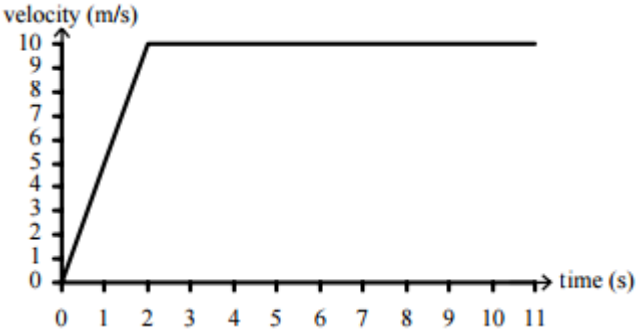
YEAR.9 PHYSICS

Forces and Motion

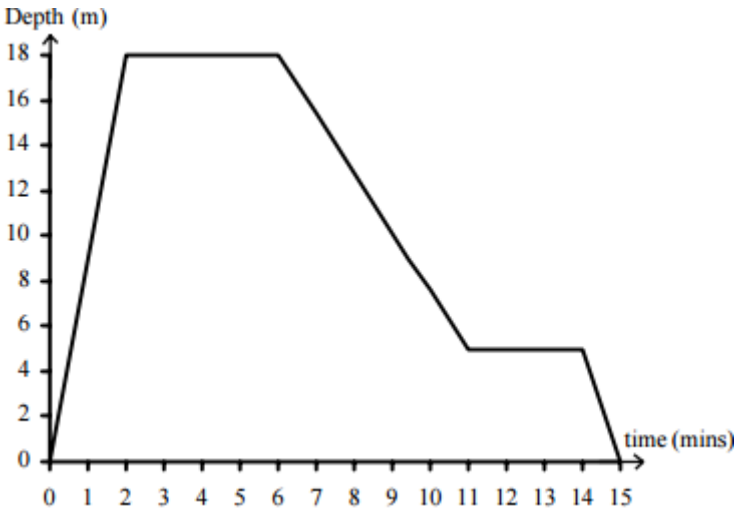
1. The graph below is an idealised velocity-time graph for a sprinter.



(a) What is the initial acceleration of the sprinter?

(b) Over what distance did the sprinter race?

2. The graph below represents the depth of a scuba diver during a 15 minute dive.



(a) Describe the motion of the scuba diver during the 15 mins dive.

(b) During which period of the dive was the diver the quickest?

(c) How long did the diver stay at the bottom of the sea, a depth of 18m?

(d) What was the velocity of the diver during his descent?

3. A supertanker of mass 4.0×10^8 kg, cruising at an initial speed of 4.5 m s^{-1} , takes one hour to come to rest. Assuming that the force slowing the tanker down is constant, calculate

(i) the deceleration of the tanker,

(ii) the distance travelled by the tanker while slowing to a stop.

4. Determine the resultant force on the object shown

What can be deduced about the motion of an object

(i) when the resultant force on it is zero,

(ii) when the resultant force on it is vertically upwards,

(iii) when the resultant force on it is in the opposite direction to its motion?

5. The table of results below were taken for a cyclist travelling along a straight road.

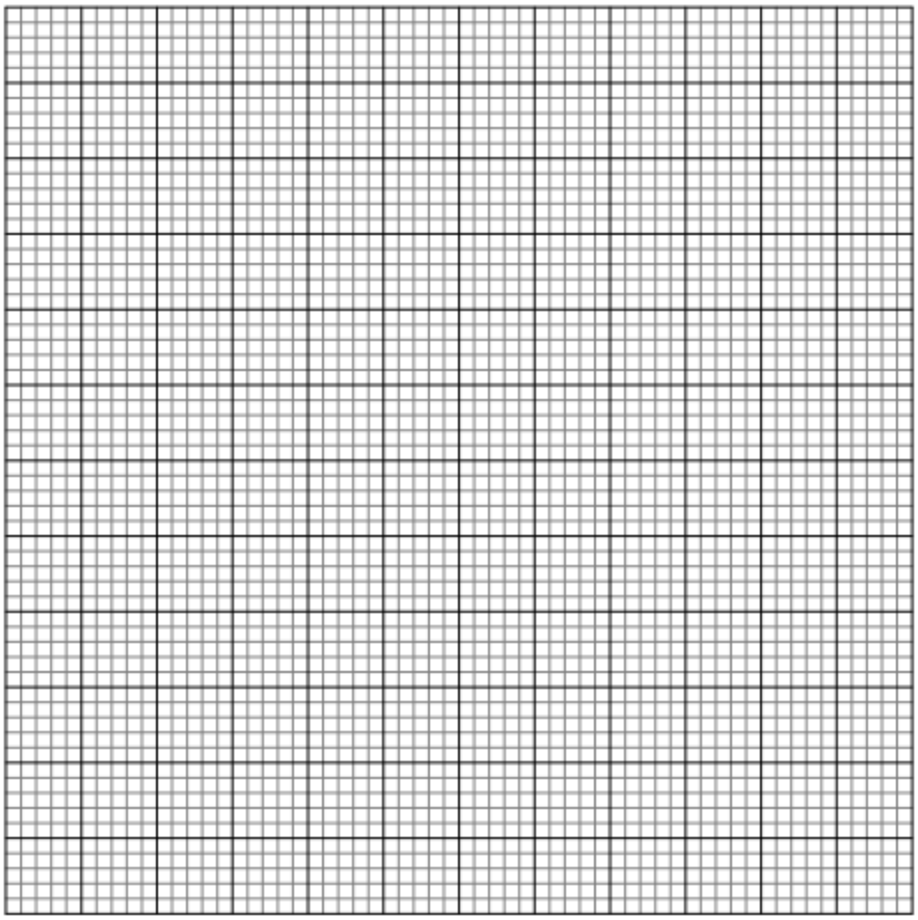
Velocity (ms^{-1})	0	5	10	15	15	12	9	6	3	0
Time taken (s)	0	10	20	30	40	50	60	70	80	90

