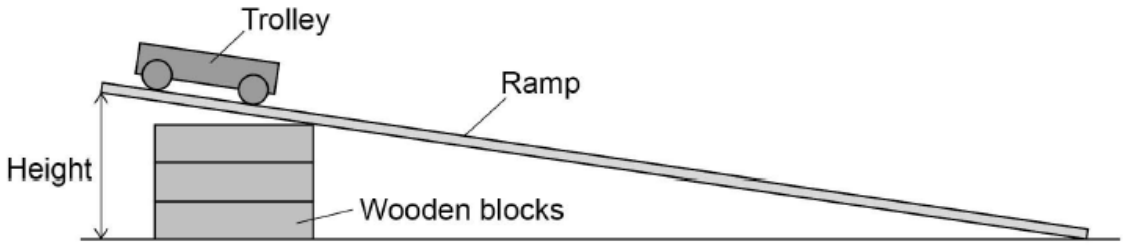
AQA - Forces and motion – GCSE Combined Science Physics

1. June/2020/Paper_2F/No.7

0 7 A student investigated how the height of a ramp affects the acceleration of a trolley down the ramp.

Figure 11 shows some of the equipment used.

Figure 11



0 7 . 1 Plan an investigation to determine how the height of the ramp affects the acceleration of the trolley.

[6 marks]

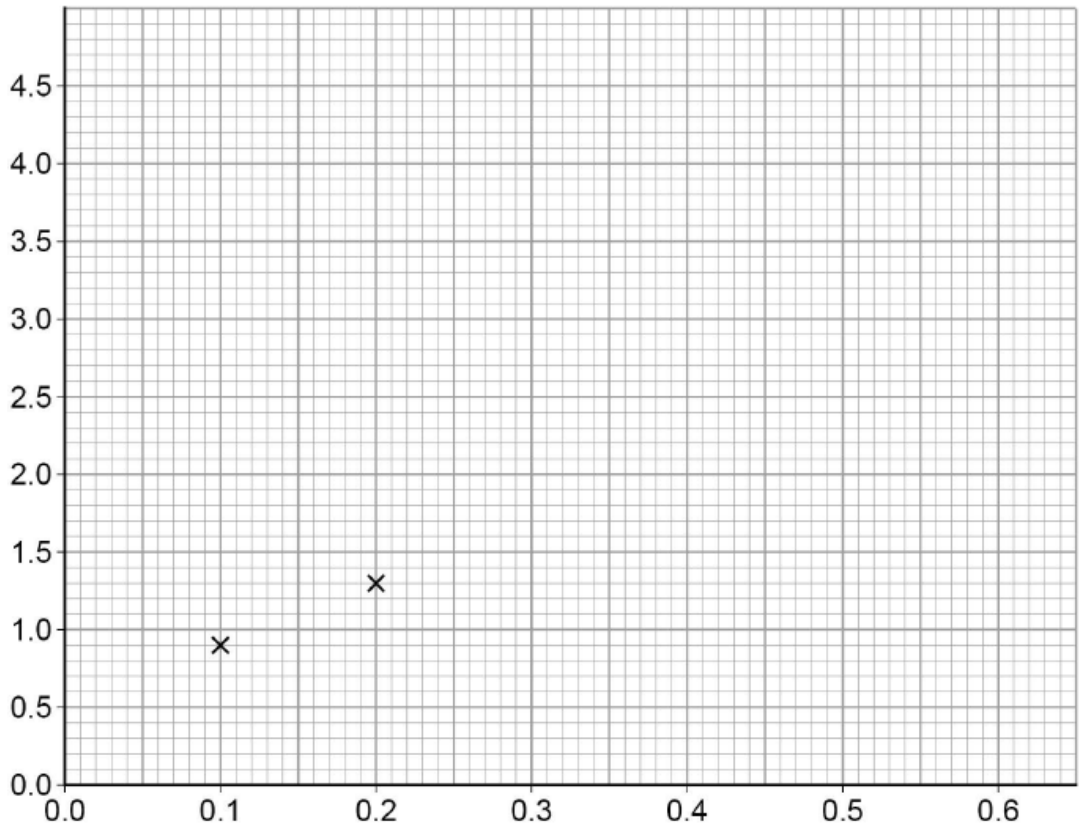
Table 2 shows the results.

