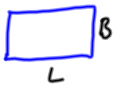
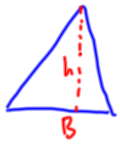
chapter 6 Length – Area – Volume

Section 6.1 Revision

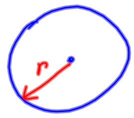
Area



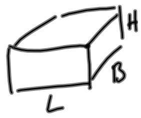
$A = LB$



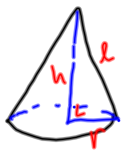
$\Delta = \frac{Bh}{2}$



$A = \pi r^2$

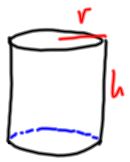


$V = LBH$



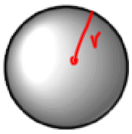
$V = \frac{\pi r^2 h}{3}$

$CSA = \pi r l$



$V = \pi r^2 h$

$CSA = 2\pi r h$



$V = \frac{4\pi r^3}{3}$

$SA = 4\pi r^2$

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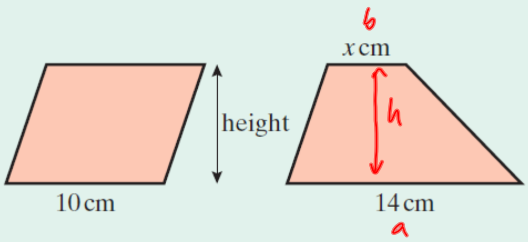
1. Trapezium

Example 1

If a parallelogram has a base of 10 cm, and a trapezium of the same area and height has a base of 14 cm, find x, the length of the other parallel side of the trapezium.



