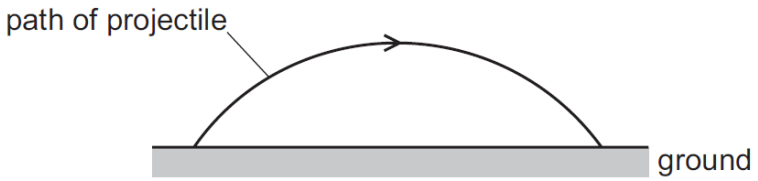
Kinematics – 2021 AS

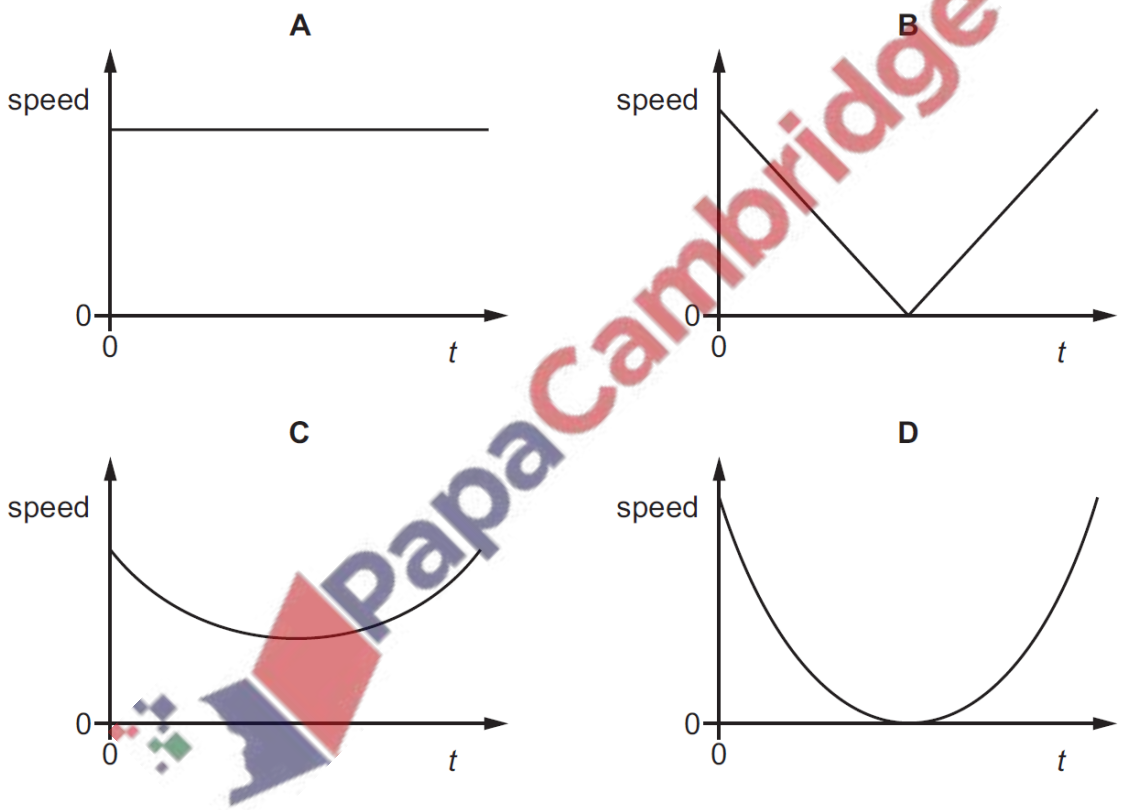
1. June/2021/Paper_11/No.6

A projectile is launched at an angle to the horizontal at time $t = 0$. It travels over horizontal ground, as shown.



Air resistance is negligible.

Which graph best shows the variation with t of the speed of the projectile from when it is launched to when it lands on the ground?



