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5 Speed, Time and Distance

The speed of a body is defined as the distance covered by it in unit time.

$$\text{Speed} = \frac{\text{distance}}{\text{time}}, \quad \text{distance} = \text{speed} \times \text{time}, \quad \text{time} = \frac{\text{distance}}{\text{speed}}$$

Usually, when the distance is measured in kilometres (km), the unit of time is the hour (h) and when the distance is measured in metres (m), the unit of time is the second (s).

Examples (i) If a car covers 40 km in 30 min, it would cover 80 km in 1 h. So, its speed is 80 km/h.

(ii) If a swimmer covers a distance of 200 m in 2 min, his speed is 200 m ÷ 120 s = 1.7 m/s (nearly).

Table 5.1 Corresponding units of distance, time and speed

Distance	Time	Speed
kilometres (km)	hours (h)	kilometres per hour (km/h)
metres (m)	minutes (min)	metres per minute (m/min)
metres (m)	seconds (s)	metres per second (m/s)
centimetres (cm)	seconds (s)	centimetres per second (cm/s)

Conversion of units

(i) Let us convert km/h into m/s and cm/s.

$$1 \text{ km/h} = \frac{1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{1000}{3600} \text{ m/s} = \frac{5}{18} \text{ m/s} = \frac{5}{18} \times 100 \text{ cm/s} = \frac{250}{9} \text{ cm/s}.$$

$$1 \text{ km/h} = \frac{5}{18} \text{ m/s} = \frac{250}{9} \text{ cm/s}$$

(ii) Let us convert m/s into km/h.

$\frac{5}{18}$ m/s = 1 km/h.

$$\therefore \quad 1 \text{ m/s} = \frac{18}{5} \text{ km/h}$$

(iii) Let us convert cm/s into km/h.

$\frac{250}{9}$ cm/s = 1 km/h. $\quad \therefore \quad 1$ cm/s $= \frac{9}{250}$ km/h.

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EXAMPLE **A man walks 100 m in 3 min.**

(i) Find his speed in km/h.

(ii) What distance would he cover in 2 h 15 min?

(iii) How long would he take to cover 3.5 km?

Solution

(i) $\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{100 \text{ m}}{3 \text{ min}} = \frac{100}{3 \times 60} \text{ m/s} = \frac{5}{9} \text{ m/s} = \frac{5}{9} \times \frac{18}{5} \text{ km/h} = 2 \text{ km/h}.$

(ii) The distance he would cover in 2 h 15 min $\left(\text{i.e., } \frac{9}{4} \text{ h}\right)$

$= \text{speed} \times \text{time} = (2 \text{ km/h}) \times \left(\frac{9}{4} \text{ h}\right) = 4.5 \text{ km}.$

(iii) The time he would take to cover 3.5 km

$= \frac{\text{distance}}{\text{speed}} = \frac{3.5 \text{ km}}{2 \text{ km/h}} = \frac{3.5}{2} \text{ h} = 1 \text{ h } 45 \text{ min}.$

Uniform speed

In the preceding example we assumed that the man walks at exactly the same pace all the time. In other words, we assumed that he covers equal distances in equal intervals of time. When a person or a body does this, we say that he/she/it has uniform speed.

For example, if a car covers a distance of 16 m in a second, its speed will be uniform provided it covers 16 m in each subsequent second.

Average speed

In reality, however, things and people mostly do not have uniform speed. They pick up speed and slow down during the course of their travel. So, we calculate the average speed by dividing the total distance covered by a body by the total time it takes to cover the distance.

$$\text{Average speed} = \frac{\text{total distance covered}}{\text{total time taken}}$$

EXAMPLE **A train covers the first 30 km of its journey at the speed of 60 km/h and the next 60 km at the speed of 80 km/h. Find its average speed.**

Solution

Time taken to cover 30 km at the speed of 60 km/h $= \frac{\text{distance}}{\text{speed}} = \frac{30}{60} \text{ h} = \frac{1}{2} \text{ h}.$

