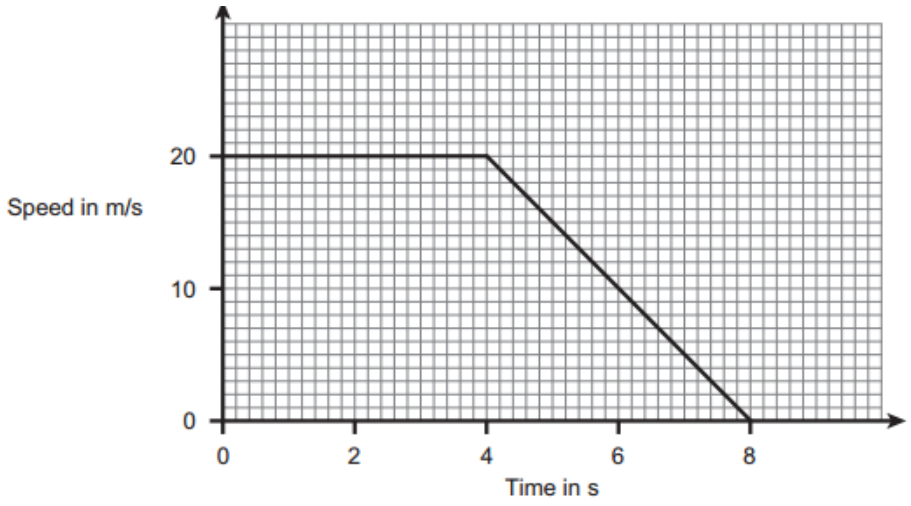
ST.MARY'S CATHOLIC HIGH SCHOOL, DUBAI

YR. 9 / YR. 10 **PHYSICS REVISION WORKSHEET**

1. (a) In 2009 the sprinter Usain Bolt ran the 100m sprint in a time of 9.58s. Calculate his average speed during this race.

(b) Explain why your answer is an average speed.

(c) The speed–time graph for the motion of a car as it approaches a set of traffic lights is shown below.

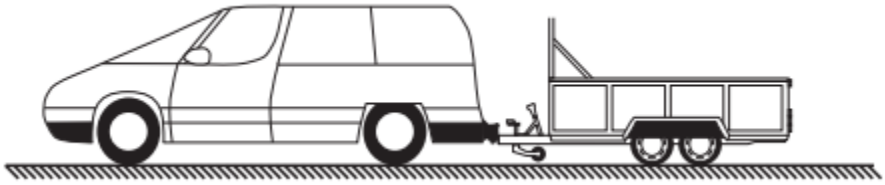


(i) Using the graph calculate the distance travelled by the car during the 8s of its motion

(ii) Calculate the deceleration of the car after the brakes have been applied.

(iii) The car has a mass of 800kg. Using your answer to part (ii) calculate the force acting on the car when the brakes are applied.

(iv) A car with the same mass (800kg) is towing a trailer. This car and trailer are also travelling at 20m/S



The braking force remains unchanged from the value you calculated for part (iii). Explain carefully why a driver should allow for a greater stopping distance when towing a trailer.

2.(a) The child and cart have a total mass of 50 kg. They travel at a velocity of 4 m/s.
Calculate the momentum of the child and cart.

(b)The father applies a steady force for a time of 1.5 s. The momentum of the child and cart increases by 450 kg m/s. Calculate the force which the father applies.

3(a) The diagram shows an athlete who is moving a hammer in a circle. The hammer is a heavy metal ball attached to a steel wire. The athlete grips the steel wire at the other end as shown below.

(i) What name is given to the force that keeps objects moving in a circle?

(ii) In what direction does this force act?

(iii) In the case shown in the diagram what provides this force?

(iv) The hammer moves in a circle with constant speed. Explain why it would b incorrect to say it moves with a constant velocity.

4. Tamsin hits two balls with a bat. The hard ball has a mass of 0.3kg and the soft ball has a mass of 0.2 kg Each ball gains the same momentum.

(a) (i) The harder ball will have a smaller velocity. Why?

