

Unit 10 Speed, D

Speed, Distance and Time

Exercise 10.1

1. Select an appropriate unit for each measurement. Explain each choice.

- (a) The height of a room
- (b) The thickness of a window

(c) The distance across your town or city

Solution: There are different units (*km*, *m*, *cm*, *mm*) to measure the length/height of different objects or distances.

- (a) The height of room is measure in metres (*m*) because it is used to measure the heights of buildings.
- (b) The thickness of window is very small length so it is measured in centimetre (*cm*) or millimetres (*mm*).
- (c) The distance across your town or city is measure in kilometre (*km*) because *km* is a big unit to measure long distances.

2. Select an appropriate unit (seconds, minutes or hours) for each event. Explain each choice.

- (a) The length of class lecture
- (b) The time taken by train from Lahore to Islamabad

(c) The time between throwing a ball in the air and back to ground.

Solution: There are different units (seconds, minutes or hours) to measure the duration of an event.

- (a) The duration of class lecture is usually measure in *minutes* approximately (30 *minutes* or 45 *minutes*).
- (b) Distance between Lahore and Islamabad is so long so train will take *hours* to reach at Islamabad from Lahore.
- (c) The time between throwing a ball in the air and back to ground is measure in *seconds* because everything move toward the earth fast due to force of attraction.
- **3.** A factory is manufacturing chocolates of different sizes. What units are appropriate for their measurements? Explain.

Solution: The sizes of chocolates may be different but we can measure the size of chocolates in *cm* or *mm*. Chocolates are small objects so we measure them in small units of length.

4. For which measurements centimetres are appropriate? Explain.

- (a) The thickness of your math book
- (b) The thickness of your fingernail
- (c) The thickness of 100 sheets of paper

(d) The height of tree

Solution: The unit centimetre (*cm*) is used to measure small lengths or heights.

- (a) The thickness of math book can be measured in centimetres (*cm*).
- (b) The thickness of nails cannot be measured in centimetres (cm) as it is measured in millimetres (mm).
- (c) The thickness of 100 sheets of paper can be measured in centimetres (cm).
- (d) The height of tree cannot be measure in centimetres (*cm*) because it is a taller object. We can measure it using metres (*m*).



5. For which periods of time seconds are appropriate'? Explain.

- (a) The time between winking of eyes
- (b) The time for lunch break
- (c) The time taken for reciting Surah Al Kausar

Solution: The unit *seconds* is used to measure smallest duration.

- (a) The time between winking of eyes can be measured in *seconds*.
- (b) The time of lunch break is measured in *hours* or *minutes*.
- (c) The time taken to recite Surah Al Kausar can be measured in seconds because it is the shortest Surah of The Holy Quran.

6. Why might you measure the thickness of a wire in millimetres rather than centimetres? Solution: Thickness of wire is so small. So, smaller unit *mm* is considered appropriate to measure the thickness of a wire.

7. Rohail is in an art gallery. What items in the gallery, if any, might be measured in these units?
 (a) millimetres
 (b) centimetres
 (c) metres
 (d) kilometres
 Solution: In art gallery the items are in different sizes. Here millimetes (*mm*), centimetres (*cm*) and metres (*m*) are appropriate units to measure different objects according to their sizes.

8. Is it likely that a tall building would be measured in kilometres? Explain.

Solution: It is not appropriate to measure the height of buildings in kilometers because the tallest building in the world is measured in metres.

9. A decimetre is 0.1 metre. A decametre is 10 m. What might be the name of the unit between decametres and decimetres? Explain.

Solution: We can say it metre (m) because it is greater than decimetre and smaller than decametre.

10. What might be the name of the unit between seconds and hours? Explain. Solution: We can say it minutes (*min*) because it is greater than seconds and smaller than hours.

11. (i) Convert hours into minutes:

(a) 2 hours

Solution: To convert hours into minutes multiply the number of hours by 60.

2 hours = 2×60 minutes

= 120 minutes

(b) **3.5 hours**

Solution: To convert hours into minutes multiply the number of hours by 60.

 $3.5 \text{ hours} = 3.5 \times 60 \text{ minutes}$

$$=\frac{35}{10} \times 60^{6} \text{ minutes}$$
$$= 35 \times 6 \text{ minutes}$$
$$= 210 \text{ minutes}$$



(c) $\frac{1}{2}$ hour

Solution: To convert hours into minutes multiply the number of hours by 60.

$$\frac{1}{2} \text{ hour } = \frac{1}{2} \times 60 \text{ minutes}$$
$$= \frac{1}{\cancel{2}} \times \cancel{60}^{30} \text{ minutes}$$
$$= 1 \times 30 \text{ minutes}$$
$$= 30 \text{ minutes}$$

(d) $\frac{3}{2}$ hours

Solution: To convert hours into minutes multiply the number of hours by 60.

$$\frac{3}{2} \text{ hours } = \frac{3}{2} \times 60 \text{ minutes}$$
$$= \frac{3}{\cancel{2}} \times \cancel{60}^{30} \text{ minutes}$$
$$= 3 \times 30 \text{ minutes}$$
$$= 90 \text{ minutes}$$

(e) 30% of an hour

Solution: To convert hours into minutes multiply the number of hours by 60.

