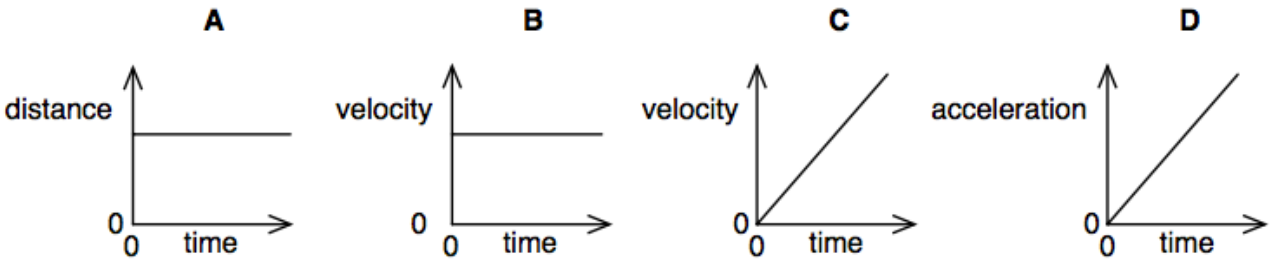
1)

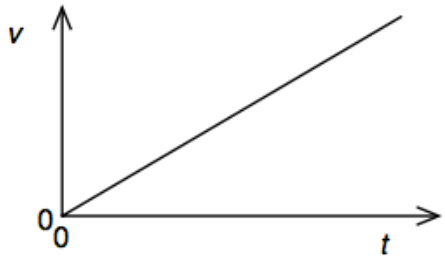
A particle is moving in a straight line with uniform acceleration.

Which graph represents the motion of the particle?

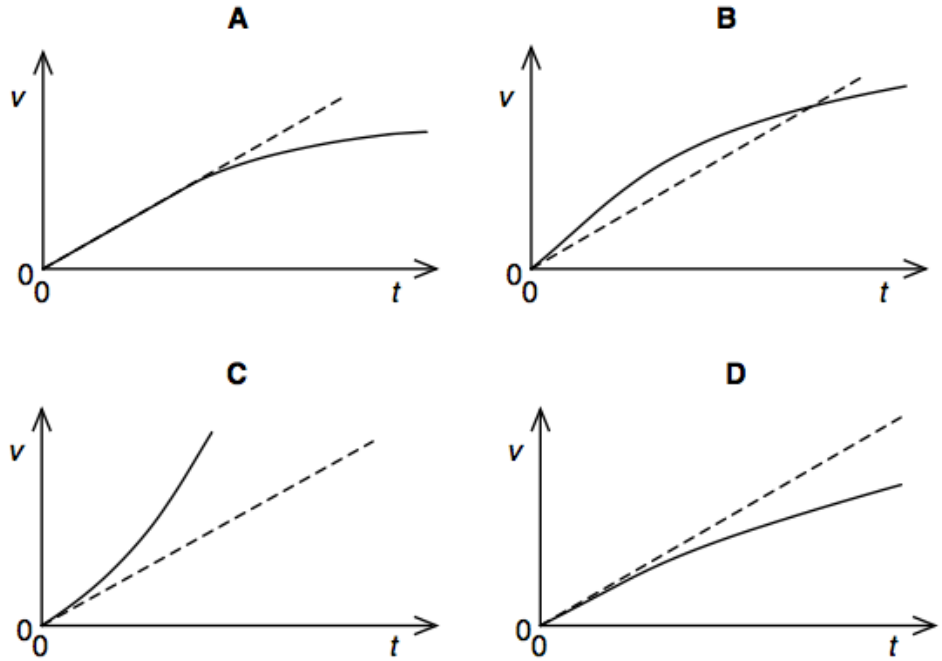


2)

A body falls from rest in a vacuum near the Earth's surface. The variation with time *t* of its speed *v* is shown below.

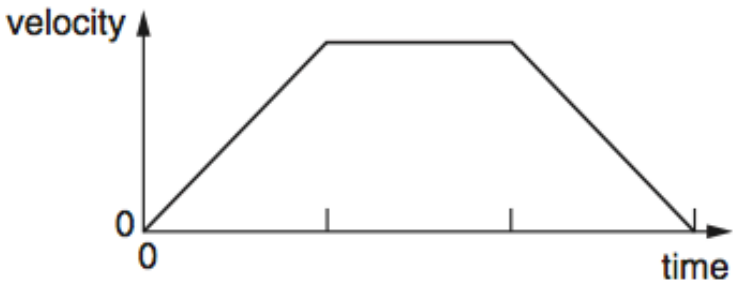


Which graph shows the variation with time *t* of the speed *v* of the same ball falling in air at the same place on Earth?



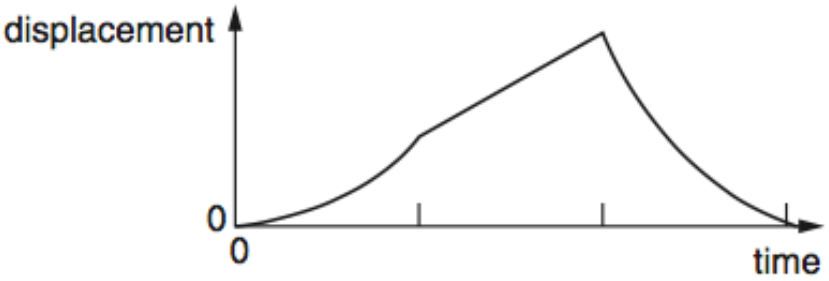
3)

The graph of velocity against time for an object moving in a straight line is shown.