Time taken to cover 60 km at the speed of 80 km/h $= \frac{60}{80} \text{ h} = \frac{3}{4} \text{ h}.$

$\therefore$ total distance covered = 30 km + 60 km = 90 km

and total time taken $= \frac{1}{2} \text{ h} + \frac{3}{4} \text{ h} = \frac{5}{4} \text{ h}.$

Hence, average speed of the train $= \frac{\text{total distance covered}}{\text{total time taken}} = \frac{90}{\frac{5}{4}} \text{ km/h} = 72 \text{ km/h}.$

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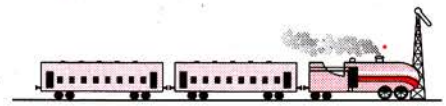
Some important points

1. When a moving train crosses a pole (or a point or a person who is stationary), it covers a distance equal to its own length.

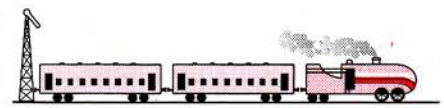


$\therefore$ time taken to cross the pole

= time taken to cover a distance equal to the length of the train

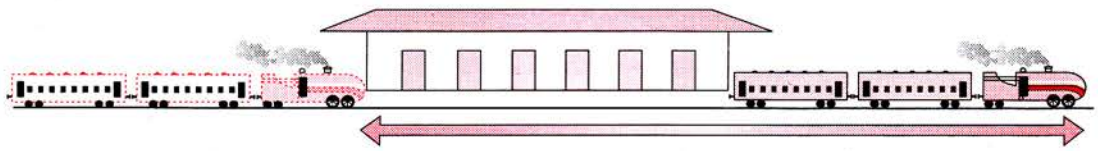
$$= \frac{\text{the length of the train}}{\text{the speed of the train}}.$$

2. When a moving train crosses a platform (or a bridge), it covers a distance equal to the sum of its length and the length of the platform.



$\therefore$ time taken to cross a platform

$$= \frac{\text{the length of the train + the length of the platform}}{\text{the speed of the train}}.$$



EXAMPLE **The length of a train is 140 m and its speed is 72 km/h. How long will it take to cross (i) a pole and (ii) a platform 220 m long?**

Solution The speed of the train = 72 km/h = $72 \times \frac{5}{18}$ m/s = 20 m/s.

(i) The distance travelled by the train in crossing the pole = the length of the train = 140 m.

$\therefore$ the time taken to cross the pole = $\frac{\text{distance travelled}}{\text{speed}} = \frac{140}{20}$ s = 7 s.

(ii) Here, the distance travelled by the train to cross the platform

= the length of the train + the length of the platform

= 140 m + 220 m = 360 m.

$\therefore$ time taken to cross the platform = $\frac{\text{distance travelled to cross the platform}}{\text{speed of the train}}$

$$= \frac{360}{20} \text{ s} = 18 \text{ s}.$$

Solved Examples

EXAMPLE 1 **A train covers the first 85 km of its journey at 51 km/h, the next 125 km at 75 km/h and the last 90 km at 135 km/h. Find (i) the total time it takes to complete the journey and (ii) its average speed for the whole journey.**

Solution The time taken to cover 85 km at 51 km/h = $\frac{\text{distance}}{\text{speed}} = \frac{85}{51}$ h = $\frac{5}{3}$ h.

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The time taken to cover 125 km at 75 km/h $= \frac{125}{75}$ h $= \frac{5}{3}$ h.

The time taken to cover 90 km at 135 km/h $= \frac{90}{135}$ h $= \frac{2}{3}$ h.

(i) Total time taken $= \left(\frac{5}{3} + \frac{5}{3} + \frac{2}{3}\right)$ h $= \frac{12}{3}$ h $= 4$ h.

(ii) Average speed $= \frac{\text{total distance covered}}{\text{total time taken}} = \frac{(85 + 125 + 90)\text{ km}}{4\text{ h}}$

$= \frac{300}{4}$ km/h $= 75$ km/h.