30% means
$$\frac{30}{100}$$
 and an hour means 60 minutes so, multiply $\frac{30}{100}$ by 60. It means :
30% of an hour $=\frac{30}{100} \times 60$ minutes
 $=\frac{1800}{100}$ minutes
 $=18$ minutes

(ii) Convert into hours or into hours and minutes:

(a) 120 min

Solution: To convert minutes into hours divide the number of minutes by 60.

120 minutes =
$$\frac{120}{60}$$
 hours
= $\frac{120^2}{60}$ hours
= 2 hours



(b) 150 min

Solution: To convert minutes into hours divide the number of minutes by 60.

150 minutes =
$$\frac{150}{60}$$
 hours
= $\frac{150^5}{60_2}$ hours
= $\frac{5}{2}$ hours or 2.5 hours
= 2 hours 30 minutes

(c) 230 min

Solution: To convert minutes into hours divide the number of minutes by 60.

230 minutes =
$$\frac{230}{60}$$
 hours
= $\frac{230^{23}}{60}$ hours
= $\frac{23}{6}$ hours or 3.83 hours
= $\frac{23}{6} \times 60^{10}$ minutes
= 230 minutes
= 3 hours 50 minutes

(d) 1200 sec

Solution: To convert seconds into hours divide the number of seconds by $60 \times 60 = 3600$.

1200 seconds =
$$\frac{1200}{3600}$$
 hours
= $\frac{1200^{1}}{3600_{3}}$ hours
= $\frac{1}{3}$ hours
= $\frac{1}{3}$ hours
= $\frac{1}{3} \times 60^{20}$ minutes
= 20 minutes

(e) $5\frac{1}{2}$ % of 6000 min

Solution: First of all solve percentage and then convert the answer into hours.

$$5\frac{1}{2}\% = \frac{11}{2}\% \text{ means } \frac{\frac{11}{2}}{100} = \frac{11}{200} \text{ so,}$$

$$5\frac{1}{2}\% \text{ of } 6000 \text{ min} = \frac{11}{200} \times 6,000 \text{ minutes}$$

$$= \frac{11}{200} \times 6,000^{30} \text{ minutes}$$

$$= 11 \times 30 \text{ minutes}$$

$$= 330 \text{ minutes}$$



Now, to convert minutes into hours divide it by 60.

$$= \frac{330}{60} \text{ hours}$$

= $\frac{330}{60}^{11} \text{ hours} = \frac{11}{2} \text{ hours}$
= 5.5 hours
= 5 hours and 0.5 hour
= 5 hours 30 minutes

(iii) Convert into seconds:

(a) 1.5 min

Solution: To convert minutes into seconds multiply the number of minutes by 60.

1.5 minutes =
$$1.5 \times 60$$
 seconds

$$= \frac{15}{10} \times 60^{6} \text{ seconds}$$
$$= 15 \times 6 \text{ seconds}$$
$$= 90 \text{ seconds}$$

(b) $\frac{4}{5}$ hour

Solution: First of all convert hours into minutes by multiplying the number of hours by 60.

$$\frac{4}{5} \text{ hour} = \frac{4}{5} \times 60 \text{ minutes}$$
$$= \frac{4}{5} \times 60^{12} \text{ minutes ublishing House}$$
$$= 4 \times 12 \text{ minutes}$$
$$= 48 \text{ minutes}$$

Now, to convert minutes into seconds multiply the number of minutes by 60.

48 minutes = 48×60 seconds

= 2,880 seconds

It means, $\frac{4}{5}$ hours = 2,880 seconds

(c) $\frac{1}{2}$ hour

Solution: First of all convert hours into minutes by multiplying the number of hours by 60.

$$\frac{1}{2}$$
 hour $=\frac{1}{2} \times 60$ minutes



 $= \frac{1}{\cancel{2}} \times \cancel{60}^{30} \text{ minutes}$ $= 1 \times 30 \text{ minutes}$ = 30 minutesNow, to convert minutes into seconds multiply the number of minutes by 60. 30 minutes = 30 × 60 seconds = 1,800 secondsIt means, $\frac{1}{2}$ hour = 1,800 seconds

(d)
$$\frac{4}{3}$$
 min

Solution: To convert minutes into seconds multiply the number of minutes by 60.

$$\frac{4}{3} \text{ minutes} = \frac{4}{3} \times 60 \text{ seconds}$$
$$= \frac{4}{\cancel{3}} \times \cancel{60}^{20} \text{ seconds}$$
$$= 4 \times 20 \text{ seconds}$$
$$= 80 \text{ seconds}$$

(d) **0.3 % of an hour**

Solution: First of all solve percentage and then convert the answer into minutes.

0.3% means
$$\frac{\frac{3}{10}}{100} = \frac{3}{1000}$$
 so,
0.3% of an hour = $\frac{3}{1000} \times 60$ minutes

$$= \frac{180^9}{1000_{50}}$$
 minutes

$$= \frac{9}{50}$$
 minutes

Now, to convert minutes into seconds multiply it by 60.

$$= \frac{9}{50} \times 60 \text{ seconds}$$
$$= \frac{540}{50} \text{ seconds}$$
$$= \frac{540}{50} \frac{54}{50} \text{ seconds}$$
$$= \frac{54}{50} \frac{54}{50} \frac{54}{50} \text{ seconds}$$

It means, 0.3% of an hour = 10.8 seconds.