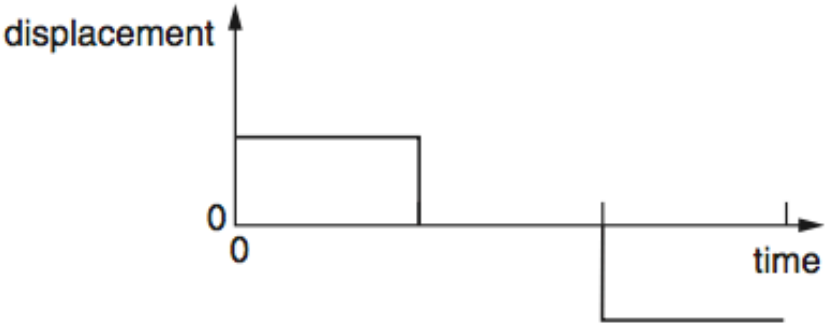


Which of the following is the corresponding graph of displacement against time?

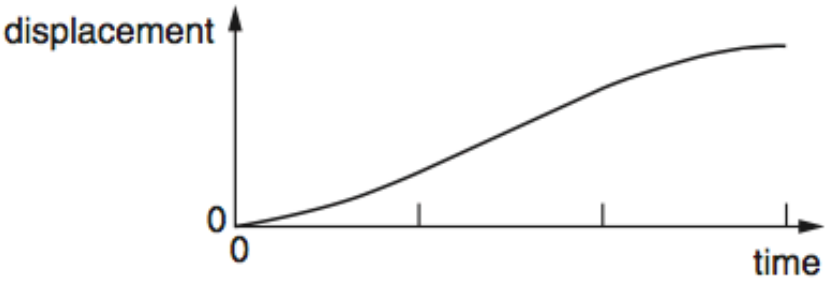
A



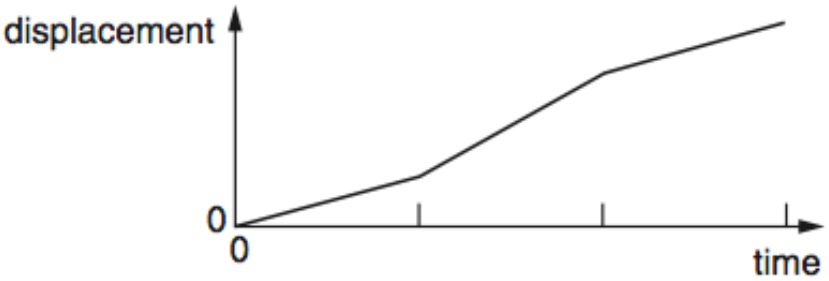
B



C

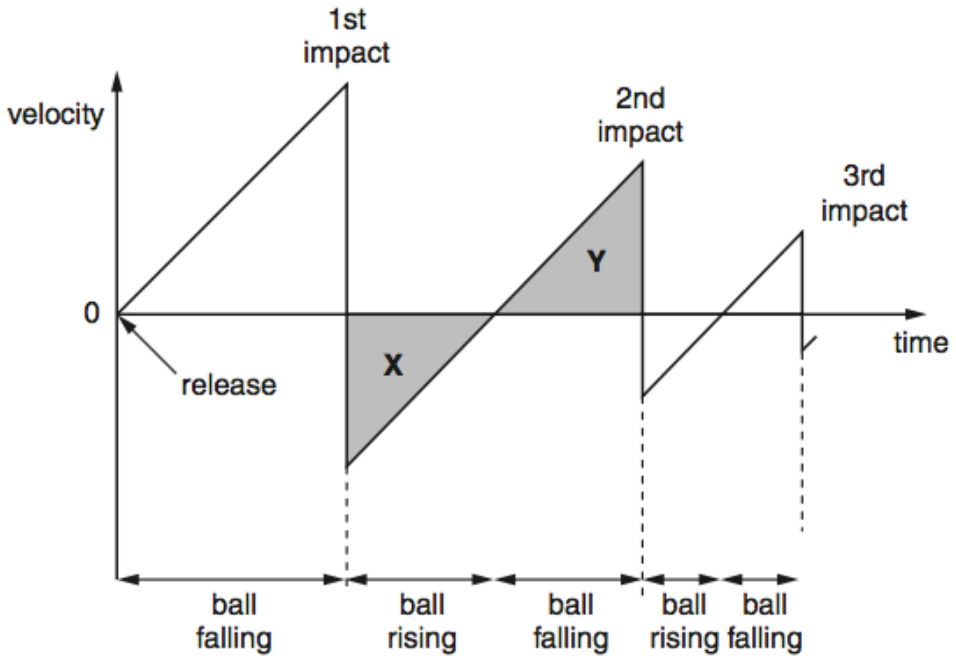


D



4)

A ball is released from rest above a horizontal surface. The graph shows the variation with time of its velocity.



