“Boat and Stream Detail Solutions”

1A
Explanation:
Suppose he move 4 km downstream in $x$ hours. Then,

Speed downstream = $\left(\frac{4}{x}\right)$ km/hr.

Speed upstream = $\left(\frac{3}{x}\right)$ km/hr.

$\therefore \frac{48}{(4/x)} + \frac{48}{(3/x)} = 14$ or $x = \frac{1}{2}$.

3. So, Speed downstream = 8 km/hr, Speed upstream = 6 km/hr.

Rate of the stream = $\frac{1}{2}(8 - 6)$ km/hr = 1 km/hr.

2. C
Explanation:
Rate downstream = $\left(\frac{1}{10} \times 60\right)$ km/hr = 6 km/hr.

Rate upstream = 2 km/hr.

Speed in still water = $\frac{1}{2}(6 + 2)$ km/hr = 4 km/hr.

$\therefore$ Required time = $\left(\frac{5}{4}\right)$ hrs = $\frac{1}{6}$ hrs = 1 hr 15 min.

3B
Explanation:
Downstream speed = $40/5 = 8$ km/hr
Upstream speed = $40/10 = 4$ km/hr
So speed of stream = $1/2*(8-4)$

4.E
Explanation:
Downstream speed = 10+5 = 15
Upstream speed = 10-5 = 5
Now total time is 25 hours
If distance between A and B is d, then distance BC = d/2
Now distance/speed = time, so
d/15 + (d/2)/5= 25
Solve, d = 150 km

5. A
Explanation – Let still water speed x km/hr and speed of current y km/hr
Given x = y + 2y
= 3 km/hr
ATQ—
\[
\frac{60}{3y+y} + \frac{48}{3y-y} = 13 \\
\frac{60+96}{4y} = 13
\]
y = 3km/hr
x = 3 \times 3 = 9 km/hr
Required time = \frac{84}{9+3} + \frac{36}{9-3}
= 7 + 6
= 13 hours

6. A
Explanation – We, know that there is no speed of current in lake
Lets speed of boat B in still water = x km/hr
And, speed of boat A in still water = 1.5x km/hr
If boat A did not loss time, it would reach one hours earlier
So,
\[
\frac{72}{x} - \frac{72}{1.5x} = \frac{120}{60} \\
\frac{x}{48} - \frac{48}{x} = 2
\]
7. A
Explanation – Let speed of boat in still water and speed of current be \(x\) km/hr and \(y\) km/hr respectively
ATQ –
\[
\frac{D}{(x+y)} = \frac{D}{(x-y)}
\]
\[
2x - 2y = x + y
\]
\[
x = 3y
\]
first part = \(240 \times \frac{12}{40} = 72\) km
second part = \(240 \times \frac{13}{40} = 78\) km
third part = \(240 \times \frac{15}{40} = 90\) km
\[
\frac{72}{3y} + y + \frac{78}{3y} \times \frac{3}{4} + y + \frac{90}{3y} \times \frac{3}{2} + y = 19.5
\]
\[
\frac{4680+6240+9360}{260y} = 19.5
\]
y = \(\frac{20280}{260 \times 19.5}\)
y = 4 km/hr

boat usual speed = \(4 \times 3 = 12\) km/hr

8. B
Let speed of boat = \(x\) km/hr, and of current = \(y\) km/hr
So
\[
\frac{18}{(x-y)} = \frac{18}{(x+y)} + 4
\]
Gives \(x^2 = 9y + y^2\)........(1)
Now when speed of boat is \(2x/3\)
\[
\frac{14}{(2x/3 -y)} = \frac{14}{(2x/3 +y)} + 12 \\
\frac{42}{(2x-3y)} = \frac{42}{(2x+3y)} + 12 \\
\text{Gives } 4x^2 = 21y + 9y^2 \quad \text{.........(2)}
\]

From (1), put value of \(x^2\) in (2) and solve
Solving, \(x = 6\), \(y = 3\)

**9. D**

Let \(x\) be speed of the boat and \(y\) be the speed of the current.
Downstream speed = \(x + y\)
Upstream speed = \(x - y\)
\(x - y = 30/6 = 5\) km/hr.
Now,
\(x = 4y\)
\(x - y = 4y - y = 3y\)
\(\Rightarrow x = (20/3)\)km/hr and \(y = (5/3)\)km/hr
Therefore, \(x + y = (25/3)\) km/hr.
Time during downstream = \(90/25 = 3.6\) hrs.