(iv) Convert into hours or into hours and minutes:

(a)
$$\frac{1}{2}$$
 day

Solution: There are 24 hours in a day. To convert a day into hours, multiply it by 24.

$$\frac{1}{2} day = \frac{1}{2} \times 24 \text{ hours}$$
$$= \frac{1}{\cancel{2}} \times \cancel{24}^{12} \text{ hours}$$
$$= 12 \text{ hours}$$

(b) $\frac{4}{3}$ day

Solution: There are 24 hours in a day. To convert a day into hours, multiply it by 24.

$$\frac{4}{3} day = \frac{4}{3} \times 24 \text{ hours}$$
$$= \frac{4}{\cancel{3}} \times \cancel{24}^{8} \text{ hours}$$
$$= 32 \text{ hours}$$

(c) 45% of a day

Solution: There are 24 hours in a day. To convert a day into hours, multiply it by 24. First of all calculate the percentage.

45% of a day =
$$\frac{45}{100} \times 24$$
 hours
= $\frac{1080}{100}$ hours
= $\frac{1080^{54}}{100^5}$ hours
= $\frac{54}{5}$ hours or 10.8 hours
10.8 hours = 10 hours and 0.8 hours
0.8 hours = $\frac{8}{5} \times 60^{-6}$ minutes

 $=8 \times 6$ minutes

=48 minutes

$$10.8$$
 hours = 10 hours and 48 minutes

It means, 45% of a day means 10 hours and 48 minutes.



(**d**) 40% of 2 days

Solution: There are 24 hours in a day. To convert a day into hours, multiply it by 24. It implies 2 days means 48 hours. First of all calculate the percentage.

$$40\% \text{ of } 2 \text{ days} = \frac{40}{100} \times 48 \text{ hours}$$
$$= \frac{1920}{100} \text{ hours}$$
$$= \frac{1920^{96}}{100_5} \text{ hours}$$
$$= \frac{96}{5} \text{ hours or } 19.2 \text{ hours}$$
$$19.2 \text{ hours} = 19 \text{ hours and } 0.2 \text{ hour}$$
$$0.2 \text{ hours} = \frac{2}{10} \times 60^{-6} \text{ minutes}$$
$$= 2 \times 6 \text{ minutes}$$
$$= 12 \text{ minutes}$$
$$19.2 \text{ hours} = 19 \text{ hours and } 12 \text{ minutes}.$$
It means, 40% of 2 days means 19 hours and 12 minutes.

(e) $\frac{3}{7}$ of a week

7 Publishing House Solution: There are 7 days in a week and one day consists of 24 hours. To convert a day into hours, multiply it by 24. First of all calculate $\frac{3}{7}$ of a week.

$$\frac{3}{7} \text{ of a week} = \frac{3}{7} \times 7 \text{ days}$$
$$= \frac{3}{7} \times 7 \text{ days}$$
$$= 3 \text{ days}$$

Now convert days into hours by multiplying number of days by 24.

 $3 \text{ days} = 3 \times 24 \text{ hours}$

$$= 72$$
 hours

It means, $\frac{3}{7}$ of a week shows 72 hours.



(v) Convert into days:

(a) $\frac{1}{2}$ month

Solution: To convert months into days multiply the number of months by 30.

$$\frac{1}{2} \text{ month} = \frac{1}{2} \times 30 \text{ days}$$
$$= \frac{1}{2} \times 30^{15} \text{ days}$$
$$= 15 \text{ days}$$

(b)
$$\frac{3}{5}$$
 month

Solution: To convert months into days multiply the number of months by 30.

$$\frac{3}{5} \text{ month} = \frac{3}{5} \times 30 \text{ days}$$
$$= \frac{3}{5} \times 30^{-6} \text{ days}$$
$$= 18 \text{ days}$$

(b) 60% of a month

Solution: To convert months into days multiply the number of months by 30. First of all calculate the percentage.

60% of a month =
$$\frac{60}{100} \times 30$$
 days
= $\frac{1800}{100}$ days
= $\frac{18,00}{100}$ days
= $\frac{18,00}{100}$ days
= 18 days

It means, 60% of a month shows 18 days.

(c) 60% of a year (365 days)

Solution: First of all calculate the percentage.

60% of a year =
$$\frac{60}{100} \times 365$$
 days
= $\frac{21900}{100}$ days
= $\frac{21900}{100}$ days
= 21900 days
= 219 days

It means, 60% of a year shows 219 days.



(d) 144000 hrs

Solution: There are 24 hours in a day. To convert hours into days, divide number of hours by 24.

$$144000 \text{ hours} = \frac{144000}{24} \text{ days}$$
$$= \frac{144000}{24} \text{ days}$$
$$= 6000 \text{ days}$$

12. Convert into metres.
(a) (5.52 + 6.09) km
Solution: First of all add both values.

 $5.52 \ km + 6.09 \ km = 11.61 \ km$

To convert kilometres into metres multiply the number of km by 1,000.

