

Q1.

An athlete trains to improve his fitness by walking, cycling and running.

(a) What is a typical mean speed for a person walking?

Tick **one** box.

1.5 m/s

3.0 m/s

4.5 m/s

6.0 m/s

(1)

(b) What is a typical mean speed for a person cycling?

Tick **one** box.

1.5 m/s

3.0 m/s

4.5 m/s

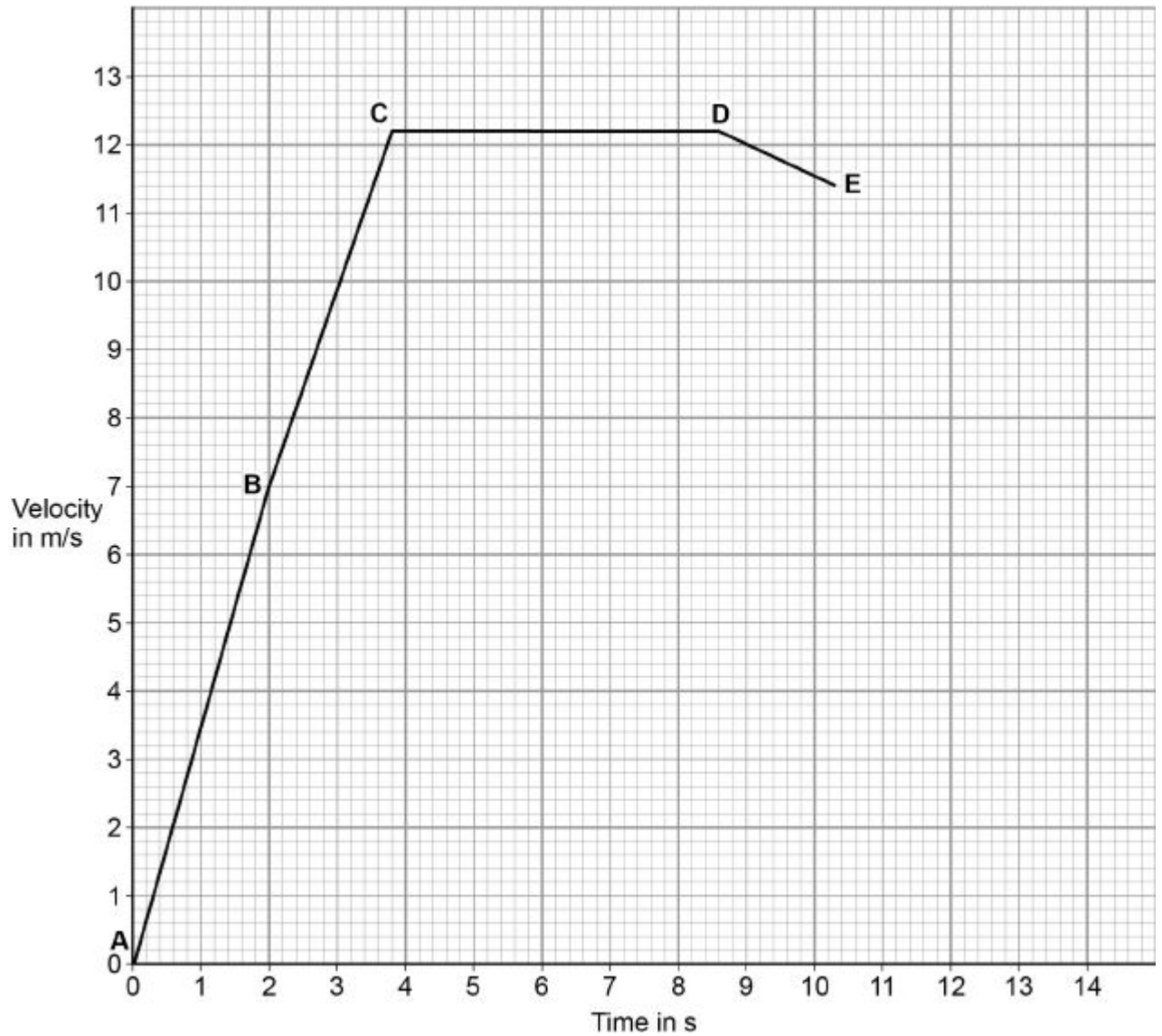
6.0 m/s

(1)

The athlete takes part in a race on a straight, horizontal running track.

