Speed, Time, Distance Revision

EXAMPLE 7

Sean is going to drive from Newcastle upon Tyne to Nottingham, a distance of 190 miles. He estimates that he will drive at an average speed of 50 miles/h. How long will it take him?

$$\text{Sean's time} = \frac{\text{distance he covers}}{\text{his average speed}} = \frac{190 \text{ miles}}{50 \text{ miles/h}} = 3.8 \text{ hours}$$

Change the 0.8 hour to minutes by multiplying by 60, to give 48 minutes.

So, the time for Sean's journey will be 3 hours 48 minutes.
(A sensible rounding off would give 4 hours or 3 hours 50 minutes.)

Remember: When you calculate a time and get a decimal answer, as in Example 7, *do not mistake* the decimal part for minutes. You must either:

- leave the time as a decimal number and give the unit as hours, or
- change the decimal part to minutes by multiplying it by 60 (1 hour = 60 minutes) and give the answer in hours and minutes.

EXERCISE 3D

1. A cyclist travels a distance of 90 miles in 5 hours. What is her average speed?

2. I drive to Bude in Cornwall from Sheffield in about 6 hours. The distance from Sheffield to Bude is 315 miles. What is my average speed?

3. The distance from Leeds to London is 210 miles. The train travels at an average speed of 90 mph. If I catch the 9:30 am train in London, at what time would you expect me to get to Leeds?

4. Complete the following table.

	Distance travelled	Time taken	Average speed
a	150 miles	2 hours	
b	260 miles		40 mph
c		5 hours	35 mph
d		3 hours	80 km/h
e	544 km	8 hours 30 minutes	
f		3 hours 15 minutes	100 km/h
g	215 km		50 km/h

HINTS AND TIPS

Remember to convert time to a decimal if you are using a calculator. For example, 8 hours 30 minutes is 8.5 hours.

5. A train travels at 50 km/h for 2 hours, then slows down to do the last 30 minutes of its journey at 40 km/h.

   a What is the total distance of this journey?

   b What is the average speed of the train over the whole journey?

6 Jane runs and walks to work each day. She runs the first 2 miles at a speed of 8 mph and then walks the next mile at a steady 4 mph.

a How long does it take Jane to get to work?

b What is her average speed?

7 Colin drives home from his son's house in 2 hours 15 minutes. He says that he drives home at an average speed of 44 mph.

a Change the 2 hours 15 minutes to decimal time.

b How far is it from Colin's home to his son's house?

8 The distance between Paris and Le Mans is 200 km. The express train between Paris and Le Mans travels at an average speed of 160 km/h.

a Calculate the time taken for the journey from Paris to Le Mans, giving your answer in decimal hour notation.

b Change your answer to part **a** to hours and minutes.

9 The distance between Sheffield and Land's End is 420 miles.

a What is the average speed of a journey from Sheffield to Land's End if it takes 8 hours 45 minutes?

b If I covered the distance at an average speed of 63 mph, how long would it take me?

10 Change the following speeds to metres per second.

a 36 km/h **b** 12 km/h **c** 60 km/h

d 150 km/h **e** 75 km/h

HINTS AND TIPS

Remember there are 3600 seconds in an hour and 1000 metres in a kilometre.

11 Change the following speeds to kilometres per hour.

a 25 m/s **b** 12 m/s **c** 4 m/s

d 30 m/s **e** 0.5 m/s

12 A train travels at an average speed of 18 m/s.

a Express its average speed in km/h.

b Find the approximate time taken to travel 500 m.

c The train set off at 7:30 on a 40 km journey. At approximately what time will it arrive?

HINTS AND TIPS

To convert a decimal of an hour to minutes just multiply by 60.

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

4 Complete the following table.

	Distance travelled	Time taken	Average speed
a	150 miles	2 hours	75 mph
b	260 miles	6 hours 30 min	40 mph
c	175 miles	5 hours	35 mph
d	240 km	3 hours	80 km/h
e	544 km	8 hours 30 minutes	64 km/h
f	325 km	3 hours 15 minutes	100 km/h
g	215 km	4 hrs 18 min	50 km/h

HINTS AND TIPS

Remember to convert time to a decimal if you are using a calculator. For example, 8 hours 30 minutes is 8.5 hours.