 $11.61 \, km = 11.61 \times 1,000 \, m$ $= \frac{1161}{100} \times 1,000 \, m$ $= 1161 \times 10 \, m$ $= 11610 \, m$

(b) 3% of 12 km

Solution: To convert kilometres into metres multiply the number of *km* by 1,000.

 $12\,km = 12 \times 1,000\,m$

= 12,000 m

Now calculate percentage.

3% of
$$12 km = \frac{3}{100} \times 12,000 m$$

= $\frac{3}{100} \times 12,000 m$
= $3 \times 120 m$
= $360 m$

(c) $\left(\frac{7}{9}+\frac{2}{3}\right)km$

Solution: First of all add both values.

$$\left(\frac{7}{9} + \frac{2}{3}\right)km = \left(\frac{7+6}{9}\right)km = \frac{13}{9}km$$

To convert kilometres into metres multiply the number of km by 1,000.

 $\frac{13}{9}km = \frac{13}{9} \times 1,000 m$ $= \frac{13000}{9} m$ = 1444.44 m



(d) $170\frac{1}{2}$ km

Solution: To convert kilometres into metres multiply the number of *km* by 1,000.

$$170\frac{1}{2}km = \frac{341}{2}km$$
$$= \frac{341}{2} \times 1,000 m$$
$$= \frac{341}{2} \times 1,000^{500}m$$
$$= 341 \times 500 m$$
$$= 170,500 m$$

(e) 365.5 *cm*

Solution: To convert centimetres into metres divide the number of *cm* by 100.

$$365.5 \, cm = \frac{3655}{10} \, cm$$

Now divide it by 100. It means

$$365.5 \, cm = \frac{3655}{10} \times \frac{1}{100} m$$
$$= \frac{3655}{1000} m$$
$$= 3.655 m$$

13. The distance between Ahmad's home and shopping center is $3\frac{1}{8}$ km. Find it into metres.

Solution: Given that

The distance between Ahmad's home and shopping center = $3\frac{1}{8}km = \frac{25}{8}km$

To convert kilometres into metres multiply the number of *km* by 1,000.

$$\frac{25}{8}km = \frac{25}{8} \times 1000 \ m$$
$$= \frac{25}{8} \times 1000^{125} \ m$$
$$= 25 \times 125 \ m$$
$$= 3,125 \ m$$

Hence, the distance between Ahmad's home and shopping center is 3,125 m.

14. Sara travels 12 km due North and 0.2 km due South. How much distance does she covers in metres?

Solution: Given that, Sara travels 12 *km* due North and 0.2 *km* due South. First of all add both distances

$$12 \ km + 0.2 \ km = 12.2 \ km$$

To convert kilometres into metres multiply the number of *km* by 1,000.





Hence, Sara covered a distance of 12,200 m.

15. The length and breadth of a bed are 180 *cm* and 160 *cm*. Find perimeter of the bed. (give your answer in metres). Find area occupied by the bed in m².



Hence, the perimeter and area of the bed in metres are 6.8 m and 288 m^2 respectively.

Exercise 10.2

 $= 288 m^2$

1. Complete the following table.

= 6.8 m

	Departure Time	Journey Time	Arrival Time
(i)	11:00 am	5 h	
(ii)	05:30 pm	2 h 15 min	
(iii)	10:45 pm	03 h 15 min	(Next day)
(iv)	11:45		18:30
(v)	8:40 pm (Monday)		(Tuesday) 3:40 am
(vi)		02 h 20 min	00:45
(vii)	22:10 Friday		07:25 Saturday
(viii)		04 h 20 min	02:30 pm



Solution: To complete this table we will solve all parts separately and then put all the values in the table to complete it.

(i) Here, Departure time is 11:00 am and Journey time is 5 hours.

As we know that

Arrival time = Departure time + Journey time

= 11:00 am + 5 hours

In 24-hour format

11:00 am means 11'o clock

11 hours + 5 hours = 16 hours

Now, in 12-hour format

16 hours means 12 + 4 = 16

After 12'o clock noon we use pm so the arrival time will be 04:00 pm.

(ii) Here, Departure time is 05:30 pm and Journey time is 2 hours 15 minutes.

As we know that

Arrival time = Departure time + Journey time

= 05:30 pm + 2 hours 15 minutes

In 24-hour format

05:30 pm means 17:30

17 hours 30 minutes + 2 hours 15 minutes = 19 hours 45 minutes

Now, in 12-hour format

19 hours means 12 + 7 = 19

After 12'o clock noon we use pm so the arrival time will be 07:45 pm.

(iii) Here, Departure time is 10:45 pm and Journey time is 3 hours 15 minutes.As we know that

Arrival time = Departure time + Journey time = 10:45 pm + 3 hours 15 minutes

In 24-hour format

10:45 pm means 22:45

22 hours 45 minutes + 3 hours 15 minutes = 26 hours 0 minutes

Now, in 12-hour format

26 hours means 24 hours + 2 hours = Next day and 2 hours

After 12'o clock midnight we use am so the arrival time will be 02:00 am (Next day).



