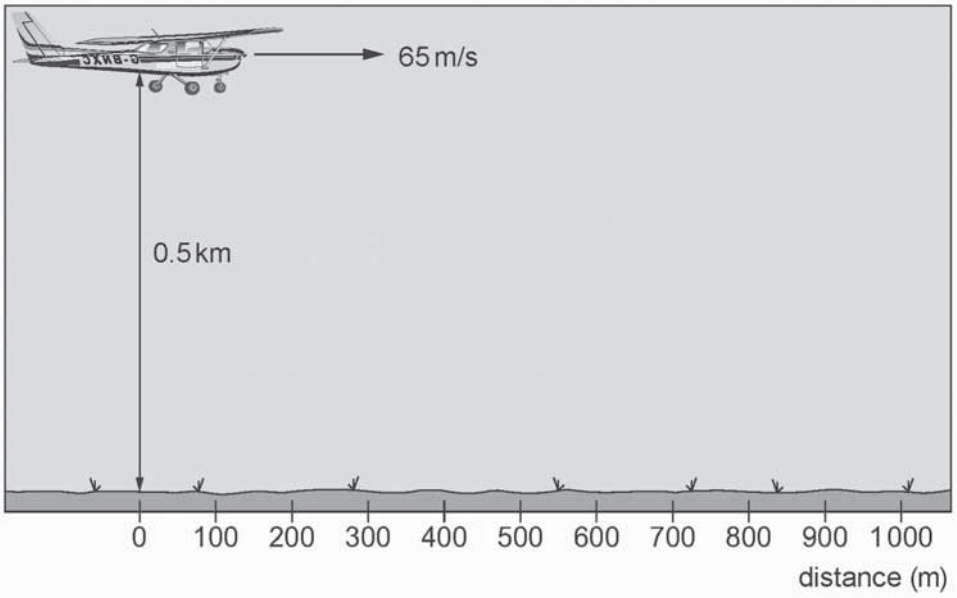
Eduqas Physics GCSE
Topic 4.1: Motion concepts
Questions by topic

1 (part (a) (i) HIGHER).

An aeroplane flies horizontally at a constant velocity of 65 m/s at a height of 0.5 km when it releases a package.



Ignore air resistance throughout the question.

(a) Use equations from page 2 to answer the following questions.

(i) Calculate the time taken for the package to reach the ground. (Acceleration due to gravity, g = 10 m/s^2) [3]

time = ... s

(ii) Calculate the distance that the aeroplane moves horizontally in this time. [2]

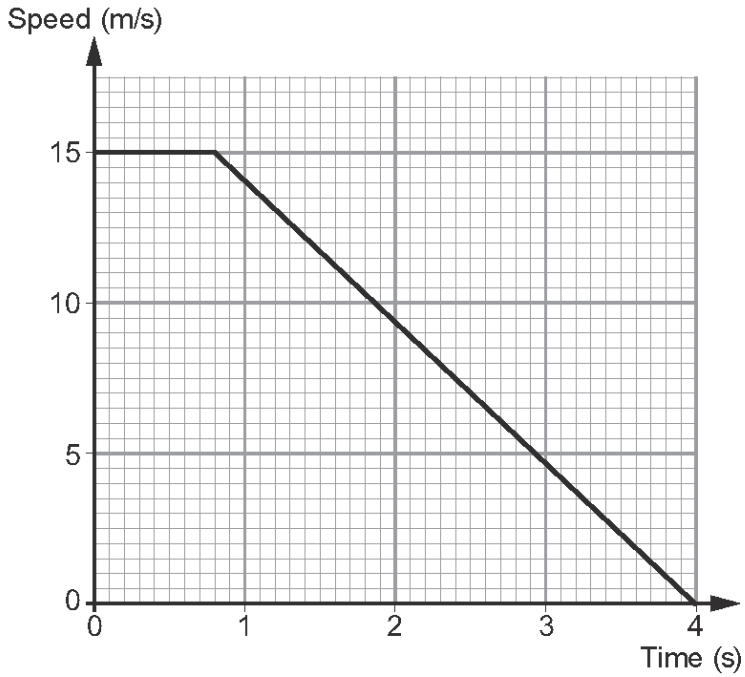
distance = ... m

(b) The horizontal motion is unaffected by gravity. **Mark an X on the diagram** above to show where the package hits the ground. [2]

2.

A car is moving at a speed of 15 m/s. A child runs out into the road causing the driver to make an emergency stop.

(a) The graph shows how the speed of the car changes from the moment the driver sees the child.