Areas **X** and **Y** are equal.

This is because

A the ball's acceleration is the same during its upward and downward motion.

B the speed at which the ball leaves the surface after an impact is equal to the speed at which it returns to the surface for the next impact.

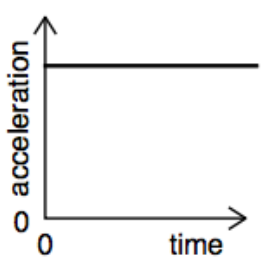
C for one impact, the speed at which the ball hits the surface equals the speed at which it leaves the surface.

D the ball rises and falls through the same distance between impacts.

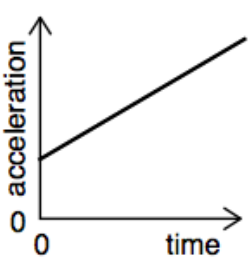
5)

Which graph represents the motion of a car that is travelling along a straight road with a uniformly increasing speed?

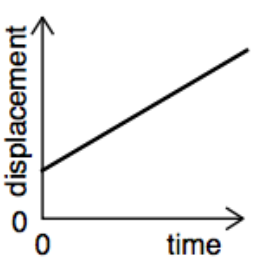
A



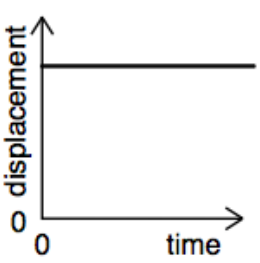
B



C



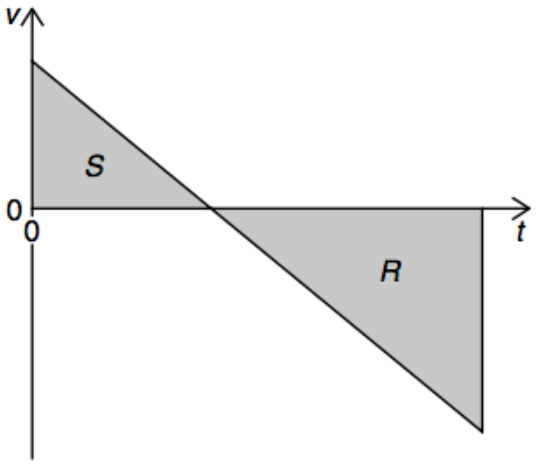
D



6)

A stone is thrown upwards from the top of a cliff. After reaching its maximum height, it falls past the cliff-top and into the sea.

The graph shows how the vertical velocity v of the stone varies with time t after being thrown upwards. R and S are the magnitudes of the areas of the two triangles.

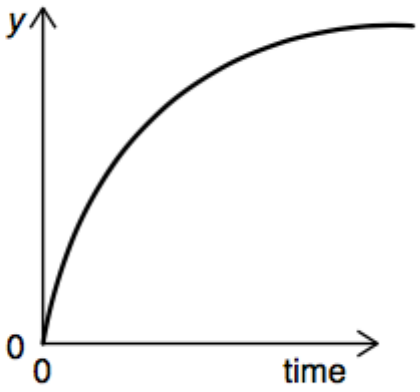


What is the height of the cliff-top above the sea?

A R **B** S **C** $R+S$ **D** $R-S$

7)

The graph relates to the motion of a falling body.



Which is a correct description of the graph?

A y is distance and air resistance is negligible

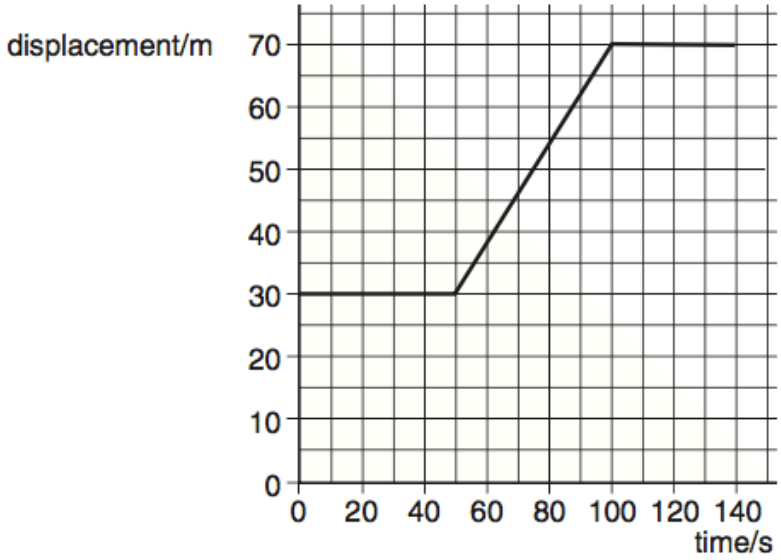
B y is distance and air resistance is not negligible

C y is speed and air resistance is negligible

D y is speed and air resistance is not negligible

8)

A car at rest in a traffic queue moves forward in a straight line and then comes to rest again. The graph shows the variation with time of its displacement.



