$$\Rightarrow 3t\left(\frac{5}{4}\right) = \frac{4t}{\sin B}$$

$$\Rightarrow \frac{15t}{4} = \frac{4t}{\sin B}$$

$$\Rightarrow \sin B = \frac{16}{15}$$

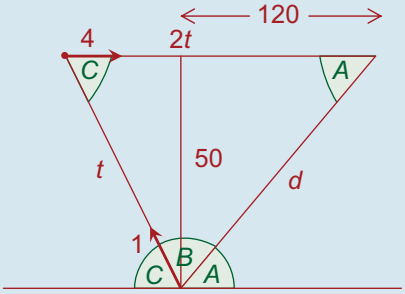
Note: This question can be solved by replacing 75 with 105.

Q. 2. (i) Let t = the time taken to cross the river.

The boat will head upstream at 1 m/s, and would travel a distance of t.

Meanwhile, the river carries the boat downstream a distance $2t$.

The boat lands 120 m downstream.



$$\tan A = \frac{50}{120}$$

$$= \frac{5}{12}$$

$$\Rightarrow A = 22.62°$$

$$d^2 = 120^2 + 50^2$$

$$\Rightarrow d = 130 \text{ m}$$

Using the Sine Rule:

$$\frac{t}{\sin A} = \frac{2t}{\sin B} \quad \ldots \text{ but } \sin A = \frac{5}{13}$$

$$\Rightarrow \frac{13}{5} = \frac{2}{\sin B}$$

$$\Rightarrow \sin B = \frac{10}{13}$$

$$\Rightarrow B = 50.28° \quad \textbf{OR} \quad B = 129.72°$$

Case 1: $B = 50.28°$

$$C = 180° - 50.28° - 22.62°$$

$$\Rightarrow C = 107.1°$$

$\Rightarrow$ 72.9° to the downstream direction

Case 2: $B = 129.72°$

$$C = 180° - 129.72° - 22.62°$$

$$\Rightarrow C = 27.66°$$

$\Rightarrow$ 27.66° to the upstream direction.

Using the Sine rule:

$$\frac{t}{\sin A} = \frac{d}{\sin C}$$

$$\Rightarrow \frac{13t}{5} = \frac{130}{\sin 107.1°}$$

$$\Rightarrow t = \frac{50}{\sin 107.1°} = 52 \text{ s}$$

$$\Rightarrow \frac{13t}{5} = \frac{130}{\sin 27.66°}$$

$$\Rightarrow t = \frac{50}{\sin 27.66°} = 108 \text{ s}$$

Q. 3. (i) $\vec{v_R} = q\vec{i}$

$\vec{v_{GR}} = p\vec{j}$ … tries to go straight across.

$$\vec{v_G} = \vec{v_{GR}} + \vec{v_R}$$

$$= q\vec{i} + p\vec{j}$$

$$\text{Time across} = \frac{\text{distance across}}{\text{speed across}}$$

$$= \frac{60}{p}$$

$$\Rightarrow \frac{60}{p} = 100 \quad \Rightarrow \quad p = 0.6$$

distance downstream = speed downstream $\times$ time $= q \times 100$

$$= 100q$$

$$\Rightarrow 100q = 45 \quad \Rightarrow \quad q = 0.45$$

(ii) Let t = the time taken to cross the river.

The girl will head upstream at 0.6 m/s, and would travel a distance $0.6t$

Meanwhile the river carries her downstream a distance $0.45t$.

She lands 45 m upstream.