2. June/2021/Paper_11/No.7

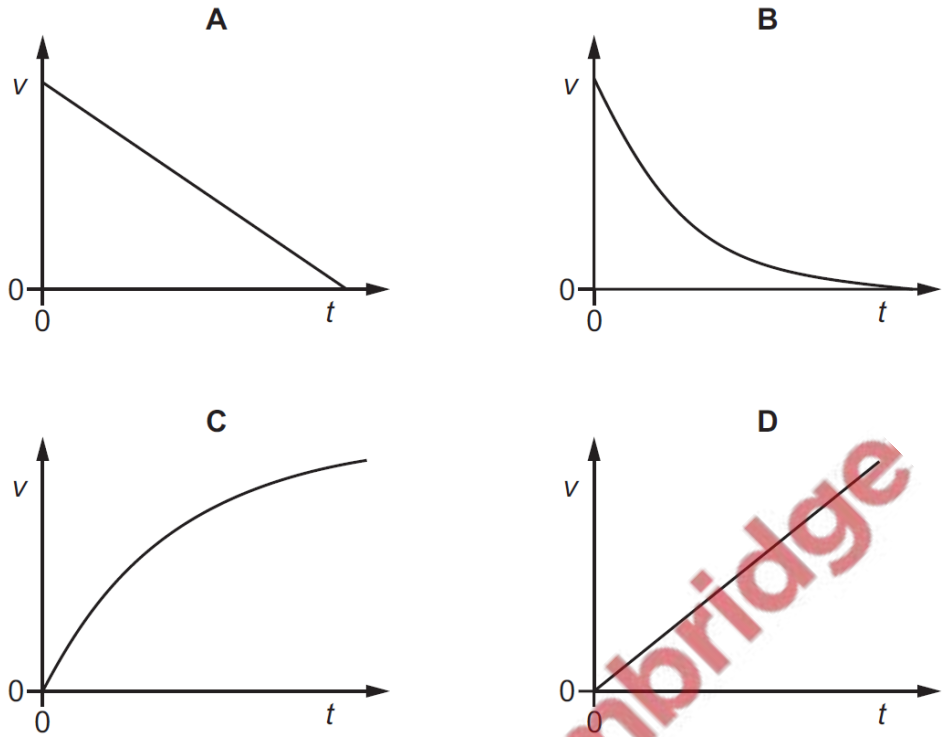
A train, initially at rest at a station, has a uniform acceleration of $0.20\,m\,s^{-2}$ until it reaches a speed of $20\,m\,s^{-1}$. It travels for a time at this constant speed and then has a uniform deceleration of $0.40\,m\,s^{-2}$ until it comes to rest at the next station. The distance between the two stations is 3000 m.

What is the time taken by the train to travel between the two stations?

A 75 s **B** 150 s **C** 230 s **D** 300 s

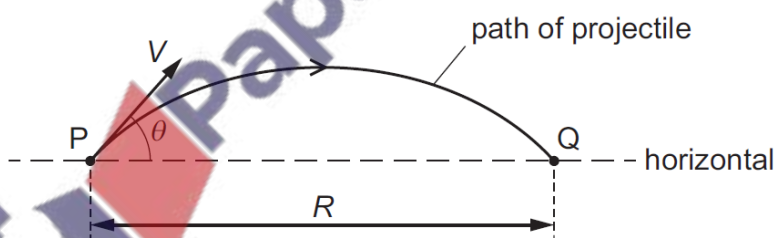
3. June/2021/Paper_12/No.6

Which graph shows the variation with time t of the velocity v of an object falling vertically downwards in a vacuum?



4. June/2021/Paper_12/No.7

A projectile is fired from point P with velocity V at an angle θ to the horizontal. It lands at point Q, a horizontal distance R from P. Air resistance is negligible.



The acceleration of free fall is g.

Which equation for R is correct?