Trapesium

$\text{Area} = \left(\frac{a+b}{2}\right)h$

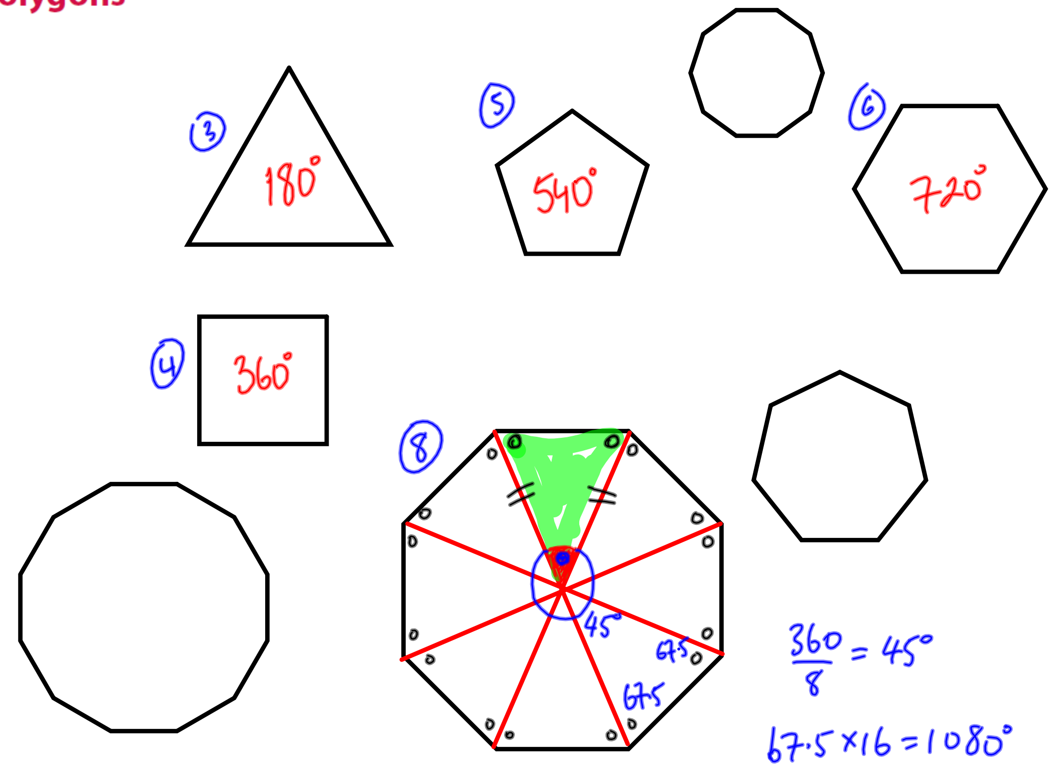
Area Parallelogram = Area Trapesium

$10\cancel{h} = \frac{(x+14)}{2}\cancel{h}$

$20 = x + 14$

$x = 6$ cm

2. Polygons

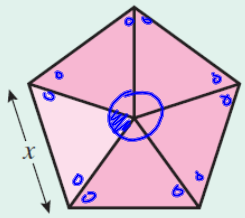


$\frac{360}{8} = 45°$

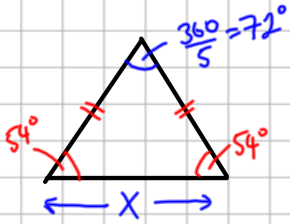
$67.5 \times 16 = 1080°$

Example 2

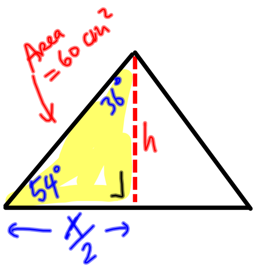
The area of the regular pentagon shown here is 600 cm^2.
Calculate the length of one side, x, of the pentagon.



Consider each triangle



Area $= \frac{600}{5} = 120\text{cm}^2$



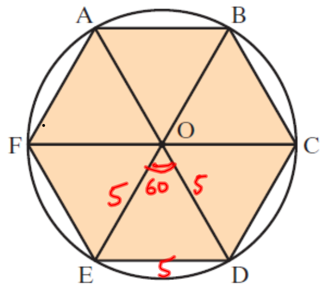
$\tan 54 = h / (x/2) \quad \Rightarrow h = \frac{x \tan 54°}{2}$

$\Delta = \frac{Bh}{2} = \frac{\left(\frac{x}{2}\right)\left(\frac{x \tan 54}{2}\right)}{2} = 60$

$\Rightarrow x^2 \tan 54 = 480 \Rightarrow x = \sqrt{\frac{480}{\tan 54}} = 18.67$

13. A regular hexagon is circumscribed by a circle of radius 5 cm. Find

(i) the size of the angle EOD
(ii) the size of the angle ODE
(iii) the area of the hexagon ABCDEFA.



720° in hexagon

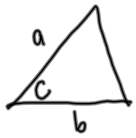
(i) $|\angle EOD| = \frac{360}{6} = 60°$

(ii) $(\angle OED) = \frac{720}{12} = 60°$

(iii)
$\Delta = \frac{1}{2}(5)(5)\sin 60° = 10.825$

hexagon = 6 triangles

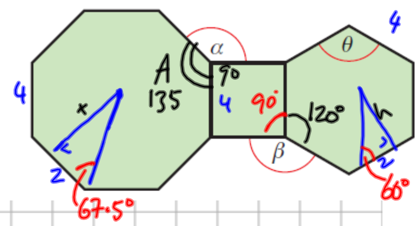
$\Rightarrow$ area hexagon $= 10.825(6)$
$= 64.951 \text{ cm}^2$



$\Delta = \frac{1}{2}ab\sin C$

14. A composite design of polygons is shown.

(i) Find the sizes of the angles α, β, θ
(ii) If the square has a side of 4 cm, find the area of this composite shape correct to one place of decimals.



360° in square
720° in hexagon
1080° in octogon

$\theta = \frac{720}{6} = 120°$

$\beta = 360 - 90 - 120 = 150°$

$A = \frac{1080}{8} = 135°$

$\alpha = 360° - 135 - 90 = 135°$

octogon?

$\Delta = \frac{Bh}{2}$

16 Δs in octogon

TOA

$\tan 67.5° = x/2 \Rightarrow x = 2\tan 67.5 = 4.828$

$\Delta = 2(4.828)/2 = 4.828$

$\Rightarrow$ Octogon Area $= 16(4.828) = \boxed{77.248}$

Square?

$A = l^2 = 4^2 = \boxed{16}$

hexagon?

$\Delta = \frac{Bh}{2}$

12 Δs in hexagon

$\tan 60° = h/2 \Rightarrow h = 2\tan 60° = 2\sqrt{3}$

$\Delta = 2(2\sqrt{3})/2 = 2\sqrt{3}$

$\Rightarrow$ Hexagon Area $= 12(2\sqrt{3}) = \boxed{24\sqrt{3}}$

Total Area $= 77.248 + 16 + 24\sqrt{3} \approx 134.8$ (1 dp)