

TIME SPEED AND DISTANCE

Speed = Distance

travelled in unit time

1 hr

1 min

1 sec

km/hr

60 km/hr

→ hr

21 km

1 hr

3 km

3 km/hr speed

10 sec

60 m

1 sec

6 m

6 m/sec

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$S = \frac{D}{T}$$

$$T = \frac{D}{S}$$

$$D = S \times T$$

Unit km/hr

$$\frac{1 \text{ km}}{1 \text{ hr}} = \frac{1000 \text{ m}}{60 \times 60 \text{ sec}} =$$

m/sec

$$\frac{5}{18} \text{ m/sec} = \frac{5}{18} \text{ m/sec}$$

$$x \frac{\text{km/hr}}{-} = x \times \frac{5}{18} \text{ m/sec}$$

$$\frac{5}{18} \text{ m/sec} = \frac{\text{km}}{\text{hr}}$$

$$\frac{\text{m/sec}}{-} = \frac{18}{5} \frac{\text{km/hr}}{-}$$

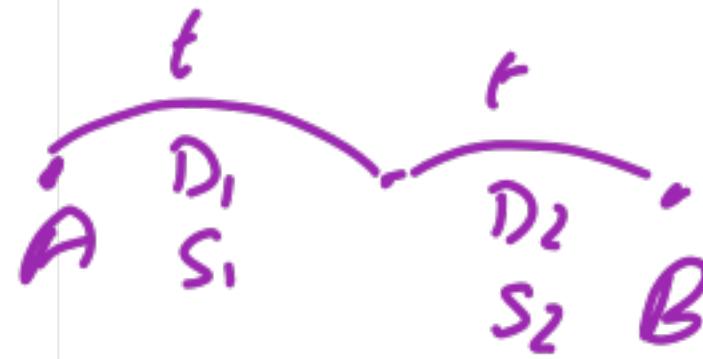
concept: 1

$$S = \frac{D}{t}$$

Time = t

$$t = \frac{D}{S}$$

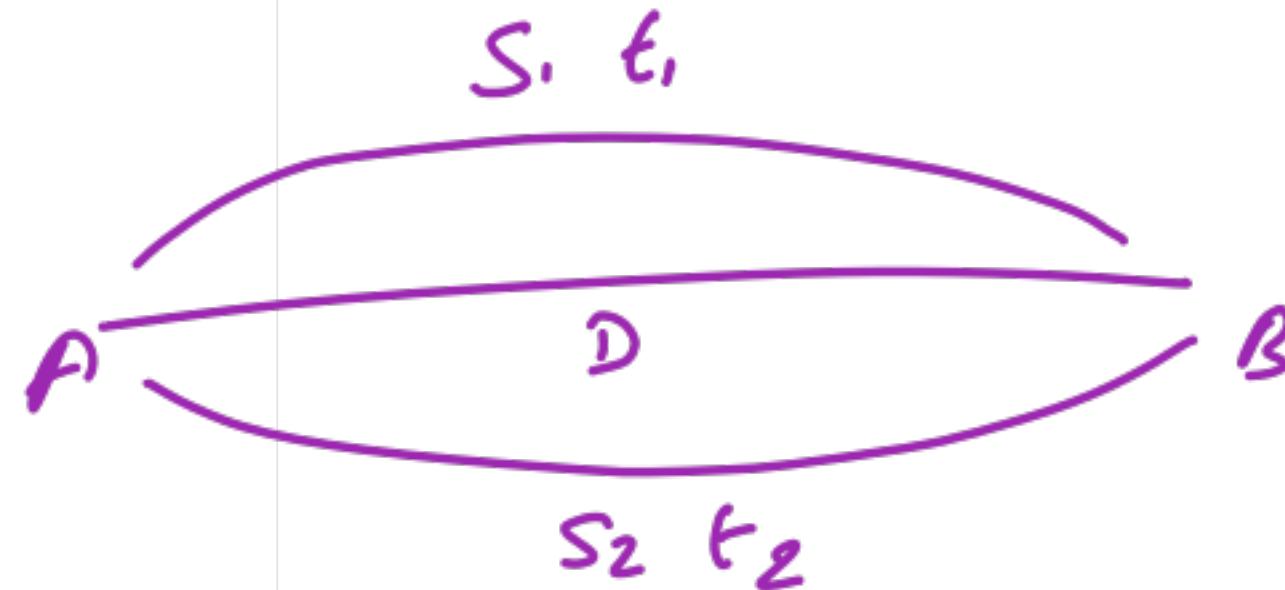
$$\frac{D_1}{D_2} = \frac{S_1 t}{S_2 t}$$