What is its speed while it is moving?

A $0.70\,m\,s^{-1}$ **B** $0.80\,m\,s^{-1}$ **C** $1.25\,m\,s^{-1}$ **D** $1.40\,m\,s^{-1}$

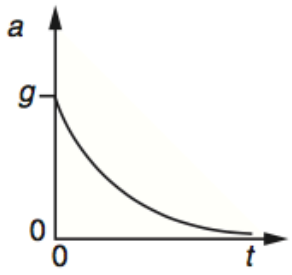
9)

An object is dropped from a great height and falls through air of uniform density.

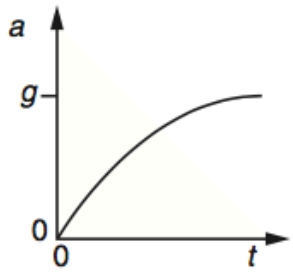
The acceleration of free fall is *g*.

Which graph could show the variation with time *t* of the acceleration *a* of the object?

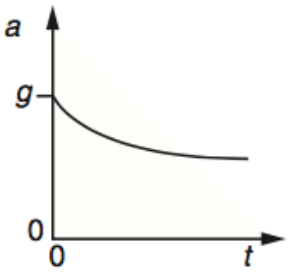
A



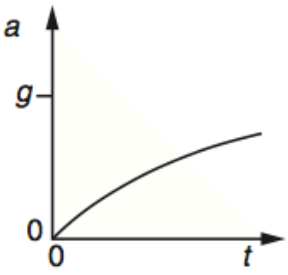
B



C



D

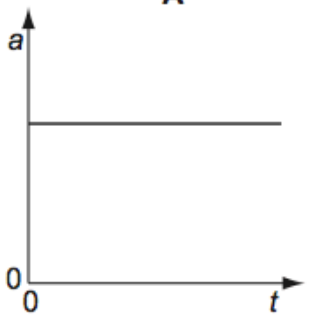


10)

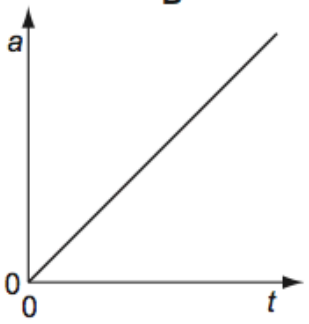
A tennis ball is released from rest at the top of a tall building.

Which graph best represents the variation with time t of the acceleration a of the ball as it falls, assuming that the effects of air resistance are appreciable?

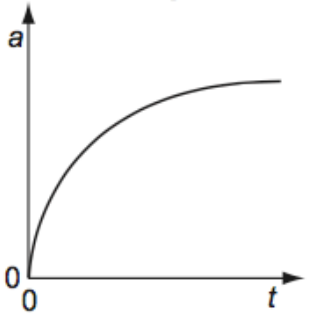
A



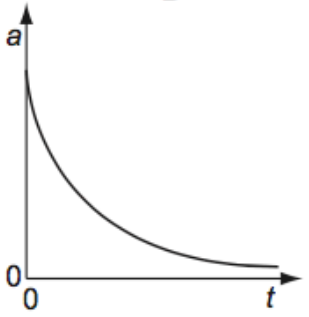
B



C

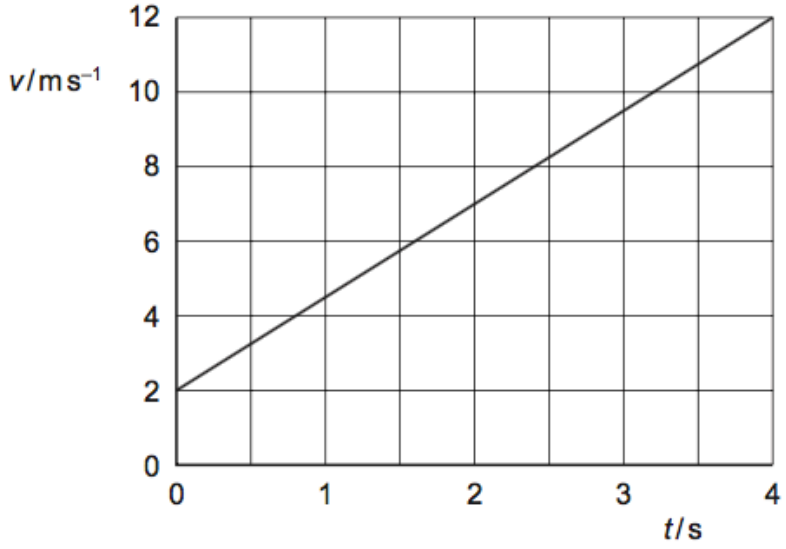


D



11)

The diagram shows a velocity-time graph for a car.

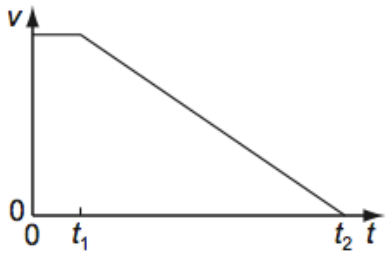


What is the distance travelled between time $t = 0$ and $t = 4$ s?