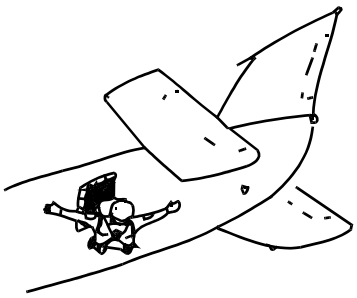
(ii) The soft ball changes shape when hit so it is in contact for longer. What effect will this have on the force acting on the soft ball? Explain your answer.

(b) The 0.3 kg hard ball hits a glass window with a speed of 4 m/s.

(i) The glass will not break if it is hit with a kinetic energy less than 10 J. Will the glass break? Use calculation to justify your answer.

(c) The 0.2 kg soft ball hits the window with a speed of 6 m/s. it bounces back from the window at a speed of 4 m/s. calculate the change in momentum of the soft ball.

5. A sky-diver steps out of an aeroplane.
After 10 seconds she is falling at a steady speed of 50m/s. She then opens her parachute.



After another 5 seconds she is once again falling at a steady speed.This speed is now only 10m/s.

(a) Calculate the sky-diver's average acceleration during the time from when she opens her parachute until she reaches her slower steady speed. (Show your working.)

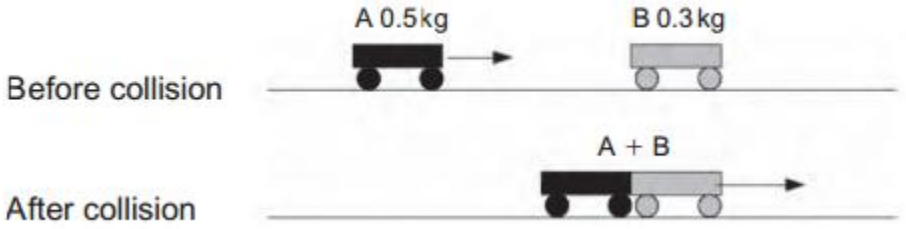
(b) Explain, as fully as you can:

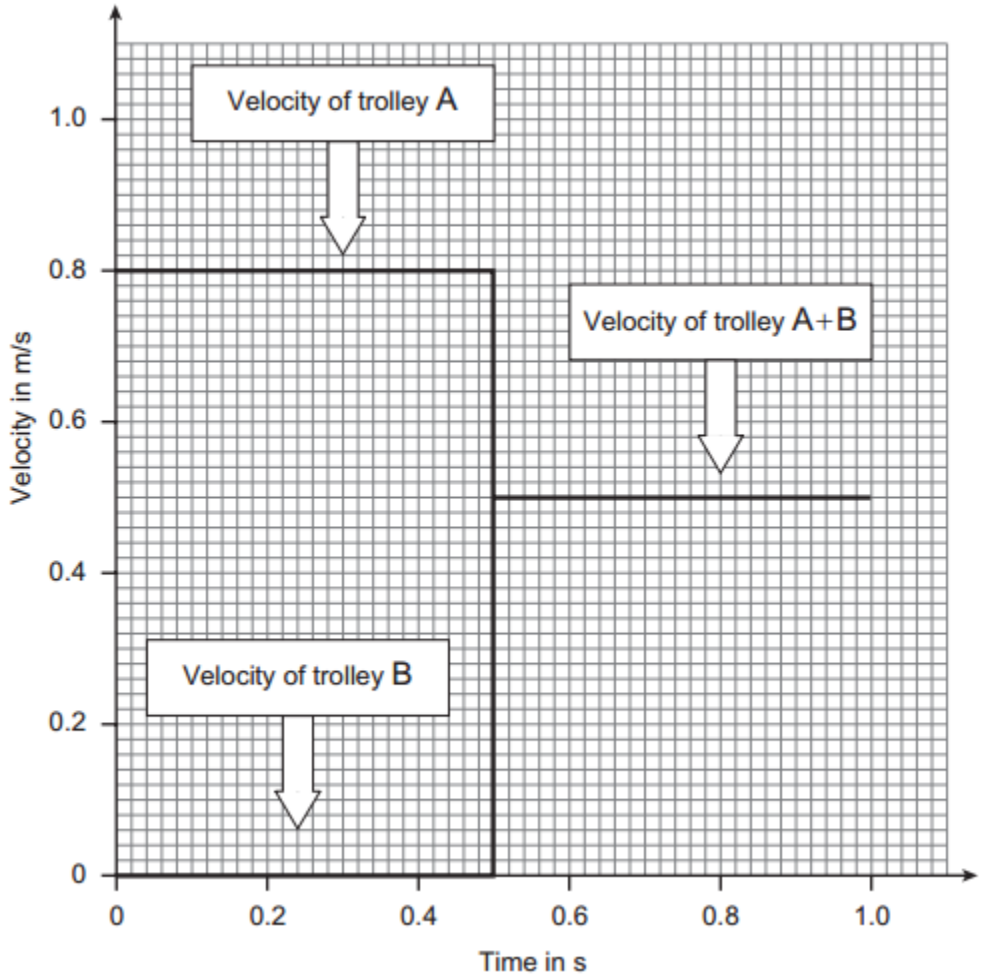
(i) why the sky-diver eventually reaches a steady speed (with or without her parachute).

