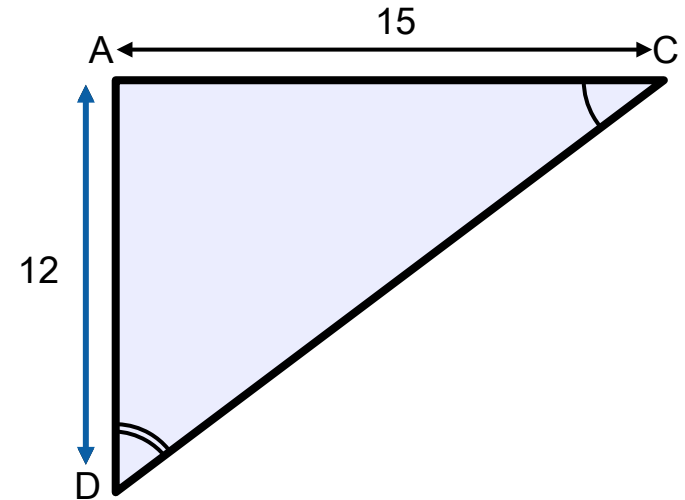
Helista qaababka isku midka ah (similar shapes) ee jaantusyada adag

Markaad xallinayso masalooyinka ku lug leh saddexagallada isku midka ah ee is-dul-saaran (nested similar triangles), waxaa caawin kara inaad sawirto labada saddexagal si gooni ah.

Raadi dhererka ED. Dhererka oo dhan waxaa lagu siiyay cm.



$$\begin{aligned}ED &= AD - AE \\&= 12 - 4 = 8 \text{ cm}\end{aligned}$$

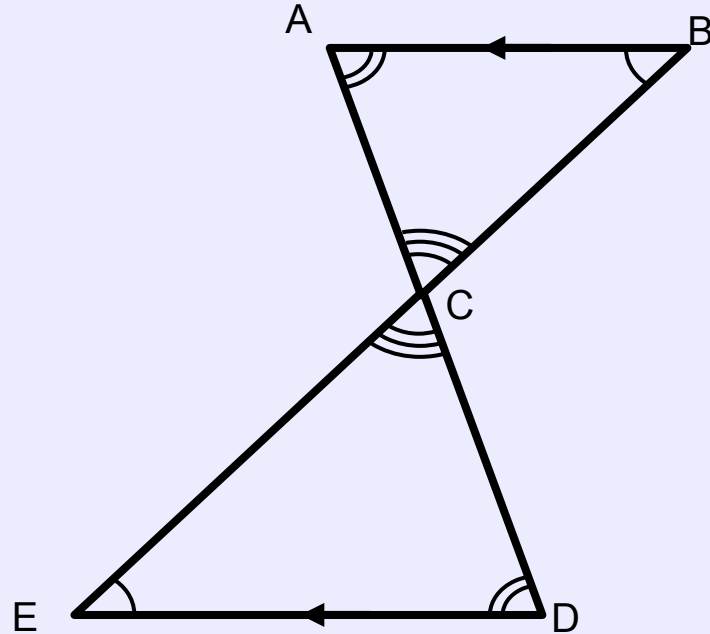


Cidhifkee ee $\triangle CDE$ ayaa ah weyneyn (enlargement) AC?