Here, Departure time is 11:45 and Arrival time is 18:30. (iv) As we know that Journey time = Arrival time – Departure time = 18:30 - 11:45= 18 hours 30 minutes - 11 hours 45 minutes Here we cannot subtract 45 minutes from 30 minutes so borrow 1 hour from 18 hours. It will become: 60 minutes + 30 minutes = 90 minutes90 minutes -45 minutes =45 minutes and 17 hours -11 hours =6 hours It means, 6 hours 45 minutes So, the journey time was 6 hours 45 minutes. **(v)** Here, Departure time is 08:40 pm (Monday) and Arrival time is 03:40 am (Tuesday). As we know that Journey time = Arrival time – Departure time = 03:40 am - 08:40 pmHere 03:40 am (Tuesday) = 27 hours 40 minutes, 08:40 pm (Monday) = 20 hours 40 minutes Journey time = Arrival time – Departure time = 27 hours 40 minutes - 20 hours 40 minutes = 7 hours So, the journey time was 7 hours. (vi) Here, Journey time is 2 hours 20 minutes and Arrival time is 00:45. As we know that Departure time = Arrival time – Journey time = 00:45 - 2 hours 20 minutes Here 00:45 (24-hour format) = 12:45 a.m or 12 hours 45 minutes Departure time = Arrival time – Journey time = 12 hours 45 minutes - 2 hours 20 minutes = 10 hours 25 minutes = 10:25 pmSo, the departure time was 10:25 pm (Night).



(vii) Here, Departure time is 22:10 (Friday) and Arrival time is 07:25 (Saturday). As we know that Journey time = Arrival time – Departure time = 07:25 - 22:10Here 07:25 (Saturday) = 31 hours 25 minutes, 22:10 (Friday) = 22 hours 10 minutes Journey time = Arrival time – Departure time = 31 hours 25 minutes - 22 hours 10 minutes = 9 hours 15 minutes So, the journey time was 9 hours 15 minutes. (viii) Here, Journey time is 4 hours 20 minutes and Arrival time is 02:30 pm. As we know that Departure time = Arrival time – Journey time = 02:30 pm - 4 hours 20 minutesHere 02:30 pm (12-hour format) or 14:30 (24-hour format) or 14 hours 30 minutes Departure time = Arrival time – Journey time = 14 hours 30 minutes - 4 hours 20 minutes = 10 hours 10 minutes = 10:10 am So, the departure time was 10:10 am (Day). **Complete Table**

	Departure Time	Journey Time	Arrival Time
(i)	11:00 am	5 h	04:00 pm
(ii)	05:30 pm	2 h 15 min	07:45 pm
(iii)	10:45 pm	03 h 15 min	02:00 am (Next day)
(iv)	11:45	6 hours 45 minutes	18:30
(v)	8:40 pm (Monday)	7 hours	(Tuesday) 3:40 am
(vi)	10:25 pm (Night)	02 h 20 min	00:45
(vii)	22:10 Friday	9 hours 15 minutes	07:25 Saturday
(viii)	10:10 am (Day)	04 h 20 min	02:30 pm



Exercise 10.3

1. Determine the time taken by an aeroplane when distance is 7,150 km and speed is 780 km/h. Solution: Given that

Distance = 7,150 km and Speed = 780 km/hWe have to calculate the time taken by the aeroplane. Using formula:

Time = $\frac{\text{Distance}}{\text{Speed}}$ = $\frac{7150 \text{ km}}{780 \text{ km} / \text{ h}}$ Reduce into the lowest form

$$=\frac{55}{6}$$
 hours
$$=9\frac{1}{6}$$
 hours

Hence, the aeroplane took $9\frac{1}{6}$ hours.

2. If distance travelled by a train is 495 km in 4 hours 30 minutes, what is its speed? Solution: Given that

Distance = 495 km and Time = 4 hours 30 minutes

We have to calculate the speed of train.

First of all convert time into hours, 4 hours 30 minutes = 4.5 hours Using formula:

Speed =
$$\frac{\text{Distance}}{\text{Time}}$$
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= $\frac{495 \text{ km}}{4.5 \text{ hours}}$
= $\frac{495 \text{ km}}{45/10 \text{ hours}}$
= $\frac{4950 \text{ km}}{45 \text{ hours}}$
= 110 km / h

Hence, the speed of train was 110 km/h.

3. Express the speed of 60 metres per minute in km per hour.

Solution: To convert metres into kilometres divide the number of metres by 1000. To convert minutes into hours divide number of minutes by 60.

It means,





60 metres per minute = $\frac{60 \text{ m} \div 1000 \text{ km}}{1 \div 60 \text{ hours}}$ $= \frac{60/1000 \text{ km}}{1/60 \text{ hours}}$ $= \frac{60}{1000} \times \frac{60}{1} \text{ km / h}$ $= \frac{36.00}{10.00} \text{ km / h}$ $= \frac{36}{10} \text{ km / h}$ = 3.6 km / h

4. A man runs at the speed of 10 km/h. How much time will he take to cover 750 metres?

Solution: Given that Speed of the man = 10 km/h Time = ? Distance = 750 metres or 0.75 km $Time = \frac{Distance}{Speed}$ $= \frac{0.75 km}{10 km / h}$ $= \frac{75/100 km}{10 km / h}$ $= \frac{75}{1000} hour$ = 0.075 hour = 0.075 hour $= 0.075 \times 60 min$ = 4.5 min

5. Haroon ran 500 metres in 100 seconds. Find the speed in km per hour.

Solution: Given that

Distance = 500 metres or 0.5 km Time = 100 seconds or 0.0278 hour Speed = ? As we know that





Speed =
$$\frac{\text{Distance}}{\text{Time}}$$
$$= \frac{0.5 \text{ km}}{0.0278 \text{ h}}$$
$$= \frac{\frac{5}{10} \text{ km}}{\frac{278}{10000} \text{ h}}$$
$$= \frac{5}{10} \times \frac{1000 \text{ } \text{ / }}{278} \text{ km / h}$$
$$= \frac{5000}{278} \text{ km / h}$$
$$\approx 18 \text{ km / h}$$

Hence, Haroon ran 18 km/h.

