TIME, SPEED AND DISTANCE-3_CSAT_ANSWER_EXPLANATION

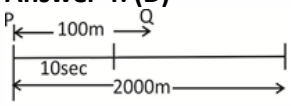
Answer 1: (D)
As, the faster runner is thrice as fast as the slowest runner, the faster runner would have completed three rounds by the time the slowest runner completes one round.
Speed of the fastest runner = 3x
Speed of the slowest runner = x
Relative distance = 400 m
Relative speed = 3x - x = 2x
ATQ,
400/2x = 4
⇒ x = 50 m/min
Speed of fastest runner = 3 × 50 = 150 m/min
Time taken by the fastest runner to complete the race = 3600/150 = 24 min

Answer 2: (A)
Length = 2400 m
Speed of A = 36 x 5/18 = 10 m/s
Speed of B = 108 x 5/18 = 30 m/s
Case I: Same direction:
Time = Length/Relative Speed
$= \frac{2400}{30-10}$ = 120 seconds
Case II: Opposite directions
Time = Length/Relative Speed
$= \frac{2400}{30+10}$ = 60 seconds

Answer 3: (A)
To win, A needs to run a distance of = (800 – 240) = 560 m

	A		B
Speed	8	:	11

B covers distance in a race of 800 m = $\frac{560}{8} \times 11 =$ 770 m
Hence, B remains 30 m behind.
∴ A wins by 30 m

Answer 4: (D)


i.e. Q takes 10 sec to run 100 m.
Speed of B = $\frac{100}{10}$ = 10 m/s
∴ Time taken by Q to run 2000 m = $\frac{2000}{10}$ = 200 sec

Answer 5: (B)

A	:	B	:	C
400	:	320	:	300

In a 320 m race, B gives C a start of 20 m.
Hence, in a 400 m race, B gives C a start of = $\frac{20}{320} \times 400$ = 25 m
∴ B can give C a start of 25m.

Answer 6: (B)

A	:	B	:	C
800	:	755	:	786

786 m → 31 m
1 m → $\frac{31}{786}$
3930 m → $\frac{31}{786} \times 3130 = 155$ m
∴ C will beat B by 155 m in a race of 3930 m.

Answer 7: (A)

	A	:	B
Time →	27	:	63
Time →	3	:	7
Speed →	7	:	3

Difference = 4 units
7unit → 700m
1unit → 100m
4unit → 400m
∴ A beats B by 400m

Answer 8: (A)
Time taken by Sourav to cover 1200 m
$= \frac{1200 \times 3}{5}$ = 720 sec
Time taken by meenakshi to cover 1120 m
= 720 + 32 = 752 sec.
∴ Speed of Meenakshi = $\frac{1152}{752} = \frac{70}{47}$
$= 1\frac{23}{47}$ m/s

Answer 9: (C)
The winner will pass the other, one time in covering 1600 m.
Hence, the winner will pass the other 3 times in completing 5 km race.

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Answer 10: (D)
When A covers 100 meters, B covers only 90 meters.
Also, when B covers 150 meters, C covers 125 meters.
Assume, total distance = 500 m
Then, when A covers 500 m, B covers 450 m, and C covers 375 m.
That is when A covers 500 meters, C covers 375 meters and their speeds are in the ratio 20 : 15
Now,
4 units = 200 m
3 units = 150 m
So, A must give C a start of 50 meters.

Answer 11: (C)
Downstream speed of boat = (20 + 5) kmph = 25 kmph
Required time = 100/25 = 4 hrs

Answer 12: (D)
If a boat moves to a certain distance downstream in 't_1' hours & returns the same distance upstream in time 't_2' hours, then:

Speed of boat in still water = $y\left[\frac{t_2+t_1}{t_2-t_1}\right]$

Hence, Speed of swimmer in still water =

$3\times\left[\frac{10+5}{10-5}\right]=3\times3$ = 9 kmph

Answer 13: (D)
The speed of boat in still water = (45 - 3.5) km/hr = 41.5 km/hr
Therefore, speed of boat against the current = (41.5 - 3.5) = 38 km/hr

Answer 14: (D)
Downstream Speed = (12 + 6) km/hr = 18 km/hr
Upstream Speed = (12 – 6) km/hr = 6 km/hr
Let the distance between A and B be x km.
Then, x/18 + (x/2)/6 = 20
⇒ x/18 + x/12 = 20
⇒ x = 144 km