$$\frac{D_1}{D_2} = \frac{S_1}{S_2} \quad S \propto D$$

concept: 2

$$D = c$$



$$D = s_1 t_1$$

$$D = s_2 t_2$$

$$D = s_1 t_1 = s_2 t_2.$$

$$s_1 t_1 = s_2 t_2.$$

$$\frac{s_1}{s_2} = \frac{t_2}{t_1}$$

$$s \propto \frac{1}{t} -$$

$$1) S = \frac{D}{t}$$

$$2) 1 \text{ km/hr} = \frac{5}{18} \text{ m/sec}$$

$$\text{m/sec} = \frac{18}{5} \text{ km/hr}$$

$$3) D \propto S \quad \frac{D_1}{D_2} = \frac{S_1}{S_2} \quad S \propto D \quad \frac{S_1}{S_2} = \frac{D_1}{D_2}$$

$$4) S \propto \frac{1}{t} \quad \frac{S_1}{S_2} = \frac{t_2}{t_1} \quad \frac{1}{t_2} \quad \frac{1}{t_1}$$

A man travels from P to Q at the speed of 60 km/h and travels from Q to P at the speed of 90 km/h. What is the average speed of the man for the whole journey?

- 1. 75 km/h
- 2. 78 km/h
- 3. 70 km/h
- 4. 72 km/h ✓

$$\text{Average Speed} = \frac{2 \times s_1 \times s_2}{s_1 + s_2}$$
$$= \frac{2 \times 60 \times 90}{150} = 72 \text{ km/h}$$

A man goes to a place on car at speed of 160 km/h and comes back at lower speed. If the average speed is 64 km/h in total, then the return speed (in km/h) is:

- 1. 25
- 2. 80
- 3. 40 ✓
- 4. 60

$$64 = \frac{2 \times 160 \times x}{160+x}$$
$$\frac{64}{160+x} = \frac{1}{2}$$

$$\frac{160+x}{64} = 2$$

$$160+x = 128$$

$$x = 160 - 128$$

$$x = 32$$

A bus covers first 200 km of a journey in 4 hours and the next 600 km in 6 hours. What is the average speed of the bus for the whole journey?

- 1. 100 km/h
- 2. 90 km/h
- 3. 60 km/h
- 4. 80 km/h

Avg Speed = $\frac{200+600}{4+6} = \frac{800}{10} = 80 \text{ km/h}$

A travels 15 km with a speed of 30 km/h. He travels another 25 km with a speed of 10 km/h. What is his average speed for the entire journey?

✓ 1. $\frac{40}{3}$ km/h

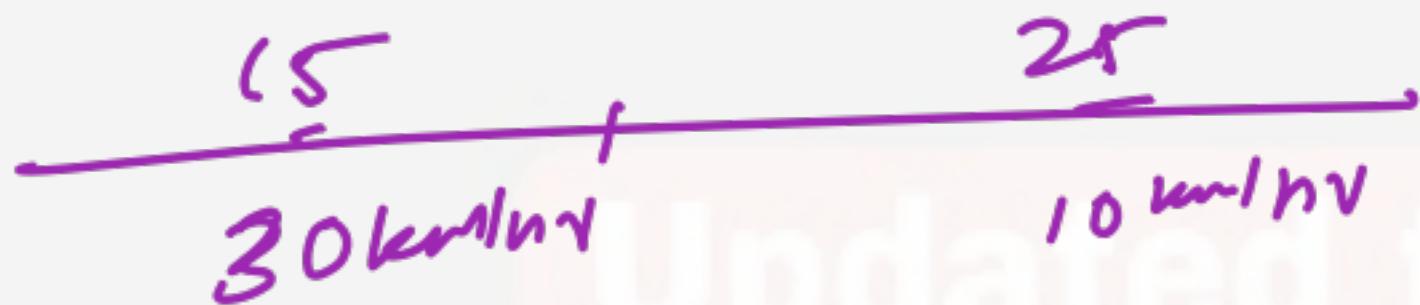
$$S = D/T$$

$$T = D/S$$

✗ 2. $\frac{80}{3}$ km/h

✗ 3. 20 km/h

✗ 4. 12 km/h



Avg speed = $\frac{15 + 25}{\frac{15}{30} + \frac{25}{10}}$

$$= \frac{40}{1.5 + 2.5} = \frac{40}{4} = \frac{40}{5}$$

A man goes from C to D at 40 km/h and he returns from D to C at x km/h. If the average speed of the man for the whole journey is 60 km/h, then what is the value of x?