a CD ✓

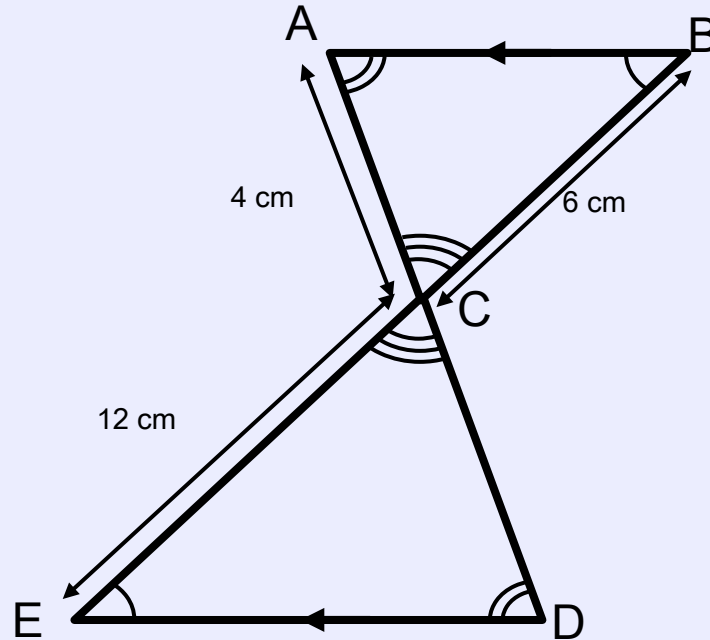
b DE

c EC

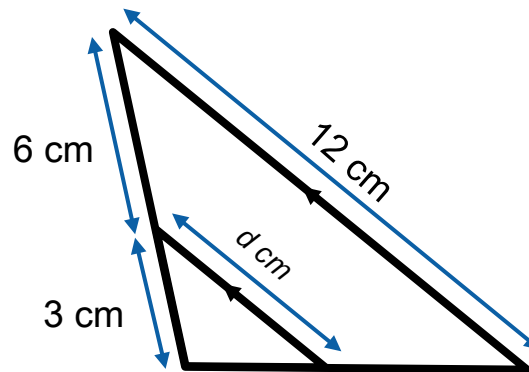
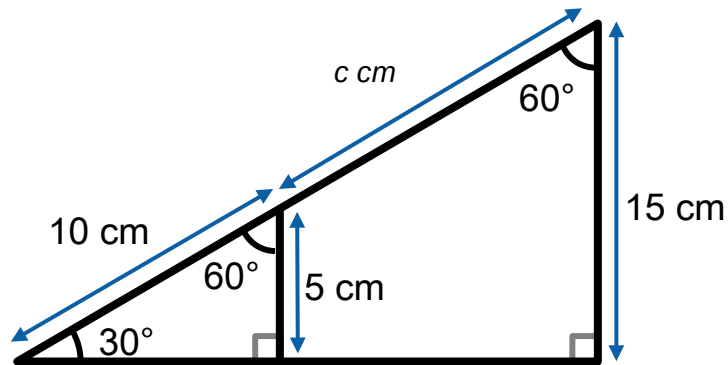
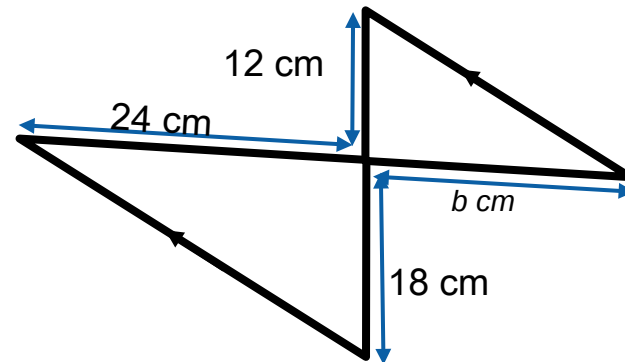
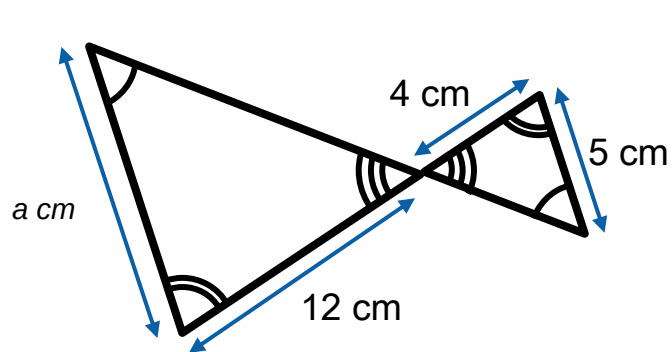


Soo hel dhererka CD (Find the length of CD).

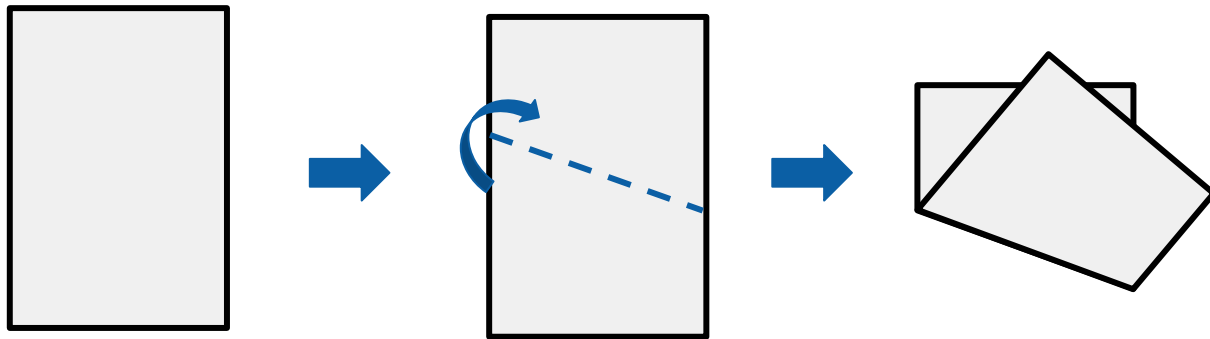
$$12 \div 6 = 2$$
$$4 \times 2 = 8 \text{ cm}$$



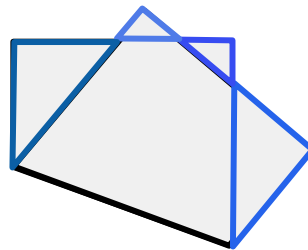
1) Soo hel qiimaha (value) mid kasta oo aan la garanayn.



