

$A(0,0)$ $B(1,4)$ $C(4,1)$ Centre $(-1,3)$

$$K = \frac{3}{2}$$

$$(-1,3) \xrightarrow{+2, +1} (1,4) \xrightarrow{+1, +\frac{1}{2}} (2, 4\frac{1}{2})$$

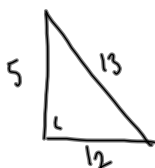
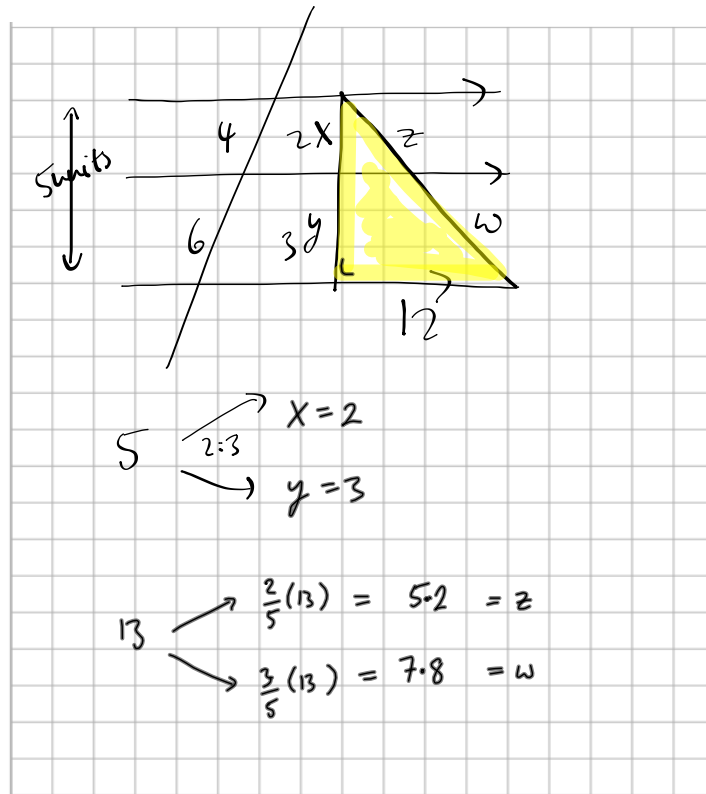
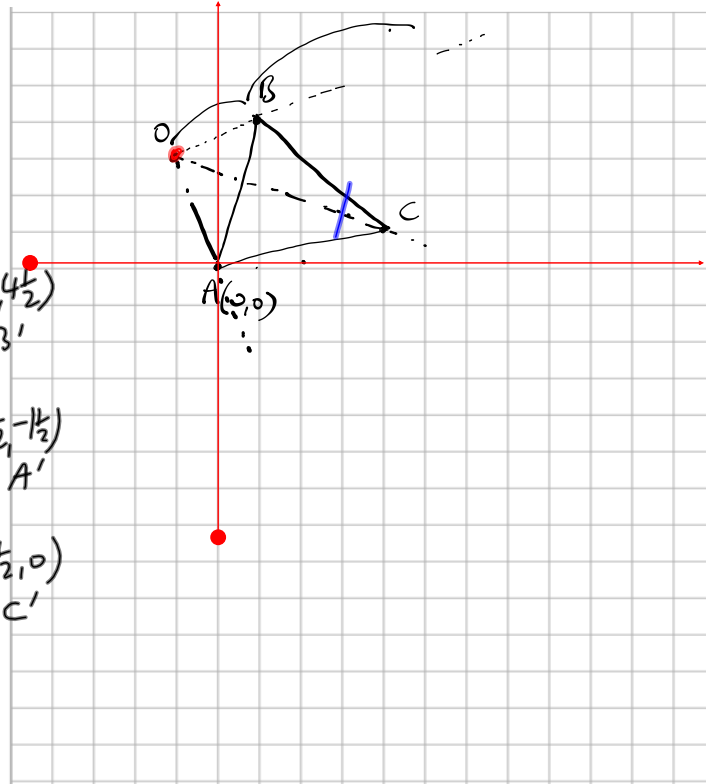
B B'