(i) What was the reaction time of the driver? [1]

..... s

(ii) How long did it take the car to stop once the brakes were applied? [1]

..... s

(iii) Use an equation from page 2 to calculate the deceleration of the car. [2]

deceleration = ... m/s^2

(iv) Explain how the graph would be different for a driver who had drunk alcohol. [2]

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(v) Explain how the graph would be different if it had been a wet day. [2]

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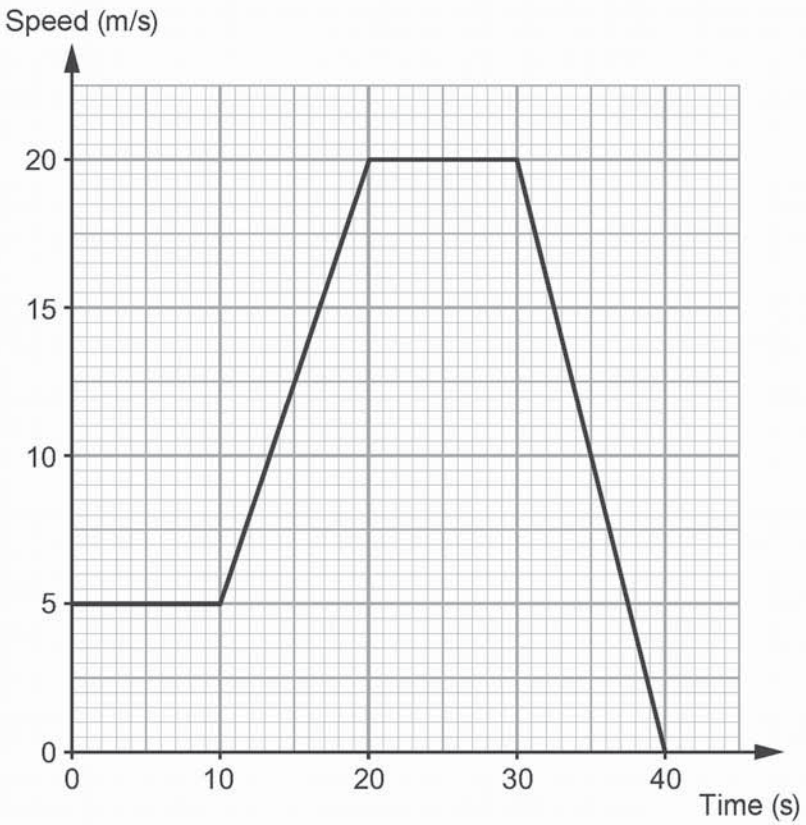
3.

The graph shows part of the journey of a cyclist.

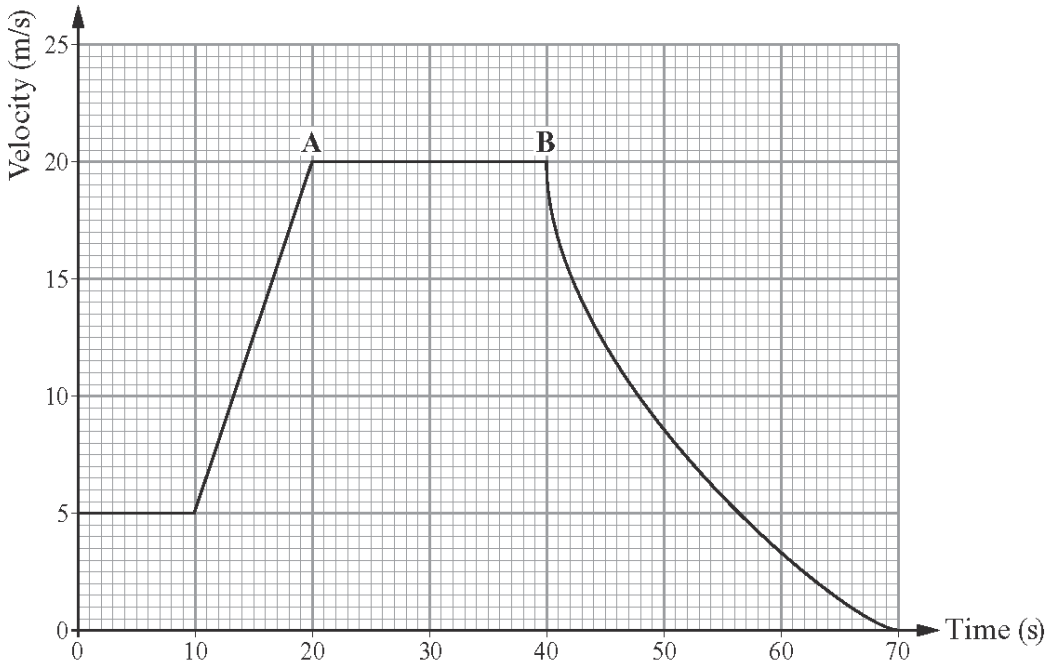


Use equations from page 2 to calculate the mean speed of the cyclist during the 40 s shown.
[4]

mean speed = ... m/s

4.

