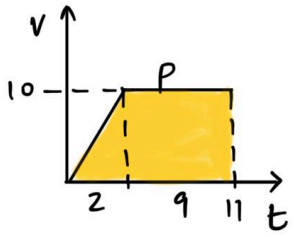
1.

A sprinter takes a time of 11.0 s to run a 100 m race. She first accelerates uniformly from rest, reaching a speed of 10 m s^{-1}. She then runs at a constant speed of 10 m s^{-1} until the finish line.

What is the uniform acceleration of the sprinter for the first part of the race?

A 0.5 m s^{-2} **B** 0.91 m s^{-2} **C** 1.7 m s^{-2} **D** 5.0 m s^{-2}

Ans: D



$\frac{1}{2}(11+p)\times 10 = 100$

$\Rightarrow 11+p = 20 \Rightarrow p = 9$

$\Rightarrow$ t of acceleration = 2s

$\therefore a = \frac{10}{2} = 5.0\,m/s^2$

2.

A ball is thrown horizontally with a speed of 10.0 m s^{-1} above horizontal ground. The ball hits the ground after a time of 3.0 s.

Air resistance is negligible.

What is the speed of the ball just before it hits the ground?

A 10 m s^{-1} **B** 29 m s^{-1} **C** 31 m s^{-1} **D** 39 m s^{-1}

Ans: C

$s_y = \frac{1}{2}(-9.81)(3)^2$

$= -44.145$

$v_y^2 = u_y^2 + 2as$

$v_y = \sqrt{2\times -9.81 \times -44.145}$

$= 29.43\,m/s$

$v = \sqrt{29.43^2 + 10^2} = 31\ m/s$

3.

A ball is kicked upwards at an angle of 45° to horizontal ground. After a short flight, the ball returns to the ground.

It may be assumed that air resistance is negligible.

What is **never** zero during the flight of the ball?

A the horizontal component of the ball's acceleration

B the horizontal component of the ball's velocity

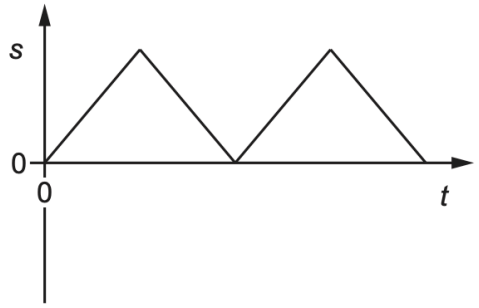
C the vertical component of the ball's momentum

D the vertical component of the ball's velocity

Ans: B

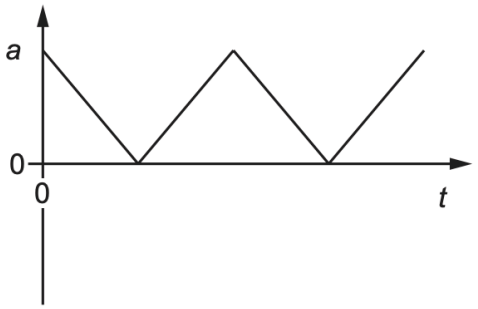
4.

The graph shows the variation with time t of the displacement s of an object.

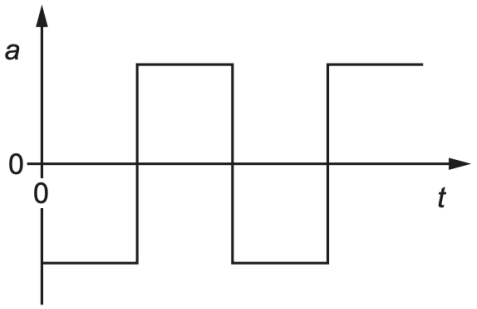


Which graph represents the variation with time t of the acceleration a of the object?