The graph below shows the velocity–time graph for the athlete. **A**, **B**, **C**, **D** and **E** represent points in the race.

Distance time graphs and acceleration F



(c) Determine the time taken for the athlete to move between points **C** and **D**.

Time at **C** = _____ s

Time at **D** = _____ s

Time taken between points **C** and **D** = _____ s

(2)

(d) Point **E** represents the end of the race.

After point **E**, the athlete has a constant deceleration.

The athlete stops 14 seconds after the start of the race.

Complete the graph above to show the motion of the athlete after point **E**.

(2)

(e) Which section of the graph above shows the athlete moving at constant velocity?

Tick **one** box.

A-B

B-C

C-D

D-E

(1)

(i) In another race, the athlete had a constant acceleration during the first 3.2 seconds. His velocity increased from 0 m/s to 11.6 m/s

Calculate the acceleration of the athlete.

Use the equation:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

Acceleration = _____ m/s²

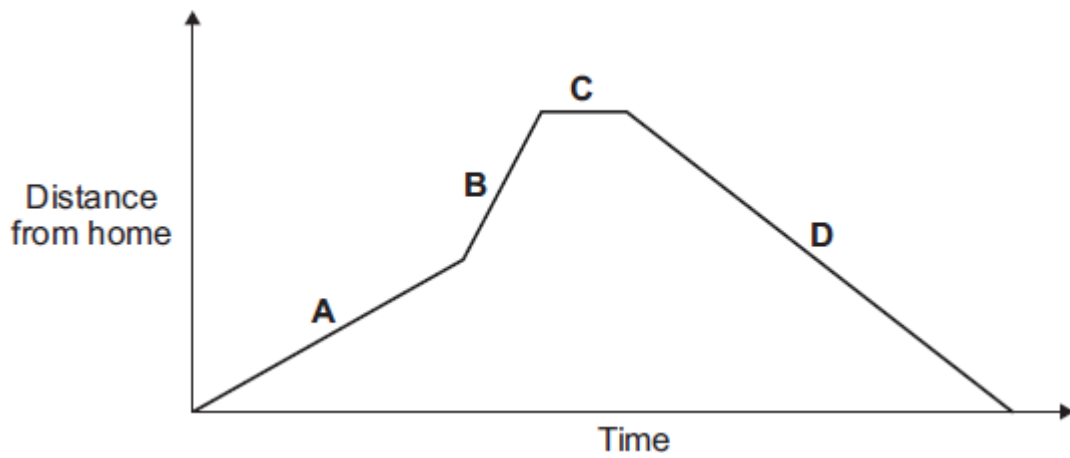
(2)

(Total 12 marks)

Q2.

- (a) A person takes their dog for a walk.

The graph shows how the distance from their home changes with time.



Which part of the graph, **A**, **B**, **C** or **D**, shows them walking the fastest?

Write your answer in the box.

Give the reason for your answer.

(2)

- (b) During the walk, both the speed and the velocity of the person and the dog change.

How is *velocity* different from *speed*?

(1)

(Total 3 marks)

Mark schemes

Q1.

- (a) 1.5 m/s 1
- (b) 6.0 m/s 1
- (c) **C = 3.8 (s) and D = 8.6 (s)** 1
- (t =) 4.8 (s)
allow correct subtraction of incorrect values given for C and / or D 1
- (d) straight line from **E** to x-axis 1
- finishing at 14 s 1
- (e) C–D 1
- (f) C–D 1
- (g) distance travelled 1
- (h) (resultant) force = mass × acceleration
allow $F = m a$ 1
- (i) $a = \frac{11.6}{3.2}$ 1
- = 3.625 (m/s²)
allow 3.6 (m/s²) or 3.63 (m/s²) 1
- an answer of 3.6 / 3.625 / 3.63 (m/s²) scores 2 marks*

[12]

Q2.

- (a) **B**
reason only scores if B is chosen

1

Distance time graphs and acceleration F

gradient / slope is the steepest / steeper
answers must be comparative
accept steepest line
ignore greatest speed

1

(b) (velocity includes) direction
'it' refers to velocity

1

[3]