Table 2

Height of ramp in metres	0.1	0.2	0.3	0.4	0.5	0.6
Acceleration in m/s^2	0.9	1.3	2.1	3.2	3.9	4.3

The first two results have been plotted on **Figure 12**.

Figure 12



0 7 . 2 Complete **Figure 12**.

You should:

- label the axes
- plot the remaining results from **Table 2**
- draw a line of best fit.

[4 marks]

0 7 . 3 Write down the equation that links acceleration (a), mass (m) and resultant force (F).

[1 mark]

0 7 . 4 When the resultant force on the trolley was 0.63 N the acceleration of the trolley was 2.1 m/s^2

Calculate the mass of the trolley.

[3 marks]

Mass of trolley = _____ kg

2. June/2020/Paper_2F/No.1

0 1 **Figure 1** shows a girl bowling a ball along a ten-pin bowling lane.

Figure 1

The girl is trying to knock down the ten pins at the end of the bowling lane.

As the ball travels along the lane the velocity of the ball decreases.

0 1 . 1 Velocity is a vector.

Which statement describes a vector?

[1 mark]

Tick (✓) **one** box.

Vectors have direction only. ☐

Vectors have magnitude and direction. ☐

Vectors have magnitude only. ☐

0 1 . 2 Why does the velocity of the ball decrease as the ball travels along the lane?

[1 mark]

Tick (✓) **one** box.

The force of gravity slows the ball down. ☐

There are no forces acting on the ball. ☐

There is a resultant force acting on the ball. ☐

0 1 . 3 The ball travels along the lane at an average speed of 4.5 m/s

It takes the ball 4.0 seconds to travel the length of the lane.

Calculate the length of the lane.

Use the equation:

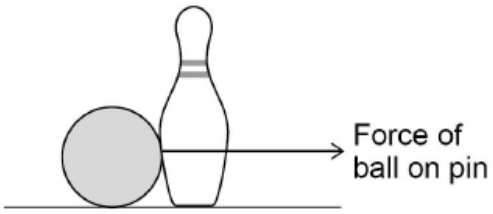
distance travelled = speed × time

[2 marks]

Length of the lane = _____ m

Figure 2 shows the ball hitting one of the pins.

Figure 2



0 1 . 4 Draw an arrow on **Figure 2** to show the force of the pin on the ball.

[2 marks]

0 1 . 5 The velocity of the pin changes from 0 to 12 m/s

It takes 0.15 seconds for the velocity to change.

Calculate the acceleration of the pin.

Use the equation:

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

[2 marks]

Acceleration = _____ m/s^2

0 1 . 6 When the pin is struck it accelerates.

Complete the sentences.

Choose answers from the box.

Each answer can be used once, more than once, or not at all.

[3 marks]

decreases	**increases**	**stays the same**

The displacement of the pin from the girl _____ .

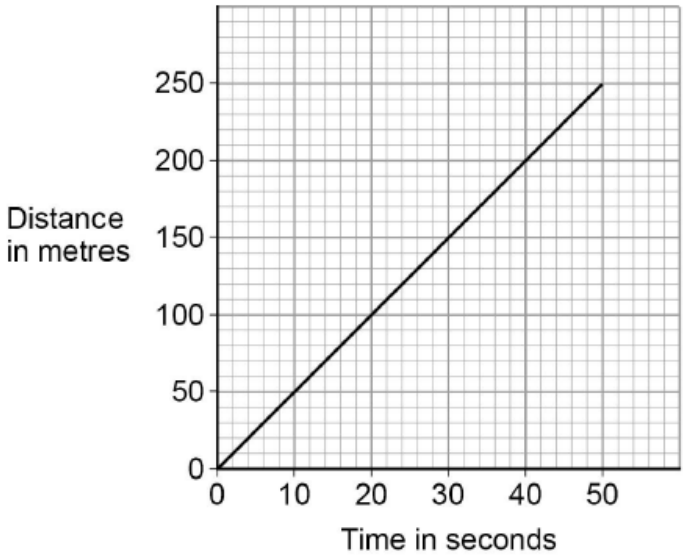
The mass of the pin _____ .