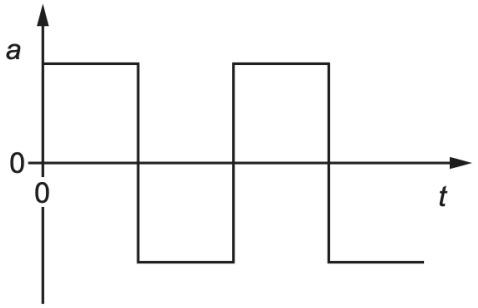
A



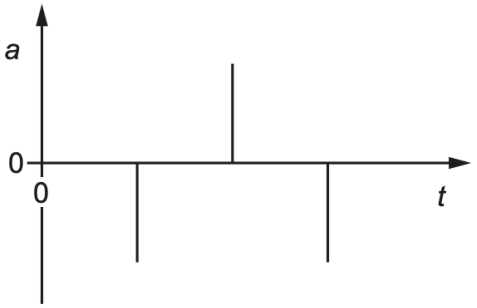
B



C



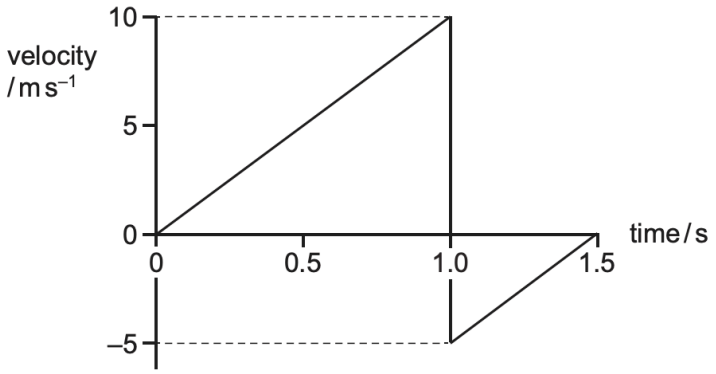
D



Ans: D

5.

A ball is released from rest at position X at time zero. At 1.0 s, it bounces inelastically from a horizontal surface and rebounds, reaching the top of its first bounce at 1.5 s.



What is the total displacement of the ball from its original position X at 1.5 s?

A 1.25 m **B** 3.75 m **C** 5.00 m **D** 6.25 m

Ans: B

½ x 10 x 1 + ½ x −5 x 0.5 = 3.75

6.

In which of the following cases does a car have a negative velocity and a positive acceleration? Check all that apply.

a. +x direction decreasing in speed.

b. +x direction increasing in speed.

c. −x direction decreasing in speed.

d. −x direction increasing in speed.

e. −x direction at a constant 20 m/s.

Ans: C

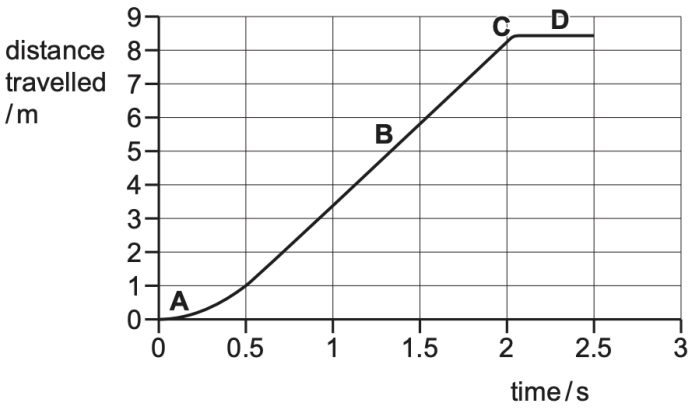
- Positive acceleration = rate of change velocity is same as direction of velocity
- Negative velocity = negative direction = −x direction
- Thus rate of change of velocity should also be negative, which means that speed is decreasing

7.

A toy parachute is dropped from a bridge and falls vertically through the air.

The graph shows the distance travelled by the parachute against time.

Which region of the graph shows when the parachute is at terminal velocity?



Ans: B

- Terminal velocity = constant speed = B