6 Jane runs and walks to work each day. She runs the first 2 miles at a speed of 8 mph and then walks the next mile at a steady 4 mph.

a How long does it take Jane to get to work?

b What is her average speed?

a) $\text{Run Time} = \frac{D}{S} = \frac{2}{8} = \frac{1}{4}$ hr

$\text{Walk Time} = \frac{D}{S} = \frac{1}{4} = \frac{1}{4}$ hr

$\frac{1}{2}$ hr = 30 min

b) $\text{Avg Speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{3}{\frac{1}{2}}$

$= 3 \times \frac{2}{1}$

$= 6$ mph

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10 Change the following speeds to metres per second.

a 36 km/h **b** 12 km/h **c** 60 km/h

d 150 km/h **e** 75 km/h

a) $36\ km/hr$

$= 36 \times 1000\ \ m/hr$

$= 36000\ \ m/hr$

$= \frac{36000}{60}\ \ m/min$

$= 600\ \ m/min$

$= \frac{600}{60}\ \ m/s$

$= 10\ \ m/s$

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11 Change the following speeds to kilometres per hour.

a 25 m/s **b** 12 m/s **c** 4 m/s

d 30 m/s **e** 0.5 m/s

a) $25\ m/s$

$= 25 \times 60\ \ m/min$

$= 25 \times 60 \times 60\ \ m/hr$

$= \frac{25 \times 60 \times 60}{1000}\ \ km/hr$

$= 90\ km/hr$

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1 A cyclist travels a distance of 90 miles in 5 hours. What is her average speed?

Avge speed $= \frac{90}{5} = 18$ mph

2 I drive to Bude in Cornwall from Sheffield in about 6 hours. The distance from Sheffield to Bude is 315 miles. What is my average speed?

Avge speed $= \frac{315}{6} = 52.5$ mph

3 The distance from Leeds to London is 210 miles. The train travels at an average speed of 90 mph. If I catch the 9:30 am train in London, at what time would you expect me to get to Leeds?

Time $= \frac{D}{S} = \frac{210}{90} = \frac{7}{3}$ hrs $=$ 2 hrs 20 min

9.30 $\rightarrow$ 11.50

11.50 am

5 A train travels at 50 km/h for 2 hours, then slows down to do the last 30 minutes of its journey at 40 km/h.

a What is the total distance of this journey?

b What is the average speed of the train over the whole journey?

a) Distance $= 50 \times 2 + 40 \times \frac{1}{2}$

$= 100 + 20$

$= 120$ km

b) Avge speed $= \frac{120}{2.5} = 48$ km/hr

$=$ TOTAL DISTANCE / TOTAL TIME

7 Colin drives home from his son's house in 2 hours 15 minutes. He says that he drives home at an average speed of 44 mph.

a Change the 2 hours 15 minutes to decimal time.

b How far is it from Colin's home to his son's house?

a) 2 hr 15 min = 2.25 hrs

b) $D = S \times T = 44 \times 2.25 = 99$ miles

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8 The distance between Paris and Le Mans is 200 km. The express train between Paris and Le Mans travels at an average speed of 160 km/h.

a Calculate the time taken for the journey from Paris to Le Mans, giving your answer in decimal hour notation.

b Change your answer to part **a** to hours and minutes.

a) $\text{Time} = \frac{D}{S} = \frac{200}{160} = 1.25$ hrs

b) 1.25 hrs = 1 hr 15 min

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9 The distance between Sheffield and Land's End is 420 miles.

a What is the average speed of a journey from Sheffield to Land's End if it takes 8 hours 45 minutes?

b If I covered the distance at an average speed of 63 mph, how long would it take me?

a) 8 hr 45 min = 8.75 hrs

$\text{Avge Speed} = \frac{D}{T} = \frac{420}{8.75} = 48$ mph

b) $T = \frac{D}{S} = \frac{420}{63} = \frac{20}{3} = 6\frac{2}{3}$ hrs

= 6 hrs 40 min

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12 A train travels at an average speed of 18 m/s.

a Express its average speed in km/h.

b Find the approximate time taken to travel 500 m.

c The train set off at 7:30 on a 40 km journey. At approximately what time will it arrive?

a) $18 \text{ m/s} = \frac{18 \times 60 \times 60}{1000} \text{ km/hr} = 64.8 \text{ km/hr}$

b) $\text{Time} = \frac{D}{S} = \frac{500}{18} = 27.78\text{s} \approx 28\text{s}$

c) $T = \frac{D}{S} = \frac{40}{64.8} = 0.6173\text{hrs}$

$= 0.6173 \times 60 \text{ min}$

$= 37.038 \text{ min}$

$\approx 37 \text{ min}$

Start at 7.30 $\longrightarrow$ 8.07 finish