Boat and Stream

Q.No	Answer
1	Correct Option: D To solve this question, we can apply a short trick approach **x = $\frac{1}{2}$(boat's rate with current + his rate against current)** Given, x is the boat's rate in still water By the short trick approach, we get x = $\frac{1}{2}(32 + 28) = \frac{60}{2}$ = 30 km/hr Hence, option D is correct.
2	Correct Option: D To solve this question, we can apply a short trick approach; **Speed of current** **= $\frac{1}{2}$(Rate of downstream – Rate of upstream)** By the short trick approach, we get = $\frac{1}{2}(16 – 11) = \frac{5}{2}$ = 2.5 kmph. Hence, option D is correct.
3	Correct Option: C Given, Speed downstream = 8 km/h Speed upstream = 6 km/h ∴ Speed of boat in still water = $\frac{\text{Speed downstream + Speed Upstream}}{2}$ = $\frac{8 + 6}{2} = \frac{14}{2}$ = 7 km/hr ∴ Reqd time = $\frac{\text{Distance}}{\text{Speed of boat}} = \frac{28}{7}$ = 4 hrs Hence, option C is correct.
4	**Answer:** Option **C** **Explanation:** Rate downstream = $\left(\frac{1}{10} \text{ x } 60\right)$km/hr = 6 km/hr. Rate upstream = 2 km/hr. Speed in still water = $\frac{1}{2}(6 + 2)$ km/hr = 4 km/hr. ∴ Required time = $\left(\frac{5}{4}\right)$hrs = 1 $\frac{1}{}$ hrs = 1 hr 15 min.
5	Correct Option: C Rate upstream = ($\frac{7}{42}$ × 60) kmph = 10 kmph. Speed of stream = 3 kmph Let speed in still water be x km/hr. Then, speed upstream = (x – 3) km/hr. ∴ x – 3 = 10 OR x = 13 km/hr.
6	Correct Option: C

	Given, Upstream rate = 3.5 kmph, Speed of a man in still water = 5 kmph Let the downstream rate be x kmph, then By the short trick approach, we get Speed of the man (boat) in still water $= \frac{1}{2}$ [**DOWNSTREAM** rate **+ UPSTREAM** rate] $\Rightarrow 5 = \frac{1}{2}(x + 3.5)$ or $x = 6.5$ kmph Hence, option C is correct.
7	Correct Option: D Speed of the man in still water = 12 km/hr Speed of the stream = 3 km/hr Speed downstream = (12 + 3) = 15 km/hr Speed upstream = (12 – 3) = 9 km/hr Let the distance travelled be 'd' km Then Average Speed $= \frac{\text{total distance}}{\text{total time}}$ $= \frac{d + d}{\frac{d}{15} + \frac{d}{9}}$ $= \frac{2d}{\frac{9d + 15d}{15 \times 9}}$ $= \frac{2d \times (15 \times 9)}{24d} = \frac{45}{4}km/hr= 11\frac{1}{4}$km/hr Hence, option (D) is correct.
8	Correct Option: D Ratio of speed of boat in downstream and speed of stream is 9 : 1 Given Speed of current = 3 km/ h Speed of boat in downstream = 9 × 3 = 27 km/h Speed of boat in still water = Speed of boat in downstream – Speed of current = 27 – 3 = 24 km/h Speed of boat in upstream = 24 – 3 = 21 km/h

	Distance travelled by boat in upstream in 5 hours = 21 × 5 = 105 km Hence, option D is correct.
9	Correct Option: B Let the speed of boat in still water = 16x, speed of stream = 5x Upstream speed = 16x – 5x = 11x $S = \frac{D}{t}$ $11x = \frac{16.5}{45} \times 60$ x = 2 speed of boat in still water = 32 km/h, speed of stream = 10 km/h Downstream speed = 32 + 10 = 42 km/h Distance = 17.5 km $\text{time} = \frac{17.5}{42}$ $= \frac{5}{12}$hour or $\frac{5}{12} \times 60$ = 25 minutes Hence, option B is correct.
10	**Answer:** Option **D** **Explanation:** Speed downstream = (15 + 3) kmph = 18 kmph. Distance travelled = $\left(18 \times \frac{12}{60}\right)$km = 3.6 km
11	Correct Option: C To solve this question, we can apply a short trick approach; $\mathbf{x(\frac{n-1}{n+1})km/hr}$ Given, x = Person speed = 18 kmph n = the no. of times of hours taken by the boat in the 2nd scenario (upstream) = 3 By the short trick approach, we get $\Rightarrow 18(\frac{3-1}{3+1}) = \frac{18 \times 2}{4}$ = 9 kmph. Hence, option C is correct.