EXAMPLE 2 **A train covers a distance of 540 km in 8 h 15 min. If it covers the first two thirds of the journey at the speed of 60 km/h, find its speed for the rest of the journey.**

Solution

The time taken to cover $\frac{2}{3}$ of 540 km, i.e., 360 km at 60 km/h $= \frac{\text{distance}}{\text{speed}}$

$= \frac{360}{60}$ h $= 6$ h.

The rest of the journey $= 540$ km $- 360$ km $= 180$ km.

The time taken to cover it $= 8$ h 15 min $- 6$ h $= \frac{9}{4}$ h.

$\therefore$ the speed for the rest of the journey $= \frac{\text{distance}}{\text{time}} = \frac{180}{\frac{9}{4}}$ km/h $= 80$ km/h.

EXAMPLE 3 **A man takes 30 minutes to cover a certain distance at the speed of 3 km/h. By how much should he increase his speed to cover the distance in 20 minutes?**

Solution

The distance covered in 30 min $\left(= \frac{1}{2}\text{ h}\right)$ at the speed of 3 km/h

$= \text{speed} \times \text{time} = 3\text{ km/h} \times \frac{1}{2}\text{ h} = \frac{3}{2}$ km.

$\therefore$ the required speed to cover $\frac{3}{2}$ km in 20 min $\left(= \frac{1}{3}\text{ h}\right) = \frac{\text{distance}}{\text{time}} = \frac{\frac{3}{2}}{\frac{1}{3}}$ km/h

$= 4.5$ km/h.

Hence, he should increase his speed by $(4.5 - 3)$ km/h $= 1.5$ km/h.

EXAMPLE 4 **A bus covers a certain distance in 6 h at the speed of 50 km/h. How much time would it take to cover the distance if it travelled 10 km/h faster?**

Solution

The distance covered in 6 h at the speed of 50 km/h $= \text{speed} \times \text{time}$

$= 50 \times 6$ km $= 300$ km.

If the bus travels 10 km/h faster, its speed $= 60$ km/h.

Then the time it would take to cover 300 km $= \frac{300}{60}$ h $= 5$ h.

EXAMPLE 5 **Ajit walks at the speed of 15 km/h and runs at the speed of 20 km/h. He covered 10 km in 37.5 minutes, partly running and partly walking. Find the time he spent and the distance he covered by walking.**

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Solution Suppose Ajit walked x km. Then the distance he covered by running $= (10 - x)$ km.

The time he took to walk x km at 15 km/h $= \frac{\text{distance}}{\text{speed}} = \frac{x \text{ km}}{15 \text{ km/h}} = \frac{x}{15}$ h.

The time he took to run $(10 - x)$ km at 20 km/h $= \frac{(10 - x) \text{ km}}{20 \text{ km/h}} = \frac{10 - x}{20}$ h.

The total time he took to cover 10 km $= 37.5$ min $= \frac{37.5}{60}$ h.

$\therefore \quad \frac{x}{15} + \frac{10 - x}{20} = \frac{37.5}{60}$ or $\frac{4x + 3(10 - x)}{60} = \frac{37.5}{60}$ or $x + 30 = 37.5$. $\therefore \quad x = 7.5$.

Thus, Ajit walked 7.5 km.

The time he took to cover 7.5 km at the speed of 15 km/h $= \frac{7.5 \text{ km}}{15 \text{ km/h}} = \frac{1}{2}$ h

$= 30$ min.

EXAMPLE 6 **A train 375 m long moving with uniform speed passes a pole in 25 s.**

(i) Find its speed in km/h.

(ii) Find the time it would take to cross a platform 150 m long.

Solution (i) To cross a pole, the train has to cover a distance equal to its own length.

$\therefore$ the distance covered $= 375$ m and the time taken $= 25$ s.

$\therefore$ the speed of the train $= \frac{375 \text{ m}}{25 \text{ s}} = 15 \text{ m/s} = 15 \times \frac{18}{5}$ km/h $= 54$ km/h.

(ii) To cross the platform, the train would have to cover a distance equal to the sum of its length and the length of the platform.

$\therefore$ the distance covered $= 375$ m $+ 150$ m $= 525$ m.