(ii) why the sky-diver's steady speed is lower when her parachute is open.

(c) The sky-diver and her equipment have a total mass of 75kg. Calculate the gravitational force acting on this mass.

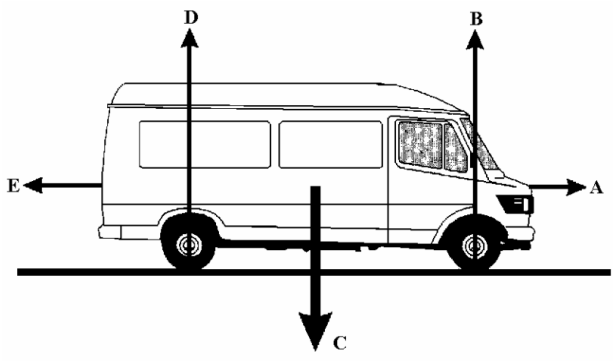
6. In order to investigate momentum the following experiment was carried out. Trolley A was made to travel along a horizontal surface and collide with a stationary trolley B. After the collision the two trolleys stick to each other and move together. The velocities of the trolleys were measured and these are shown on the graph below





Use the data from the graph, calculate momentum before and after collision and hence verify the Principle of Conservation of Momentum.

7. Five forces, **A, B, C, D** and **E** act on the van.



(a) Complete the following sentences by choosing the correct forces from **A** to **E**.

Force ..... is the forward force from the engine.

Force ..... is the force resisting the van's motion.

(b) The size of forces **A** and **E** can change.
Complete the table to show how big force **A** is compared to force **E** for each motion of the van.
Do this by placing a tick in the correct box.
The first one has been done for you.

Motion of van	**Force A smaller than force E**	**Force A equal to force E**	**Force A bigger than force E**
Not moving		✓	
Speeding up			
Constant speed			
Slowing down			

(c) When is force **E** zero?

8.(a) The child and cart have a total mass of 50 kg. They travel at a velocity of 4 m/s.
Calculate the momentum of the child and cart.