1. 100

2. 120 ✓

3. 110

4. 80

$$60 = \frac{2 \times 40 \times x}{40 + x}$$

$$3 \times (40 + x) = 0x$$

$$120 + 3x = 0x$$

$$120 = x$$

$$\begin{aligned} & 120 - 3x \\ & x \end{aligned}$$

A person travels a certain distance at a speed of 18 km/h and returns to the starting point at 12 km/h. If he takes 2 hours 55 minutes for the whole journey, the distance one way is:

- 1. 21 km ✓
- 2. 25 km
- 3. 18 km
- 4. 24 km

Ans speed = $\frac{2 \times 18 \times 12}{30}$

2 hr 55 min

120 + 55 min

$\frac{175}{60}$ hr

$S \times T = D.$

$$= \frac{2 \times 18 \times 12}{30} \times \frac{\frac{175}{60}}{12} = 6 \times 7 = \frac{42}{2} = 21$$

A car travels for 6 hours at different speeds. For the first two hours at 60 m/s, for the next 2 hours at 50 m/s and for the remaining time at x m/s. If the average speed for the entire journey is $\frac{52}{6}$ m/s, what is the value of x ?

✓ 1. $46 \frac{1}{2}$ sec

✗ 2. $44 \frac{1}{2}$

✗ 3. 48

✗ 4. $45 \frac{1}{2}$

Avg speed =

$$\frac{D_1 + D_2 + D_3}{T_1 + T_2 + T_3}$$

$$D = S \times T$$

$$\frac{60 \times 2 + 50 \times 2 + x \times 2}{6}$$

$$\frac{312}{220} = \frac{92}{92}$$

$$2x = 92 \quad \text{M/S} \quad S_2 \times 6 = 120 + 100 + 2x$$

$$x = 92/2$$

$$312 = 220 + 2x$$

$$2x = 312 - 220$$

Speed of a man is 45 km/h. In how much time (in seconds) will he cover a distance of 225 metres?

- 1. 24
- 2. 16
- 3. 18
- 4. 22

$$65 \text{ km/hr} = \frac{65}{18} \times 5 \text{ m/sec}$$

$T = ?$ D
 $S = D/T$
 $T = D/S$

$$T = \frac{225}{25/2}$$
$$= \frac{225}{25} \times 2 = 18 \text{ sec}$$

The speed of a car is 36 km/h. How much time (in minutes) will a bus traveling at one-fifth of the speed of the car take to cover a distance of 900 m?

~~X~~ 1. $5\frac{1}{2}$ \cancel{D}

$$36 \text{ km/hr} = \frac{2}{36} \times 5\frac{1}{8} = 10 \text{ m/sec}$$

~~✓~~ 2. $7\frac{1}{2}$ $\cancel{\nearrow}$

$$S_{BW} = 10 \times \frac{1}{8} = 2 \text{ m/sec}$$

~~X~~ 3. $10\frac{1}{2}$

$$S = \frac{D}{T}$$

~~X~~ 4. $8\frac{1}{2}$

$$T = \frac{D}{S} = \frac{900}{10} = 90 \text{ sec}$$

$$\frac{450}{60} = 7\frac{3}{62} = 7\frac{1}{2} \text{ min}$$

A takes 10 minutes more than B in covering a certain distance. If their speeds are in the ratio of 3 : 4, then what is the time taken by B to cover the same distance?

- 1. 40 minutes
- 2. 30 minutes
- 3. 50 minutes
- 4. 20 minutes

$$\frac{s_1}{s_2} = \frac{3}{4}$$
$$\frac{T_A}{T_B} = \frac{4}{3} \rightarrow 1 - 10 \text{ min}$$

If a student walks with speed 30% more than the usual speed, he reaches 15min earlier to his destination. How much time (in minutes) does he take to reach his destination normally?