**10. B**

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.
\(X*8 \frac{4}{5} = 4y\)
\(44/5x = 4y\)
\(Y = 11/5x.\)

Required ratio \((y+x)/2 = (y-x)/2\)
\(16x/10:6x/10\)
\(8:3\)

Q11. Ans(E)

**Explanation:**

\(S+R = D/t\); \(S-R+x = D/t\)
\(S+R = S-R+x\)
\(R = x/2\)

Can’t determine
Q12. Ans(B)
**Explanation:**

\[ 19 = \frac{240}{60} + \frac{240}{60+x} + \frac{480}{20+x} \]

\[ x = 20 \]

Q13. Ans(D)
**Explanation:**

Let total distance be \( D \) km.
And, speed of boat A in still water be \( x \) km/hr
Speed of boat B in still water be \( y \) km/hr
Speed of stream be \( r \) km/hr

ATQ -

\[ \frac{D}{x+r} : \frac{D}{y+r} = \frac{3}{4} \]

Or, \[ \frac{y+r}{x+r} = \frac{3}{4} \] \[ \text{(i)} \]

Also, for a distance \( D_1 \),

\[ \frac{D_1}{y-r} = \frac{3}{2} \left( \frac{D_1}{y+r} \right) \]

or, \[ 2y + 2r = 3y - 3r \]

or, \[ y = 5r \]

Putting this in (i),

\[ \frac{6r}{x+r} = \frac{3}{4} \]

or, \[ 3x + 3r = 24r \]

or, \[ x = 7r \]

Ratio of speed of boat A and B in still water = 7r : 5r

= 7 : 5

Q14. Ans(A)
**Explanation:**
Speed of current = \( \frac{5}{9} \times \frac{18}{5} \)
= 2 km/hr

Let's still water speed = \( x \) km/hr

ATQ,
\[ \frac{28 \times \frac{3}{4}}{(x-2) (x+2)} = 3 \]

\[ 28 \times \frac{3}{4} - 28 = 3 \]

\[ 21x + 42 - 28x + 56 = 3x^2 - 12 \]

\[ -7x + 98 = 3x^2 - 12 \]

\[ 3x^2 + 7x - 110 = 0 \]

\[ x = 5 \text{ km/hr} \]

Q15. Ans(D)

**Explanation:**

\[ \text{Answer: } \frac{5}{9} \times \frac{18}{5} = 2 \text{ km/hr} \]

\[ \text{Let's still water speed } = x \text{ km/hr} \]

\[ \frac{28 \times \frac{3}{4}}{(x-2) (x+2)} = 3 \]

\[ 28 \times \frac{3}{4} - 28 = 3 \]

\[ 21x + 42 - 28x + 56 = 3x^2 - 12 \]

\[ -7x + 98 = 3x^2 - 12 \]

\[ 3x^2 + 7x - 110 = 0 \]

\[ x = 5 \text{ km/hr} \]
Speed of motor boats in upstream
\[ = 8 \times \frac{60}{48} \]
\[ = 10 \text{ km/hr} \]
ATQ.
Let speed of motor boats be \(6x\) km/hr and speed of stream be \(x\) km/hr
\[ 6x - x = 10 \]
\[ x = 2 \text{ km/hr} \]
Downstream speed of all boats
\[ = (6 \times 2 + 2) \]
\[ = 14 \text{ km/hr} \]
Let distance between point P to Q on first day = \(y\) km
Second day distance = \((y + 9)\)
\[ 14 = \frac{y + 9}{4.5} \]
\[ y = 63 - 9 \]
\[ y = 63 - 9 \]
\[ y = 54 \text{ km} \]
Distance travelled on third day = \(54 + 9 \times 2\)
\[ = 72 \text{ km} \]
Total time taken by boat C on third day to reach point Q
\[ = \frac{72}{14} \]
\[ = 5 \frac{2}{7}\text{ hours} \]

Q16. Ans(C)

**Explanation:**
Let speed of boat and stream is \(x\) and \(y\) respectively.
ATQ,
\[ \frac{75}{x + y} = \frac{60}{x - y} \]
\[ 75x - 75y = 60x + 60y \]
\[ 15x = 135y \]
\[ x = 9y \]
Required percentage = \[ \frac{10y}{9y} \times 100 = 111 \frac{1}{9}\% \]
Q17. Ans(C)
Explanation:
Time to collide = \( \frac{20}{10 + 5} = \frac{4}{3} \) hr
1 minute before collision, distance
\[ = 20 - \left( \frac{79}{60} \times 5 + \frac{79}{60} \times 10 \right) \]
\[ = 20 - \frac{237}{12} \]
\[ = \frac{1}{4} \text{ km} \]