The velocity-time graph for part of a journey of a bus is shown below.



(i) Using data from the graph, describe the motion of the bus during the 70 s shown.

[6 QWC]

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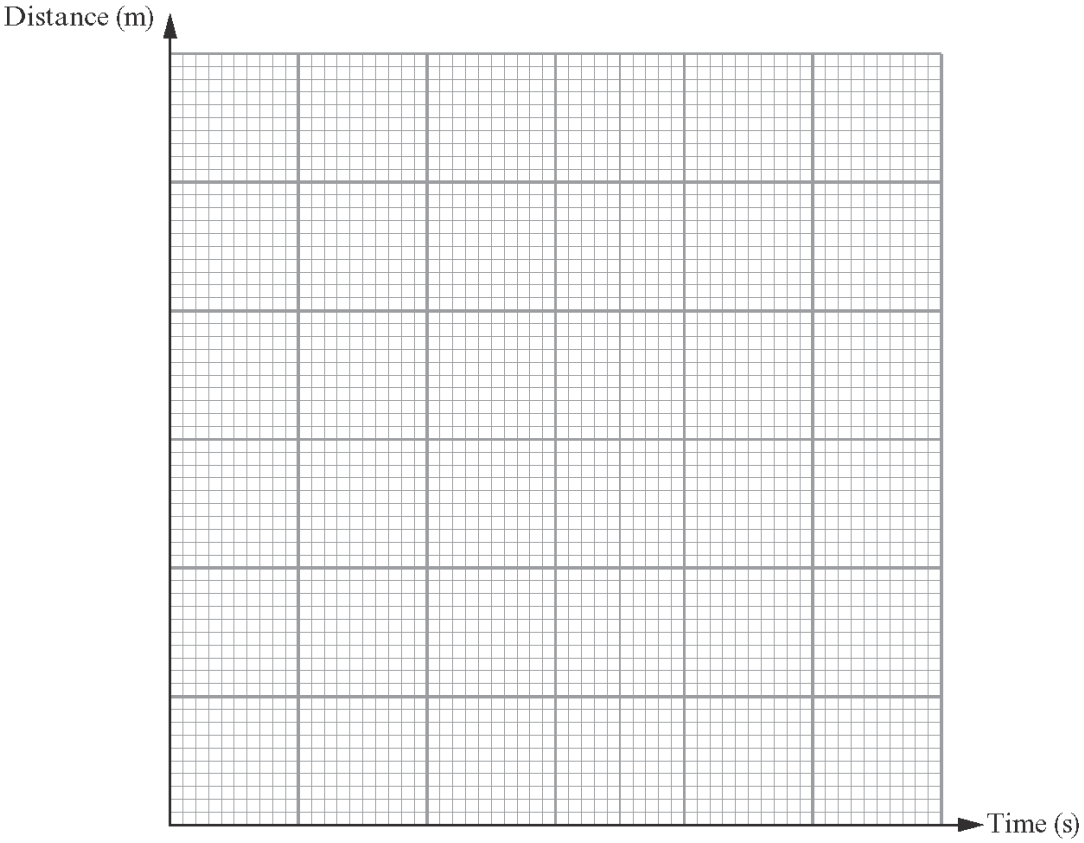
(ii) During the first 10 s, the bus travels 50 m. Use this information to construct a distance-time graph for the **first 10 s only** on the grid below. [3]



(iii) Use the equation:

$$\text{distance} = \text{speed} \times \text{time}$$

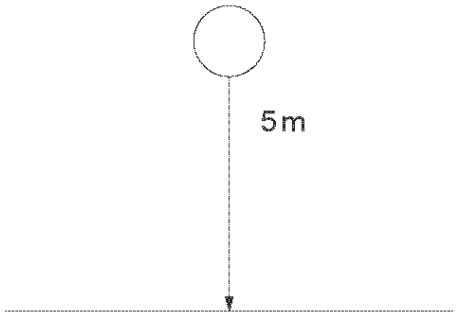
to calculate the distance travelled by the bus between **A** and **B** on the graph opposite. [3]

Distance travelled = ... m

12

5.