The kinetic energy of the pin _____ .

3. June/2020/Paper_2F/No.4

0 4 **Figure 5** shows a distance-time graph for 50 seconds of a bicycle ride.

Figure 5



0 4 . 1 The gradient of the distance-time graph gives the speed of the bicycle.

Determine the speed of the bicycle.

[2 marks]

Speed = _____ m/s

0 4 . 2 Which force acting on the moving bicycle is a non-contact force?

[1 mark]

Tick (✓) **one** box.

Air resistance ☐

Friction ☐

Gravitational force ☐

Normal contact force ☐

0 4 . 3 The bicycle travels a distance of 250 m

The bicycle exerts a constant horizontal force of 30 N on the ground.

Calculate the work done.

Use the equation:

work done = force × distance

Choose the unit from the box.

[3 marks]

J	**kg**	**m**

Work done = _____ Unit _____

0 4 . 4 The bicycle travels at a constant speed.

Complete the sentences.

Choose answers from the box.

[3 marks]

chemical	**frictional**	**kinetic**
magnetic		**tension**

As the bicycle moves, work is done against _____ forces.

There is no change in the cyclist's _____ store of energy.

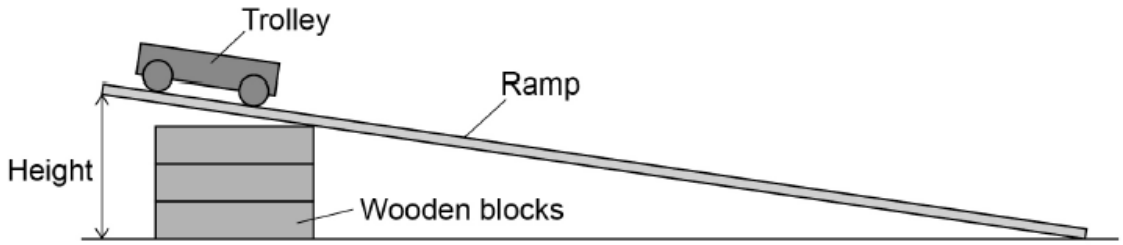
There is a decrease in the cyclist's _____ store of energy.

4. June/2020/Paper_2H/No.2

0 2 A student investigated how the height of a ramp affects the acceleration of a trolley down the ramp.

Figure 3 shows some of the equipment used.

Figure 3



0 2 . 1 Plan an investigation to determine how the height of the ramp affects the acceleration of the trolley.

[6 marks]

Table 1 shows the results.

Table 1

Height of ramp in metres	0.1	0.2	0.3	0.4	0.5	0.6
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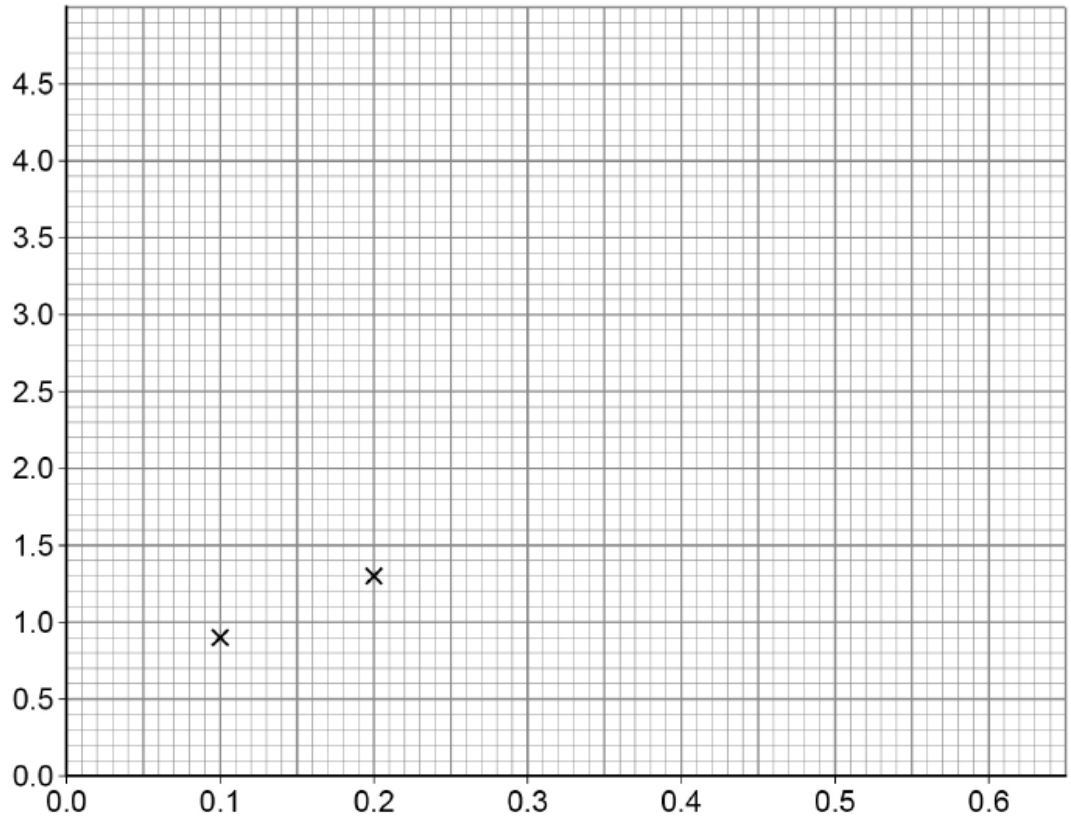
Figure 4