Q18. Ans(E)
Explanation:
Let speed of boat in still water be \( x \) km/hr and the speed of stream is \( y \) km/hr
\( 0.4x - y = \frac{160}{8} = 20 \) km/hr
\( 0.6x + y = \frac{160}{4} = 40 \) km/hr
\( \therefore x = 60 \) km/hr
\( y = 4 \) km/hr
\( \therefore \) speed of man = \( \frac{60 + 4}{2} = 32 \) km/hr
Required distance = \( (32 - 4) \times 6 \)
\[ = 28 \times 6 = 168 \text{ km} \]

Q19. Ans(A)
Explanation:
Downstream speed = \( \frac{30}{2} = 15 \) km
Upstream speed = \( \frac{30}{6} = 5 \) km
\[ \therefore \text{Speed of the boat} = \frac{15 + 5}{2} = \frac{20}{2} = 10 \text{ kmph} \]

Q20. Ans(B)

**Explanation:**
Let the speed of the motorboat in still water = 3a km/hr then the speed of the motorboat in stream = a km/hr

According to the question, 3a – a = 2a = 4

\[ a = 2 \text{ km/hr} \]

the speed of the motorboat in still water = 3a km/hr = 6 km/hr

the speed of the motorboat in stream = a km/hr = 2 km per hour

Upstream speed = 6 – 2 = 4 km/hr

Downstream speed = 6 + 2 = 8 km per hour

\[ \frac{x}{4} + \frac{x + 20}{8} = 17.5 \]

\[ 8x + 4x + 80 = 17.5 \times 32 = 560 \]

\[ 12x = 560 - 80 = 480 \]

\[ x = 40 \]

Q21. Ans(B)
Explanation:
Let the speed of stream = \( x \) km per hour
The speed of the motorboat in still water = \( 100 + 500 \)% of \( x \) = 600% of \( x \) = 6\( x \) km per hour
The upstream speed = \( 6x - x = 5x \) km per hour

\[
\frac{600}{12} = 50 \text{ km per hour}
\]

\( x = 10 \) km per hour

The distance the motorboat can travel in 5 hours upstream = \( 5 \times (6x - x) \)
= \( 5 \times 5x = 250 \) km

Q22. Ans(A)
Explanation:
Let the speed of steamer A in still water = \( a \) km per hour and the speed of steamer B in still water = \( b \) km per hour

The speed of stream = 2 km per hour

Then, according to the question, \( (b - 2) - (a - 2) = b - a = 3 \)

In downstream, the speed of steamer A = \( a + 2 = b - 3 + 2 = b - 1 \) km per hour

The speed of steamer B = \( b + 2 \) km per hour

Then, according to the question,

\[
\frac{120}{b - 1} - \frac{120}{b + 2} = 2
\]
By solving, \( b = 13 \) km per hour

Therefore, the speed of steamer A in still water = \( 13 - 3 = 10 \) km per hour

The required sum = \( 10 + 13 = 23 \) km per hour

Q23. Ans(B)

**Explanation:**
Let the distance between A and B is \( 2d \) km

Upstream speed = \( 16 - 4 = 12 \) km/h

Downstream speed = \( 16 + 4 = 20 \) km/h

According to the question

\[
\frac{2d}{12} + \frac{d}{20} = 65
\]

\[
\Rightarrow \frac{10d + 3d}{60} = 65
\]

\[
\Rightarrow \frac{13d}{60} = 65
\]

\[
\Rightarrow d = 65 \times \frac{60}{13}
\]

\[
\Rightarrow d = 300 \text{ km}
\]

Q24. Ans(B)

**Explanation:**
We know that
Distance
= time taken × \frac{(speed of the boat)^2 - (speed of the stream)^2}{2 \times speed of the boat}

⇒ d = 9 \times \frac{8^2 - 4^2}{2 \times 8}

⇒ d = 9 \times \frac{64 - 16}{16}

⇒ d = 9 \times \frac{48}{16}

⇒ d = 27 \text{ km}

Q25. Ans(D)

**Explanation:**
Let the speed of the swimmer = x km/h
And the speed of the stream = y km/h

Now,
\[ \frac{42}{x + y} = 3 \]
⇒ \(x + y = 14 \) ............. (i)

\[ \frac{18}{x - y} = 3 \]
⇒ \(x - y = 6 \) ............. (ii)
Adding equations (i) and (ii)

\[ 2x = 20 \]
\[ \Rightarrow x = 10 \]

From (i)

\[ 10 + y = 14 \]
\[ \Rightarrow y = 4 \text{ km/h} \]

Q26. Ans(D)

**Explanation:**

Let the speed of the motorboat in still water = \( x \) km per hour

and the speed of the stream = \( y \) km per hour

then, according to the question, \( x - y \)

= 75% of \( x \)

\[ 25x = 100y \]

\[ \frac{x}{y} = 4 : 1 \]