A 2.5 m **B** 3.0 m **C** 20 m **D** 28 m

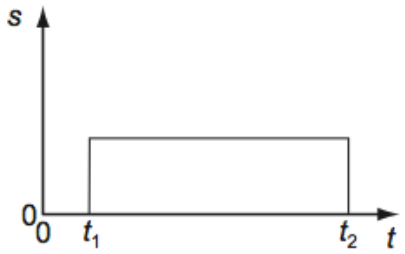
12)

When a car driver sees a hazard ahead, she applies the brakes as soon as she can and brings the car to rest. The graph shows how the speed v of the car varies with time t after the hazard is seen.

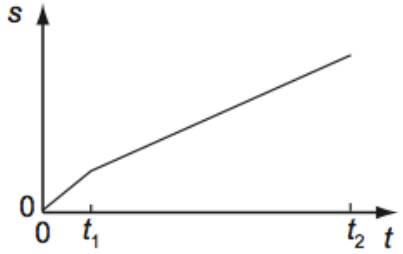


Which graph represents the variation with time t of the distance s travelled by the car after the hazard has been seen?

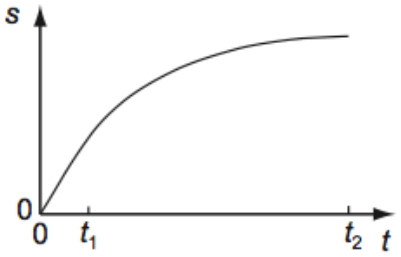
A



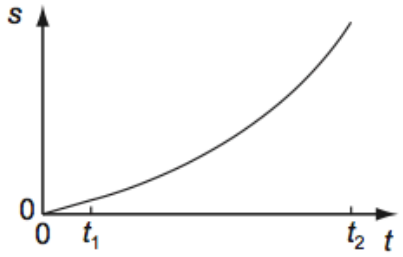
B



C



D



13)

Which feature of a graph allows acceleration to be determined?

A the area under a displacement-time graph

B the area under a velocity-time graph

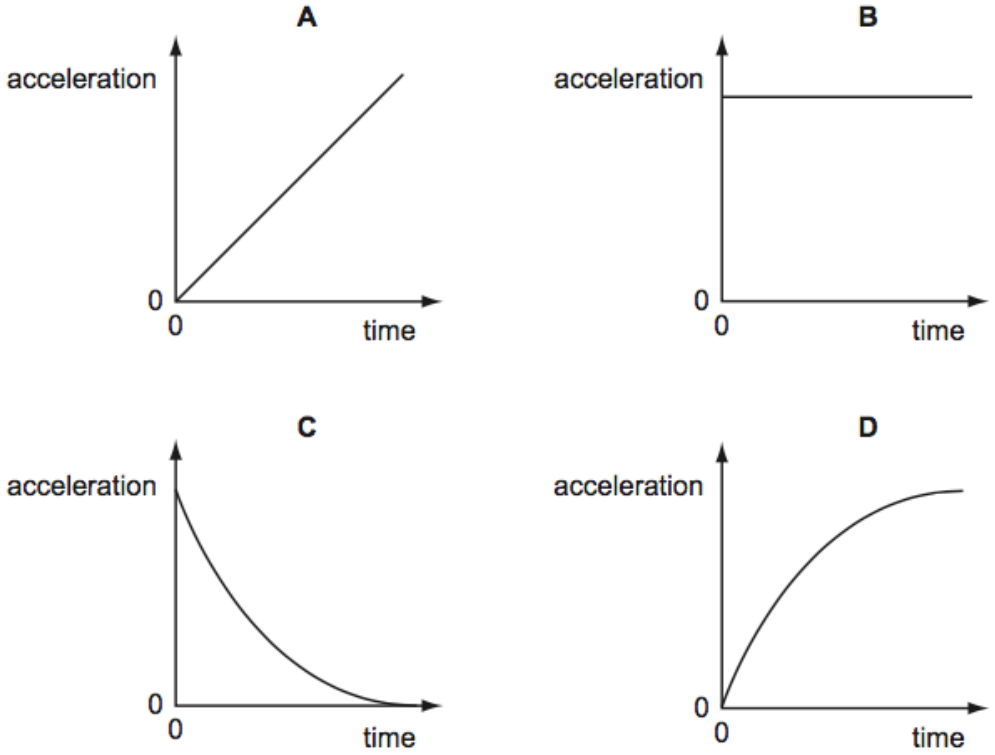
C the slope of a displacement-time graph

D the slope of a velocity-time graph

14)

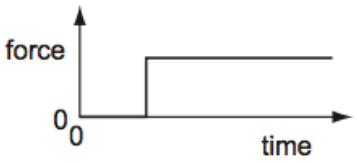
A football is dropped from the top of a tall building.

Which acceleration-time graph best represents the motion of the football through the air?