0 2 . 2 Complete **Figure 4**.

You should:

- label the axes
- plot the remaining results from **Table 1**
- draw a line of best fit.

[4 marks]

0 2 . 3 Write down the equation that links acceleration (a), mass (m) and resultant force (F).

[1 mark]

0 2 . 4 When the resultant force on the trolley was 0.63 N the acceleration of the trolley was 2.1 m/s^2

Calculate the mass of the trolley.

[3 marks]

Mass of trolley = _____ kg

5. June/2020/Paper_2H/No.4(4.1)

0 4 **Figure 8** shows a girl bowling a ball along a ten-pin bowling lane.

Figure 8

The girl is trying to knock down the ten pins at the end of the bowling lane.

0 4 . 1 Velocity is a vector quantity, speed is a scalar quantity.

Describe what is meant by a vector quantity and a scalar quantity.

[2 marks]

Vector quantity _____

_____

Scalar quantity _____

_____

6. June/2020/Paper_2H/No.6

0 6 The speed limit on many roads in towns is 13.5 m/s

Outside schools this speed limit is often **reduced by** one-third.

0 6 . 1 Calculate the reduced speed limit.

[2 marks]

Reduced speed limit = _____ m/s

0 6 . 2 A reduced speed limit may reduce air pollution.

Explain **one** other advantage of a reduced speed limit.

[2 marks]

0 6 . 3 **Figure 11** shows a car being driven at a constant speed past a speed camera.

Figure 11

The camera recorded two images of the car 0.70 s apart.

The car travelled 14 m between the two images being taken.

The maximum deceleration of the car is 6.25 m/s^2

Calculate the minimum braking distance for the car at the speed it passed the speed camera.

[6 marks]

Minimum braking distance = _____ m

0 6 . 4 **Figure 12** shows a delivery van full of packages.

Figure 12

The driver delivers all the packages.

The empty van has a shorter stopping distance than the full van when driven at the same speed.

Explain why.

[3 marks]

7. June/2019/Paper_2F/No.3

0 3 **Figure 4** shows two children playing table tennis.

The boy hits the ball from one end of the table.

Figure 4

0 3 . 1 Why does the velocity of the ball change when the boy hits it?

[1 mark]

Tick (✓) **one** box.

The direction of the ball does not change. ☐

There is a resultant force on the ball. ☐

The mass of the ball increases. ☐

The speed of the ball is constant. ☐

0 3 . 2 The ball has an average speed of 11 m/s

The ball takes 0.25 s to travel the same distance as the length of the table.

Calculate the length of the table.

Use the equation:

distance travelled = speed × time

[2 marks]

Length of table = _____ m

0 3 . 3 A table tennis ball should only be used if it bounces to at least 75% of the height it was dropped from.

A manufacturer tested a table tennis ball.

Table 1 shows the results.

