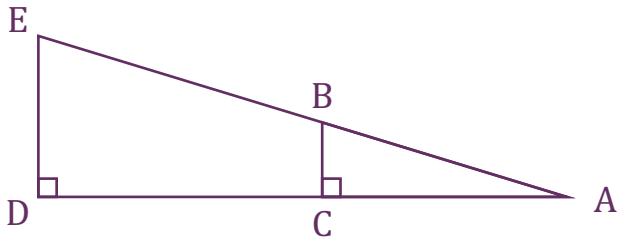
Pythagoras and Trigonometry with... Similar Shapes



AB	10 cm
BC	6 cm
AC	
Area of ABC	

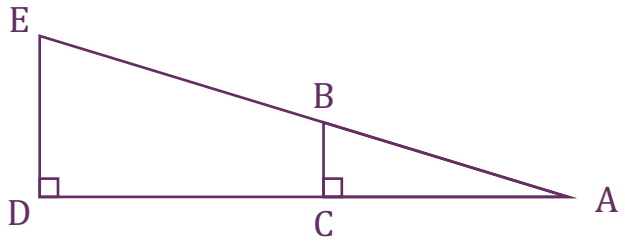
AE	25 cm
DE	
AD	
Area of ADE	

BE	
CD	
Area of BCDE	
Area of ABD	

BD	
CE	
Area of DCE	
Area of DBE	

Perimeter ABC	
Perimeter AED	
Perimeter BCDE	
Perimeter ABD	

Angle $B\hat{A}C$	
Angle $B\hat{E}D$	
Angle $C\hat{B}E$	
Angle $A\hat{B}D$	



AB	
BC	7 cm
AC	
Area of ABC	

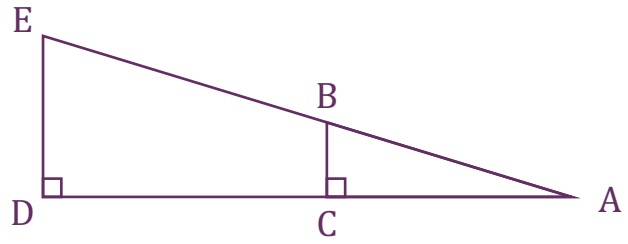
AE	
DE	
AD	
Area of ADE	

BE	
CD	24 cm
Area of BCDE	252 cm^2
Area of ABD	

BD	
CE	
Area of DCE	
Area of DBE	

Perimeter ABC	
Perimeter AED	
Perimeter BCDE	
Perimeter ABD	

Angle $B\hat{A}C$	
Angle $B\hat{E}D$	
Angle $C\hat{B}E$	
Angle $A\hat{B}D$	



AB	
BC	
AC	
Area of ABC	

AE	68 cm
DE	
AD	60 cm
Area of ADE	

BE	
CD	
Area of BCDE	
Area of ABD	

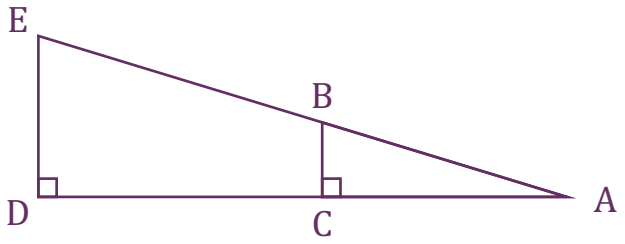
BD	
CE	
Area of DCE	
Area of DBE	

Perimeter ABC	40 cm
Perimeter AED	
Perimeter BCDE	
Perimeter ABD	

Angle $B\hat{A}C$	
Angle $B\hat{E}D$	
Angle $C\hat{B}E$	
Angle $A\hat{B}D$	

Pythag and Trig with... Similar Shapes

Solutions



AB	10 cm
BC	6 cm
AC	8 cm
Area of ABC	24 cm^2

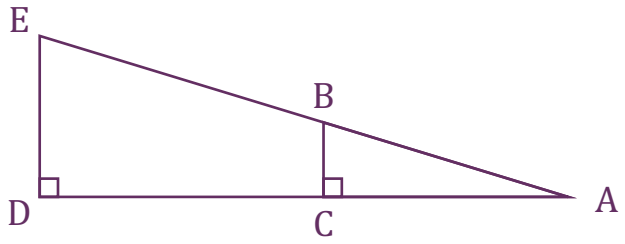
AE	25 cm
DE	15 cm
AD	20 cm
Area of ADE	150 cm^2

