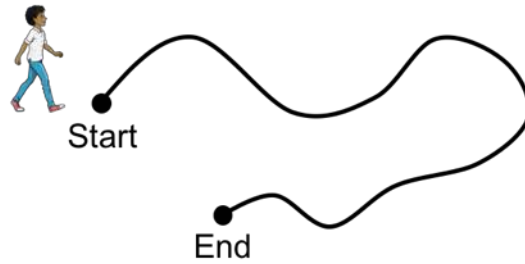| 0	1

In a treasure hunt, Wilson takes the following path:

SCALE

1 cm: 100 m

0	1	.	1

During the hunt, Wilson covered a distance of 1.2 km in ten minutes.
Calculate his **average speed** for the entire journey.
Write your answer in metres per second.

s = 1.2 km = 1200 m
t = 10 minutes = 600 seconds

v = s ÷ t = 1200 ÷ 600 = **2 m/s**

0	1	.	2

Explain why his *instantaneous speed* (his speed at a given point in time) would probably have been higher or lower than his average speed throughout the hunt.

Wilson probably would have travelled faster and slower at different points in the journey, and perhaps would have stopped at times [1].
His average speed is the total distance he travelled by the total amount of time taken [1].

0	1	.	3

Using the scale provided in the diagram above, determine his final **displacement** from his starting position.

Displacement of end from start = 2.2 cm (on page)
Using scale of 1 cm: 100 m, 2.2 cm is equivalent to a displacement of 2.2 × 100 = 220 m
(Accept values from 190 − 250 m)

0	1	.	4

Hence determine his **average velocity** for the entire journey.

Velocity = displacement ÷ time = 220 ÷ 600 = 0.37 m/s
(Accept values from 0.32 − 0.42 m/s)

| 0 | 2 | . | 1 |

In a competition, a rally car is travelling at a top speed of 40 m/s (approximately 90 mph).

Calculate the maximum distance which the car could cover in five minutes.

t = 5 × 60 = 300 s
s = v × t = 40 × 300 = 12,000 m = **12 km**

| 0 | 2 | . | 2 |

With just 4 km to go in the race, the car runs into mechanical difficulties. As a result, its top speed is reduced by 60%.

At this point in the race, the driver must cross the finish line within four minutes in order to progress to the next stage of the competition. Will he succeed? Show all of your working in the space below.
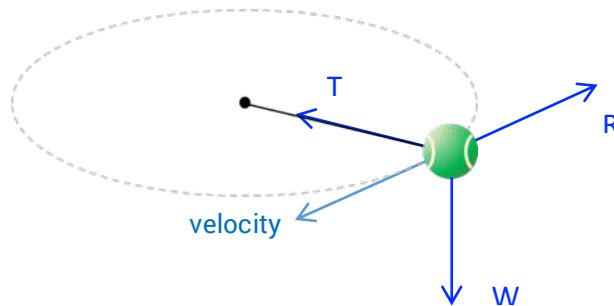
New top speed, v = 40 × 0.4 = 16 m/s
Shortest time possible, t = s ÷ v = 4000 ÷ 16 = 250 s (4 min, 10 sec)

Therefore, the driver will NOT cross the finish line within four minutes, and so will not progress to the next stage of the competition.

| 0 | 3 |

In a game, a tennis ball which is attached to a piece of string is being swung around in a horizontal circle, as shown in the below diagram.

| 0 | 3 | . | 1 |

Draw **labelled** arrows onto the diagram to indicate the direction in which the following forces act on the tennis ball:

- Weight (W)
- Tension in string (T)
- Air resistance (R)

| 0 | 3 | . | 2 |

Which of these forces causes the tennis ball to move in a circular path?

Force: Tension in string (T)