

• Practice:

1. The distance between two cities A and B is 495 km. A train starts from A at 7 : 30 a.m. and travels towards B at 60 km/hr. Another train starts from B at 9 a.m. and travels towards A at 75 km/hr. At what time do they meet?
2. A train of length 300 metres crosses a tree in 20 seconds and crosses another train of the same length travelling in opposite direction in 25 seconds. What is the speed of the second train?
3. Two trains of length 120 meters and 140 meters are moving in the same direction on parallel tracks at speed of 82 km/hr and 64 km/hr. In what time the first train will cross the second train?
4. A train of length 200 meters takes 12 seconds to cross a man who is running at a speed of 10 km/hr in opposite direction of the train. What is the speed of the train?
5. A train crosses two men who are running in the direction of train at 4 km/hr and 8 km/hr in 18 and 20 seconds respectively. Find the length of train.



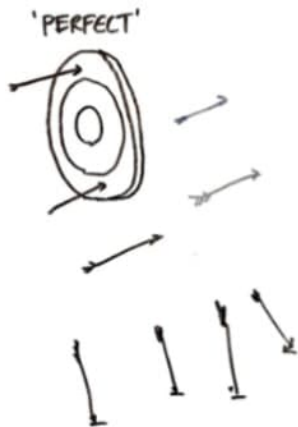
PRACTICE

• Practice:

6. A man rows to a place 48 km distant and come back in 14 hours. He finds that he can row 4 km with the stream in the same time as 3 km against the stream. The rate of the stream is?
7. A man can row a boat at a speed of 20 km/hr in still water. If the speed of the stream is 5 km/hr, in what time he can row a distance of 75 km downstream?
8. A boat covers 800 meters in 600 seconds against the stream and returns downstream in 5 minutes. What is the speed of the boat in still water?
9. A man rows downstream at 20 km/hr and rows upstream at 15 km/hr. At what speed he can row in still water?
10. A man swims 12 km downstream and 10 km upstream. If he takes 2 hours each time, what is the speed of the stream?

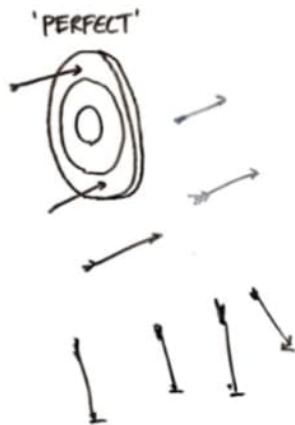


PRACTICE



• Practice:

1. The speed of a boat in still water is 15 km/hr and the rate of current is 3 km/hr. The distance travelled downstream in 12 minutes is?
2. A boat takes 90 minutes less to travel 36 miles downstream than to travel the same distance upstream. If the speed of the boat in still water is 10 mph, the speed of the stream is?
3. A boat covers a certain distance downstream in 1 hour, while it comes back in 1.5 hours. If the speed of the stream be 3 kmph, what is the speed of the boat in still water?
4. A boatman goes 2 km against the current of the stream in 1 hour and goes 1 km along the current in 10 minutes. How long will it take to go 5 km in stationary water?
5. Speed of a boat in standing water is 9 kmph and the speed of the stream is 1.5 kmph. A man rows to a place at a distance of 105 km and comes back to the starting point. The total time taken by him is?

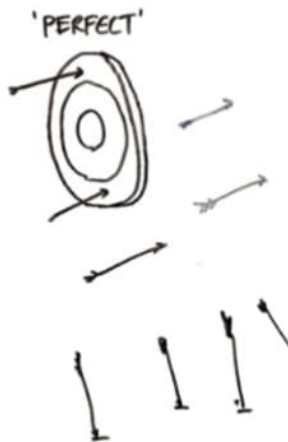


• Practice:

6. Two stations P and Q are 160 km apart on a straight track. A train starts running from station P at 8 a.m. at a speed of 30 km/hr towards station Q. Another train starts from station Q at 9 a.m. at a speed of 35 km/hr towards station P. At what time they will meet?
7. Two trains are moving towards each other with speeds 40 km/hr and 45 km/hr from different stations P and Q. When they meet the second train from station Q has covered 20 km more distance than the first train which starts from station P. What is the distance between the two stations?
8. A train of length 200 meters is moving at a speed of 80 km/hr. In what time it will cross a man who is running at 10 km/hr in opposite direction of the train?
9. A man sitting in a train which is running at a speed of 100 km/hr saw a goods train which is running in opposite direction towards him. The goods train crosses the man in 8 seconds. If the length of goods train is 300 meters, find its speed.
10. A train crosses a pole and a bridge of length 280 meters in 6 seconds and 20 seconds respectively. At what speed the train is running?