Table 1

Height ball was dropped from in cm	Height of bounce in cm
30.0	25.1

Determine whether the ball can be used.

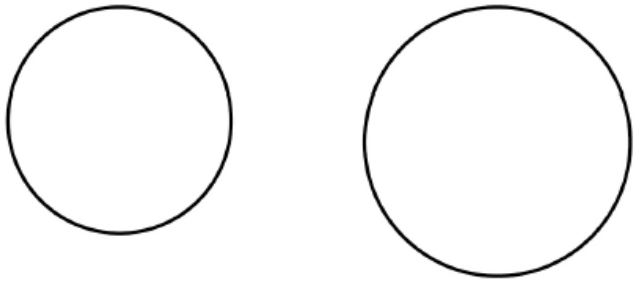
Use the data from **Table 1**.

[3 marks]

0 3 . 4 **Figure 5** shows two table tennis balls.

The balls are different sizes but have the same mass.

Figure 5



Both balls were dropped onto the table from the same height.

After they were dropped, the resultant force on the smaller ball was greater than the resultant force on the larger ball.

Explain why.

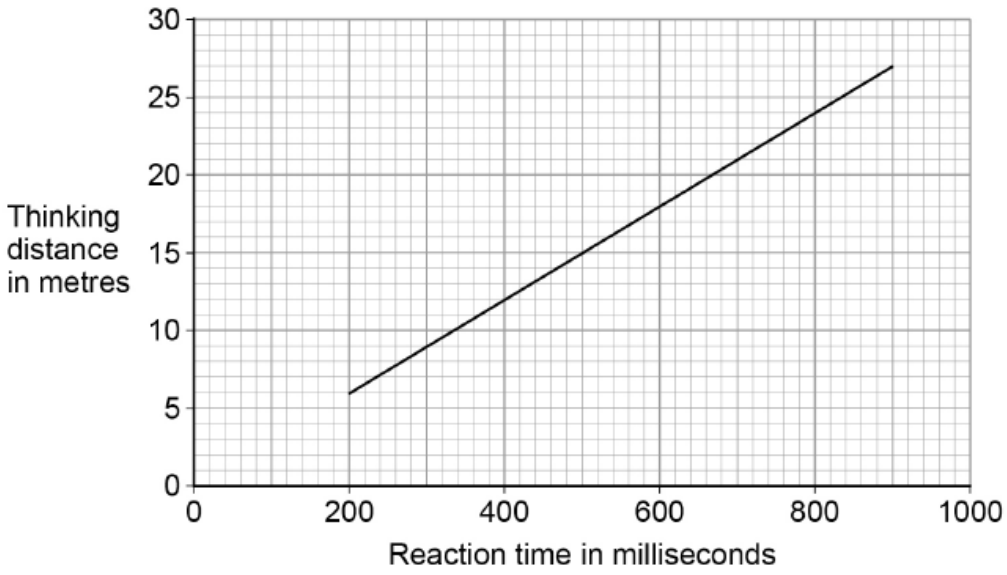
[2 marks]

8. June/2019/Paper_2F/No.4(4.1_4.6)

0 4 The thinking distance of a car depends on the reaction time of the driver.

Figure 6 shows how thinking distance varies with reaction time for a car travelling at 30 m/s

Figure 6



0 4 . 1 The reaction time of a driver can double if the driver is distracted.

Explain the effect doubling the reaction time has on the thinking distance.

Use data from **Figure 6**.

[2 marks]

0 4 . 2 Give the reason why there are no values of thinking distance for reaction times less than 200 milliseconds.

[1 mark]

A driver measured her reaction time using an online test. She did the test five times.

Table 2 shows the results.

Table 2

Reaction time in milliseconds				
258	265	302	248	327

0 4 . 3 How does the data in **Table 2** show that it was important that the driver did the test five times?

[1 mark]

0 4 . 4 Calculate the mean reaction time of the driver.

[2 marks]

Mean reaction time = _____ ms

0 4 . 5 The driver is driving her car at 30 m/s

Determine the thinking distance.

Use **Figure 6** and your answer from Question **04.4**

[1 mark]

Thinking distance = _____ m

0 4 . 6 The driver applies the brakes and the car comes to a stop.

The force exerted by the brakes affects the braking distance.