6. Convert the following:

(i) 20 m/sec into km/h

Solution: To convert metres into kilometres divide metres by 1,000, to convert seconds into hours divide seconds by 3600.



(ii) 20 km/h into m/s

Solution: To convert kilometres into metres multiply it by 1000 and to convert hours into seconds multiply it by 3600.

$$20 \text{ km / h} = \frac{20 \times 1000 \text{ m}}{3600 \text{ sec}}$$
$$= \frac{20000 \text{ m}}{3600 \text{ s}}$$
$$= 5.55 \text{ m / s}$$

7. A child cycles at a speed of 4 m/s. How much distance will he cover in 2 minutes? Solution: Given that

Speed = 4 m/s, Time = 2 minutes or 120 seconds, Distance = ?

 $Distance = Speed \times Time$

 $=4 \text{ m/s} \times 120 \text{ sec}$

=480 metres

Hence, the child will cover 480 metres in 2 minutes.



8. Sohan travels in an aeroplane for a distance of 1200 km. For the first half of the distance the plane flies at a speed of 900 km per hour and for the rest of the distance it flies at a speed of 750 km per hour. How long does the trip take?

Solution: Given that

Total distance = 1200 km

Half distance means 600 km.

For the first half speed was 900 km/h and for the rest half speed was 750 km/h.

To find time

$Time = \frac{Distance}{Speed}$	$Time = \frac{Distance}{Speed}$
$=\frac{600\mathrm{km}}{900\mathrm{km}/\mathrm{h}}$	$=\frac{600\mathrm{km}}{750\mathrm{km}/\mathrm{h}}$
= 0.67 hours	= 0.8 hours

Time = 0.67 hours + 0.8 hours

= 1.47 hours

= 1 hour 28 minutes

Hence, Sohan spent 1 hour 28 minutes in travelling.

9. A car started from Lahore and travelled towards Faislabad at speed of 70 km/h. At the same time a van started from Faislabad and travelled towards Lahore at speed of 60 km/h. Find the time when car and van meet.

Solution: Given that

Lahore to Faislabad, the speed of car = 70 km/h

Faislabad to Lahore, the speed of van = 60 km/h

Time when both car and van meet = ?

Distance between Lahore and Faislabad is approximately 192 km.

Let the required time be 't'.

Distance covered by car = 70 t

Distance covered by van = 60 t

Total distance =
$$192 \text{ km}$$

70 t + 60 t = 192

130 t = 192

 $t = 192 \div 130$ hours

= 1.48 hours or 1 hour 29 minutes

Hence, the car and van meet each other after 1 hour 29 minutes approximately.



10. A train 260 m long running at 72 km/h, crosses a bridge 240 m long. Find the time taken by it to cross the bridge.

Solution: Given that

Length of train = 260 m, Speed of train = 72 km/h, Length of bridge = 240 m, Time = ? The train needs to cover a distance of 260 m + 240 m = 500 m = 0.5 km

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

= $\frac{0.5 \text{ km}}{72 \text{ km / h}}$
= $\frac{5/10 \text{ km}}{72 \text{ km / h}}$
= $\frac{5}{720}$ hour
= $\frac{5}{720} \times 60 \times 60 \text{ sec}$
= $\frac{5}{\sqrt{200}} \times 60 \times 60^{-5} \text{ sec}$
= $5 \times 5 = 25 \text{ sec}$

Hence, the train required 25 seconds to cross the bridge.

11. In a flight of 2 hours, an airplane travels one third of the time at 760 km/h and the remaining time at 800 km/h. What is the overall distance covered?

Solution: Given that

Total distance = ?

Time of flight = 2 hours

For one third time speed was 760 km/h and for the rest time speed was 800 km/h.

One third time means
$$\frac{2 \text{ hours}}{3} = \frac{2 \times 60 \text{ min}}{3}$$

= $\frac{120 \text{ min}}{3}$
= 40 min or 0.67 hour

Remaining time 80 minutes or 1.33 hours.

To find total distance:

Distance = Speed \times Time	Distance = Speed \times Time
= 760 km/h \times 0.67 hour	= 800 km/h \times 1.33 hours
= 509.2 km	= 1064 km

Total distance = 509.2 km + 1064 km= 1573.2 km

Hence, the total covered distance was 1573.2 km.