1. 45

2. 65

3. 50

4. 39

$$\frac{100\%}{130\%} = \frac{10}{13} \cdot \frac{13}{10} \quad | \quad 3 - 15 \text{ min}$$

$$| = 5 \text{ min}$$

$$13 : 5 \times 13$$

$$= 65 \text{ min}$$

sv $\cancel{15}$

A sport car going at an average speed of 108 km/h takes 15 minutes to complete a lap on a racing track. How much speed (in km/h) should be increased to complete the lap in 9 minutes?

- 1. 180
- 2. 108
- 3. 72
- 4. 100

$$\frac{T_1}{T_2} = \frac{s_2}{s_1}$$

$$\frac{15}{9} = \frac{36}{s_1}$$

$$s_1 = 36 \text{ km/h}$$

An athlete crosses a distance of 900 m in 10 minutes. What is his speed in km per hour ?

- (a) 5.4 km/h ✓
- (b) 3.6 km/h
- (c) 4.8 km/h
- (d) 6.9 km/h

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Given:

- Distance = 900 m
- Time = 10 min

Conversion factors:

- 10 min \times $\frac{1 \text{ hr}}{60 \text{ min}}$ = 1/6 hr
- 900 m \times $\frac{1 \text{ km}}{1000 \text{ m}}$ = 9/10 km

Calculation:

$$\text{Speed} = \frac{9/10 \text{ km}}{1/6 \text{ hr}} = 5.4 \text{ km/hr}$$

An athlete runs an 800 m race in 96 seconds. Find his speed in km/hr ?

एक एथलीट 96 सेकंड में 800 मीटर की दौड़ चलाता है। किमी / घंटा में उसकी गति ज्ञात कीजिये?

[CGL Mains 2019]

- (a) 40 km/hr
- (b) 20 km/hr
- (c) 25 km/hr
- (d) 30 km/hr

$$D \quad T \\ 800 \text{ m} \quad 96 \text{ sec.}$$

$$S = \frac{D}{T}$$

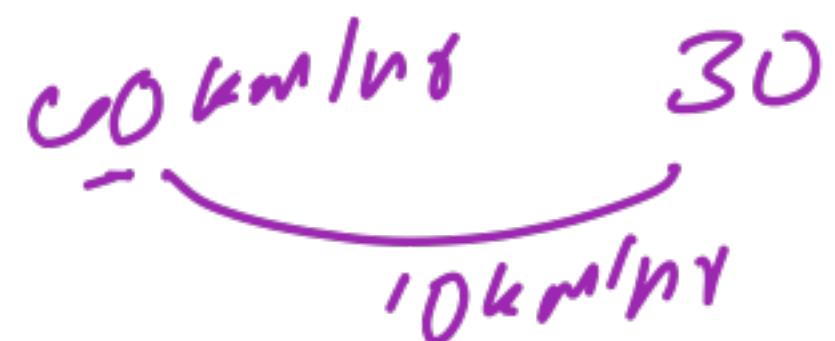
$$S = \frac{800 \text{ m/s}}{96} \\ \frac{800}{96} \times \frac{10^3}{3600} \text{ km/hr} \\ \frac{10}{12} = 30 \text{ km/hr}$$

m/s - $18\frac{2}{5}$ km/hr

A runner is running at a speed of 40 km/h. If he runs at a speed of 30 km/h, then what will be the decrease in the percentage of his speed ? —

एक धावक 40 किमी / घंटा की गति से दौड़ रहा है। यदि वह 30 किमी / घंटा की गति से चलता है, तो उसकी गति के प्रतिशत में क्या कमी होगी? [CHSL 2019]

- (a) 15%
- (b) 20%
- (c) 25% 
- (d) 30%



$$\therefore = \frac{10}{40} \times 100 = 25\%$$

The speed of two trains are in the ratio 6 : 7. If the second train runs 364 km in 4 hours, then the speed of first train is

2 ट्रेन के चाल का अनुपात 6 : 7 है। यदि दूसरी ट्रेन 364 km 4 घंटे मे जाती है। तो पहली ट्रेन की चाल क्या होगी ?