PRACTICE



Time, Speed & Distance Problems on Trains

1) Ans: Distance = 495 Km

Train A: Starts at 7:30 am, Speed = 60 km/h

Train B: Starts at 9:00 am, Speed = 75 km/h

From 7:30 to 9:00 → Train A travels:

$$\text{Distance} = 60 \times 1.5 = 90 \text{ km}$$

$$\text{Remaining distance} = 495 - 90 = 405 \text{ km}$$

$$\text{Relative Speed} = 60 + 75 = 135 \text{ km/h}$$

$$\text{Time to meet} = \frac{405}{135} = 3 \text{ hrs}$$

$$\therefore \text{Meeting Time} = 9 + 3 = 12:00 \text{ noon}$$

2) Ans: Train Crossed a level in 20s →

$$\text{Speed} = \frac{300}{20} = 15 \text{ m/s}$$

Two trains of same length (300m each)
Cross each other in 25s

Total distance = 600m

Let Second train's speed = x m/s

$$\text{Relative Speed} = 15 + x \text{ m/s}$$

$$600 = (15 + x) \times 25 \Rightarrow 15 + x = 24 \Rightarrow x = 9 \text{ m/s}$$

$$\Rightarrow 9 \times 18/5 = 32.4 \text{ km/h}$$

3) Ans: - Train length = 120m and 140m

$$\text{Speed} = 82 - 64 = 18 \text{ km/h} = 18 \times 5/18 = 5 \text{ m/s}$$

$$\text{Total length} = 260 \text{ m}$$

$$\text{Time} = \frac{260}{5} = 52 \text{ seconds}$$

4) Ans: - Length = 200m, Time = 12s

$$\text{Relative Speed} = \frac{260}{12} = 16.67 \text{ m/s}$$

$$\text{Man's Speed} = 10 \text{ km/h} = \frac{25}{9} \text{ m/s}$$

$$\begin{aligned} \text{Train's Speed} &= 16.67 + \frac{25}{9} = 16.67 + 2.77 \\ &= 19.45 \text{ m/s} \\ &= 19.45 \times 18/5 \\ &= 70 \text{ km/h} \end{aligned}$$

5) Ans: - Let train length = x m

$$\text{Speed} = \frac{x}{18} = \frac{x}{20} \quad (\text{for } 4 \text{ km/h \& } 8 \text{ km/h})$$

Relative Speeds:

$$\text{For } 18 \text{ s: } \frac{x}{18} = \text{Train Speed} - \frac{4 \times 5}{18} = T - 1.11 \quad (1)$$

$$\text{For } 20 \text{ s: } \frac{x}{20} = T - \frac{8 \times 5}{18} = T - 2.22 \quad (2)$$

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$$\frac{x}{18} - \frac{x}{20} = 1.11 \Rightarrow x \left(\frac{1}{18} - \frac{1}{20} \right) = 1.11$$

$$\Rightarrow \frac{x \times 2}{180} = 1.11 \Rightarrow x = \frac{1.11 \times 180}{2}$$

$$x = 99.9 \approx 100 \text{ m/s}$$

6 Ans:- Distance = 160km

Train P: 30km/h at 8:00am

Train Q: 35km/h at 9:00am

From 8:00 to 9:00 \rightarrow Train P covers 30km

Remaining distance = 130km

Relative speed = 30 + 35 = 65km/h

$$\text{Time} = \frac{130}{65} = 2 \text{ hrs}$$

$$\therefore \text{M.T} = 9:00 \text{ am} + 2 \text{ hrs} = 11:00 \text{ am}$$

7 Ans:- Let distance = dkm

Let time = t hours when they meet

Train P covers = 40t, Train Q = 45t

$$\text{Given: } 45t = 40t + 20$$

$$\Rightarrow 5t = 20 \Rightarrow t = 4$$

$$\therefore \text{Distance} = 40 \times 4 = 160, 45 \times 4 = 180$$

$$\therefore \text{Total} = 340 \text{ km}$$

$$\begin{aligned} 8 \text{ Ans: Relative Speed} &= 80 + 10 = 90 \text{ km/h} \\ &= \frac{25}{1} \text{ m/s} \end{aligned}$$

$$\text{Time} = \frac{200}{25} = 8 \text{ seconds}$$

$$9 \text{ Ans: Relative Speed} = \frac{300}{8} = 37.5 \text{ m/s}$$

$$\text{Man's speed} = 100 \text{ km/h} = 27.78 \text{ m/s}$$

$$\begin{aligned} \text{Goods train speed} &= 37.5 - 27.78 \\ &= 9.72 \text{ m/s} \end{aligned}$$

$$\text{In km/h: } [9.72 \times 18/5 = 70 \text{ km/h}]$$

$$\text{Ans: } \text{Pole crossed in } 6 \text{ s} \rightarrow \text{Train length} = \text{Speed} \times \text{time}$$

$$\text{Let speed} = x \text{ m/s}$$

$$\text{So, } x \times 6 = \text{length} \Rightarrow \text{length} = 6x$$

$$\text{Bridge length} = 280 \text{ m}$$

$$\Rightarrow 6x = \text{train length}$$

$$\Rightarrow 20x = \text{train} + \text{bridge} = 6x + 280$$

$$\Rightarrow 14x = 280 \Rightarrow [x = 20 \text{ m/s}]$$

$$\text{Convert to km/h: } 20 \times 18/5 = 72 \text{ km/h}$$

Boats & Stream

$$\text{Ans: } - \text{Distance travelled downstream in } 12 \text{ min}$$

$$\text{Speed of boat in still water} = 15 \text{ km/h}$$

$$\text{Rate of current} = 3 \text{ km/h}$$

$$\text{Downstream speed} = 15 + 3 = 18 \text{ km/h}$$

$$\text{Time} = 12 \text{ min} = 12/60 = 0.2 \text{ hr}$$

$$\text{Distance} = \text{Speed} \times \text{Time} \\ = 18 \times 0.2 = 3.6 \text{ km}$$

