

$$1. (0, 84) = (x_1, y_1)$$

$$(168, 336) = (x_2, y_2)$$

Division point

$$\left(x_1 + \frac{a}{b}(x_2 - x_1), y_1 + \frac{a}{b}(y_2 - y_1) \right)$$

$$\left(0 + \frac{3}{4}(168 - 0), 84 + \frac{3}{4}(336 - 84) \right)$$

$$\left(0 + \frac{3}{4}(168), 84 + \frac{3}{4}(252) \right)$$

$$\left(0 + 126, 84 + 189 \right)$$

$$(126, 273)$$

Paul stopped at point $(126, 273)$

$$2. \text{ Midpoint : } \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$
$$\left(\frac{-12 + 72}{2}, \frac{36 + 84}{2} \right)$$
$$\left(\frac{60}{2}, \frac{120}{2} \right)$$
$$(30, 60)$$

The centre of the circle is $(30, 60)$

$$3. y = ax + b$$

$$a = -\frac{3}{8}$$

$$b = -3$$

$$\therefore y = -\frac{3}{8}x - 3$$

OR

$$0 = -\frac{3}{8}x - y - 3 \quad (x - 8)$$

$$0 = 3x + 8y + 24$$

4. Ratio = 2:1 $\therefore \frac{a}{b} = \frac{2}{3}$

Division point $\left(0 + \frac{2}{3}(36-0), 3 + \frac{2}{3}(18-3) \right)$
 $\left(0 + \frac{2}{3}(36), 3 + \frac{2}{3}(15) \right)$
 $(0 + 24, 3 + 10)$
 $(24, 13)$

The cyclists stopped at point (24, 13)

5. Ben : $\frac{3}{4}$ Steve: $\frac{1}{2}$ Valerie: 2:1 $\Rightarrow \frac{2}{3}$

1st station: Steve
 2nd station: Valerie
 3rd station: Ben

6. $\frac{d}{t} = \text{speed}$ distance = (speed) \times (time) time = $\frac{\text{distance}}{\text{speed}}$

ratio: 2:1 Lucy travels $\frac{2}{3}$ of the way, Veronica, $\frac{1}{3}$

$$\begin{aligned} d(P, Q) &= \sqrt{(14-2)^2 + (4-13)^2} \\ &= \sqrt{12^2 + (-9)^2} \\ &= \sqrt{144 + 81} \\ &= \sqrt{225} \\ &= 15 \end{aligned}$$

The distance is 15 km

Lucy: $\frac{2}{3} \times 15 = 10 \text{ km}$

Veronica: 5 km

$$\begin{aligned} \text{time} &= \frac{d}{s} = \frac{10 \text{ km}}{20 \text{ km/h}} \\ &= 0.5 \text{ hours} \\ &\quad (30 \text{ minutes}) \end{aligned}$$

$$\begin{aligned} \text{time} &= \frac{d}{s} = \frac{5 \text{ km}}{15 \text{ km/h}} \\ &= 0.3 \text{ h} \\ &\quad (20 \text{ minutes}) \end{aligned}$$

Veronica will have to wait 10 minutes.

7. Point B : $\left(50 + \frac{2}{5}(300 - 50), 300 + \frac{2}{5}(400 - 300) \right)$
 $\left(50 + \frac{2}{5}(250), 300 + \frac{2}{5}(100) \right)$
 $(50 + 100, 300 + 40)$
B (150, 340)

$$\begin{aligned} d(A, B) &= \sqrt{(150 - 50)^2 + (340 - 300)^2} \\ &= \sqrt{100^2 + 40^2} \\ &= \sqrt{11600} \\ &= 107.7 \text{ km} \end{aligned}$$

$$\begin{aligned} d(B, D) &= 340 - 100 \quad (y_2 - y_1) \\ &= 240 \text{ km} \end{aligned}$$

Total distance = 107.7 km + 240 km
= 347.7 km

8. \overline{AB} : $a = \frac{16 - 4}{8 - 2} = \frac{12}{6} = 2$

Line l : $a = -\frac{1}{2}$ C(4, 8)

$$y = ax + b$$

$$8 = -\frac{1}{2}(4) + b$$

$$8 = -2 + b$$

$$10 = b$$

$\therefore y = -\frac{1}{2}x + 10$

or

$$0 = -\frac{1}{2}x - y + 10$$

$$0 = x + 2y - 20$$