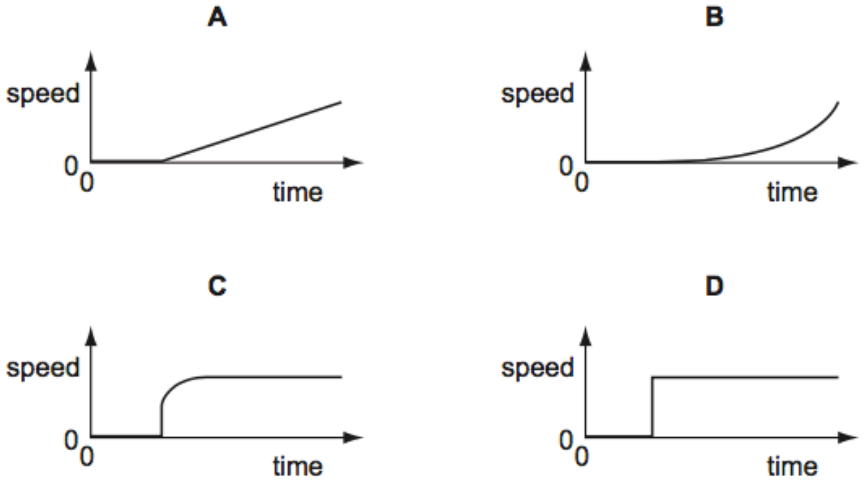


15)

A car driver sharply presses down the accelerator when the traffic lights go green. The resultant horizontal force acting on the car varies with time as shown.



Which graph shows the variation with time of the speed of the car?



16)

A student has been asked to determine the linear acceleration of a toy car as it moves down a slope. He sets up the apparatus as shown in Fig. 3.1.

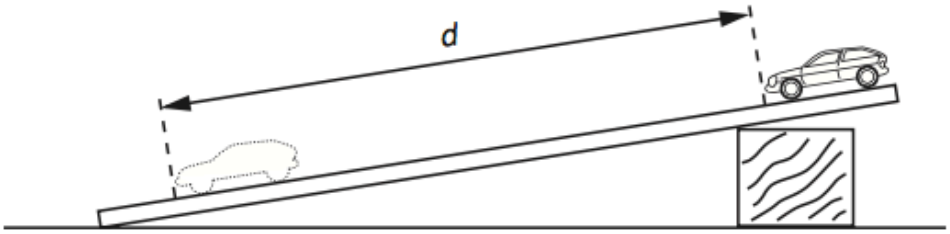


Fig. 3.1

The time t to move from rest through a distance d is found for different values of d. A graph of d (y-axis) is plotted against t^2 (x-axis) as shown in Fig. 3.2.