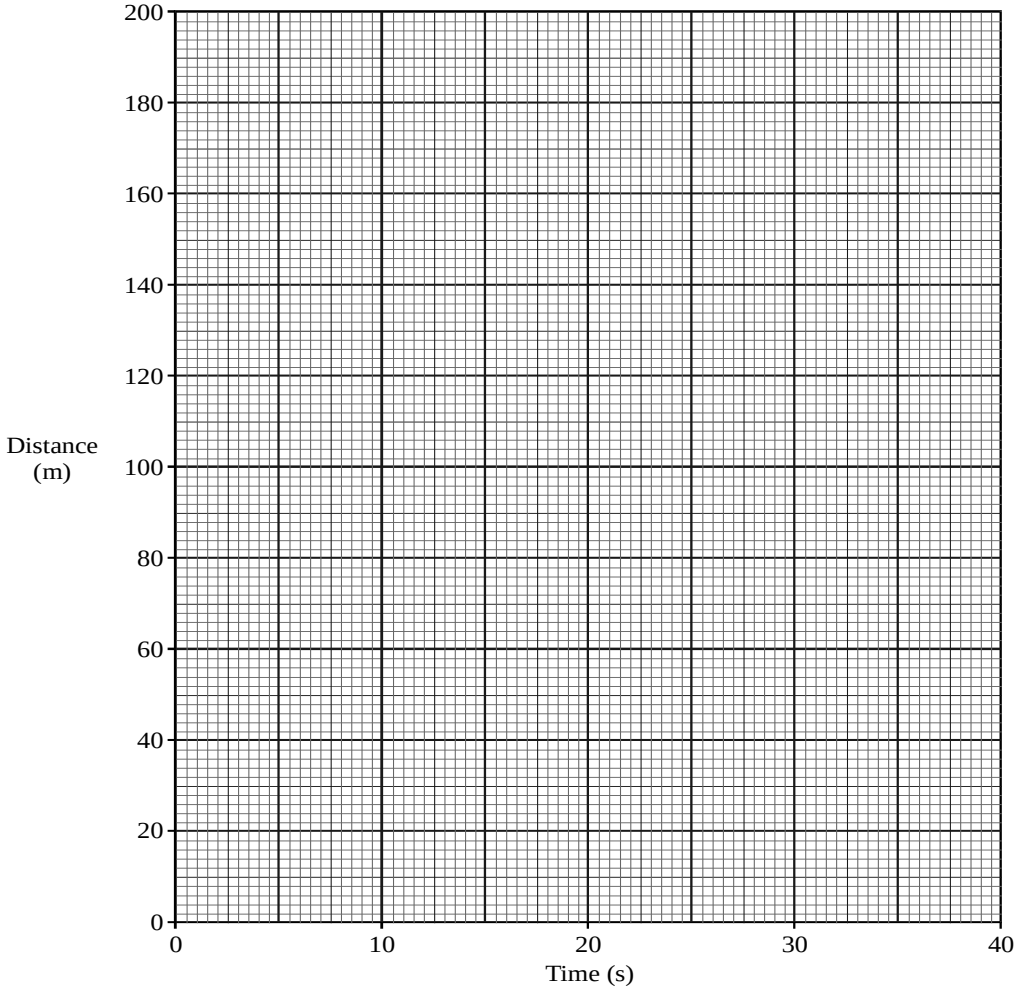
(b)The father applies a steady force for a time of 1.5 s. The momentum of the child and cart increases by 450 kg m/s. Calculate the force which the father applies.

9. A car is travelling at 10 m/s. It then accelerates at 5 m/s2 until it reaches a velocity of 20 m/s. Calculate how far it travels while it is accelerating.

10. Two pupils are given the task of finding out how fast a tractor moves across a field. As the tractor starts a straight run across the field the pupils time how long it takes to pass a series of posts which are forty metres apart. The results obtained are shown in the table below.

Distance travelled (m)	0	40	80	120	160	200
Time taken (s)	0	8	16	24	32	40

(i) Draw a graph of distance travelled against time taken using the axes on the graph below. Label your graph line A.



(ii) Calculate the speed of the tractor.

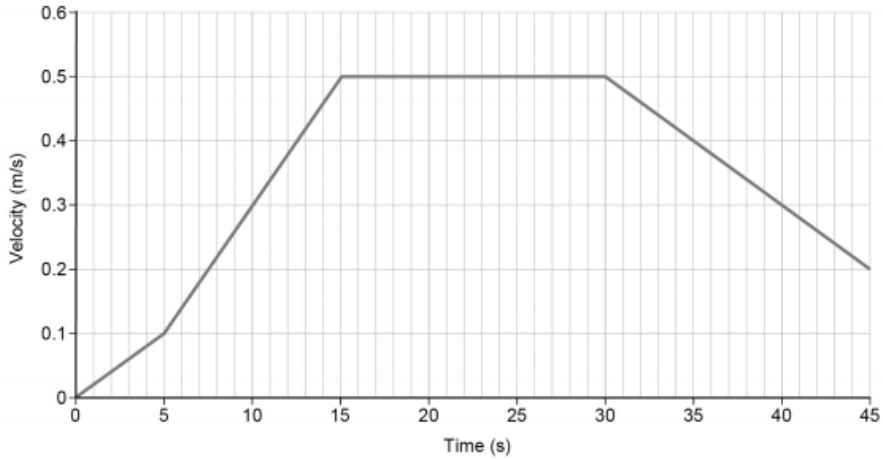
(c) In another, wetter field there is more resistance to the movement of the tractor. It now travels at 4m/s.