12	Correct Option: C To solve this question, we can apply a short trick approach; **Time = $[\frac{\text{2 × Distance × Speed in still water}}{\text{(Speed in still water)}^2 - \text{(Speed of current)}^2}]$hrs.** By the short trick approach, we get $= (\frac{2 \times 10 \times 3}{(3)^2 - (2)^2})$hrs $= \frac{60}{9-4} = \frac{60}{5} = 12$ hrs Hence, option C is correct.
13	Correct Option: D Let the speed of the motorboat in still water be x kmph. Then, Speed downstream = (x + 2) kmph; Speed upstream = (x – 2) kmph. $\therefore \frac{6}{x+2} + \frac{6}{x-2} = \frac{33}{60} \Leftrightarrow 11x^2 - 240x - 44 = 0$ $\Rightarrow 11x^2 - 242x + 2x - 44 = 0 \Leftrightarrow (x-22)(11x+2) = 0 \Leftrightarrow x = 22.$ Hence, speed of motorboat in still water = 22 kmph. Hence, option D is correct.
14	Correct Option: A Let the required distance be x km, then As per the question, $\text{Time}_{\text{downstream}} + \text{Time}_{\text{upstream}}$ = Total time $\Rightarrow \frac{x}{25+5} + \frac{x}{25-5} = 15$ $\Rightarrow \frac{x}{30} + \frac{x}{20} = 15$ $\Rightarrow \frac{2x+3x}{60} = 15$ $\Rightarrow 5x = 60 \times 15 \Rightarrow x = 180$ km Hence, option A is correct.
15	Correct Option: C Rate upstream = 8 – 1.5 = 6.5 kmph Rate downstream = 8 + 1.5 = 9.5 kmph Time taken to go upstream = $\frac{61.75}{6.5} = 9.5$ hr. Time taken to go downstream = $\frac{61.75}{9.5} = 6.5$ hr. Total time = 9.5 + 6.5 = 16 hrs. Hence, option C is correct.

16	Correct Option: C To solve this question, we can apply a short trick approach; **A person can row a a speed of 'x' in still water. If stream is flowing at a speed of 'y', it takes time 'T' to row to a place and back, then distance** **between two placed is given by $\frac{T(x^2 - y^2)}{2x}$.** Given, Total Time (T) = 32 min = $\frac{32}{60} = \frac{8}{15}$hr By the short trick approach, we get **=** $[\frac{8/15 \times \{(8)^2 - (2)^2\}}{2 \times 8}]$km = $\frac{8 \times \{64 - 4\}}{15 \times 2 \times 8}$ $= \frac{8 \times 60}{15 \times 16} = 2$ km Hence, option C is correct
17	**Answer:** Option **B** **Explanation:** Let the speed of the stream be *x* km/hr. Then, Speed downstream = (15 + *x*) km/hr, Speed upstream = (15 - *x*) km/hr. $\therefore \frac{30}{(15 + x)} + \frac{30}{(15 - x)} = 4\frac{1}{2}$ $\Rightarrow \frac{900}{225 - x^2} = \frac{9}{2}$ $\Rightarrow 9x^2 = 225$ $\Rightarrow x^2 = 25$ $\Rightarrow x = 5$ km/hr.
18	Correct Option: C To solve this question, we can apply a short trick approach; **x**$(\frac{\mathbf{n - 1}}{\mathbf{n + 1}})$**km/hr.** Given, x = Person speed = $7\frac{1}{2} = \frac{15}{2}$km n = the no. of times of hours taken by the boat in the 2nd scenario (upstream) = 2 By the short trick approach, we get $\frac{15}{2}(\frac{2 - 1}{2 + 1}) = \frac{15}{2} \times \frac{1}{3} = 2\frac{1}{2}$km/hr. Hence, option C is correct.
19	Correct Option: B