The reqd. \( \% = \frac{1 \times 100}{4} = 25\% \)

Q27. Ans(D)

**Explanation:**

the speed of the boat in still water is 66.66% more than that of the speed
Let the speed of stream = x km/hr

Then speed of the boat will become = 166.66% of x

= \frac{5x}{3} \text{ km/hr}

\text{Speed in upstream} = \frac{5x}{3} - x = \frac{2x}{3} \text{ km/hr} \quad \text{......(i)}

\text{Speed in downstream} = \frac{5x}{3} + x = \frac{8x}{3} \text{ km/hr} \quad \text{......(ii)}

According to question,
\frac{48}{2x} + \frac{48}{8x} = 15 \text{ hrs}

By solving this,
X = 6

From the equation (i)
\text{Speed of upstream} = 2 \times \frac{6}{3} = 4 \text{ km/hr}

The total distance travelled by him in upstream in 15 hrs = 15 \times 4 = 60 \text{ km}

Q28. \text{Ans}(E)
Explanation:
Let the speed of boy in still water be X km/h

And the speed of current is given = 5 km/h

Downstream speed = (X + 5) km/h

Upstream speed = (X – 5) km/h

Let time be ‘t’ hours.

⇒ \( \frac{(X + 5) t}{3} = (X - 5) t \)

⇒ X + 5 = 3X – 15

⇒ 2X = 20

⇒ X = 10 km/h

Downstream speed = 10 + 5 = 15 km/hr

Upstream speed = 10 – 5 = 5 km/hr

Q29. Ans(E)

Explanation:
Let he moves 8 km downstream in x hours.

Downstream speed = \( \frac{8}{x} \)

Upstream speed = \( \frac{6}{x} \)
Then,

\[
\Rightarrow \frac{120}{8/x} + \frac{120}{6/x} = 35
\]

\[
\Rightarrow 120 \times \frac{7x}{24} = 35
\]

\[
\Rightarrow 35x = 35
\]

\[
\Rightarrow x = 1
\]

Then downstream speed = 8 km/h

Upstream speed = 6 km/h

\[
U = \frac{8 + 6}{2} = 7 \text{ km/h}
\]

\[
V = \frac{8 - 6}{2} = 1 \text{ km/h}
\]

Required ratio = 7 : 1

Q30. Ans(A)

**Explanation:**

Let speed of man in still water = \(x\) km/h

Speed of current = \(y\) km/h

Downstream speed = \((x + y)\) km/h
Upstream speed = \((x - y)\) km/h

Let \(PQ = QR = A\) and \(PR = 2A\)

So,

\[
\frac{2A}{x + y} = 24 \quad \text{and} \quad \frac{A}{x - y} = 16
\]

By dividing both equations-

\[
\frac{2A(x - y)}{A(x + y)} = \frac{24}{16}
\]

\[
4x - 4y = 3x + 3y
\]

\[
\Rightarrow \frac{x}{y} = \frac{7}{1}
\]

Required ratio = Speed of man in still water : Speed of current

\[
\Rightarrow 7 : 1
\]

Q31. Ans(D)

**Explanation:**

Upstream, \(U = \text{Speed of boat} - \text{speed of stream}\)

Downstream, \(D = \text{Speed of boat} + \text{speed of stream}\)

\[
\frac{65}{U} + \frac{130}{D} = 23
\]

\[
45 + 104 = 17
\]
On solving the above two equations, we will get

\[ U = \text{Speed of boat} - \text{speed of stream} = 5 \]

\[ D = \text{Speed of boat} + \text{speed of stream} = 13 \]

Thus, Speed of boat = 9 and speed of stream = 4

Q32. Ans(D)

**Explanation:**

Let the speed of boat in upstream = 8x km/hr

And the speed of the stream = x km/hr

Speed of boat in downstream = \( \frac{500}{20} = 25 \) km/hr

Let the speed of boat in still water = p km/hr

Then, \( p + x = 25 \) km/hr ........(i)

\( p - x = 8x , p = 9x \) ...........(ii)

Put the value of \( p \) in the equation (i)

10x = 25, \( x = 2.5 \)

From the equation (ii) speed of boat in still water = \( 9x = 9 \times 2.5 = 22.5 \) km/hr
The total distance travelled by the boat in still water in 20 hours = 450 km

Q33. Ans(C)

Explanation:
Let the speed of stream = x km/hr

The speed of the motorboat in upstream = (35 - x) km/hr

We know that distance = speed × time

180 = (35 - x) × 6

By solving, x = 5 km/hr

While returning the motorboat will go in downstream

The speed of the motorboat in downstream = (35 + 5) km/hr

The required time taken = \(\frac{180}{4}\) = 4.5 hours

Q34. Ans(B)

