

NAME:

DATE:

Key

UNIT:

Advisor:

Physical Sci#6

# 18 Speed, Distance and Time

## 18.1 Speed

In this section we introduce the idea of speed, considering both *instantaneous speed* and *average speed*.

Instantaneous speed = speed at any instant in time

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

If a car travels 100 miles in 2 hours,

$$\begin{aligned} \text{average speed} &= \frac{100}{2} \\ &= 50 \text{ mph} \end{aligned}$$

The car does not travel at a constant speed of 50 mph; its speed varies during the journey between 0 mph and, perhaps, 70 mph. The speed at any time is called the *instantaneous speed*.

The following table lists units in common use for speed and their abbreviations:

<i>Distance</i>	<i>Time</i>	<i>Speed</i>	<i>Abbreviation</i>
mile	hours	miles per hour	mph
kilometres	hours	kilometres per hour	km/h
metres	hours	metres per hour	m/h
metres	seconds	metres per second	m/s
feet	seconds	feet per second	f.p.s. or ft. per sec.
centimetres	seconds	centimetres per second	cm/sec or cm/s



### Example 1

Judith drives from Plymouth to Southampton, a distance of 160 miles, in 4 hours.

She then drives from Southampton to London, a distance of 90 miles, in 1 hour and 30 minutes.

Determine her average speed for each journey.

See steps on back.

**Solution**

$$\begin{aligned} \text{Plymouth to Southampton} \quad \text{Average speed} &= \frac{160}{4} \\ &= 40 \text{ mph} \end{aligned}$$

$$\begin{aligned} \text{Southampton to London} \quad \text{Time taken} &= 1 \text{ hour and } 30 \text{ minutes} \\ &= 1\frac{1}{2} \text{ hours or } \frac{3}{2} \text{ hours} \end{aligned}$$

$$\begin{aligned} \text{Average speed} &= 90 \div \frac{3}{2} \\ &= 90 \times \frac{2}{3} \\ &= 60 \text{ mph} \end{aligned}$$

**Example 2**

John can type 960 words in 20 minutes.

Calculate his typing speed in:

- (a) words per minute,
- (b) words per hour.

**Solution**

$$\begin{aligned} \text{(a) Typing speed} &= \frac{960}{20} \\ &= 48 \text{ words per minute} \end{aligned}$$

$$\begin{aligned} \text{(b) Typing speed} &= 48 \times 60 \\ &= 2880 \text{ words per hour} \end{aligned}$$

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

Make sure to use units.



### Exercises

1. Peter drives 320 miles in 8 hours. Calculate his average speed. 40 mph

2. Daisy drives from Sheffield to London, a distance of 168 miles, in 4 hours. Calculate her average speed. 42 mph

3. A snail moves 8 m in 2 hours. Calculate the average speed of the snail in metres per hour. 4 meters per hour

4. A lorry driver keeps a record of each journey he makes. Calculate the average speed for each journey, using the table below:

Start	Finish	Start Time	Finish Time	Distance
Brighton	Norwich	0800	1200	172 miles
Norwich	Carlisle	1400	1900	280 miles
Carlisle	Cardiff	1000	1800	300 miles
Cardiff	Exeter	0700	0930	120 miles
Exeter	Brighton	1030	1530	175 miles

$S = 43 \text{ mph}$   
 $S = 56 \text{ mph}$   
 $S = 37.5 \text{ mph}$   
 $S = 48 \text{ mph}$   
 $S = 35 \text{ mph}$

5. Javinda takes  $1\frac{1}{2}$  hours to drive 30 km in the rush hour. Calculate his average speed in km/h.

20 km/hr

6. Rebecca cycles 20 miles on her bike in 2 hours and 30 minutes. Calculate her average speed in mph.

8 mph

7. Julie can type 50 words in 2 minutes. Debbie can type 300 words in 15 minutes.

Calculate the typing speed of each of the girls in:

(a) words per minute,

Julie:

Debbie:

(b) words per hour.

25 wpm  
1500 wph

20 wpm  
1200 wph

8. Fatima, Emma and Andy each drive from London to Brighton, a distance of 60 miles. Fatima takes 1 hour, Emma takes 2 hours and Andy takes  $1\frac{1}{2}$  hours. Calculate the average speed for each of the drivers.

Fatima: 60 mph  
 Emma: 30 mph  
 Andy: 40 mph

9. Eva drives from Edinburgh to Dover in 3 stages:

	Start Time	Finish Time	Distance	
Edinburgh to Leeds	0620	0920	210 miles	$S = 70 \text{ mph}$
Leeds to London	1035	1305	200 miles	$S = 80 \text{ mph}$
London to Dover	1503	1703	78 miles	$S = 39 \text{ mph}$

Calculate her average speed for each stage of her journey.

10. Delia drives 220 km in  $3\frac{1}{2}$  hours. Calculate her average speed correct to the nearest km/h.

63 km/h

## 18.2 Calculating Speed, Distance and Time

In this section we extend the ideas of speed to calculating *distances* and *times*, using the following formulae:

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

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

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



### Example 1

Jane drives at an average speed of 45 mph on a journey of 135 miles. How long does the journey take?



### Solution

$$\begin{aligned} \text{Time} &= \frac{\text{distance}}{\text{speed}} \\ &= \frac{135}{45} \\ &= 3 \text{ hours} \end{aligned}$$