Give **two** other factors that affect the braking distance.

[2 marks]

1 _____

2 _____

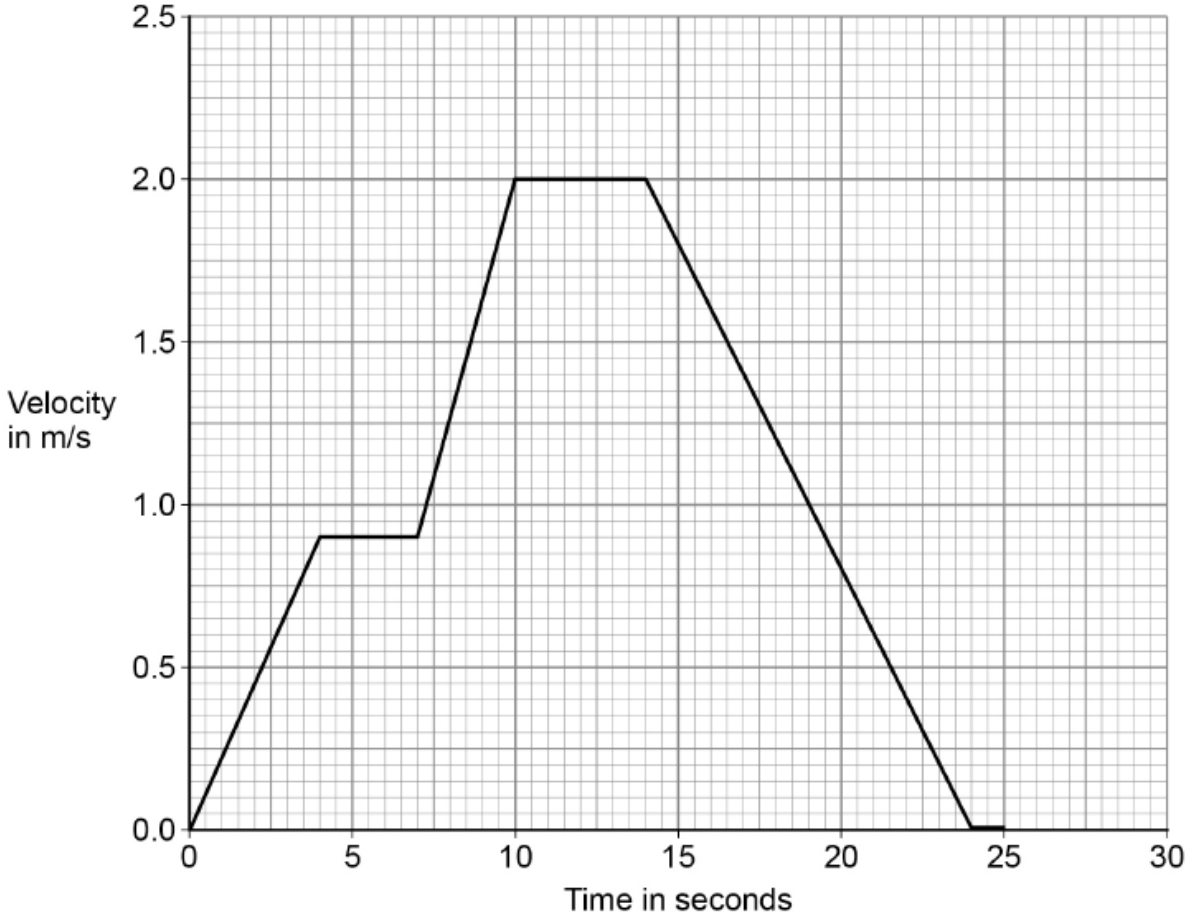
9. June/2019/Paper_2F/No.6(6.1_6.2)

0 6 **Figure 9** shows a runner using a smart watch and a mobile phone to monitor her run.

Figure 9

Figure 10 is a velocity–time graph for part of the runner's warm-up.

Figure 10



0 6 . 1 Determine the total time for which the velocity of the runner was increasing.

[2 marks]

Time = _____ s

0 6 . 2 Determine the deceleration of the runner.