a) Draw a graph of velocity on the vertical axis against time on the horizontal axis for the journey.

(b) Calculate the deceleration of the cyclist in the final 50 seconds of the journey.

(c) Calculate the total distance that the cyclist travelled along the straight road.

(d) Calculate the average velocity of the cyclist for the entire journey.



6. The manufacturer of a family car gave the following information.

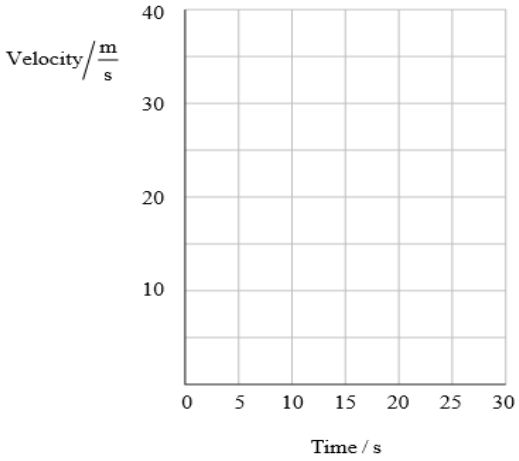
Mass of car 950 kg. The car will accelerate from 0 to 33 m/s in 11 seconds.

(a) Calculate the acceleration of the car during the 11 seconds

(b) Calculate the force needed to produce this acceleration.

7. A train moves with a constant velocity of 30 m/s for 10 s before decelerating uniformly to rest in a further 15s.

Draw a velocity–time graph on the axes below.



(b) State the property of a velocity–time graph that can be used to determine the distance travelled by the train.

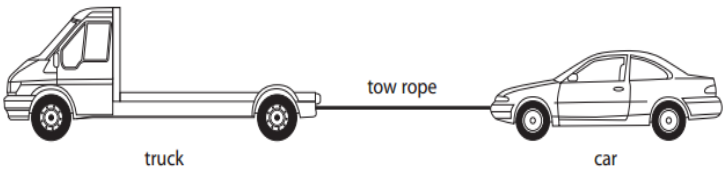
(c) Calculate the distance travelled by the train

8. The strength of gravity on the Moon is 1.6 newtons per kilogram.
If an astronaut's weight is 800 N on Earth, what would it be on the Moon?

9. A bike accelerates uniformly from rest to a speed of 7.10 m/s over a distance of 35.4 m. Determine the acceleration of the bike.

10. A race car accelerates uniformly from 18.5 m/s to 46.1 m/s in 2.47 seconds. Determine the acceleration of the car and the distance travelled

11. A truck is towing a car along a level road at a constant velocity. A tow rope is attached to the truck and the car. Which of these shows the directions of the forces between the car and the tow rope? Put a cross (✓) in the box next to your answer.



	force exerted by car on tow rope	force exerted by tow rope on car
☐ A	←	→
☐ B	→	←
☐ C	→	→
☐ D	←	←

(b) The truck has to provide a force of 4000 N to the left on the car to keep the car at a constant velocity. Complete the sentence by putting a cross (x) in the box next to your answer. The resultant force on the car is

A 0 N B 4000 N to the left C 4000 N to the right D 8000 N to the left

(c) Both vehicles are travelling at 13 m/s. The driver of the truck then accelerates at 1.2 m/s^2 until both vehicles are travelling at 20 m/s. Calculate the time taken for this acceleration.

(ii) The mass of the car is 1400 kg. Calculate the resultant force on the car needed to produce an acceleration of 1.2 m/s^2 .

Complete worksheet file till Newton's third law