Answer 15: (A)
Let the speed of boat and speed of current be x kmph and y kmph respectively.
Now, x = 4y
ATQ,
x - y = 40/8 = 5 kmph
Therefore, x = 20/3 kmph and y = 5/3 kmph
Then, x + y = 20/3 + 5/3 = 25/3 kmph

Required time = $\frac{40}{\frac{25}{3}}=4\frac{4}{5}$ hours

Answer 16: (C)
Speed of boat in still water (x) = 50 km/hr
Speed of stream (y) = 10 km/hr
If a boat moves at 'x' km/hr speed and covers the same distance up and down in a stream of speed 'y' km/hr, then average speed of boat is calculated by,
∴ Average Speed =

$\frac{\text{Downstream Speed x Upstream Speed}}{\text{Speed in still water}}$

$=\frac{(x+y)(x-y)}{x}$ kmph

∴ Average Speed = $\frac{(50+10)(50-10)}{50}=\frac{60\times40}{50}$

= 48 kmph

Answer 17: (A)
Downstream speed = (x + y) km/hr
= 15 + 5 = 20 kmph
Distance = 180 km

Hence, time taken = $\frac{\text{Distance}}{\text{Speed}}$ = 180/20 = 9 hours

Answer 18: (C)
Downstream speed = 30 × 1 = 30 kmph
Upstream speed = 24/2 = 12 kmph
∴ Speed of boat = $\frac{1}{2}$ x [Downstream speed (S_d) + Upstream speed (S_u)]

$=\frac{1}{2}\times(30+12)$ = 21 kmph

Thus, the time required to reach the distance of 210 km = 210/21 = 10 hrs

Answer 19: (A)
If a boat moves to a certain distance downstream in 't_1' hours & returns the same distance upstream in time 't_2' hours, then:

Speed of Rahul in still water = $y\left[\frac{t_2+t_1}{t_2-t_1}\right]$

$=21\times\left[\frac{5+2}{5-2}\right]$ = 49 km/h

Answer 20: (B)
Speed of a boat in still water = 16 km/hr
Speed of running water = 4 km/hr
Required time = 5 hrs to travel upstream more than downstream
Therefore, we know that,
If a boat takes time 't' hours more going upstream than to move downstream for the same distance, then the distance is given by,

Distance = $\left[\frac{(x^2-y^2)}{2y}\times t\right]$ km

Hence, Distance = $\frac{16^2-4^2}{2\times4}\times5=\frac{240}{8}\times5$

= 150 km

Answer 21: (C)

Speed of boat in still water (x) = 30 km/hr

Speed of stream (y) = 6 km/hr

If a boat moves at 'x' km/hr speed and covers the same distance up and down in a stream of speed 'y' km/hr, then average speed of boat is calculated by,

∴ Average Speed =

$$\frac{\text{Downstream Speed x Upstream Speed}}{\text{Speed in still water}}$$

= $\frac{(x+y)(x-y)}{x}$ kmph

∴ Average Speed = $\frac{(30+6)(30-6)}{30}=\frac{36\times24}{30}$ = 28.8 kmph

Answer 22: (D)

If a boat moves to a certain distance downstream in 't_1' hours & returns the same distance upstream in time 't_2' hours, then

Speed of boat in still water = $y\left[\frac{t_2+t_1}{t_2-t_1}\right]$

Hence, Speed of swimmer in still water =

$7\times\left[\frac{25+15}{25-15}\right]=7\times\frac{40}{10}$ = 28 kmph

Answer 23: (A)

Let the speed of the current be x kmph.

According to the question,

$\therefore \frac{6}{6-x}=3$

$\Rightarrow$ 18 – 3x = 6

$\Rightarrow$ 3x = 18 – 6

$\Rightarrow$ x = 12/3 = 4 kmph

Answer 24: (C)

Here, x = 5, y = 3, t = 3

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

= $\frac{3\left(5^2-3^2\right)}{2\times5}=\frac{3\times16}{10}=4.8$ km

Answer 25: (B)

Let the rate of swimming in still water be x kmph

Rate downstream = (x + 3) kmph

Rate upstream = (x – 3) kmph

According to the question,

(x + 3) t = 2 (x – 3) × t

⇒ x + 3 = 2x – 6

⇒ x = 9 kmph

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Only for gharishkumar1998@gmail.com

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