	Speed downstrem = (12 + 4)km/hr = 16 km/hr; Speed upstream = (12 - 4) km/hr = 8 km/hr. Let the distance between A and B be x km, Then, $\frac{x}{16} + \frac{(x/2)}{8} = 19 \Leftrightarrow \frac{x}{16} + \frac{x}{16} = 19$ $\Leftrightarrow \frac{2x}{16} = 19 \Leftrightarrow x = 152$ km.
20	Correct Option: B Let the required distance be x km. As per the question, $Time_{upstream} - Time_{downstream} = 3$ $\Rightarrow \frac{Distance}{Speed_{upstream}} - \frac{Distance}{Speed_{downstream}} = 3$ $\therefore \frac{x}{6-2} - \frac{x}{6+2} = 3$ $\Rightarrow \frac{x}{4} - \frac{x}{8} = 3$ $\Rightarrow \frac{2x - x}{8} = 3$ $\Rightarrow x = 3 \times 8 = 24$ km. Hence, option B is correct.
21	**Answer:** Option **A** **Explanation:** Let the speed of the stream *x* mph. Then, Speed downstream = (10 + *x*) mph, Speed upstream = (10 - *x*) mph. $\therefore \frac{36}{(10-x)} - \frac{36}{(10+x)} = \frac{90}{60}$ $\Rightarrow 72x \times 60 = 90(100 - x^2)$ $\Rightarrow x^2 + 48x - 100 = 0$ $\Rightarrow (x + 50)(x - 2) = 0$ $\Rightarrow x = 2$ mph.
22	Correct Option: D Let the speed of stream be x kmph $\therefore$ Rate upstream = $\frac{15}{2} - x$ And rate downstream = $\frac{15}{2} + x$ Let's also assume the time taken in downstream and upstream is 1 hr and 4 hrs respectively. We know that, Distance = Speed × Time $\therefore (\frac{15}{2} + x) \times 1 = (\frac{15}{2} - x) \times 4$ $\Rightarrow (15 + 2x) = (60 - 8x) \Rightarrow 10x = 45$ $\therefore x = \frac{45}{10} = \frac{9}{2} = 4.5$ kmph

	Hence, the option D is correct.
23	Correct Option: C Let the speed of the stream be x kmph and both the boats meet after t hours. According to the question, Distance covered while going downstream + Distance covered while going upstream = Total Distance $\Rightarrow$ (16 + x) t + (14 – x) t = 150 $\Rightarrow$ 16t + 14t = 150 $\Rightarrow$ 30t = 150 $\Rightarrow$ t = 5 hrs Hence, option C is correct.
24	**Answer:** Option **B** **Explanation:** Let man's rate upstream be *x* kmph. Then, his rate downstream = 2*x* kmph. $\therefore$ (Speed in still water) : (Speed of stream) = $\left(\frac{2x + x}{2}\right) : \left(\frac{2x - x}{2}\right)$ $= \frac{3x}{2} : \frac{x}{2}$ = 3 : 1.
25	**Answer:** Option **C** **Explanation:** Let the man's rate upstream be *x* kmph and that downstream be *y* kmph. Then, distance covered upstream in 8 hrs 48 min = Distance covered downstream in 4 hrs. $\Rightarrow \left(x \times 8\frac{4}{5}\right) = (y \times 4)$ $\Rightarrow \frac{44}{5}x = 4y$ $\Rightarrow y = \frac{11}{5}x.$ $\therefore$ Required ratio = $\left(\frac{y + x}{2}\right) : \left(\frac{y - x}{2}\right)$ $= \left(\frac{16x}{5} \times \frac{1}{2}\right) : \left(\frac{6x}{5} \times \frac{1}{2}\right)$ $= \frac{8}{5} : \frac{3}{5}$ = 8 : 3.
26	Correct Option: C Time taken by him in travelling = 19 hours 32 minutes – 20 minutes = 19 hours 12 minutes Let Distance = x km