A $R = \dfrac{V^2 \sin\theta \cos\theta}{g}$

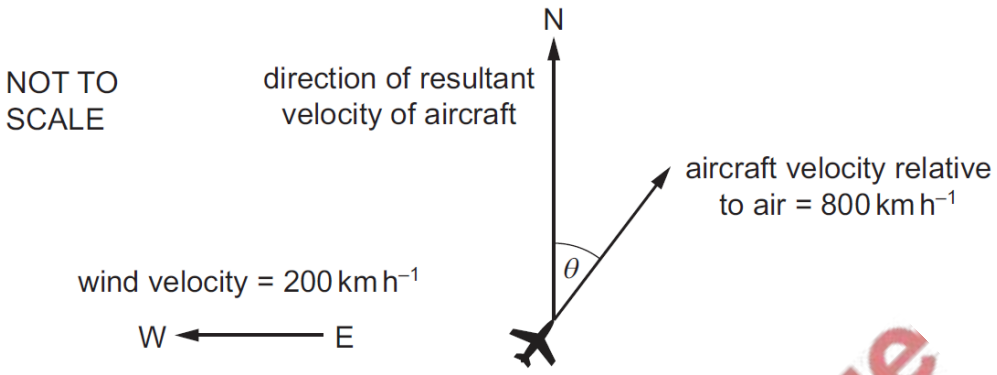
B $R = \dfrac{2V^2 \sin\theta \cos\theta}{g}$

C $R = \dfrac{V^2 \sin\theta \cos\theta}{2g}$

D $R = \dfrac{V^2 g \sin\theta \cos\theta}{2}$

5. Nov/2021/Paper_11/No.3

An aircraft heads in a direction at an angle θ east of north with a horizontal velocity relative to the air of 800 km h^{-1}. The wind blows with a horizontal velocity of 200 km h^{-1} from east to west, as shown.



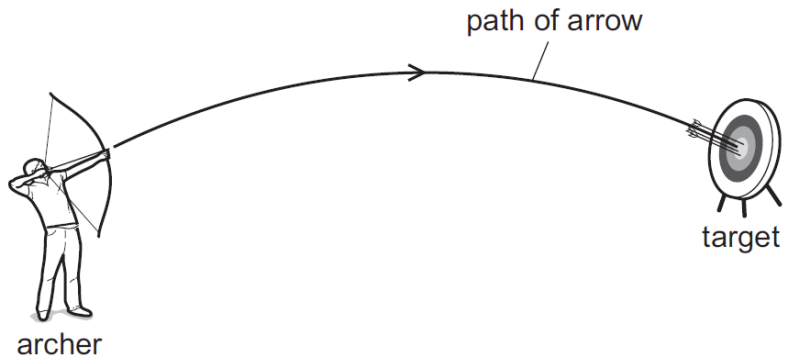
The resultant velocity of the aircraft is in a direction due north.

What is angle θ and what is the magnitude of the resultant velocity?

	θ / °	resultant velocity / km h^{-1}
A	14	770
B	14	820
C	76	770
D	76	820

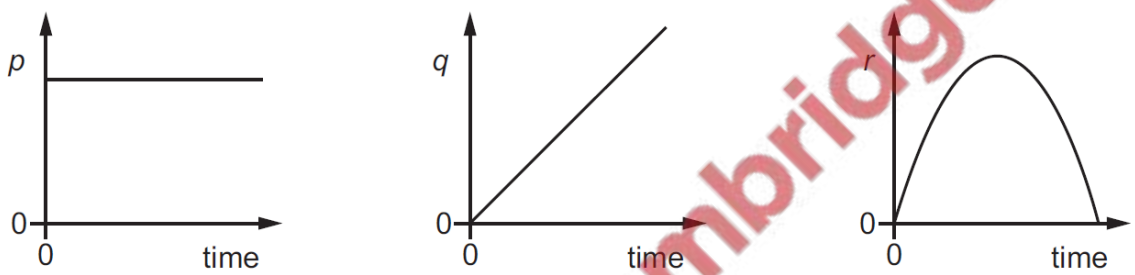
6. Nov/2021/Paper_11/No.6

An archer shoots an arrow at a target. The diagram shows the path of the arrow.



Air resistance is negligible.

The graphs show how three different quantities *p*, *q* and *r* vary with time.