2) Qaad warqad oo laab, sida hoos ku muujisan.

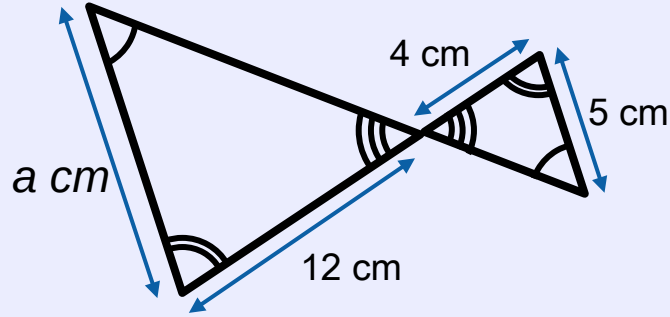


Warqadda aan isqabsan ayay samaysaa afar saddexagal.

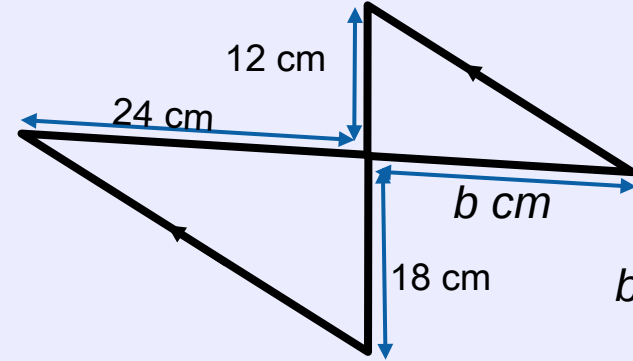


Caddee in afar saddexagalkani ay dhammaan yihiin kuwo isku mid ah.

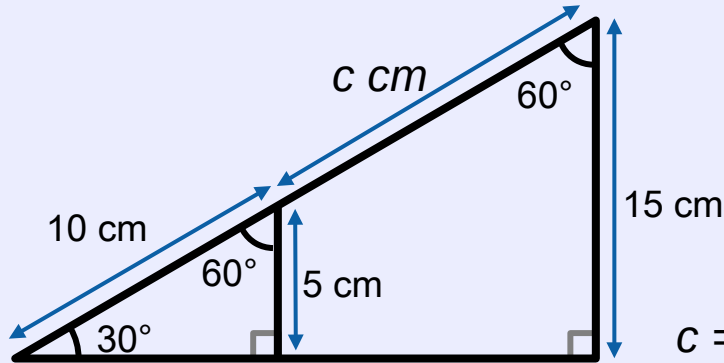
1) Raadi qiimaha (value) mid kasta oo aan la garanayn.