A ball of mass 0.2 kg, initially at rest, is dropped from a height of 5 m.



Use equations from page 2 to answer the following questions.
Assume acceleration due to gravity = 10 m/s^2 and that air resistance is negligible.

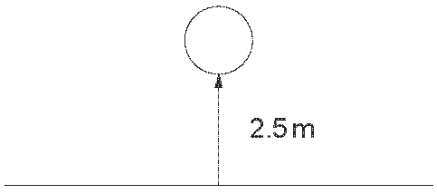
(i) Calculate the speed with which the ball hits the ground. [3]

speed = ... m/s

(ii) As the ball rebounds it loses **half of its kinetic energy**. Calculate the rebound speed. [2]

speed = ... m/s

(iii) The ball rebounds to a maximum height of 2.5 m. Calculate how long it takes to reach this height after it rebounds. [3]



time = ... s

8

6.

A car is travelling at 15 m/s and decelerates to 0 m/s in 5 s on a dry road.

(i) Use an equation from page 2 to calculate the deceleration of the car. [2]

deceleration = ... m/s^2

(ii) (I) Use the equation:

$$\text{mean speed} = \frac{(\text{initial speed} + \text{final speed})}{2}$$

to calculate the mean speed of the car as it decelerates. [2]

mean speed = ... m/s

(II) Explain how the mean speed of the decelerating car travelling at 15 m/s would have changed (if at all) if the road had been icy instead of dry. [2]

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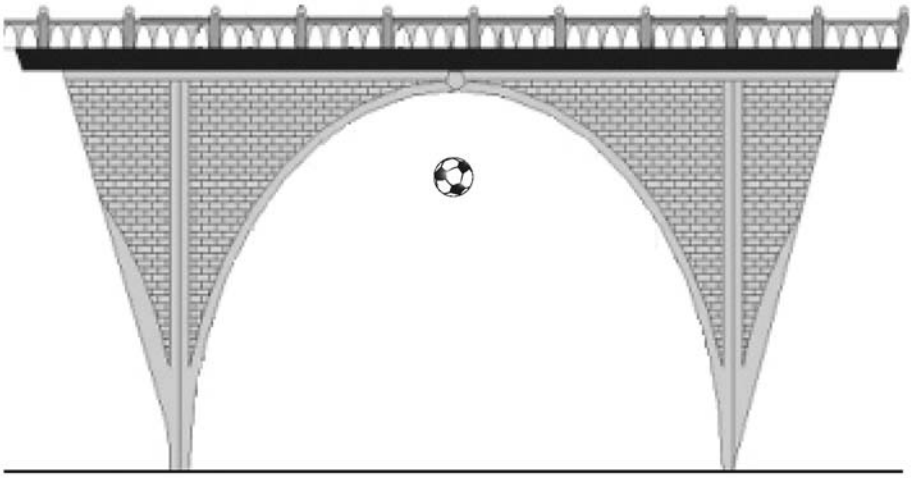
7.

A football of mass 0.3 kg is dropped from rest off a bridge and takes 2.8 seconds to reach the ground below.



The diagram is not drawn to scale

Use equations from page 2 to answer the questions below.
Assume the acceleration due to gravity = 10 m/s^2 and that air resistance is negligible.

(a) Calculate the height of the bridge. [2]

height = ... m

(c) The ball rebounds from the ground with a speed of 14 m/s.

(i) Calculate the kinetic energy of the football as it leaves the ground. [2]

kinetic energy = ... J

8. **(a)** State the factors which completely describe a vector quantity.

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..... [1]

9.

Fig. 2.1 is a head-on view of an airliner flying at constant speed in a circular horizontal path. The centre of the circle is to the left of the diagram.

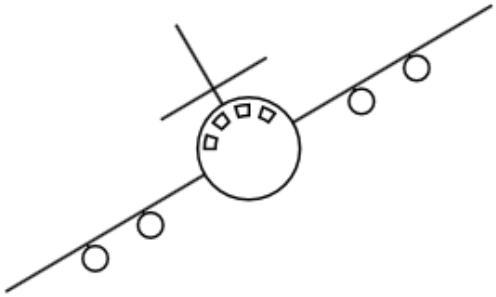

Fig. 2.1

(a) On Fig. 2.1, draw the resultant force acting on the airliner. Explain your answer.

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..... [3]

(c) The speed is constant as the airliner flies in this circular path.

State and explain what is happening to the velocity.

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..... [2]