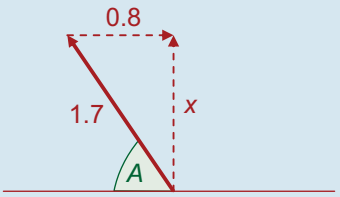
(ii) Heads upstream at an angle A to the bank at full speed, 2.5 m/s.



$x^2 + 0.8^2 = 1.7^2$

$\Rightarrow x = 1.5$

$\Rightarrow$ Boat travels at 1.5 m/s straight across.

$$\text{Time across} = \frac{\text{distance across}}{\text{speed across}}$$
$$= \frac{510}{1.5}$$
$$= 340 \text{ s}$$

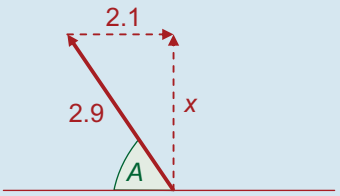
Q. 7. (i) Puts all effort into going across:

$\Rightarrow \overrightarrow{v_B} = 2.1\vec{i} + 2.9\vec{j}$

$$\text{Time across} = \frac{\text{distance across}}{\text{speed across}}$$
$$= \frac{58}{2.9}$$
$$= 20 \text{ s}$$

Distance downstream:
speed downstream $\times$ time
$$= 2.1 \times 20$$
$$= 42 \text{ m}$$

(ii) Heads upstream at an angle A to the bank at full speed, 2.9 m/s.



$x^2 + 2.1^2 = 2.9^2$

$\Rightarrow x = 2$

$\Rightarrow$ Boat travels at 2 m/s straight across.

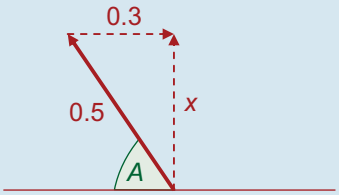
$$\text{Time across} = \frac{\text{distance across}}{\text{speed across}}$$
$$= \frac{58}{2}$$
$$= 29 \text{ s}$$

Q. 8. Quickest route: Puts all effort into going across:

$\Rightarrow \overrightarrow{v_B} = 0.3\vec{i} + 0.5\vec{j}$

$$\text{Time across} = \frac{\text{distance across}}{\text{speed across}}$$
$$= \frac{50}{0.5}$$
$$= 100 \text{ s}$$

Shortest route: Heads upstream at an angle A to the bank at full speed, 0.5 m/s.



$x^2 + 0.3^2 = 0.5^2$

$\Rightarrow x = 0.4$

$\Rightarrow$ Boat travels at 0.4 m/s straight across.

$$\text{Time across} = \frac{\text{distance across}}{\text{speed across}}$$
$$= \frac{50}{0.4}$$
$$= 125 \text{ s}$$

$\Rightarrow$ Crossing times differ by 25 seconds.

Q. 9. (i) He should head straight across.

(ii) $\overrightarrow{v_B} = \frac{5}{6}\vec{i} + \frac{5}{9}\vec{j}$

$$\text{Time across} = \frac{\text{distance across}}{\text{speed across}}$$
$$= \frac{50}{\frac{5}{9}}$$
$$= 50\left(\frac{9}{5}\right)$$
$$= 90 \text{ s}$$

(iii) Distance downstream:
speed downstream $\times$ time
$$= \frac{5}{6} \times 90$$
$$= 75 \text{ m}$$