PQ 4

Equations of Motion

Q

Q1

A racing car starts from rest and accelerates uniformly in a straight line at 12 m s^{-2} for 5 s. Calculate the **final velocity** of the car.

Q2

A speedboat travels 400 m in a straight line when it accelerates uniformly from 2.5 m s^{-1} in 10 s. Calculate the acceleration of the speedboat.

Q3

A rocket is travelling through outer space with uniform velocity. It then accelerates at 2.5 m s^{-2} in a straight line in the original direction, reaching 100 m s^{-1} after travelling 1 875 m. Calculate the rocket's **initial velocity**?

Q4

A car, travelling in a straight line, decelerates uniformly at 2 m s^{-2} from 25 m s^{-1} for 3 s. Calculate the car's velocity after the 3 s.

Q5

A greyhound is running at 6 m s^{-1}. It decelerates uniformly in a straight line at 0.5 m s^{-2} for 3 s. Calculate the **displacement** of the greyhound while it was decelerating.

Q6

A curling stone leaves a player's hand at 5 m s^{-1} and decelerates uniformly at 0.75 m s^{-2} in a straight line for 16.5 m until it strikes another stationary stone. Calculate the **velocity** of the decelerating curling stone at the instant it strikes the stationary one.

Q7

A firework rocket is launched vertically upwards from the ground at 49 m s^{-1}.

(a) What will be the velocity of the rocket at its maximum height?

(b) Calculate:

(i) the time taken for the rocket to reach its maximum height;

(ii) the maximum height.

Q8

A long-range artillery shell is fired from level ground with a velocity of 500 m s^{-1} at an angle of 30^{o} to the horizontal. Determine:

(a) the greatest **height** the shell reaches;

(b) the **time** taken to reach that height;

(c) the **total time** the shell is in the air;

(d) the **horizontal distance** the shell travels (i.e., its **range**).

Q8 continued

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