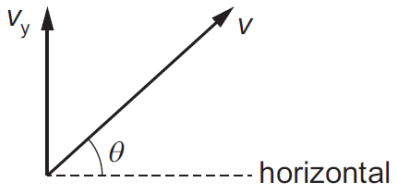


Which quantity could be the horizontal component of displacement and which quantity could be the vertical component of displacement of the arrow?

	horizontal component of displacement	vertical component of displacement
A	*p*	*q*
B	*q*	*r*
C	*r*	*p*
D	*r*	*q*

7. Nov/2021/Paper_12/No.3

A tennis ball is hit so that it leaves the racket with velocity v at an angle θ to the horizontal.



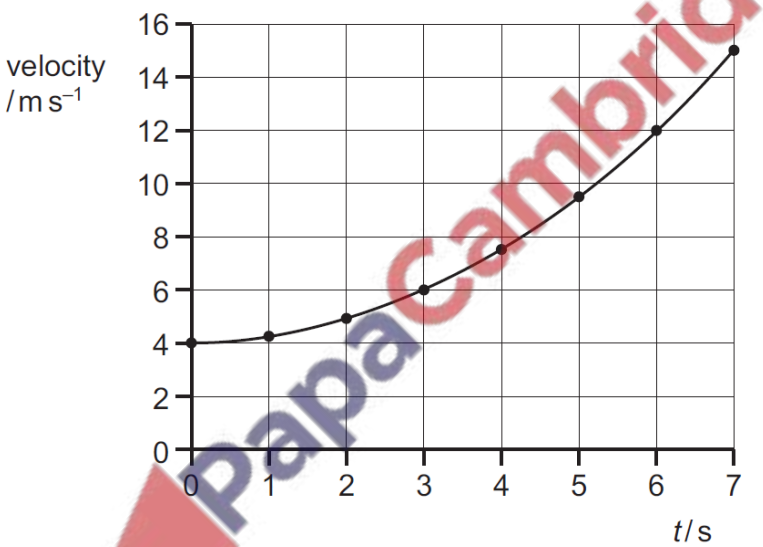
The vertical component of the velocity is v_y.

What is the magnitude of the horizontal component of v?

A $v \sin\theta$ **B** $v_y \cos\theta$ **C** $v_y \sin\theta$ **D** $(v^2 - v_y^2)^{\frac{1}{2}}$

8. Nov/2021/Paper_12/No.6

The graph shows the variation with time t of the velocity of a vehicle moving in a straight line.



The vehicle, moving at 4.0 m s^{-1}, begins to accelerate at time t = 0.

What is the vehicle's acceleration at time t = 3.0 s?

A 0.67 m s^{-2} **B** 1.0 m s^{-2} **C** 1.3 m s^{-2} **D** 2.0 m s^{-2}

9. Nov/2021/Paper_12/No.7

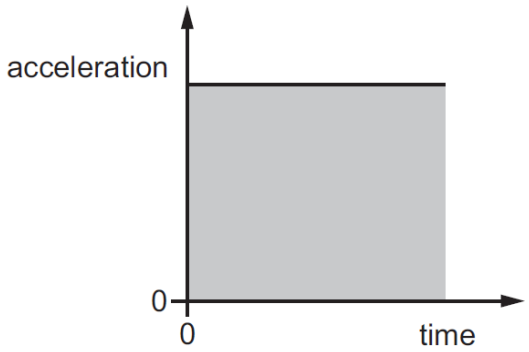
A stone is projected vertically upwards from the ground at an initial speed of 15 m s^{-1}. Air resistance is negligible.

What is the maximum height reached by the stone?

A 0.76 m **B** 11 m **C** 23 m **D** 110 m

10. Nov/2021/Paper_13/No.6

The graph shows the variation with time of the acceleration of a car.



What **must** the shaded area under the graph represent?

A the average velocity of the car

B the change in velocity of the car

C the final velocity of the car

D the initial velocity of the car

11. Nov/2021/Paper_13/No.7

A stone is thrown horizontally off a cliff and then lands in the sea. Air resistance is negligible.

Which statement about the stone's motion is **not** correct?

A The final displacement of the stone depends upon its initial horizontal velocity.

B The stone travels with a constant horizontal component of velocity until it hits the water.

C The stone travels with an increasing vertical component of velocity.

D The time taken for the stone to hit the surface of the water depends on its initial horizontal velocity.