Explanation:
Let the downstream speed be u km/hr and upstream speed be v km/hr

\[
46 \left(\frac{1}{u} + \frac{1}{v}\right) = \frac{23}{2}
\]

\[
\frac{1}{u} + \frac{1}{v} = \frac{1}{4} \quad \text{.........(i)}
\]

\[
5 = 4 \Rightarrow v = 4 \frac{u}{u} \quad \text{.........(ii)}
\]
\[
\begin{align*}
1 & \quad 5 \\
\frac{1}{u} & \quad \frac{5}{4u} = \frac{1}{4} \\
9 & = \frac{1}{4u} \\
u & = 9 \\
v & = \frac{4}{5} \times 9 = 7.2
\end{align*}
\]

Speed of stream = \(\frac{9 - 7.2}{2} = \frac{1.8}{2} = 0.9\) km/hr.

Q35. Ans(D)

**Explanation:**
Let the speed of the motorboat B in still water = \(u\) km per hr then according to the question, the speed of the motorboat A in still water = \(2u\) km per hour and let the speed of the stream = \(v\) km per hour

And, \(2u - u = 15\) km/hr

\(u = 15\) km per hour

When motorboat A and B travel towards each other then the relative speed = \((2u - v) + (u + v) = 3u\) km per hour

We know that, Distance = speed \times time = 3u \times 15 = 45u \text{ km}

Put the value of \(u = 15\) then the total distance = \(45 \times 15 = 675\) km

Q36. Ans(A)

**Explanation:**
Q37. Ans(C)

**Explanation:**

Let total distance from A to B = 'D'
ATQ, Satish cover 20% distance in 6.5 hours So,
he can cover 30% distance (M to mid-point of A and B) in
\[ \frac{6.5}{2} \times 3 = 9.75 \text{ hr.} \]
Time taken by Satish to come back from mid-point to M
\[ = 29.25 - 9.75 = 19.5 \text{ hr} \]
30% distance covered by Satish in 19.5 hr.
100% distance covered by Satish in \[ \frac{19.5}{3} \times 10 = 65 \text{ hr} \]

Q38. Ans(D)

**Explanation:**
Let, the speeds of boat and man in still water be $x$ and $y$ km/h.

Since the distance is same, the ratio of speeds will be inverse of the ratio of time taken.

Downstream speed of boat : Downstream speed of man $= 2 : 1$

\[
\frac{x + 3}{y + 3} = \frac{2}{1}
\]

\[\Rightarrow x + 3 = 2y + 6 \]
\[\Rightarrow x - 2y = 3 \quad \text{...............(i)}\]

And,

Upstream speed of boat : Upstream speed of man $= 4 : 1$

\[
\frac{x - 3}{y - 3} = \frac{4}{1}
\]

\[\Rightarrow x - 3 = 4y - 12 \]
\[\Rightarrow x - 4y = -9 \quad \text{...............(ii)}\]

Solving (i) and (ii),

$x = 15 \text{ & } y = 6$

Hence, the speeds of the boat and the man in still water are 15 km/h and 6 km/h respectively.

Q39. Ans(D)

**Explanation:**

Let speed of boat in still water $= x$ km/hr
And speed of current $= y$ km/hr

ATQ,

\[x - y + x + y = 72\]
\[2x = 72\]
\[x = 36 \text{ km/hr}\]

and \(x - y = \frac{105}{3.5} = 30 \text{ km/hr}\)

\[y = 6 \text{ km/hr}\]

Downstream $= x + y = 42 \text{ km/hr}$

\[x + y = \frac{126}{t}\]

\[t = \frac{126}{42} = 3 \text{ hours.}\]
Q40. Ans(B)
**Explanation:**
Let, speed of current be \( x \) m/minute
\[
\frac{200}{48-x} = \frac{200}{48+x} + 10
\]
\[
\Rightarrow x = 32 \text{ m/min}.
\]

Q41. Ans(B)
**Explanation:**
Let distance between D to C is ‘d’
\[
\frac{d}{15+3} + \frac{d}{15-3} = 25
\]
\[
\frac{d}{18} + \frac{d}{12} = 25
\]
\[
\frac{5d}{36} = 25
\]
\[
d = 180 \text{ km}
\]