(i) Calculate the time needed to travel 200m.

(ii) On the graph in part (b) draw a line to represent the motion of the tractor across the second field. Label this line B.

(d) On a road the tractor accelerates from rest up to a speed of 6 m/s in 15 seconds. Calculate the acceleration of the tractor.

11. The graph shows how the velocity of a train on a model railway changes during part of a journey.



a Between which times is the train travelling fastest?

b Use information from the graph to calculate the acceleration of the model train between 5 and 15 seconds after the beginning of its journey. Show your working.

c The train travels further between 30 seconds and 35 seconds than it does between 10 and 15 seconds. Which information from the graph tells you that this statement is correct?

d Calculate how far the train travelled between 30 seconds and 40 seconds. Show your working

e Another model train starts 10 seconds after the first one. Ten seconds later it reaches a velocity of 0.4 m/s, and stays at that velocity for 20 seconds. Draw a line on the graph above to show the journey of the second model train

12. The distance–time graph for a car approaching traffic lights is shown below.

At A the driver sees the lights.
At B the driver applies the brakes.
At C the car stops.

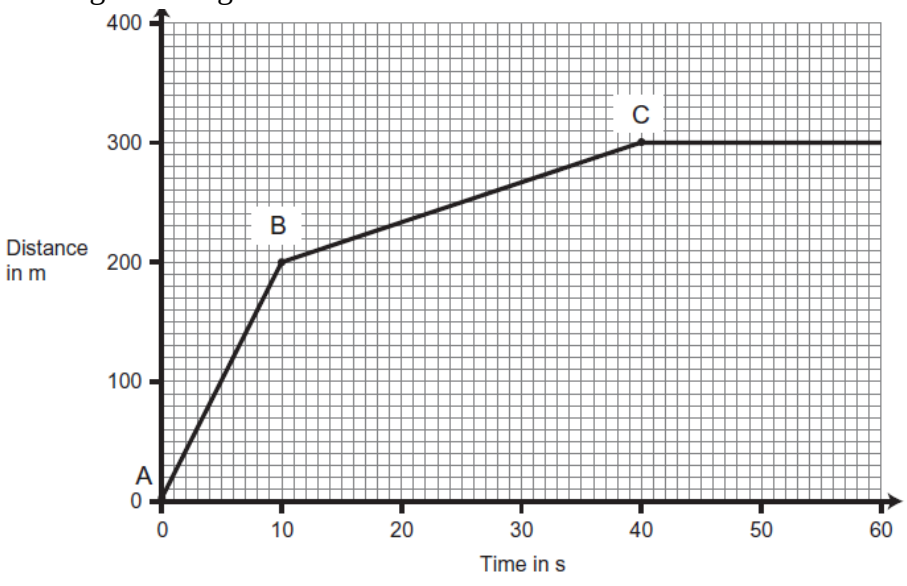
(a) At what speed is the car travelling before the driver applies the brakes?

The distance the car travels while the brakes are being applied is called the braking distance.

(b) Use the graph to find the braking distance for this car.

(c) Will the braking distance increase, decrease or remain the same if there is ice on the road?

(d) What feature of the graph tells you that the car is stationary after 40 s?



13. A person with mass 80 kg stands on Earth, draw a force diagram labelling all forces and values of each of the forces.

14. A person standing on a skateboard pushes against a wall with a force of 20 N.

(i) Draw a force diagram for this scenario.

(ii)The value of the friction force is 30N. Add this to your diagram, does the person move? Why?

(iii) The person now increases the force he pushes the wall with to 40N. Redraw the force diagram, does the person move? Why?

15. Cars have a number of features that make them safer in a collision.
(a) Apart from seat belts, name two safety features that reduce the risk of serious injury in a car crash.

(b) Photograph A shows a person wearing a seat belt.

Using ideas of momentum and force, explain how a seat belt reduces the risk of serious injury in a car crash.

Photograph B

Photograph B shows a full-body harness used in a racing car.
Photograph C shows a crash-test dummy in a car. The car has crashed into a concrete wall.
State what happens to the momentum of the car during the crash.