Review Exercise 10 1. Choose the correct option. (i) $\frac{1}{2}h = \cdots$ 0.2 h 30 min (c) (b) 60 min (d) 90 min (a) (ii) If departure time is 10:30 pm and the journey time is 2 hrs 30 min, the arrival time is 01:00 a.m. 13:00 (b) 1:00 p.m. (c) (d) (a) 08:00 p.m. (iii) $2\frac{1}{2}\%$ of 800 km = ____ m 20 (b) 200 (c) 2000 (d) 20000 (a) (iv) A 150 m long train travels at a speed of 100 km/h. How long will it take to cross a 100 m long platform? 8 sec (b) 9 sec (c) 10 sec (d) 12 sec (a) (v) Average speed = Total distance covered ÷ (a) Total time (b) (c) 60 sec (d) 1 hr speed 2. A dog runs at a speed of 100 metres in a minute. Find its speed in km/h. **Solution:** Given that The speed of dog = 100 metres per minute To find speed in km/h convert metres into kilometres and minutes into hours. 100 metres per minute means $\frac{100 \text{ metres}}{1 \text{ min}} = \frac{100 \div 1000 \text{ km}}{1 \div 60 \text{ h}}$ House $=\frac{0.1 \text{km}}{0.0167 \text{ h}}$ $\approx 6 \text{ km} / \text{ h}$ Hence, the speed of dog is approximately 6 km/h. 3. A rectangular field is 72 m by 58 m. A man walks around it at a speed of 3 km per hour. How much time will he take to complete two rounds? Solution: First of all find perimeter of the rectangular field. As we know that Perimeter of rectangle = $2 \times (\text{Length} + \text{Width})$ $= 2 \times (72 \text{ m} + 58 \text{ m})$ $= 2 \times (130 \text{ m})$ = 260 mIt means, total distance is 260 m. Speed = 3 km/hTime = ?



Distance = 2 rounds = 2 × 260 m = 520 m or 0.52 km Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{0.52 \text{ km}}{3 \text{ km / h}}$ = $\frac{\frac{52}{100} \text{ km}}{3 \text{ km / h}}$ = $\frac{52}{300}$ hour = 0.173 hour or 10 min 24 sec

It means, the man took 10 min 24 sec to complete two rounds around the rectangular park.

4. A car running at 45 km/hr takes 6 hours to cover a journey. What speed must it travels to complete the same journey in 5 hours?

Solution: Given that

If speed of car is 45 km/h then it takes 6 hours to cover a journey.

First of all find distance

Distance = Speed \times Time = 45 km/h \times 6 hour = 270 km

It means, we have to calculate the required speed to cover the journey of 270 km in 5 hours. As we know that



Hence, the required speed of car is 54 km/h to complete the same journey.

5. A train covers the first 60 km of its journey at a speed of 80 km/h the next 90 km at a speed of 100 km/h and the rest of 330 km journey at a speed of 120 km/h. Find the total time taken to complete its journey. Also find its average speed.

Solution: Given thatDistance = 60 kmDistance = 90 kmDistance = 330 kmSpeed = 80 km/hSpeed = 100 km/hSpeed = 120 km/hSpeed = 120 km/hTime = ?Time = ?Time = ?As we know thatAs we know thatTime =
$$\frac{\text{Distance}}{\text{Speed}}$$
As we know thatTime = $\frac{\text{Distance}}{\text{Speed}}$ Time = $\frac{\text{Distance}}{\text{Speed}}$ = $\frac{60 \text{ km}}{80 \text{ km / h}}$ = $\frac{90 \text{ km}}{100 \text{ km / h}}$ = $\frac{330 \text{ km}}{120 \text{ km / h}}$ = 0.75 hours= 0.9 hours= 2.75 hours



Now to calculate total time add all the obtained time periods. Total time to complete the journey = 0.75 hours + 0.9 hours + 2.75 hours = 4.4 hours It means, the train took 4.4 hours to complete the journey.

To find average speed:

Average speed -	Total Distance
Average speed –	Total time
_	60 km + 90 km + 330 km
_	$0.75\mathrm{hr} + 0.9\mathrm{hr} + 2.75\mathrm{hr}$
_	480 km
—	4.4 hr
≈1	109 km / h

Hence, the average speed of the train was 109 km/h.

6. A truck and a bus started off at 10: 30 a.m. from opposite end of highway. The truck traveled at a speed of 40 km/h and the bus traveled at a speed of 54 km/h. If they pass each other at 1: 00 p.m. What was the length of highway?

Solution: Given that

Speed of the truck = 40 km/h

Speed of the bus = 54 km/h

The truck and bus started off at 10:30 a.m. and pass each other at 1:00 p.m. It means the duration (time) is 2.5 hours.

Here we have to find total distance covered by both truck and bus which will be the length of highway.

Speed of the truck = 40 km/h Time = 2.5 hours Distance = ? As we know that Distance = Speed \times Time = 40 km/h \times 2.5 hours = 100 km The length of highway = Total distance covered by both vehicles Speed of the bus = 54 km/h Time = 2.5 hours Distance = ? As we know that = 54 km/h \times 2.5 hours = 135 km

= 100 km + 135 km = 235 km

Hence, the length of highway was 235 km.