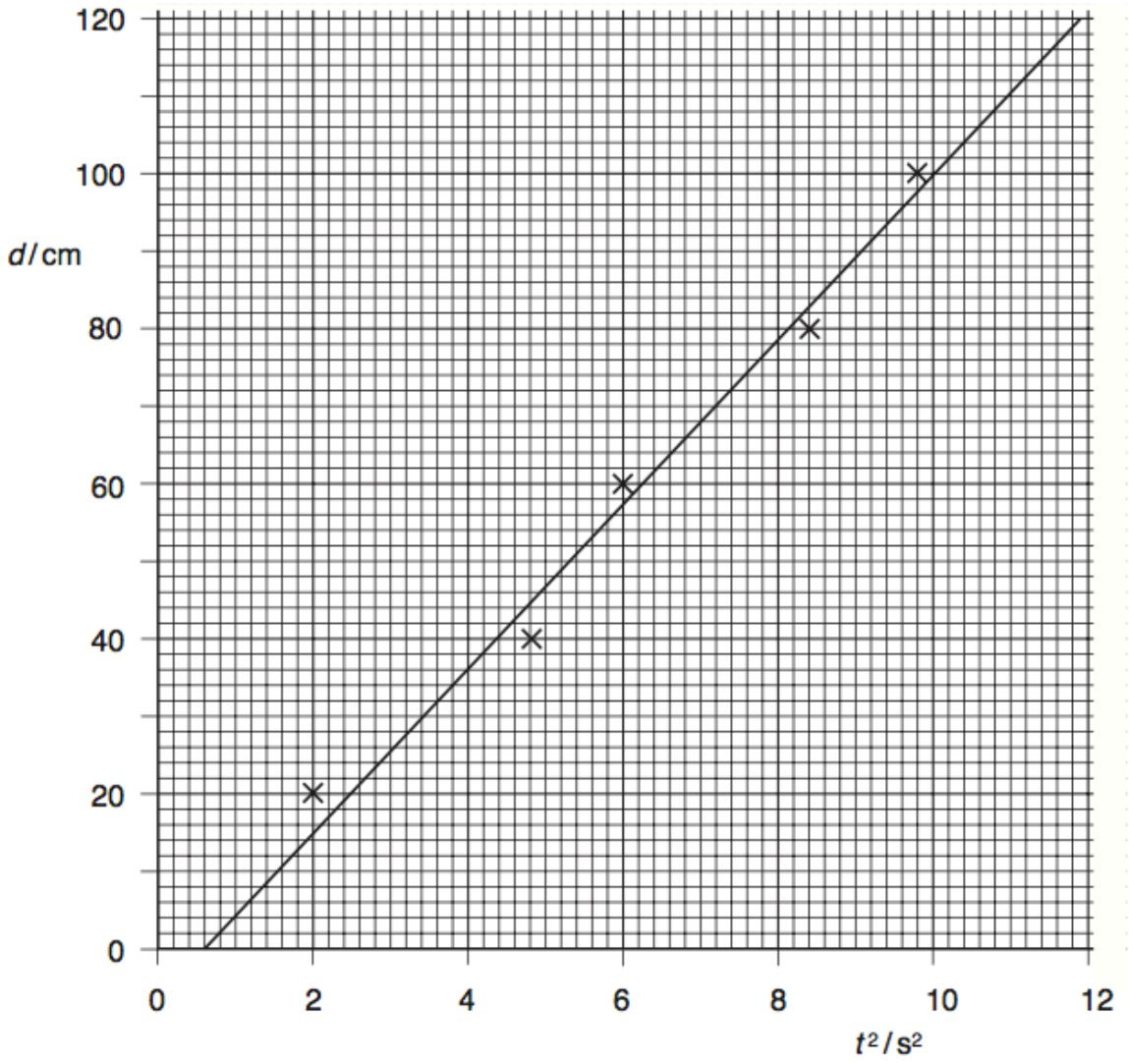


Fig. 3.2

(a) Theory suggests that the graph is a straight line through the origin.
Name the feature on Fig. 3.2 that indicates the presence of

(i) random error,

.....

(ii) systematic error.

.....
[2]

(b) **(i)** Determine the gradient of the line of the graph in Fig. 3.2.

gradient = ... [2]

(ii) Use your answer to **(i)** to calculate the acceleration of the toy down the slope.
Explain your working.

acceleration = ... $m\,s^{-2}$ [3]

17)

A student investigates the speed of a trolley as it rolls down a slope, as illustrated in Fig. 2.1.

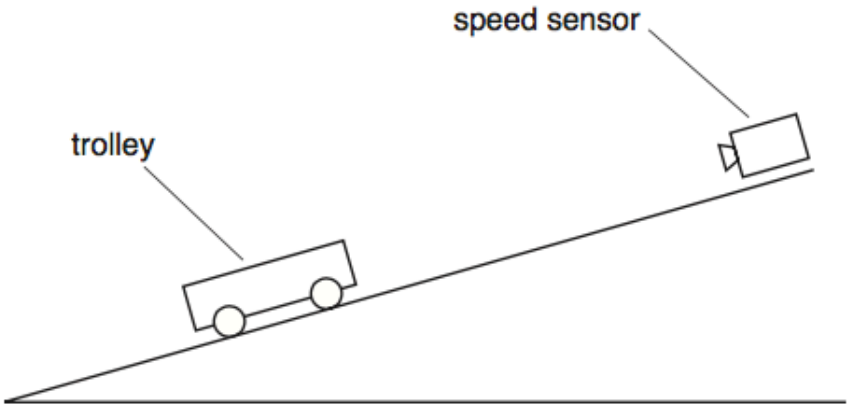


Fig. 2.1

The speed *v* of the trolley is measured using a speed sensor for different values of the time *t* that the trolley has moved from rest down the slope.

Fig. 2.2 shows the variation with *t* of *v*.