[2 marks]

Deceleration = _____ m/s^2

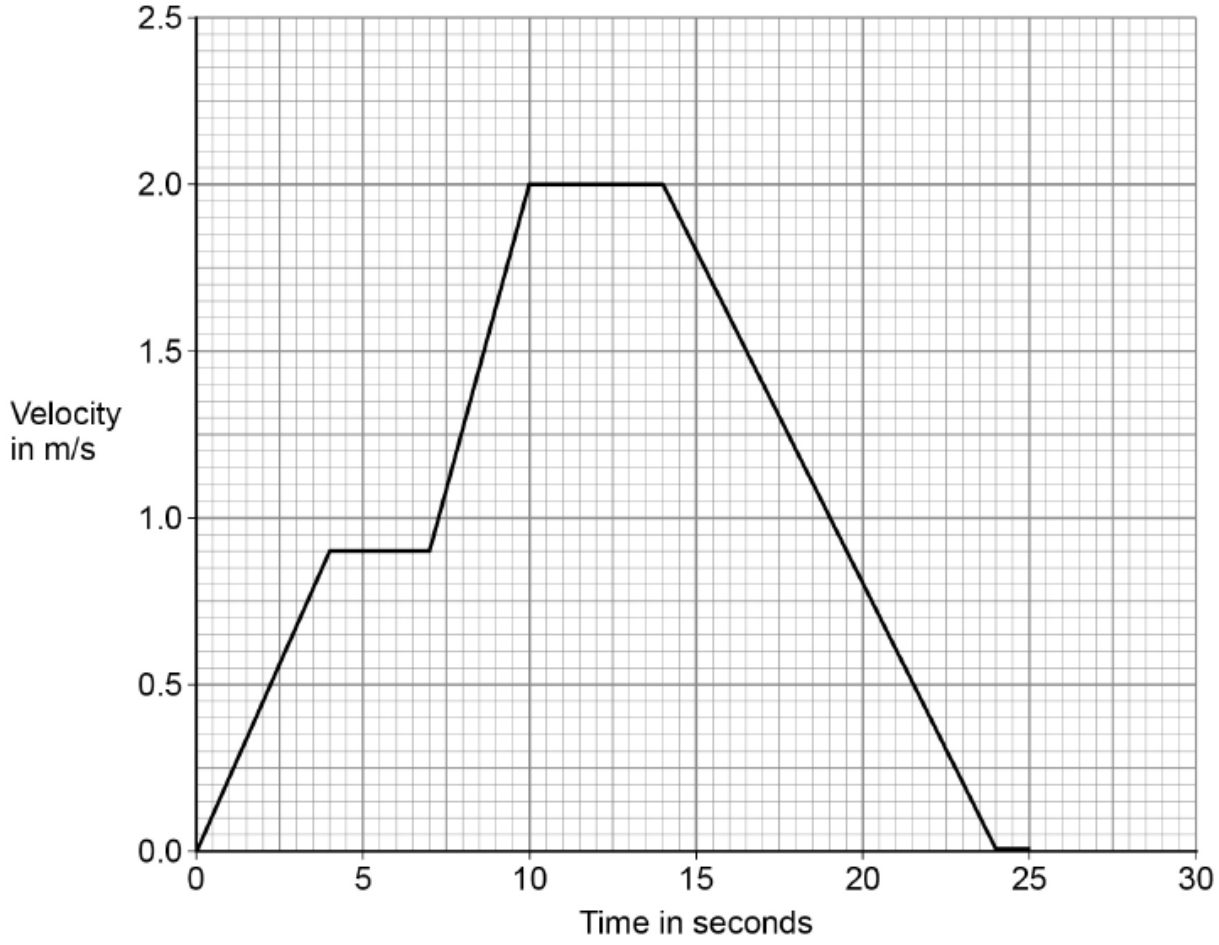
10. June/2019/Paper_2H/No.1(1.1-1.2)

0 1 **Figure 1** shows a runner using a smart watch and a mobile phone to monitor her run

Figure 1

Figure 2 is a velocity–time graph for part of the runner's warm-up.

Figure 2



0 1 . 1 Determine the total time for which the velocity of the runner was increasing.

[2 marks]

Time = _____ s

0 1 . 2 Determine the deceleration of the runner.

[2 marks]

Deceleration = _____ m/s^2