YEAR 1 | WEEK 11 EXAM QUESTIONS

Question	1	2	3	4	5	6	Total
Marks							
Max Marks	4	6	7	13	10	11	51

1. A man of mass $70\ \text{kg}$ stands on the floor of a lift which is moving with an upward acceleration of $0.3\ \text{ms}^{-2}$. Calculate the magnitude of the force exerted by the floor on the man.

[4 marks]

2. A car of mass $900\ \text{kg}$ is travelling in a straight line on a horizontal road. The driving force acting on the car is $600\ \text{N}$, and a resisting force of $240\ \text{N}$ opposes the motion.

(a) Show that the acceleration of the car is $0.4\ \text{ms}^{-2}$.

[2 marks]

(b) Calculate the time and the distance required for the speed of the car to increase from $5\ \text{ms}^{-1}$ to $9\ \text{ms}^{-1}$.

[4 marks]

3. A small stone is projected vertically upwards from a point O with a speed of $19.6\,\text{ms}^{-1}$. Modelling the stone as a particle moving freely under gravity.

(a) Find the greatest height above O reached by the stone.

[2 marks]

(b) Find the length of time for which the stone is more than $14.7\ \text{m}$ above O.

[5 marks]

4. A car is moving on a straight horizontal road. At time $t = 0$, the car is moving with speed $20\ \text{ms}^{-1}$ and is at the point A. The car maintains the speed of $20\ \text{ms}^{-1}$ for $25\ \text{s}$.

The car then moves with constant deceleration $0.4\ \text{ms}^{-2}$, reducing its speed from $20\ \text{ms}^{-1}$ to $8\ \text{ms}^{-1}$. The car then moves with constant speed $8\ \text{ms}^{-1}$ for $60\ \text{s}$. The car then moves with constant acceleration until it is moving with speed $20\ \text{ms}^{-1}$ at the point B.

(a) Sketch a velocity-time graph to represent the motion of the car from A to B.

[3 marks]

(b) Find the time for which the car is decelerating.

[2 marks]

Given that the distance from A to B is $1960\ \text{m}$,

(c) find the time taken for the car to move from A to B.

[8 marks]

5. Two athletes, Sam and Tom, are in a race. Sam runs at a constant speed of $8.8\ \text{ms}^{-1}$. When Sam is $180\ \text{m}$ from the finishing tape, Tom is $10\ \text{m}$ behind him. At this moment, Tom, who was running at $8.5\ \text{ms}^{-1}$, begins to accelerate at a constant rate of $0.2\ \text{ms}^{-2}$. When his speed reaches $9.3\ \text{ms}^{-1}$, he ceases to accelerate and continues to run with this speed.

(a) (i) Find the time taken for Tom to accelerate from $8.5\ \text{ms}^{-1}$ to $9.3\ \text{ms}^{-1}$.

[2 marks]

(ii) Find the distance Tom runs during this time.

[2 marks]

(b) Determine

(i) which athlete wins the race;

[5 marks]

(ii) how far ahead of the other athlete the winning athlete is when he passes the finishing tape.

[1 mark]

6. A particle P is projected vertically upwards, from horizontal ground, with speed $8.4\ \text{ms}^{-1}$.

(a) Show that the greatest height above the ground reached by P is $3.6\ \text{m}$.

[3 marks]

A particle Q is projected vertically upwards, from a point $2\ \text{m}$ above the ground, with speed $u\ \text{ms}^{-1}$. The greatest height **above the ground** reached by Q is also $3.6\ \text{m}$.

(b) Find the value of u.

[2 marks]

It is given that P and Q are projected simultaneously.

(c) Show that, at the instant when P and Q are at the same height, the particles have the same speed and are moving in opposite directions.

[6 marks]