The speed of the train $= 54$ km/h $= 54 \times \frac{5}{18}$ m/s $= 15$ m/s.

$\therefore$ the required time $= \frac{525 \text{ m}}{15 \text{ m/s}} = 35$ s.

EXAMPLE 7 **A train travelling at 48 km/h crosses a platform 250 m long in 30 s. Find its length.**

Solution Let the length of the train $= x$ m.

Then, the distance covered in crossing the platform

$=$ the length of the train $+$ the length of the platform $= (x + 250)$ m.

The speed of the train $= 48$ km/h $= 48 \times \frac{5}{18}$ m/s $= \frac{40}{3}$ m/s.

The time taken to cross the platform $= 30$ s.

Now, distance $=$ speed $\times$ time or $x + 250 = \frac{40}{3} \times 30$ or $x + 250 = 400$ or $x = 150$.

Hence, the length of the train $= 150$ m.

EXAMPLE 8 **A train passes a platform 135 m long in 19 s and a man standing on the platform in 10 s. Find (i) the speed of the train and (ii) the length of the train.**

Solution The distance covered in 19 s $=$ the length of the train $+ 135$ m ... (1)

And, the distance covered in 10 s $=$ the length of the train ... (2)

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(i) Subtracting equation (2) from equation (1), the distance covered in 9 s = 135 m.

$\therefore$ the speed of the train $= \frac{135 \text{ m}}{9 \text{ s}} = 15 \text{ m/s} = 15 \times \frac{18}{5} \text{ km/h} = 54 \text{ km/h}.$

(ii) From equation (2), the length of the train = the distance covered in 10 s

$= (15 \text{ m/s}) \times (10 \text{ s}) = 150 \text{ m}.$

EXAMPLE 9 **A train travelling at a uniform speed passes a platform 300 m long in 30 s and another platform 225 m long in 25 s. Find the length of the train and the speed of the train in km/h.**

Solution

Let the length of the train = x m.

The train passes a platform 300 m long in 30 s, i.e., covers a distance of $(x + 300)$ m in 30 s.

$\therefore$ the speed of the train $= \frac{x + 300}{30}$ m/s ... (1)

Further, it covers a distance of $(x + 225)$ m in 25 s.

$\therefore$ the speed of the train $= \frac{x + 225}{25}$ m/s ... (2)

From (1) and (2), $\frac{x + 300}{30} = \frac{x + 225}{25}$ or $5(x + 300) = 6(x + 225)$

or $6x - 5x = 1500 - 1350$ or $x = 150$.

$\therefore$ the length of the train = 150 m.

From (1), the speed of the train $= \frac{150 + 300}{30}$ m/s $= \frac{450}{30}$ m/s = 15 m/s

$= 15 \times \frac{18}{5}$ km/h = 54 km/h.

Remember These

1. (i) speed $= \frac{\text{distance}}{\text{time}}$ (ii) time $= \frac{\text{distance}}{\text{speed}}$ (iii) distance = speed $\times$ time
2. (i) 1 km/h $= \frac{5}{18}$ m/s (ii) 1 m/s $= \frac{18}{5}$ km/h
3. Average speed $= \frac{\text{total distance covered}}{\text{total time taken}}$
4. The time taken by a train to cross a point $= \frac{\text{the length of the train}}{\text{the speed of the train}}$
5. The time taken by a train to cross a platform

$= \frac{\text{the length of the train} + \text{the length of the platform}}{\text{the speed of the train}}$

EXERCISE 5A

1. Convert to m/s: (i) 72 km/h (ii) 97.2 km/h (iii) 3.6 km/h
2. Convert to km/h: (i) 30 m/s (ii) 10 m/s (iii) 2.5 m/s

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3. (i) If a man takes 3 min to walk down a street 258 m long, find his speed in km/h.
(ii) A car covers 300 m in 20 s. Find its speed in km/h.

