1. (C) 20km/hr downstream | upstream | $y = 4$ km/hr

time = 2hrs | 3hrs | $x = ?$

$x+y$ | $x-y$

$$\frac{\text{distance travelled in}}{\text{downstream}} = \frac{\text{distance travelled in}}{\text{upstream}}$$

$$(x+y)\,2 = (x-y)\,3$$

$$2x+2y = 3x-3y$$

$$5y = x$$

$$x = 5y$$

$$x = 5(4) = 20 \text{ km/hr}$$

2. (E) $4\frac{2}{3}$ km/hr

$x = 9\frac{1}{3}$ km/hr $y = ?$

$\quad = \frac{28}{3}$ km/hr   Let distance travelled be d

Time taken in upstream $= 3\left(\text{Time taken in downstream}\right)$

$$\frac{d}{xt} \quad \frac{d}{x-y} = 3\left(\frac{d}{x+y}\right)$$

$$\frac{1}{x-y} = \frac{3}{x+y}$$

$$x+y = 3x-3y$$

$$4y = 2x$$

$$x = 2y$$

$$y = \frac{x}{2} = \frac{1}{2} \times \frac{28}{3} = \frac{14}{3} = 4\frac{2}{3} \text{ km/hr}$$

3. (d)

total time = 3 hrs

$x = 4$ km/hr

distance b/w A & B = ? = d

upstream	downstream
$x-y$	$x+y$
d	d

$$\frac{d}{x-y} + \frac{d}{x+y} = 3$$

Data is insufficient.

4. (b) 3 hours

upstream	Downstream
16 km	8 km
2 hrs	20 minutes
$x-y$	$x+y$

time taken = ?

distance travelled = 48 km

$$x - y = \frac{16}{2} \qquad\qquad x + y = \frac{8}{20} \times 60$$

$$x - y = 8 \to \text{①} \qquad\qquad x + y = 24 \to \text{②}$$

solving ① & ② -

$$x = 16 \, km/hr$$

$$Speed = \frac{distance \ travelled}{time \ taken}$$

$$16 = \frac{48}{time} \qquad\qquad time = \frac{48}{16} = 3 hrs$$

$$time = \frac{48}{16} = 3 hrs$$

5. (c) 6:1

upstream	Downstream
9 hrs 48 minutes	7 hrs
↳= 9.8 hours	
$x - y$	$x + y$

$$\frac{x}{y} = \, ?$$

$$\frac{distance \ travelled}{in \ upstream} = \frac{distance \ travelled}{in \ downstream}$$

$$(x - y) \, 9.8 = (x + y) \, 7$$

$$(x - y) \, \frac{\cancel{49}^{7}}{5} = (x + y) \, \cancel{7}$$

$$7x - 7y = 5x + 5y$$

$$2x = 12y$$

$$x = 6y$$

$$\frac{x}{y} = \frac{6}{1}$$

6.(d) 24 hrs $x = 9\,km/hr$ $y = 1.5\,km/hr$

total time =   upstream time + downstream time

$$= \frac{105}{x-y} + \frac{105}{x+y}$$

$$= \frac{105}{7.5} + \frac{105}{10.5}$$

$$= 14 + 10$$

$$= 24\ hours$$

7. (c) 8 km/hr

Downstream	Upstream	
11 km/hr	5 km/hr	total time = 1 hr
$x+y$	$x-y$	$x=?$

$$\left.\begin{array}{l} x+y=11 \\ x-y=5 \end{array}\right\} \text{solving} \qquad x=8 \text{ km/hr}$$

8. (c) 6.5 km/hr $x = 5$ km/hr

upstream speed = 3.5 km/hr

downstream speed = ?

upstream speed = $x \pm y = 3.5$

$5 \mp y = 3.5$

$5 - y = 3.5$ ∴

$y = 5 - 3.5$

$y = 1.5$ km/hr

downstream speed = $x+y = 5+1.5 = 6.5$ km/hr

9. (c) 14 km/hr

$x = 42$ km/hr $y = ?$

Time taken to
row in upstream $= 2 \left(\begin{array}{l} \text{Time taken to row} \\ \text{in downstream} \end{array} \right)$

Let distance travelled be d

$$\frac{d}{x-y} = 2 \left(\frac{d}{x+y} \right)$$

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

$$2(x-y) = x+y$$

$$2x - 2y = x+y$$

$$x = 3y$$

$$y = \frac{x}{3} = \frac{42}{3} = 14 \text{ km/hr}$$

10. (d) 12.5 km/hr

downstream	upstream	
80 km	20 km →	total time = 4 hrs
45 km	40 km →	total time = 7 hrs
		x = ?

$$\frac{80}{x+y} + \frac{20}{x-y} = 4$$

$$\frac{45}{x+y} + \frac{40}{x-y} = 7$$

Let $x+y = a \quad x-y = b$

$$\frac{80}{a} + \frac{20}{b} = 4$$

$$\frac{45}{a} + \frac{40}{b} = 7$$

$$80b + 20a = 4ab$$

$$45b + 40a = 7ab$$

$$ab = \left(\frac{30}{4}b + \frac{20a}{4}\right)$$

$$45b + 40a = \left(\frac{15}{2}b + 5a\right)7$$

$$\frac{75}{2}b + 35a = 0$$

$$45b + 40a = \frac{105}{2}b + 35a$$

$$5a = \frac{15}{2}b$$

$$\boxed{a = \frac{3}{2}b}$$

$$30b + 20a = 4ab$$

$$30b + 20\left(\frac{3}{2}b\right) = 4 \times \frac{3}{2}b \times b$$

$$30b + 30b = 6b^2$$

$$60b = 6b^2$$

$$6b^2 - 60b = 0$$

$$6b(b - 10) = 0$$
$$b = 0 \mid b = 10$$
$$a = 0 \mid a = \frac{30}{2}$$

$$x - y = 10$$
$$x + y = \frac{30}{2}$$
$$2x = 25$$
$$x = 12.5 \, km/hr$$