7. A 120 m long train travels at the speed of 60 km/h. how long will it take to cross a platform of length 180 m?

Solution: Given that Length of train = 120 m Speed of train = 60 km/h Length of platform = 180 m Time = ? The train needs to cover a distance of 180 m + 120 m = 300 m = 0.3 km





Time = $\frac{\text{Distance}}{\text{Speed}}$ = $\frac{0.3 \text{ km}}{60 \text{ km / h}}$ = $\frac{3/10 \text{ km}}{60 \text{ km / h}}$ = $\frac{3}{600}$ hour = $\frac{3}{600} \times 60 \times 60 \text{ sec}$ = $\frac{3}{10} \times 60 \times 60^{-6}$ sec = $3 \times 6 = 18 \text{ sec}$

Hence, the train required 18 seconds to cross the platform.

8. A train travelling at a uniform speed passes by a platform 220 m long in 30 s and another platform 325 m long in 39 s. Find:

(ii) The speed of the train

(i) The length of the train Solution: Given that

Length of platform = 220 m

Time to passed the platform = 30 sec

The same train took 39 seconds to pass the platform of length 325 m.

(i) Let the length of train is '*l*' and speed of the train is '*s*' According to given conditions

$$s = \frac{t + 220}{30}$$
(i)
 $s = \frac{t + 325}{39}$ (ii)

By eliminating 's' we can write them as:

$$\frac{t+220}{30} = \frac{t+325}{39}$$

By cross multiplying
 $39 \times (t+220) = 30 \times (t+325)$
 $39t+8580 = 30t+9750$
 $39t-30t = 9750-8580$
 $9t = 1170$
Divide both sides by '9'
 $\frac{9t}{9} = \frac{1170}{9}$
 $t = 130$



(ii) To find the value of 's' use the value of 't' in eq. (i) $s = \frac{130 + 220}{30}$ $= \frac{350}{30}$ = 11.66 m/s

9. How long will a 50 m long train traveling at 72 km/h take to cross a pole? Solution: Given that

Length of train = 50 m = 0.05 km

Speed of train = 72 km/h

Time = ?

$$Time = \frac{Distance}{Speed} = \frac{0.05 \text{ km}}{72 \text{ km}/\text{h}}$$
$$= \frac{5}{100} \frac{\text{km}}{72 \text{ km}/\text{h}}$$
$$= \frac{5}{7200} \text{ hour}$$
$$= \frac{5}{7200} \times 60 \times 60 \text{ sec}$$
$$= \frac{5}{7200} \times 60 \times 60^{-1} \text{ sec}$$
$$= \frac{5}{2^{120}} \frac{5}{7200} \times 60 \times 60^{-1} \text{ sec}$$
$$= \frac{5 \times 1}{2} \text{ sec} = 2.5 \text{ sec}$$
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Hence, the train required 2.5 seconds to cross the pole.

10. 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 by walking?

Solution: Given that

Walking speed = 6 km/h or

Running speed = 8 km/h

Total distance to cover = 6 km

Total time taken = 50 minutes

Suppose the distance covered while walking is 'x' km and running is (6 - x) km

According to given conditions



 $\frac{x}{6/60} + \frac{6-x}{8/60} = 50$ Now solve this equation for x $\frac{60x}{6} + \frac{60(6-x)}{8} = 50$ $\frac{60x}{6} + \frac{360 - 60x}{8} = 50$ $\frac{240x + 3(360 - 60x)}{24} = 50$ $\frac{240x + 1080 - 180x}{24} = 50$ $\frac{60x + 1080}{24} = 50$ $60x + 1080 = 50 \times 24$ 60x + 1080 = 120060x = 1200 - 108060x = 120Divide both sides by 60 $\frac{\cancel{60x}}{\cancel{60}} = \frac{\cancel{120}^2}{\cancel{60}}$ Publishing House x = 2

(i) He walked for $\frac{x}{\frac{6}{60}}$ minutes It means $\frac{2}{\frac{6}{60}} = \frac{120}{6}$ = 20 min

(ii) Distance covered while walking = x = 2 km

11. Two persons start travelling at the same time in opposite direction at the speed of 4 m/s and 6 m/s respectively. After 1 hour of travelling what will be the difference of their distances? Solution: Given that

Speed of 1^{st} person = 4 m/s Speed of 2^{nd} person = 6 m/s Time = 1 hour = 60 min or 3600 sec



Distance covered by 1^{st} person = 4 m/s × 3600 sec

= 14400 m or 14.4 km

Distance covered by 2^{nd} person = 6 m/s × 3600 sec

= 21600 m or 21.6 km

Now we have to calculate the difference between their distances.

21.6 km - 14.4 km = 7.2 km

Hence, the difference between their distances after 1 hour will be 7.2 km.

12. 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 the total time it takes to complete the journey? Find the average speed of the train during the whole journey?

Solution: Given that



Now to calculate total time add all the obtained time periods. 9 House

Total time to complete the journey = 4 hours + 4 hours + 4 hours = 12 hours

It means, the train took 12 hours to complete the journey.

To find average speed:

Average speed =
$$\frac{\text{Total Distance}}{\text{Total time}}$$

= $\frac{160 \text{ km} + 180 \text{ km} + 200 \text{ km}}{4 \text{ hr} + 4 \text{ hr} + 4 \text{ hr}}$
= $\frac{540 \text{ km}}{12 \text{ hr}}$
= $45 \text{ km}/\text{ h}$

Hence, the average speed of the train was 45 km/h.