QAns: Stream Speed if boat takes 90 mins less downstream (36 min)

- Speed of boat in still water = 10 mph
- Let Stream Speed be x mph
- Downstream Speed = $10 + x$
- Upstream Speed = $10 - x$
- Difference in time = 90 min = 1.5 hr

$$\frac{36}{10-x} - \frac{36}{10+x} = 1.5$$

$$\Rightarrow 36 \left(\frac{1}{10-x} - \frac{1}{10+x} \right) = 1.5$$

$$36 \left(\frac{(10+x) - (10-x)}{(10-x)(10+x)} \right) = 1.5$$

$$\frac{36(10+x-10+x)}{(10^2 - x^2)} = 1.5$$

$$\frac{36(2x)}{100 - x^2} = 1.5$$

$$\textcircled{1} \begin{array}{r} 36x \\ \times 2 \\ \hline 72 \end{array}$$

$$\Rightarrow \frac{72x}{100 - x^2} = 1.5$$

$$72x = 1.5(100 - x^2)$$

$$72x = 150 - 1.5x^2$$

$$72x + 1.5x^2 - 150 = 0$$

$$1.5x + 72x - 150 = 0$$

$$\Rightarrow x = 1.25 \text{ mph}$$

3Ans:- Time downstream = 1 hr, Upstream = 1.5 hr

- Stream Speed = 3 kmph
- Let Boat Speed = x kmph
- Distance is same both ways

$$\frac{D}{x+3} = 1, \frac{D}{x-3} = 1.5 \Rightarrow \frac{1}{x+3} = \frac{1.5}{x-3}$$

$$\Rightarrow \frac{1}{x+3} = \frac{3}{2(x-3)}$$

$$\Rightarrow 2(x-3) = 3(x+3)$$

$$\Rightarrow 2x - 6 = 3x + 9$$

$$[x = -15] \text{ (not possible)}$$

4Ans:- Time for 5 km in still water

- Against Current: 2 km in 1 hr \rightarrow Speed = 2 km/hr

- With Current: 1 km in 10 mins = $\frac{1}{6}$ hr \rightarrow Speed = 6 km/hr

Let Still water speed = x , Current = y

$$x - y = 2, x + y = 6 \Rightarrow x = 4 \text{ km/hr}$$

Now, time = Distance / Speed = $5/4 = 1.25$ hr

5Ans:- Still water Speed = 4 kmph
 Stream speed = 1.5 kmph

Downstream = $9 + 1.5 = 10.5 \text{ km/hr}$
 upstream = $9 - 1.5 = 7.5$

Time to go: $105 / 10.5 = 10 \text{ hr}$

Time to return: $105 / 7.5 = 14 \text{ hr}$

Total time = 24 hr

Ans: 48 km up & down in 14 hr

• With Stream: 4 km in same time as 3 km against

• Let downstream speed = x , upstream speed = y

• Time = $4/x = 3/y$
 $\Rightarrow 4y = 3x \Rightarrow y =$

• Total time = $48/x + 48/y = 14$
 Substitute y :

$$\frac{48}{x} + \frac{48}{3x/4} = 14$$

$$\Rightarrow \frac{48}{x} + \frac{64}{x} = 14$$

$$\Rightarrow \frac{112}{x} = 14 \Rightarrow x = 8$$

• Still in water = $(8 + 6)/2 = 7 \text{ kmph}$
 Stream speed = $(8 - 6)/2 = 1 \text{ kmph}$

Ans: - Time to go 75 km downstream

Boat speed = 20 kmph , Stream =

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COMPASS

Date: _____

→ Downstream = 25 kmph

→ Time = $75/25 = 3$ hrs //

8Ans: Boat covered 800m against in 600 Sec i.e.
upstream in 5 mins

• 600 Sec = 10 min

→ Speed against = $0.8 \text{ km} / (600/3600)$

= 4.8 kmph

• Downstream: $0.8 \text{ km in } 5 \text{ min} = 0.8 / (5/60)$
 = 9.6 kmph //

→ Speed in still water = $(4.8 + 9.6) / 2 = 7.2$

①

9.6

4.8

14.4 9Ans: - Speed in still water

Downstream = 20 kmph

upstream = 15 kmph

→ Still water = $(20 + 15) / 2 = 17.5 \text{ kmph}$ //

10Ans: Let Still water speed = x , Stream = y

$$\frac{12}{x+y} = 2 \Rightarrow x+y = 6 \left(\frac{10}{x-y} \right) = 2 \Rightarrow x-y = 5$$

Solving: $x+y = 6$

$x-y = 5$

$2x = 11 \Rightarrow x = 5.5$

$\Rightarrow y = 0.5$ (Stream speed)