BE	15 cm
CD	12 cm
Area of BCDE	126 cm^2
Area of ABD	60 cm^2

BD	13.4 cm
CE	19.2 cm
Area of DCE	90 cm^2
Area of DBE	90 cm^2

Perimeter ABC	24 cm
Perimeter AED	60 cm
Perimeter BCDE	48 cm
Perimeter ABD	43.4 cm

Angle B$\hat{A}$C	36.9°
Angle B$\hat{E}$D	53.1°
Angle C$\hat{B}$E	126.9°
Angle A$\hat{B}$D	116.6°



AB	25 cm
BC	7 cm
AC	24 cm
Area of ABC	84 cm^2

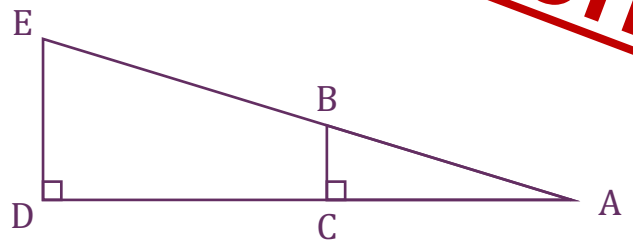
AE	50 cm
DE	14 cm
AD	48 cm
Area of ADE	336 cm^2

BE	25 cm
CD	24 cm
Area of BCDE	252 cm^2
Area of ABD	168 cm^2

BD	25 cm
CE	27.8 cm
Area of DCE	168 cm^2
Area of DBE	168 cm^2

Perimeter ABC	56 cm
Perimeter AED	112 cm
Perimeter BCDE	70 cm
Perimeter ABD	98 cm

Angle B$\hat{A}$C	16.3°
Angle B$\hat{E}$D	73.7°
Angle C$\hat{B}$E	106.3°
Angle A$\hat{B}$D	147.5°



AB	17 cm
BC	8 cm
AC	15 cm
Area of ABC	60 cm^2

AE	68 cm
DE	32 cm
AD	60 cm
Area of ADE	960 cm^2

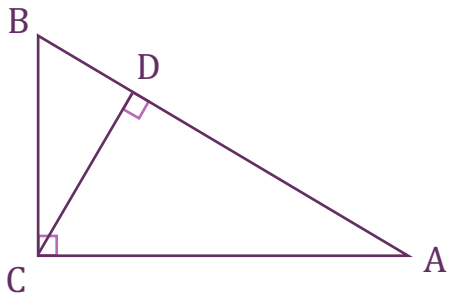
BE	51 cm
CD	45 cm
Area of BCDE	900 cm^2
Area of ABD	240 cm^2

BD	45.7 cm
CE	55.2 cm
Area of DCE	720 cm^2
Area of DBE	720 cm^2

Perimeter ABC	40 cm
Perimeter AED	160 cm
Perimeter BCDE	136 cm
Perimeter ABD	122.7 cm

Angle B$\hat{A}$C	28.1°
Angle B$\hat{E}$D	61.9°
Angle C$\hat{B}$E	118.1°
Angle A$\hat{B}$D	108.0°

Pythagorean Areas with... Similar Shapes



Show that triangles ABC, ACD and CBD are similar.

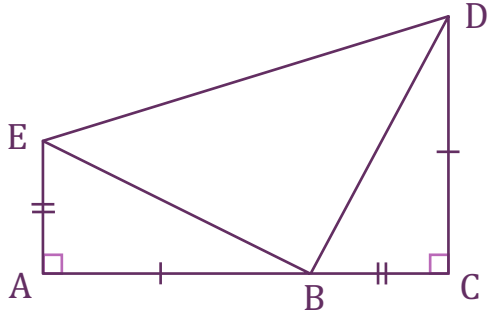
BC	15 cm
CA	20 cm
AB	25 cm

AD	
DB	
CD	

Area of ABC	
Area of ACD	
Area of CBD	

Ratio of hypotenuses of each triangle	

Ratio of areas of each triangle	



Show that angle $E\hat{B}D$ is a right angle.