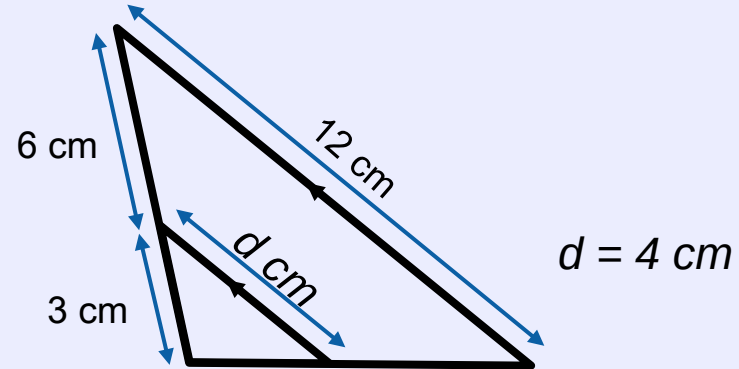
$$a = 15 \text{ cm}$$



$$b = 16 \text{ cm}$$

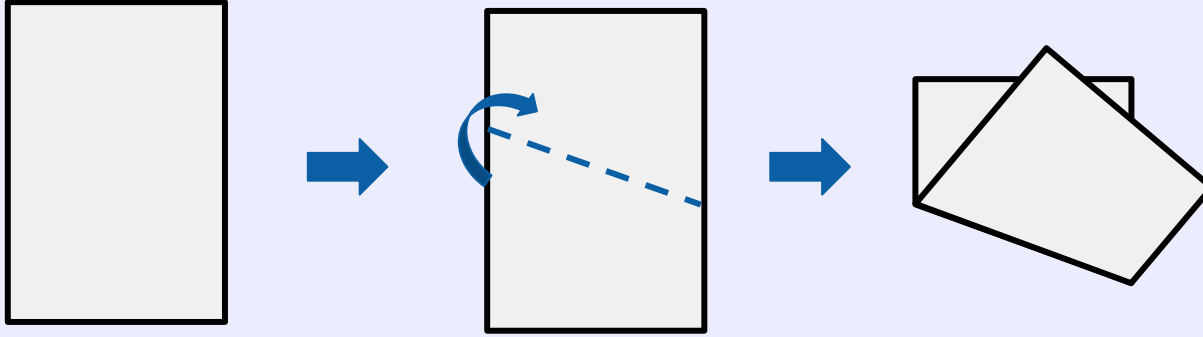


$$c = 20 \text{ cm}$$

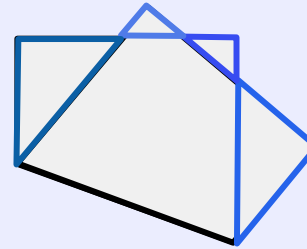


$$d = 4 \text{ cm}$$

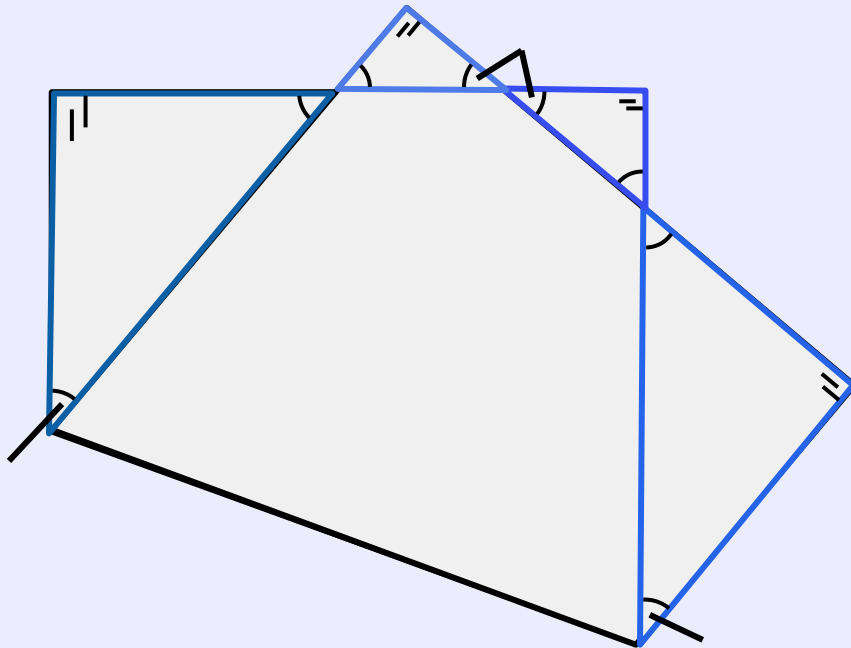
2) Qaad warqad oo laab sida hoos ku qoran.



Warqadda aan is dulsaarin waxay samaysaa afar saddex-xagal (triangles).



Caddee in afar saddex-xagalkan oo dhami isku mid yihiin (similar).



Saddex-xagal kasta wuxuu ka kooban yahay xagal quman (right angle) oo ka yimid afarta gees ee warqadda.

- Xaglaha saddex-xagalka wadartoodu waa 180° .
- Xaglaha iska soo horjeeda (vertically opposite angles) waa siman yihiin.

Xaglaha saddex-xagalka wadartoodu waa 180° .

Afarta saddex-xagal oo dhami waxay ka kooban yihiin isku xagal, marka dhammaantood waa isku mid (similar).

Soo koobid Isku midnimo (Similarity) ee qaababka

- Laba qaab oo keliya ayaa isku mid ah (similar) haddii xiriirka isku dhufashada (multiplicative relationship) ee u dhexeeya geesaha u dhigma (corresponding edges) uu la mid yahay lammaane kasta oo geesaha u dhigma ah.
- Xagluhu waa invariant (invariant) inta u dhaxaysa qaababka isku midka ah (similar shapes).
- Qaababka isku midka ah (similar shapes) mar walba ma fududa in la arko.
- Jadwalka saamiga (ratio table) wuxuu kaa caawin karaa inaad hesho tirada scalar (scalar) iyo functional multipliers (functional multipliers) ee qaababka isku midka ah (similar shapes).