- (a) 60 km/hr
- (b) 72 km/hr
- (c) 78 km/hr ✓
- (d) 84 km/hr

$$\frac{s_1}{s_2} = \frac{6}{7} = \frac{9}{7}$$

$$6 \rightarrow 13 \text{ km/h}$$

D [SSC CPO]

364 km 4 hr

$$S = \frac{D}{T}$$
$$S_2 = \frac{364}{4} \text{ km/h}$$
$$= 91 \text{ km/h}$$

A person covers a certain distance with a certain speed. If he reduced his speed by $16\frac{2}{3}\%$ then he will be 3.5 min late. Find the time taken by him to cover this distance now?

- (a) 21 min
- (b) 28 min
- (c) 14 min
- (d) 35 min

$$\begin{array}{l} \text{Speed} : = \frac{50}{3} \text{ min} \\ \text{Time} : = \frac{80}{2} = \frac{1}{6} \text{ min} \\ \frac{5}{6} \text{ min} = 3.5 \text{ min} \\ 6 = 3.5 \times 6 \end{array}$$

$$S \propto \frac{1}{t} \quad \frac{S_1}{S_2} = \frac{t_2}{t_1} = \frac{1}{6}$$

$$= 21.0$$

$$= 21 \text{ min}$$

A person covers a certain distance with a certain speed if he reduces his speed by 12 km/hr. Then he will 7.2 min late. If his initial speed is 150 km/hr. Find the distance covered by him.

- (a) 180 km
- (b) 192 km
- (c) 206 km
- (d) 207 km

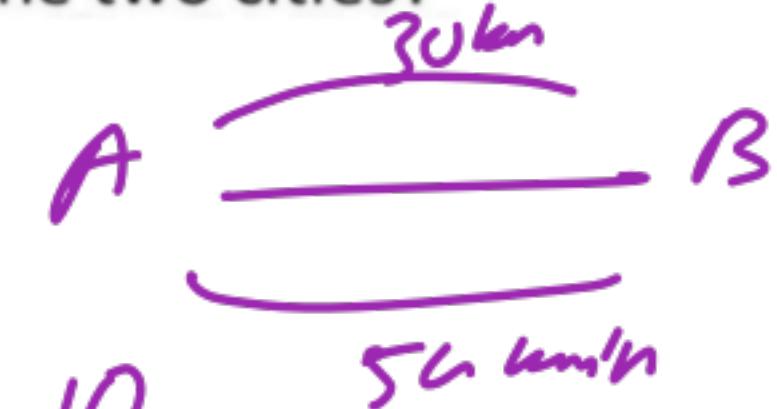
S	T
$\frac{150}{138}$	$\frac{138}{150} \frac{23}{25} \frac{25}{25} \frac{25}{25} = 7.2 \text{ min}$
$D = S \times T$	$1 = 3.6 \text{ min}$
$= 138 \times 3\frac{1}{2}$	$25 = 75 + 15$
?	$= 90 \text{ min}$
	$= \frac{90}{60}$
	$= \frac{3}{2} \text{ hr}$

Ravi travels by bus from city A to city B at an average speed of 30 km/hr. Raju travels by taxi from city A to city B at an average speed of 54 km/hr and takes 10 hours lesser than time taken by Ravi. What is the distance (in km) between the two cities?

- (a) 616
- (b) 672
- (c) 560
- (d) 675

$$\begin{array}{ccc}
 & S & T \\
 \frac{54}{-30} & \frac{30}{50} & \frac{5}{9} \\
 \end{array}$$

$$\begin{aligned}
 \frac{5}{9} t &= 10 \\
 t &= \frac{10 \times 9}{5} \\
 &= 18
 \end{aligned}$$



$$\begin{aligned}
 t &= 5/2 \\
 d &= 5/2 \times 9 \text{ hr}
 \end{aligned}$$

$$D = 30 \times 5/2 \times 9$$

$\frac{15}{2}$
 $2 \sum 4(5)$

A train, 700 m long crosses a pole in 35 seconds. How much time does it take to cross a platform of length 740 m?

