1 A car journey is in two stages.

Stage 1 The car travels 110 miles in 2 hours.

Stage 2 The car travels 44 miles at the same average speed as Stage 1

Work out the time for Stage 2

Give your answer in minutes.

[3 marks]

$\text{speed}_1 : \frac{110}{2} = 55$ (1)

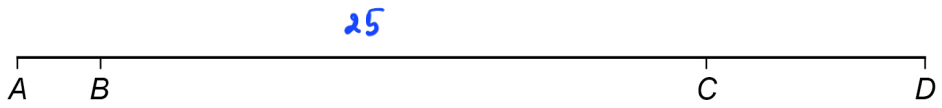
$\text{time}_2 : \frac{44}{55} = 0.8$ hours (1)

$0.8 \times 60 = 48$ min (1)

Answer 48 minutes

2 *A*, *B*, *C* and *D* are junctions on a motorway.

Not drawn accurately



distance *CD* = 3 × distance *AB*

distance *BC* = 25 miles

Salma drives from *A* to *C*.

She drives for 30 minutes at an average speed of 62 miles per hour.

Work out the distance *AD*.

[4 marks]

$62 = \frac{25 + AB}{30 \div 60}$

(0.5) $62 = 25 + AB$ (1)

(1)

$31 = 25 + AB$

$AB = 6$ miles

$CD = 3 \times 6$ (1)

$= 18$

$AD = 6 + 25 + 18 = 49$ (1)

Answer 49 miles

3 Tom and Adil are the two runners in a 200-metre race.

Tom completes the race in 24 seconds.

Adil completes the race at an average speed of 28.8 kilometres per hour.

Who wins the race?

You **must** show your working.

[3 marks]

speed in m/s :

Tom $= \frac{200\ m}{24\ s} = 8.33\ ms^{-1}$ (1)

Adil $= \frac{28.8\ km}{1\ hour} \times \frac{1000\ m}{1\ km} \times \frac{1\ hour}{3600\ s}$

$= 8\ ms^{-1}$ (1)

Tom wins. (1)

Answer Tom

4 A journey has two stages.

	Distance (km)	Average speed (km/h)	Time (h)
Stage 1	30	a	$\frac{30}{a}$
Stage 2	30	b	$\frac{30}{b}$

Show that the average speed for the **whole** journey, in km/h, is $\frac{2ab}{a+b}$

[3 marks]

total time $= \frac{30}{a} + \frac{30}{b} = \frac{30a + 30b}{ab}$ (1)

total distance $= 30 + 30 = 60$

average speed $= \frac{60(ab)}{30a + 30b}$ (1) $= \frac{30(2ab)}{30(a+b)}$

$= \frac{2ab}{a+b}$ (1)

5 Charlie is driving 293 miles home.

He

- leaves at 9.00 am
- travels the first 176 miles at an average speed of 48 mph
- drives the rest of the way at an average speed of 65 mph

Will he be home by 2.30 pm?

You **must** show your working.

[4 marks]

first : $\frac{176}{48} = 3\frac{2}{3}$ hours = 3 hours 40 minutes (1)

the rest : $\frac{293-176}{65} = \frac{117}{65}$ = 1.8 hours

= 1 hour 48 minutes (1)

9 am + 3 hour 40 mins + 1 hour 48 mins

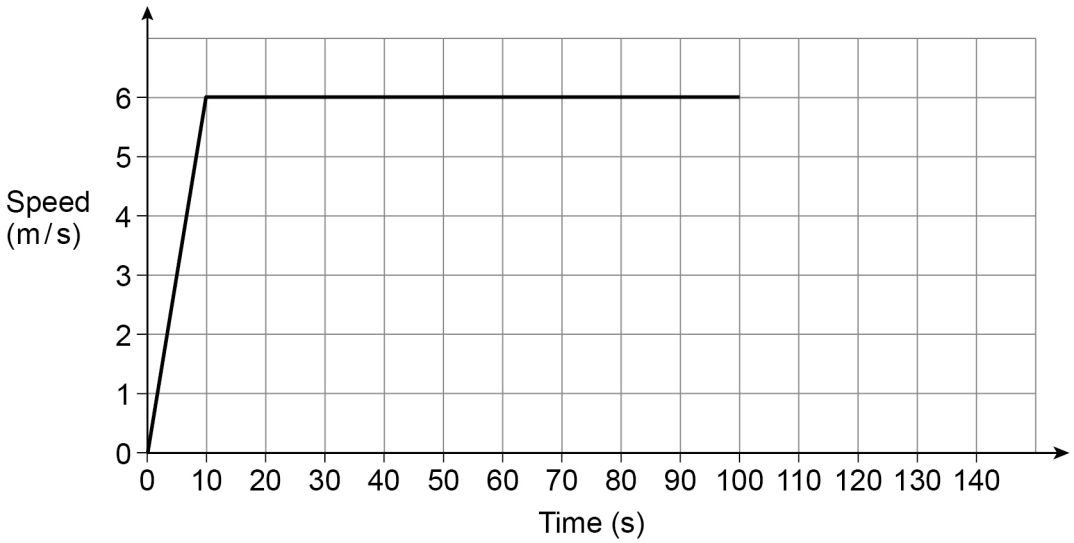
= 2.28 pm (1)

(1)

Yes. He arrives at 2.28 pm

6 Helena ran an 800-metre race in 140 seconds.

The speed-time graph represents the first 100 seconds of her run.



Helena ran the last 40 seconds with constant deceleration.

Work out her speed as she finished the race.