	According to the question, $\frac{x}{60+15} + \frac{x}{60-15} = 19\frac{12}{60}$ $\frac{x}{75} + \frac{x}{45} = \frac{96}{5}$ $\frac{5x + 3x}{225} = \frac{96}{5}$ $\frac{8x}{225} = \frac{96}{5}$ x = 540 km Hence, option C is correct
27	Correct Option: B For the first boat let the speed of the stream be 5x and the speed of the boat be 7x. For the 2nd boat, let the speed of the stream be 6y and the speed of the 2nd boat be 8y. The speed of the stream will be the same. $\therefore$ 5x = 6y or, $x = \frac{6}{5}y$ Now, the required ratio of the speed of the first boat to that of the second boat = 7x : 8y $\Rightarrow 7 \times \frac{6}{5}y : 8y$ [Putting x in terms of y] $\therefore \frac{21}{5}y : 4y = 21 : 20$
28	Correct Option: B Let rate upstream = x km/hr and rate downstream = y km/hr. Then, $\frac{40}{x} + \frac{55}{y} = 13$ ... (i) and $\frac{30}{x} + \frac{44}{y} = 10$ .... (ii) Multiplying (ii) by 4 and (i) by 3 and subtracting, we get: $\frac{11}{y} = 1$ or y = 11. Substituting y = 11 in (i), we get: x = 5. $\therefore$ Rate in still water = $\frac{1}{2}(11 + 5)$ kmph = 8 kmph. Rate in current = $\frac{1}{2}(11 - 5)$ kmph = 3 kmph.

	2 Hence, option B is correct.
29	Correct Option: E Ratio = (24 + 24) : (25 + 40) = 48 : 65 Hence, option E is correct.
30	Correct Option: A Speed of Boat R in still water = 40 × 110% = 44 km/h Speed of stream = 15 × 120% = 18 km/h Time taken by Boat R to cover the distance of 91 km upstream = 91/ (44 – 18) = 91/ 26 = 3.5 hours Hence, option A is correct.
31	Correct Option: C Total time = $\frac{210}{(40-20)} + \frac{210}{(40+20)}$ = $\frac{210}{20} + \frac{210}{60}$ = 10.5 + 3.5 = 14 hours Hence, option C is correct.
32	Correct Option: D Speed of the Boat Q in still water = 24 km/h Speed of the Boat U in still water = $\frac{24}{4}$ × 5 = 30 km/h Let the speed of stream = x km/h According to the question, $\frac{126}{(30+x)} + \frac{81}{(30-x)} = \frac{15}{2}$ $\frac{126(30-x) + 81(30+x)}{(900-x^2)} = \frac{15}{2}$ $2(3780 - 126x + 2430 + 81x) = 15(900 - x^2)$ $2(6210 - 45x) = 13500 - 15x^2$ $12420 - 90x = 13500 - 15x^2$ $15x^2 - 90x - 1080 = 0$

	$x^2 - 6x - 72 = 0$ $x^2 - 12x + 6x - 72 = 0$ $x(x - 12) + 6(x - 12) = 0$ $(x + 6)(x - 12) = 0$ $x = -6, 12$ Speed of stream = 12 km/h Hence, option D is correct.
33	Correct Option: C According to the question, Speed of Boat Q and S in still water together = (25 + 24) = 49 km/h Speed of stream of Boat Q and S together = 18 km/h % more = $\frac{49 - 18}{18} \times 100$ = $\frac{31}{18} \times 100 = 172.22\% \approx 170\%$ Hence, option C is correct.
34	**Answer:** Option **E** **Explanation:** **I.** Speed of the current = 1 km/hr. **II.** PQ = 4 km. Let the speed of the boat in still water be *x* km/hr. Then, $\frac{4}{(x + 1)} + \frac{4}{(x - 1)} = 3$. This gives *x*. $\therefore$ Correct answer is (E).
35	**Answer:** Option **D** **Explanation:** Let AB = *x* km. **I.** Speed downstream = $\frac{x}{2}$ km/hr **II.** Speed upstream = $\frac{x}{4}$ km/hr. Speed of boat in still water = $\frac{1}{2}\left(\frac{x}{2} + \frac{x}{4}\right)$ km/hr. Thus, I and II both even do not give the answer. $\therefore$ Correct answer is (D).
36	**Answer:** Option **E** **Explanation:** **I.** Speed upstream = $\frac{48}{6}$ km/hr = 8 km/hr.

	II. Speed downstream = $\frac{48}{4}$ km/hr = 12 km/hr. Speed of the boat = $\frac{1}{2}$(8 + 12) km/hr = 10 km/hr. Thus, I and II together give the answer. $\therefore$ Correct answer is (E).