1. 1 min 24 sec

2. 1 min 30 sec

3. 1 min 12 sec

4. 1 min 20 sec

$$\frac{700 \text{ m}}{2} \rightarrow \frac{35}{2} \text{ s}$$
$$\frac{740}{2} \text{ s}$$

$$37 \text{ s}$$
$$\frac{37}{72} \text{ s}$$

2) $S = \frac{D}{T} = \frac{200}{35} = 20 \text{ m/s}$

$$60 \quad 12$$

1 min 12 sec

$$T = \frac{D}{S} = \frac{700 + 700}{20}$$

$$= \frac{1400}{20} = 72 \text{ sec} = 60 + 12$$

1 min 12 sec.

A train with 72 km/h speed crosses a stationary pole in 35 seconds. How much time (in minutes) does it take to cross a 1.1 km long bridge?

1. 2.5

2. 3

3. 2

4. 1.5

$$D = S \cdot T$$
$$l = \frac{72}{18} \times 5 \times 35$$
$$l = \frac{20}{1} \times 35 = 700 \text{ m}$$
$$T = \frac{D}{S} = \frac{1800}{720} = 90 \text{ sec}$$

$$= 60 + 30$$
$$= 1 \text{ min } 0.5 \text{ min}$$
$$= 1.5 \text{ min}$$

A train moves at the speed of 80 km/h and crosses a platform in 0.75 minutes. If the length of the train is equal to the length of the platform, then what is the length of the platform? , 60

1. 400 m

2. 480 m

3. 450 m

4. 500 m ✓

$$\begin{aligned}l_1 + l_2 &= s \cdot t \\l_1 = l_2 &= 80 \times \frac{5}{18} \times 0.75 \times 60 \\&= 8 \times \frac{5}{18} \times 25 \times 6\end{aligned}$$

$$2l = 8 \times 25 = 1000 \text{ m}$$

$$l = \frac{1000}{2} = 500 \text{ m}$$

A train crosses two platforms of length 1000 m and 600 m in 80 seconds and 60 seconds respectively. What is the length of the train?

- 1. 720 m
- 2. 600 m
- 3. 540 m
- 4. 400 m

$$1000+l = 1600$$
$$l = 600 \text{ m}$$

$$600 \text{ m} ($$

$1000 \text{ m} + l$	\rightarrow	80 sec
$600 \text{ m} + l$	\rightarrow	60 sec

$$) 20 \text{ sec.}$$
$$20 \text{ sec.} \rightarrow 20 \text{ see.}$$
$$20 \text{ m} \leftarrow 1 \text{ sec}$$

$$\text{Speed} = 20 \text{ m/s}$$

$$\frac{1 \text{ sec}}{80} \quad \frac{20 \text{ m}}{20 \times 80 = 800}$$

A train starts from A at 6 AM and reaches B at 11 AM on the same day. Another train starts from B at 8 AM and reaches A at 3 PM on the same day. At what time the two trains will have crossed each other?

- 1. 9:45 AM
- 2. 8:45 AM
- 3. 10:30 AM
- 4. 7:45 AM

S S T D
? P 5
5 Q 7
35

6 10 1 21
7 35

$\frac{2}{12} \text{ hr } 1\frac{3}{4}$
 $1 \text{ hr } 3\frac{15}{60}$
 $1 \text{ hr } 45 \text{ min.}$

Two trains each having a length of 160 meters moving in opposite direction crossed each other in 9 seconds. If one train crossed a 200-metre-long platform in 18 seconds, then the ratio of their speeds is:

~~X~~ 1. $2 : 3$

✓ 2. $9 : 7$

~~X~~ 3. $5 : 8$

~~X~~ 4. $3 : 4$

$$l_1 + l_2 = (s_1 + s_2) \times 9$$

$$s_1 + s_2 = \frac{320}{9}$$

$$s_2 = \frac{320}{9} - s_1$$

$$s_1 : s_2 = \frac{360}{18} : \frac{280}{18} = \frac{320}{9} - \frac{360}{18}$$

$$= 9 : 7$$

$$s_2 = \frac{640}{18} - \frac{360}{18} = \frac{280}{18}$$

$$\begin{aligned} 160 + 200 &= s \times 18 \\ \therefore \frac{360}{18} &= s \end{aligned}$$

Two trains are moving in opposite directions with speeds of 35 m/s and 45 m/s respectively. From the time they are 12 km apart, how much time would they take to cross each other?