[4 marks]

distance$_1$ = $\frac{1}{2} \times 10 \times 6 = 30$ m (1)

distance$_2$ = $6 \times 90 = 540$ m

distance ran = $30 + 540 = 570$ m

$800 - 570 = 230$ m balance (1)

$\frac{1}{2} \times (v+6) \times 40 = 230$ (1)

$v + 6 = 11.5$

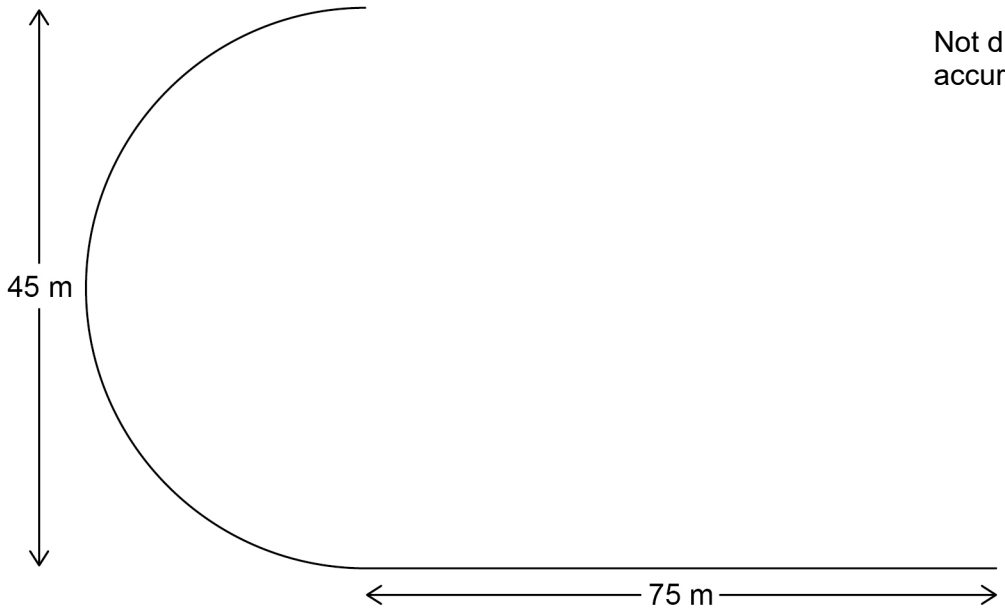
$v = 5.5$ (1)

Answer 5.5 metres per second

7 Part of a running track is the arc of a semicircle joined to a straight line.

The semicircle has diameter 45 metres.

The straight line has length 75 metres.



Not drawn accurately

Abby runs once along this part of the track in 18 seconds.

Work out her average speed.

Give your answer to 2 significant figures.

[4 marks]

Arc length = $\frac{1}{2} \times \pi \times 45 = 22.5\pi$ (1)

Total length = $22.5\pi + 75$

$= 145.695$ (1)

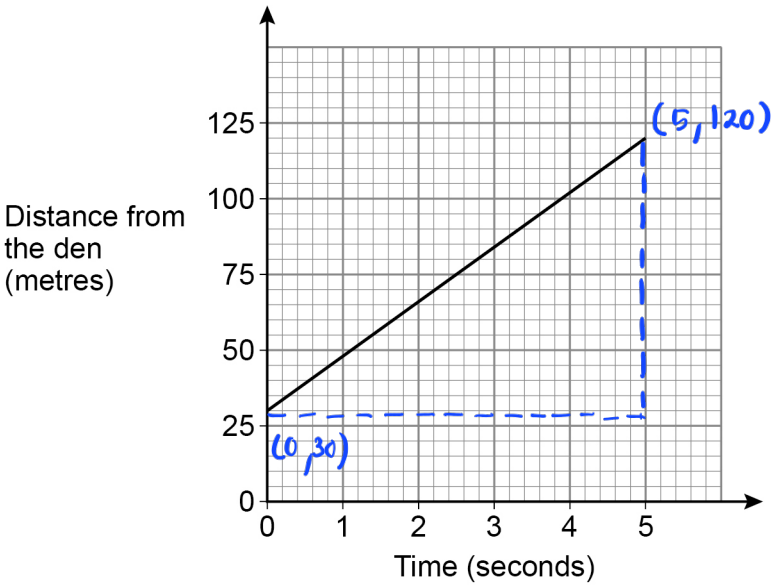
Average speed = $\frac{145.695}{18}$ (1) $= 8.09$

$= 8.1$ (1)

Answer 8.1 m/s

8 A lion is sprinting in a straight line away from its den.

The graph shows the lion's distance from the den.



Work out the speed of the lion in metres per second.

[3 marks]

Speed = distance / time

= (120 − 30) / 5 ✓0

= 90 / 5 ✓0

= 18 ms^{-1} ✓0

Answer 18 m/s

9 (a) On Monday, Larrs swims 50 metres in 40 **seconds** at a constant speed.

On Tuesday, Larrs swims 1.5 kilometres.

Assume he swims at the same constant speed as on Monday.

How many **minutes** does he swim for on Tuesday?

[5 marks]

$\text{Speed} = \frac{50\text{ m}}{40\text{ s}} = 1.25\text{ ms}^{-1}$ (1)

$\text{Time on Tuesday} : \frac{1500\text{ m}}{t} = 1.25\text{ ms}^{-1}$

$t = \frac{1500}{1.25} = 1200\text{ s}$ (2)

$= 1200\text{ s} \times \frac{1\text{ min}}{60\text{ s}}$ (1)

$= 20\text{ min}$

Answer 20 (1) minutes

9 (b) In fact, on Tuesday Larrs swims at a slower constant speed than on Monday.

What does this mean about the number of minutes he swims for on Tuesday?

Tick the correct box.

[1 mark]

- ☐ It is less than the answer to part (a)
- ☐ It is the same as the answer to part (a)
- ☑ It is greater than the answer to part (a) (1)
- ☐ It is not possible to say