EA	6 cm
AB	8 cm
BE	10 cm
Area of ABE	
Area of BCD	
Area of BDE	

Area of trapezium ACDE (two methods)	

BC	a cm
CA	b cm
AB	c cm

AD	
DB	
CD	

Area of ABC	
Area of CAD	
Area of BCD	

Ratio of hypotenuses of each triangle	

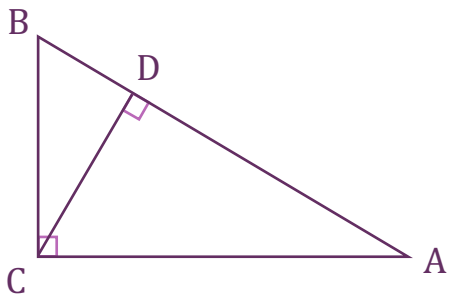
Ratio of areas of each triangle	

EA	a cm
AB	b cm
BE	c cm
Area of ABE	
Area of BCD	
Area of BDE	

Area of trapezium ACDE (two methods)	

Pythagorean Areas with... Similar Shapes

Solutions



Show that triangles ABC, ACD and CBD are similar.

Angles $C\hat{A}D$ and $A\hat{B}C$ sum to 90°.
So do angles $C\hat{A}D$ and $D\hat{C}A$.

Therefore, $\mathbf{A\hat{B}C = D\hat{C}A}$. Similarly, $\mathbf{C\hat{A}B = B\hat{C}D}$.

All three triangles have the same angles, and are therefore similar.

BC	15 cm
CA	20 cm
AB	25 cm

AD	16 cm
DB	9 cm
CD	12 cm

Area of ABC	150 cm^2
Area of ACD	96 cm^2
Area of CBD	54 cm^2

Ratio of hypotenuses of each triangle	15 : 20 : 25 3 : 4 : 5

Ratio of areas of each triangle	54 : 96 : 150 9 : 16 : 25

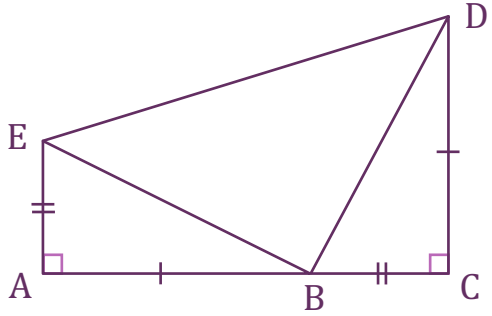
BC	a cm
CA	b cm
AB	c cm

AD	$\frac{b^2}{c}$
DB	$\frac{a^2}{c}$
CD	$\frac{ab}{c}$

Area of ABC	$\frac{ab}{2}$
Area of CAD	$\frac{ab}{2} \times \frac{b^2}{c^2}$
Area of BCD	$\frac{ab}{2} \times \frac{a^2}{c^2}$

Ratio of hypotenuses of each triangle	$a : b : c$

Ratio of areas of each triangle	$a^2 : b^2 : c^2$



Show that angle $E\hat{B}D$ is a right angle.

Triangles ABE and BCD are congruent.
Angles $A\hat{E}B$ and $A\hat{B}E$ sum to 90°.
Angle $D\hat{B}C$ is equal to $A\hat{E}B$.

Therefore, $E\hat{B}D = 180° - (A\hat{B}E + D\hat{B}C)$
$= 180° - 90°$
$= 90°$, a right angle.

EA	6 cm
AB	8 cm
BE	10 cm
Area of ABE	24 cm^2
Area of BCD	24 cm^2
Area of BDE	50 cm^2

Area of trapezium ACDE (two methods)

$\frac{1}{2}(EA + DC) \times AC$

$= \frac{1}{2}(6 + 8) \times 14$

$= 98$ cm^2

$\overbrace{ABE}^{\text{Area}} + BCD + BDE$

$= 24 + 24 + 50$

$= 98$ cm^2

EA	a cm
AB	b cm
BE	c cm
Area of ABE	$\frac{ab}{2}$
Area of BCD	$\frac{ab}{2}$
Area of BDE	$\frac{c^2}{2}$

Area of trapezium ACDE (two methods)

$\frac{1}{2}(EA + DC) \times AC$

$= \frac{1}{2}(a + b)(a + b)$

$= \frac{1}{2}(a^2 + b^2 + 2ab)$

$\overbrace{ABE}^{\text{Area}} + BCD + BDE$

$= \frac{ab}{2} + \frac{ab}{2} + \frac{c^2}{2}$

$= \frac{1}{2}(c^2 + 2ab)$