✓ 1. 2 minutes 30 seconds

✗ 2. 2 minutes

✗ 3. 3 minutes

✗ 4. 3 minutes 30 seconds

$$t = \frac{D}{S} = \frac{12000}{80} = 150 \text{ sec}$$

2 min 30 sec

A 600 metres long train can cross a 1200 metres long platform in 36 seconds. In how much time (in seconds) can it cross a bridge 2200 metres long?

✓ 1. 56

✗ 2. 52

✗ 3. 48

✗ 4. 44

$$600 + 1200 = S \times 36$$

$$S = \frac{1800}{36} \text{ m's}$$

$$600 + 2200 = \frac{1800}{36} \times T$$

$$56 = \frac{2800}{1800} = T$$

A train X travelling at 72 km/h crosses another train Y travelling at 63 km/h (in opposite direction) in 18 seconds. If the length of train Y is two-third the length of X, then length of train X is:

- 1. 300 m
- 2. 420 m
- 3. 405 m
- 4. 270 m

$$y = \frac{2}{3} x$$

$$\frac{x}{y} = \frac{3}{2}$$

$$l_1 + l_2 = (72 + 63) \times \frac{5}{18} \times 18$$

$$l_1 + l_2 = 135 \times 5$$

$$x + y = 135 \times 5$$

$$\frac{3}{2}$$

$$y = 135 \times \frac{2}{5}$$

$$= 135$$

$$3 \Rightarrow 135 \times \sqrt{3}$$

A train's average speed is 72 km/h but is reduced to 60 km/h due to stoppages. For how much time does the train stop in an hour?

1. 10 minutes

2. 12 minutes

3. 15 minutes

4. 8 minutes

s

$\frac{72}{60}$

$\frac{60}{72}$

τ

$\frac{60 \times 5}{72} = \frac{5}{6}$

$\frac{5}{6} \times 60 = 50$

A bus covers a distance of 1.8 km in 3 minutes. How much faster (in m/s) is it than a young athlete who runs 200 m in 25 s?

1. 1.5

2. 1

3. 2 ✓

4. 2.5

$$S_B = \frac{D}{T} = \frac{1.8 \times 1000}{3 \times 60} = \frac{1800}{180} = 10 \text{ m/s}$$

$$S_A = \frac{200}{25} = 8 \text{ m/s}$$

2 m/s

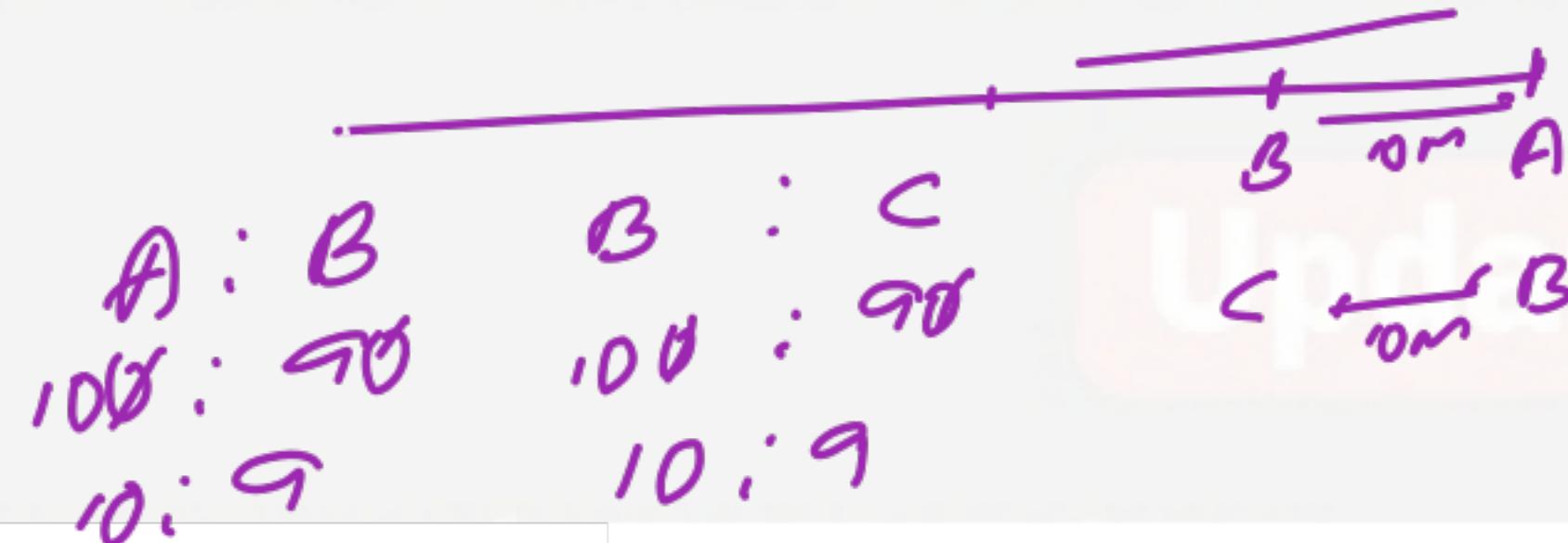
In a 100 m race, A beats B by 10 m and B beats C by 10 m. By what distance does A beat C (in m)?