4. A panther runs at the speed of 80 km/h. What distance will it cover in 90 min?

5. How long will it take a bus travelling at 48 km/h to cover a distance of 360 m?

6. A car covers 200 km in $4\frac{1}{2}$ h and then another 240 km in $3\frac{1}{2}$ h. Find its average speed.

7. A truck travels at 40 km/h for 3 h and at 35 km/h for 2 h. Find its average speed.

8. A man walks 6 km at 12 km/h and returns at 10 km/h. Find his average speed.

9. A train covers the first 160 km of a journey at 40 km/h, the next 180 km at 45 km/h and the last 200 km at 50 km/h. Find (i) the total time it takes to complete the journey and (ii) the average speed of the train during the whole journey.

10. (i) A train covers a distance of 670 km in 6 h 5 min. If it covers the first 390 km of the journey at 90 km/h, find its speed for the rest of the journey.
(ii) A bus covers 630 km in 9 h. If it completes the first two thirds of the journey at 60 km/h, calculate its speed for the rest of the journey.

11. A train travelling at 60 km/h completes a journey in 8 h. How much faster would it have to travel to cover the same distance in 6 h?

12. A bus travelling at 42 km/h covers a distance in 5 h. How much time would it save if it increased its speed by 8 km/h?

13. A girl walks 12 km at the speed of 3 km/h. What change should she make in her speed to take (i) an hour less and (ii) an hour more to cover the distance?

14. A motorcyclist travels at 30 km/h and stops for half an hour at the end of every 75 km. How long will it take him to cover 375 km?

15. A woman walks a certain distance in 84 min. She covers two thirds of it at 4 km/h and the rest at 5 km/h. Find the total distance she covered.

16. A man walks at 6 km/h and runs at 8 km/h. He covers 6 km in 50 min partly by running and partly by walking.
(i) For how long did he walk? (ii) What distance did he cover walking?

17. (i) The speed of a train is 30 km/h. How long will it take to cross a signal if its length is 25 m?
(ii) How long will a train 50 m long travelling at 72 km/h take to cross a pole?

18. (i) A train 110 m long travels at 30 km/h. How long will it take to cross a platform 90 m long?
(ii) A train 120 m long travels at the speed of 60 km/h. How long will it take to cross a platform of length 180 m?

19. (i) A train travelling at the speed of 36 km/h crosses a 98-m-long platform in 20 s. Find the length of the train.
(ii) A train travelling at 60 km/h takes 18 s to cross a 180-m-long platform. Find the length of the train.

20. A man standing on a platform 225 m long notices that a train travelling at uniform speed passes him in 6 s and passes by the platform in 21 s. Find
(i) the length of the train and (ii) the speed of the train.

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21. A train travelling at uniform speed passes by a platform 220 m long in 30 s and another platform 325 m long in 39 s. Find (i) the length of the train and (ii) the speed of the train.

ANSWERS

1. (i) 20 m/s (ii) 27 m/s (iii) 1 m/s **2.** (i) 108 km/h (ii) 36 km/h (iii) 9 km/h
3. (i) 5.16 km/h (ii) 54 km/h **4.** 120 km **5.** 27 s
6. 55 km/h **7.** 38 km/h **8.** $10\frac{10}{11}$ km/h **9.** (i) 12 h (ii) 45 km/h
10. (i) 160 km/h (ii) 105 km/h **11.** 20 km/h **12.** 48 min
13. (i) Increase speed by 1 km/h (ii) Reduce speed by 0.6 km/h **14.** $14\frac{1}{2}$ h
15. 6 km **16.** (i) 20 min (ii) 2 km **17.** (i) 3 s (ii) 2.5 s **18.** (i) 24 s (ii) 18 s
19. (i) 102 m (ii) 120 m **20.** (i) 90 m (ii) 54 km/h **21.** (i) 130 m (ii) 42 km/h

Relative speed

Suppose a goods train and an express train travel at 50 km/h and 80 km/h respectively on parallel tracks in the same direction. Then the distance between them will increase by (80 – 50) km or 30 km per hour. This is their relative speed. If on the other hand, the two trains travel in opposite directions, the distance between them will decrease by (80 + 50) km, i.e., 130 km per hour, which is their relative speed.