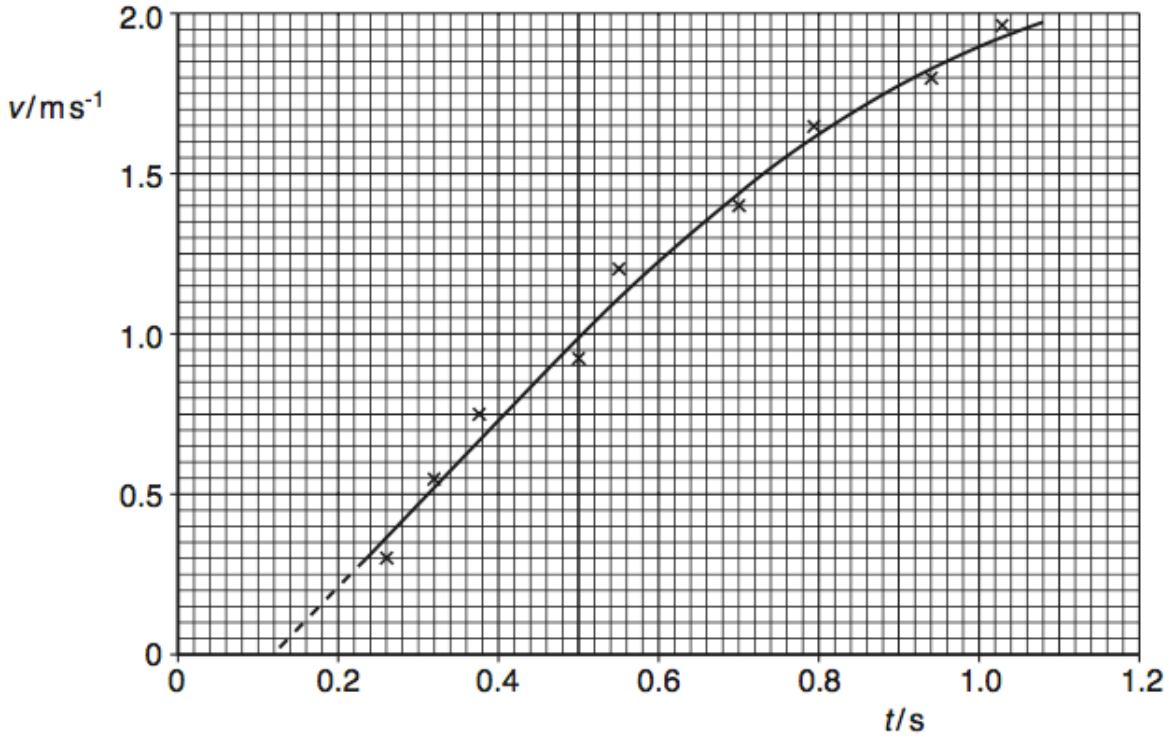


Fig. 2.2

(a) Use Fig. 2.2 to determine the acceleration of the trolley at the point on the graph where $t = 0.80$ s.

acceleration = ... $m\,s^{-2}$ [4]

(b) **(i)** State whether the acceleration is increasing or decreasing for values of t greater than 0.6 s. Justify your answer by reference to Fig. 2.2.

.....

.....

..... [2]

(ii) Suggest an explanation for this change in acceleration.

.....

..... [1]

(c) Name the feature of Fig. 2.2 that indicates the presence of

(i) random error,

.....

..... [1]

(ii) systematic error.

.....

..... [1]

18)

A ball falls from rest onto a flat horizontal surface. Fig. 3.1 shows the variation with time *t* of the velocity *v* of the ball as it approaches and rebounds from the surface.

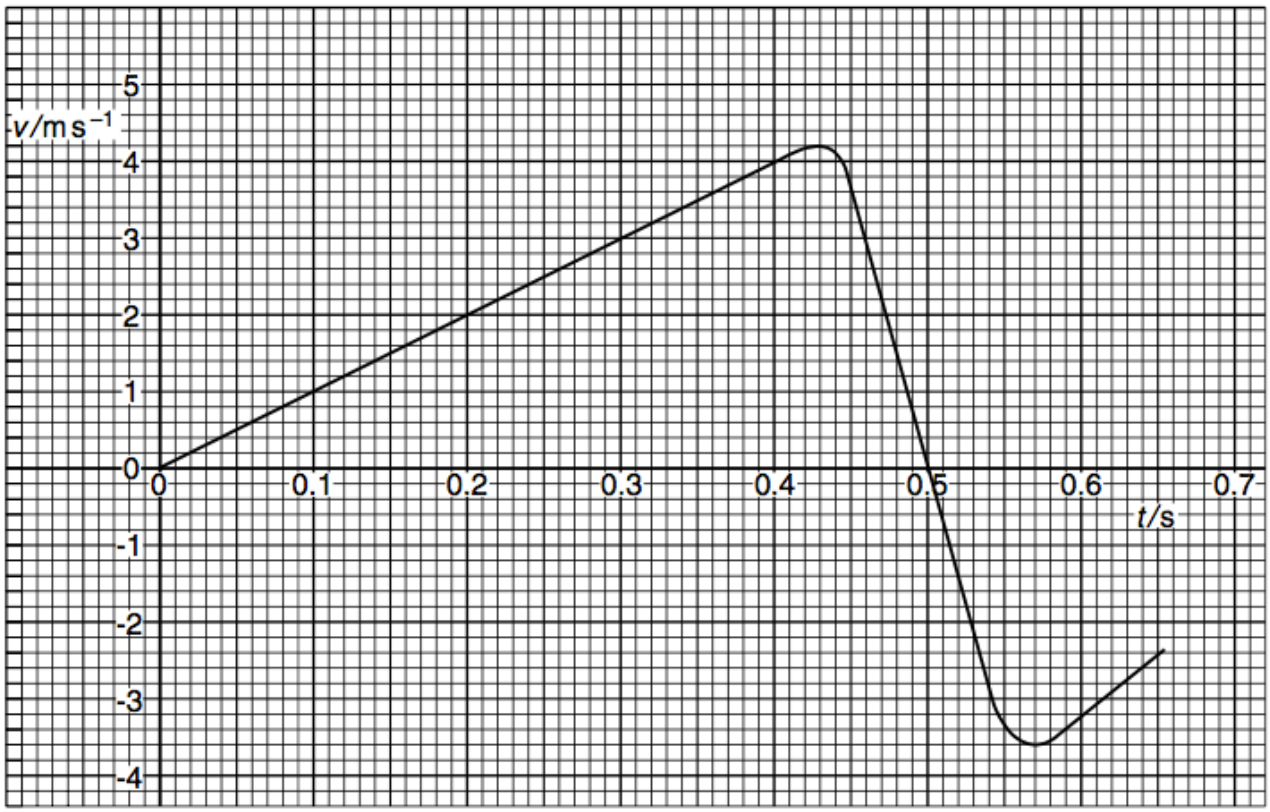


Fig. 3.1

Use data from Fig. 3.1 to determine

(a) the distance travelled by the ball during the first 0.40 s,

distance = ... m [2]