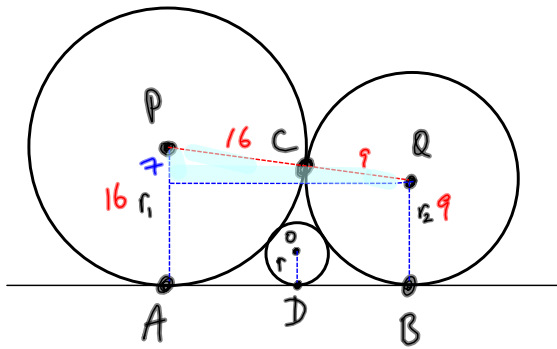
$$(-1,3) \xrightarrow{+1, -3} (0,0) \xrightarrow{+\frac{1}{2}, -\frac{3}{2}} (\frac{1}{2}, -\frac{1}{2})$$

A A'

$$(-1,3) \xrightarrow{+5, -2} (4,1) \xrightarrow{+\frac{1}{2}, -1} (4\frac{1}{2}, 0)$$

C C'





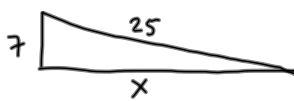
a(i)

$$r_1 = 16 \text{ cm}$$

$$r_2 = 9 \text{ cm}$$

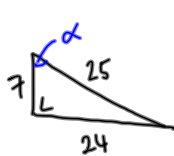
$$a(ii) |PQ| = 25 \text{ cm}$$

b (i) horizontal distance between PA and QB

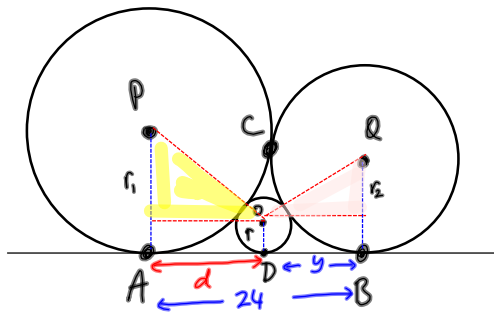


$$x = \sqrt{25^2 - 7^2} = 24 \text{ cm}$$

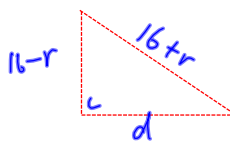
(ii) $|\angle APQ|$ in radians to 3 d.p. Hence area of sector APC



SOH $\sin \alpha = \frac{24}{25} \Rightarrow \alpha = \sin^{-1}\left(\frac{24}{25}\right) \approx 1.287$



c(i) horizontal distance between PA and OD (in terms of r)



$$d = \sqrt{(16+r)^2 - (16-r)^2}$$

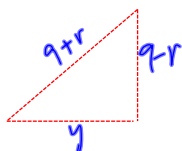
$$= \sqrt{256 + 32r + r^2 - [256 - 32r + r^2]}$$

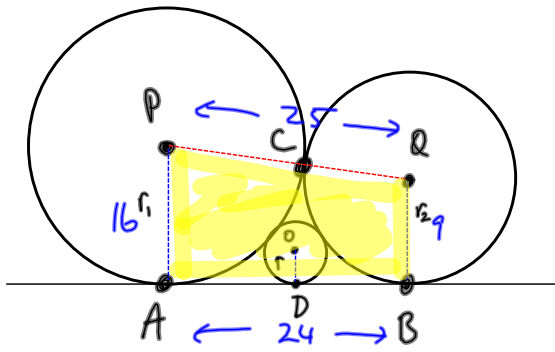
$$= \sqrt{\cancel{256} + 32r + \cancel{r^2} - \cancel{256} + 32r - \cancel{r^2}} = \sqrt{64r} = 8\sqrt{r}$$

(ii) horizontal distance between QB and OD (in terms of r)

$$y = 24 - 8\sqrt{r}$$

$$y = \sqrt{(9+r)^2 - (9-r)^2} = \sqrt{36r} = 6\sqrt{r}$$

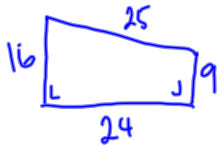




(d) Find the value of r . Write your answer in form $\frac{p}{q}$, $p, q \in \mathbb{N}$

$$\left. \begin{array}{l} y = 6\sqrt{r} \\ y = 24 - 8\sqrt{r} \end{array} \right\} \Rightarrow \begin{array}{l} 6\sqrt{r} = 24 - 8\sqrt{r} \\ 14\sqrt{r} = 24 \\ \sqrt{r} = \frac{24}{14} = \frac{12}{7} \Rightarrow r = \frac{144}{49} \end{array}$$

(e) Area of trapezium ABQP.



$$\Delta = 24 \left(\frac{16+9}{2} \right) = 300 \text{ units}^2$$