Thus, the relative speed of two moving bodies is the rate at which the distance between them increases or decreases.

(i) For two bodies moving in the same direction,
relative speed = difference of their speeds.
(ii) For two bodies moving in opposite directions, relative speed = sum of their speeds.

Solved Examples

EXAMPLE 1 **Two trains 120 m and 180 m long are travelling along parallel tracks with speeds of 85 km/h and 95 km/h respectively. How long will they take to pass by each other if they travel (i) in opposite directions and (ii) in the same direction?**

Solution The distance covered in passing by each other = the sum of the lengths of the trains = 120 m + 180 m = 300 m.

(i) When the two trains travel in opposite directions,
their relative speed = sum of their speeds = 85 km/h + 95 km/h
$= 180 \text{ km/h} = 180 \times \frac{5}{18} \text{ m/s} = 50 \text{ m/s}.$

$\therefore$ the time they take to pass by each other $= \frac{300 \text{ m}}{50 \text{ m/s}} = 6 \text{ s}.$

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(ii) When the two trains travel in the same direction,

the relative speed = difference of their speeds = 95 km/h – 85 km/h = 10 km/h

$$= 10 \times \frac{5}{18} \text{ m/s} = \frac{25}{9} \text{ m/s}.$$

$\therefore$ the required time $= \dfrac{300 \text{ m}}{\frac{25}{9} \text{ m/s}} = 300 \times \dfrac{9}{25} \text{ s} = 108 \text{ s} = 1 \text{ min } 48 \text{ s}.$

EXAMPLE 2 **A train 100 m long travels at 45 km/h and a man walks at 5 km/h. How much time will the train take to pass by him if they travel in (i) the same direction (ii) opposite directions?**

Solution The distance covered by the train in passing by the man = 100 m.

(i) When the train and the man travel in the same direction,

the relative speed = the difference of their speeds = 45 km/h – 5 km/h

$$= 40 \text{ km/h} = 40 \times \frac{5}{18} \text{ m/s} = \frac{100}{9} \text{ m/s}.$$

$\therefore$ the time taken by the train to pass by the man $= \dfrac{100 \text{ m}}{\frac{100}{9} \text{ m/s}} = 9 \text{ s}.$

(ii) When they travel in opposite directions,

the relative speed = the sum of their speeds = (45 + 5) km/h

$$= 50 \text{ km/h} = 50 \times \frac{5}{18} \text{ m/s} = \frac{125}{9} \text{ m/s}.$$

$\therefore$ the time taken $= \dfrac{100 \text{ m}}{\frac{125}{9} \text{ m/s}} = 7.2 \text{ s}.$

EXAMPLE 3 **A dog pursues a hare at a speed of 54 km/h, while the hare runs at 36 km/h. After what distance and time will the dog be able to catch the hare if the hare is 300 m ahead of the dog?**

Solution Since both are running in the same direction,

the relative speed = (54 – 36) km/h = 18 km/h $= 18 \times \dfrac{5}{18}$ m/s = 5 m/s.

The time taken $= \dfrac{\text{distance}}{\text{(relative) speed}} = \dfrac{300 \text{ m}}{5 \text{ m/s}} = 60 \text{ s} = 1 \text{ min}.$

Now, the speed of the dog = 54 km/h $= 54 \times \dfrac{5}{18}$ m/s = 15 m/s.

$\therefore$ the distance covered by the dog in 1 min = (15 m/s) × (60 s) = 900 m.

Therefore, the dog will catch the hare after covering 900 m in 1 min.

EXAMPLE 4 **The speed of a boat in still water is 9 km/h and the speed of a stream is 3 km/h. Find the time taken by the boat to cover (i) 24 km upstream (ii) 42 km downstream.**

Solution (i) The speed of the boat upstream

= the speed of the boat in still water – speed of the stream

= (9 – 3) km/h = 6 km/h.

$\therefore$ the time taken by the boat to cover 24 km upstream $= \dfrac{24 \text{ km}}{6 \text{ km/h}} = 4 \text{ h}.$

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(ii) the speed of the boat downstream
= the speed of the boat in still water + the speed of the stream
= (9 + 3) km/h = 12 km/h.