Q42. Ans(C)
**Explanation:**
Let, speed of Hunny be ‘\( a \)’
Speed of Bunny be ‘\( b \)’
And speed of stream be ‘\( r \)’,
ATQ,
\[
\frac{D}{a+r} : \frac{D}{b+r} = \frac{3}{4}
\]
Or, \( \frac{b+r}{a+r} = \frac{3}{4} \) .......(i)
Also, for a distance \( D_1 \),
\[
\frac{D_1}{b-r} = \frac{3}{2} \left( \frac{D_1}{b+r} \right)
\]
or, \( 2b + 2r = 3b - 3r \)
or, \( b = 5r \)
putting this in (i),
\[
\frac{6r}{a + r} = \frac{3}{4}
\]
or, \(3a + 3r = 24r\)
or, \(a = 7r\)

ratio of their speed = \(7r : 5r = 7 : 5\)

Speed of Hunny = \(\frac{14}{1} = 14\) km/hr

Then, speed of Bunny = \(14 \times \frac{5}{7} = 10\) km/hr

Required time taken = \(\frac{48}{24-2} + \frac{48}{24+2}\) = \(4\frac{4}{143}\) hr.

Q43. Ans(A)

Let times by Rahul to cover a distance ‘D’ in downstream is \(\rightarrow 3x\)
So, time taken to cover ‘D’ distance in upstream \(\rightarrow 7x\)
\(\Rightarrow\) Speed of Rahul in downstream and upstream be \(7x\) and \(3x\) respectively

Speed of stream \(\rightarrow \frac{7x-3x}{2} = \frac{4x}{2} = 2x\)

And, speed of Rahul’s friend in downstream \(\rightarrow 7x \times \frac{6}{7} = 6x\)

Speed of Rahul in still water = \(7x - 2x = 5x\)
Speed of Rahul’s friend in still water = \(6x - 2x = 4x\)
Required ratio = \(5 : 4\)

Q44. Ans(E)

Explanation:
Let speed of man = \( x \) 
and speed of stream = \( y \) 

ATQ,
\[
\frac{75x}{100} + y = \frac{128}{8} = 16
\]
\[\Rightarrow 0.75x + y = 16\quad \text{...(i)}\]

and, \( 0.5x - y = \frac{128}{32} = 4 \)
\[\Rightarrow 0.5x - y = 4\quad \text{...(ii)}\]

On solving (i) and (ii)
\( x = 16, y = 4 \)

Required\% = \( \frac{16 - 4}{4} \times 100\)
\[
= \frac{12}{4} \times 100
= 300\%
\]

**Q45. Ans(D)**

**Explanation:**

Let, speed of Rahul = \( x \)
Speed of stream = \( y \)

ATQ,
\[
\frac{120}{x - y} - \frac{120}{x + y} = 7.5\quad \text{...(i)}
\]

\[
\frac{120}{4} \times \frac{3}{x - y} - \frac{120}{4} \times \frac{3}{x + y} = 4\quad \text{...(ii)}
\]

On solving (i) & (ii)
\( x = 12 \text{ km/h} \)
\( y = 4 \text{ km/h} \)

Required \% = \( \frac{4}{12} \times 100 = 33\frac{1}{3}\% \)

**Q46. Ans(D)**

**Explanation:**

Let distance = \( D \)
Q47. Ans(E)
Explanation:

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Lakshya will reach Ichagarh in \( \frac{300}{(25+5)} = 10 \) hrs and return back. Before reaching Ichagarh
Lakshya and rupu already met once.
Distance between Lakshya and Rupu when Lakshya reaches Ichagarh = 10 \( \times \) 10 = 100 km
Relative speed when they both going in same direction = \((25 - 5) - (15 - 5) = 10 \) km/hr
Time required to meet second time = \(10 + \frac{100}{10} \)
= 10 + 10
= 20 hr

Q48. Ans(B)
Explanation:
Data I—
Let speed of INS Vikramaditya be 7x km/hr and speed of current be x km/hr
Downstream speed = \(25.6 \times \frac{60}{48} = 32\) km/h
Speed of INS Vikramaditya = \(32 \times \frac{7x}{8x} = 28\) km/hr
Speed of Indian Ocean = \(32 \times \frac{x}{8x} = 4\) km/hr

Data II—
Let speed of INS Vikrant be 9y km/hr and 2y km/hr respectively
Upstream speed = \(19.6 \times \frac{60}{42} = 28\) km/hr
Speed of INS Vikrant = \(28 \times \frac{9y}{(9y-2y)} = 36\) km/hr
Speed of Arabic sea = \(28 \times \frac{2x}{9x-7x} = 8\) km/hr

New speed of INS Vikramaditya = \(28 \times \frac{3}{4} = 21\) km/hr
New speed of INS Vikrant = \(36 \times \frac{5}{4} = 45\) km/hr
Upstream speed of INS Vikrant= \(45 - 8 = 37\) km/hr
Downstream speed of INS Vikramaditya = \(21 + 8 = 29\) km/hr
Relative speed of INS Vikramaditya & INS Vikrant = \(37 + 29 = 66\) km/hr
Total distance between point P & Q = \(66 \times 15 = 990\) km
Let Still water speed of Virat be x km/hr
ATQ –
\(990 \times \frac{3}{55} = (x + 8)\)
x + 8 = 54
x = 48 km/hr