✓ 1. 19

✗ 2. 18

✗ 3. 20

✗ 4. 21



$$A:B = 10:9$$

$$B:C = 10:9$$

$$A:B:C = 100:90:80$$

19 m

A motor car moves at a speed of 72 km/h and 54 km/h after and before repairing respectively. It covers X distance in 6 hours after repairing. How much time (in hours) will it take to cover $5X$ distance before repairing?

✓ 1. 40 ✓

✗ 2. 45

✗ 3. 30

✗ 4. 36

Before $S = 54 \text{ km/hr}$ ✓

After $S = 72 \text{ km/hr}$ $T = \frac{D}{S}$

$$X = S \cdot T$$

$$D = 5X = 72 \times 6 \times 5$$

$$T = \frac{72 \times 6 \times 5}{80} = 40 \text{ hr}$$

A man on a tour travels first 360 km by train at 72 km/h, the next 160 km on a motor cycle at 12.80 km/h, and the last 200 km by on a bicycle at 16 km/h. Ignoring the buffer times between the different modes of travel, what is the average speed (in m/s) for his tour?

1. 6.67 ✓

2. 7.33

3. 4.33

4. 5.67

$$= \frac{720}{30} \times 5\frac{1}{18} \text{ m/s}$$

30

$$= \frac{20}{3} 6.666 \\ 6.67 \text{ m/s}$$

AVG SPEED:

$$\text{km/h} = 5\frac{1}{18}$$

$$\begin{aligned} \text{AVG SPEED: } & \frac{D_1 + D_2 + D_3}{T_1 + T_2 + T_3} \\ & = \frac{360 + 160 + 200}{\frac{360}{72} + \frac{160}{12.8} + \frac{200}{16}} \\ & = \frac{720}{5 + 12.5 + 12.5} \end{aligned}$$

$$T: D' \text{ s. } 100$$

$$\begin{array}{r} 400 \\ 1600 \\ \hline 128 \end{array} 12.5$$

32

$$\begin{array}{r} 8 \\ 50 \\ 200 \\ \hline 16 \end{array} 12.5$$

16

The speed of a train is 3 times that of a car and 1.5 times that of a steamer. A person travelled x km by steamer, $3.75x$ km by train and $\frac{x}{2}$ km by car. If the speed of the car is 40 km/h and total time taken by him is $4\frac{1}{2}$ hours, then the total distance travelled by him in three modes is:

1. 450 km

2. 520 km

3. 480 km

4. 420 km

	T	C	S
Speed:	3.	1	2
D.	$3.75x$	$\frac{x}{2}$	x
		40	80

	T	C	S
Speed:	120	40	80
D.	$3.75x$	$\frac{x}{2}$	x
		40	80

$$\text{Total Time: } \text{Time (Train)} + \text{Time (Car)} + \text{Time (Steamer)}$$

$$3.75 \frac{x}{120} + \frac{2}{2 \times 40} + \frac{x}{80} = \frac{7.5x + 3x + 3x}{240}$$

$$13.5x = \frac{9}{2} \times 240$$

$$x = \frac{120}{2 \times 13.5}$$

$$x = \frac{120}{15} \times 10^{1.5} = 80$$

$$\frac{3.75x}{300} = \frac{x}{2} \times 40 = 80$$

$$120 \text{ km}$$