$\therefore$ the time taken by the boat to cover 42 km downstream $= \frac{42 \text{ km}}{12 \text{ km/h}} = 3\frac{1}{2}$ h.

EXAMPLE 5 **A boat can travel at 9 km/h upstream and at 12 km/h downstream. Find the speed of the boat in still water and the speed of the stream.**

Solution

Let the speed of the boat in still water = x km/h
and the speed of the stream = y km/h.
Given, the speed of the boat upstream = 9 km/h.
$\therefore \quad x - y = 9$ ... (1)
Again, the speed of the boat downstream = 12 km/h.
$\therefore \quad x + y = 12$ ... (2)
Adding (1) and (2), $2x = 21$ or $x = 10.5$.
From (2), $y = 12 - x = 12 - 10.5 = 1.5$.
Hence, the speed of the boat in still water = 10.5 km/h
and the speed of the stream = 1.5 km/h.

EXAMPLE 6 **A boat covers 20 km in 5 hours while moving down a river flowing at 2 km/h. Find the speed of the boat in still water.**

Solution

The speed of the boat downstream $= \frac{20 \text{ km}}{5 \text{ h}} = 4$ km/h

$\Rightarrow$ the speed of the boat in still water + the speed of the river = 4 km/h.
$\therefore$ the speed of the boat in still water = 4 km/h – speed of the river
= 4 km/h – 2 km/h = 2 km/h.

Remember These

1. For two bodies moving in the same direction, relative speed = difference of their speeds.
2. For two bodies moving in opposite directions, relative speed = sum of their speeds.
3. The time taken for one moving train to pass by another $= \frac{\text{sum of the lengths of the trains}}{\text{relative speed}}$.
4. If the speed of a boat in still water = x km/h and the speed of a stream = y km/h,
   (i) the speed of the boat downstream = $(x + y)$ km/h.
   (ii) the speed of the boat upstream = $(x - y)$ km/h.

EXERCISE 5B

1. Two trains, 115 m and 135 m long, are running along parallel tracks at the speeds of 35 km/h and 45 km/h respectively. How long will they take to pass by each other if they run (i) in opposite directions (ii) in the same direction?

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2. Ravi and John are standing 300 m apart. If they run towards each other with speeds of 2 m/s and 1 m/s respectively, how much time will they take to cross each other?
3. Jagat and Ramesh can run at speeds of 6 m/s and 4 m/s respectively. Both start at the same place at the same time and run in opposite directions. Find the distance between them after one hour.
4. A man is walking at the speed of 5 km/h when a train passes by him. If the speed of the train is 55 km/h and its length is 125 m, how much time will the train take to pass by him if they travel in (i) the same direction (ii) opposite directions?
5. A man walks at the speed of 4 km/h. A train coming from behind him at 22 km/h passes by him in 30 s. Find the length of the train.
6. A train 180 m long is moving at 35 km/h. Another train moving in the opposite direction at 25 km/h along a parallel track passes by it in 18 s. Find the length of the train.
7. A policeman follows a thief who is 800 m ahead of him. If they run at speeds of 8 km/h and 7 km/h respectively, how long will the policeman take to catch up with the thief?
8. The speed of a boat in still water is 15 km/h and the speed of a stream is 5 km/h. Find the time taken by the boat to cover (i) 40 km upstream (ii) 36 km downstream.
9. A boat travels at 8 km/h upstream and at 14 km/h downstream. Find the speed of the boat in still water and the speed of the stream.
10. A boat covers a distance of 24 km upstream in 3 h. If the stream flows at 4 km/h, find the speed of the boat in still water.

ANSWERS

1. (i) 11.25 s (ii) 1 min 30 s **2.** 1 min 40 s **3.** 36 km
4. (i) 9 s (ii) 7.5 s **5.** 150 m **6.** 120 m **7.** 48 min
8. (i) 4 h (ii) 1 h 48 min **9.** 11 km/h, 3 km/h **10.** 12 km/h

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