Q49. Ans(D)
Explanation:
Q50. Ans(B)

Explanation:

Downstream of boat = $12 \times \frac{60}{35} = 20$ km/hr

Speed of boat in still water

$= 20 \times \frac{4}{5}$

$= 16$ km/hr

Speed of current $= 20 \times \frac{1}{5} = 4$ km/hr
Boat goes A to C upstream, when river change direction then boat start again upstream from point C but when boat reach midpoint river change direction and now boat cover distance of B to A downstream—

ATQ—
\[
\frac{X+24}{(16-4)} + \frac{X+24}{2(16-4)} + \frac{X+24}{2(16+4)} = \frac{63}{5}
\]
\[
\frac{X+24}{12} + \frac{X+24}{24} + \frac{X+24}{40} = \frac{63}{5}
\]
\[18X = 1512 - 432\]
\[X = 60 \text{ km}\]

Total distance covered by boat
\[= 2 \times (60 + 24)\]
\[= 168 \text{ km}\]

Q51. Ans(D)

**Explanation:**

Let speed of boat be \(a\) km/hr

Speed of stream be \(b\) km/hr

And distance be ‘D’ km

ATQ — 8 \((a^2 - b^2)\)

\[\frac{D}{(a-b)} - \frac{D}{(a+b)} = 8\]

\[D = 8(a^2 - b^2)/2b \quad \text{---------------- (i)}\]

Also, new speed of boat = \(\frac{3a}{2}\) km/hr

\[\frac{D}{(3a-2b)} - \frac{D}{(3a+2b)} = \frac{3}{2}\]

\[D = 3(9a^2 - 4b^2)/8b \quad \text{---------------- (ii)}\]

From (i) & (ii) we get

\[27a^2 - 12b^2 = 32a^2 - 32b^2\]

\[20b^2 = 5a^2\]

\[a^2 : b^2 = 4 : 1\]

\[b : a = 1 : 2\]
Q52. Ans(A)

**Explanation:**

Let speed of boat and stream be \( b \) km/hr and \( c \) km/h respectively.

Then downstream and upstream speed will be \((b + c)\)km/h and \((b - c)\)km/h respectively.

Now,

\[
\frac{8}{b - c} + \frac{24}{b + c} = 4
\]

\[
\Rightarrow \frac{2}{b - c} + \frac{6}{b + c} = 1 \quad \text{....(i)}
\]

\[
\frac{12}{b - c} + \frac{12}{b + c} = 4
\]

\[
\Rightarrow \frac{3}{b - c} + \frac{3}{b + c} = 1 \quad \text{....(ii)}
\]

Multiplying \( \cdot \text{(i)} \) by 3 and \( \cdot \text{(ii)} \) by 2 and subtracting \( \cdot \text{(ii)} \) from \( \cdot \text{(i)} \) we get

\[
\frac{1}{b - c} = \frac{1}{4}
\]

\[
b - c = 4 \quad \text{....(a)}
\]

And,

\[
\frac{1}{b + c} = \frac{1}{12}
\]

\[
b + c = 12 \quad \text{....(b)}
\]
Adding (a) and (b) we get,

\[2b = 16 \implies b = 8 \text{ km/h and so } c = 4 \text{ km/h}\]

⇒ time taken to cover 144 km downstream and 40 km upstream

\[= \frac{40}{b-c} + \frac{144}{b+c}\]

⇒ Substituting values of b and c we have

\[\frac{40}{4} + \frac{144}{12} = 10 + 12 = 22 \text{h}\]

Q53. Ans(D)

Explanation:

Let speed of stream be c km/hr

Then downstream speed = (10 + x)km/hr

And upstream speed = (10 - x)km/hr

Time taken by boat to go 91 km upstream = \(\frac{91}{10 - x}\) Hours

Time taken by boat to go 91 km downstream = \(\frac{91}{10 + x}\) Hours

Since boat takes a total of 20 hours in going and coming back to original point

\[91 + 91 = 20\]
\[10 - x \quad 10 + x\]

\[\Rightarrow \frac{91(10 + x) + 91(10 - x)}{(10 + x)(10 - x)} = 20\]

\[\Rightarrow \frac{910 + 91x + 910 - 91x}{(10 + x)(10 - x)} = 20\]

\[\Rightarrow 1820 = 20 \times (100 - x^2)\]

\[\Rightarrow (100 - x^2) = 91\]

\[\Rightarrow x^2 = 9\]

\[\Rightarrow x = 3 \text{ km/hr}\]

**Q54. Ans(C)**

**Explanation:**

Let the distance between A and B = \(X\) km

and distance between B and C is \(\frac{X}{2}\) km

Upstream speed = \(16 - 4 = 12\) kmph

Downstream speed = \(16 + 4 = 20\) kmph

According to question,

\[\frac{X}{12} + \frac{X/2}{20} = 26\]
\[
\frac{X}{12} + \frac{X}{40} = 26
\]

\[
\Rightarrow X = 240 \text{ km}
\]

Total distance covered by the boat

\[
= X + \frac{X}{2} = 240 + 120 = 360\text{km}
\]

Q55. Ans(B)

Explanation:

Upstream speed of boat between 2 pm and 3 pm = (18 – 3) km/hr = 15 km/hr

Upstream speed of boat between 3 pm and 6 pm = (18 – 2) km/hr = 16 km/hr

So, boat will cover 15 km between 2 pm and 3 pm.

∴ Time required to cover remaining 32 km upstream

\[
= \frac{32}{16} = 2 \text{ hours}
\]

∴ Boat reaches destination at 5 pm.

Q56. Ans(D)

Explanation:

Let the speed of the motorboat in still water = x km per hour
Then the speed of the motorboat in upstream = \( x - 2 \) km per hour

And the speed of the motorboat in downstream = \( x + 2 \) km per hour

According to the question,

\[
\frac{120}{x - 2} + \frac{120}{x + 2} = 25
\]

\[
\frac{2x}{x^2 - 4} = \frac{25}{120} = \frac{5}{24}
\]

\[
48x = 5x^2 - 20
\]

\[
5x^2 - 48x - 20 = 0
\]

By solving, \( x = 10 \) or \(-0.4\)

Negative value is not possible therefore, \( x = 10 \) km per hour

The speed of the motorboat in upstream = \( 10 - 2 = 8 \) km per hour

Q57. Ans(A)

Explanation:

Downstream speed of boat

\[
= \frac{67.5}{2.5} \text{ km/hr} = 27 \text{ km/hr}
\]

Ratio of speed of boat in still water to speed of stream = 8 : 1
So, 9 units = 27 km/hr

1 unit = 3 km/hr

\[ \therefore \text{Difference between speed of boat in still water and speed of stream} = (8 - 1) = 7 \text{ units} \]

\[ = 7 \times 3 = 21 \text{ km/hr}. \]

**Q58. Ans(E)**

**Explanation:**

Downstream speed of boat

\[ \frac{67.5}{2.5} \text{ km/hr} = 27 \text{ km/hr} \]

Ratio of speed of boat in still water to speed of stream = 8 : 1

So, 9 units = 27 km/hr

1 unit = 3 km/hr

\[ \therefore \text{Difference between speed of boat in still water and speed of stream} = (8 - 1) = 7 \text{ units} \]

\[ = 7 \times 3 = 21 \text{ km/hr}. \]

Distance travelled by boat in upstream in 5 hours = 21 \times 5 = 105 \text{ km}

**Q59. Ans(D)**

**Explanation:**

Let the speed of the motorboat in still water = 5x km per hour
Its upstream speed = 80% of 5x = 4x km per hour

The speed of the stream = 5x – 4x = x km per hour

The downstream speed = 5x + x = 6x km per hour

\[
\frac{60}{4x} + \frac{60}{6x} = 12.5
\]

By solving, x = 2

The speed of the motorboat in still water = 5x = 10 km per hour

The time taken to travel 75 km =

\[
\frac{75}{10} = 7.5 = 7 \text{ hours 30 minutes}
\]

Q60. Ans(B)

**Explanation:**
Let the total distance from point P to Q = x km

Then, Total time taken in upstream = \(\frac{x}{12}\) hours

Total time taken in downstream = \(\frac{x}{18}\) hours

The average speed = \(\frac{2x}{\frac{x}{12} + \frac{x}{18}}\) = \(\frac{2 \times 12 \times 18}{12 + 18}\) = \(\frac{2 \times 12 \times 18}{30}\) = 14.4 km per hour
Q61. Ans(D)
Explanation:

Let the time taken to go uphill = x + 2 hour then time to come downhill = x hour

Since, the distance is same

Let the speed to come downhill = 5a km per hour then the speed to go uphill = 4a km per hour

We know that, distance = speed × time

5a × x = 4a(x + 2)

x = 8 hours

Therefore, the total distance taken by him in the entire journey = 8 + 10 = 18 hours
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All the best for your Exam 😊