|  |  |
| --- | --- |
| GCSE YR10 FORCES PART 1  (Home Learning Questions and Answers Booklet) | |
| |  | | --- | | Instructions:   1. Watch all video clips on Educake homework titled: **Forces In Action Part 1. Before attempting to answer GCSE practice questions on this booklet.** 2. You **must attempt all practice questions** in this booklet **before** looking at the answers. 3. Watch video clips on forces, make notes and complete all set task on Educake and Easy-Education. 4. Watch out for **Forces Part 2 titled: Forces In Motion** – I will be focusing on Newton’s Laws of Motion.   I.Ukiwah  Physics teacher/Head of Science  Email: ukiwahi@langdonpark.org | |  | | |  |  | | --- | --- | | Name: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | Class: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | Date: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |

|  |  |
| --- | --- |
|  | |
| Time: | **75 minutes** |
| Marks: | **70 marks** |
|  | |

**Q1.**

Momentum is a vector quantity.

(a)     How is a vector quantity different to a scalar quantity?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(b)     Name another vector quantity.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(c)     Give the definition of momentum.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

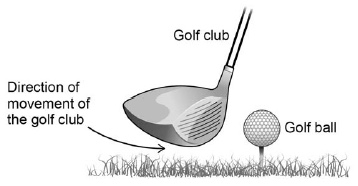
**(1)**

(d)     What is the unit of momentum?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(e)     The image shows a golf club about to hit a stationary golf ball.



The golf club is in contact with the golf ball for 1.8 ms and exerts a force of 1500 N on the golf ball.

The mass of the golf ball is 0.045kg

Calculate the velocity of the golf ball as it leaves the golf club.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Velocity = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m/s

**(4)**

(f)      When hitting the golf ball the golfer swings the golf club to keep it in contact with the golf ball for as long as possible.

The force acting on the golf ball is constant during this time.

Explain the effect that the time of contact between the golf club and the golf ball has on the distance the golf ball travels.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(4)**

**(Total 12 marks)**

**Q2.**

Quantities in physics are either scalars or vectors.

(a)     Use the correct answers from the box to complete the sentence.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **acceleration** | **direction** | **distance** | **speed** | **time** |

Velocity is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a given \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

**(2)**

(b)     Complete the table to show which quantities are scalars and which quantities are vectors.

Put **one** tick () in each row.

The first row has been completed for you.

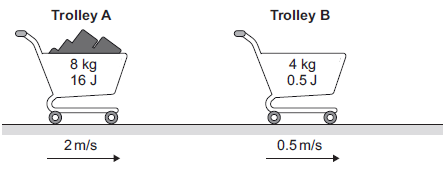
|  |  |  |
| --- | --- | --- |
| **Quantity** | **Scalar** | **Vector** |
| Momentum |  |  |
| Acceleration |  |  |
| Distance |  |  |
| Force |  |  |
| Time |  |  |

**(3)**

(c)     The diagram shows two supermarket trolleys moving in the same direction.

Trolley **A** is full of shopping, has a total mass of 8 kg and is moving at a velocity of 2 m / s with a kinetic energy of 16 J.

Trolley **B** is empty, has a mass of 4 kg and is moving at a velocity of 0.5 m / s with a kinetic energy of 0.5 J.



(i)      Calculate the momentum of both trolley **A** and trolley **B**.

Give the unit.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Momentum of trolley **A** = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Momentum of trolley **B** = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Unit \_\_\_\_\_\_\_\_\_\_

**(4)**

(ii)     The trolleys in the diagram collide and join together. They move off together.

Calculate the velocity with which they move off together.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Velocity = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m / s

**(3)**

(iii)     In a different situation, the trolleys in the digram move at the same speeds as before but now move towards each other.

Calculate the total momentum and the total kinetic energy of the two trolleys before they collide.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total momentum = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total kinetic energy = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ J

**(2)**

**(Total 14 marks)**

**Q3.**

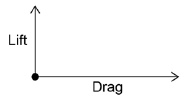
(a)     **Figure 1** shows an aircraft flying at a constant velocity and at a constant height above the ground.

**Figure 1**

****

Complete the free body diagram in **Figure 2** to show the other two forces acting on the aircraft.

**Figure 2**

****

**(2)**

(b)     A small aircraft accelerated down a runway at 4.0 m/s2

The aircraft started from rest and reached a speed of 34 m/s just before take-off.

Calculate the distance the aircraft travelled while accelerating.

Give your answer to 2 significant figures.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

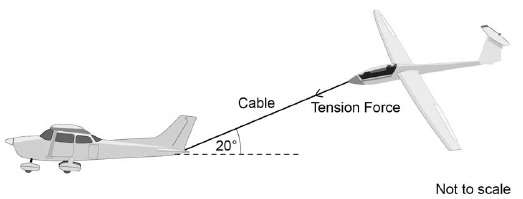
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Distance = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m

**(4)**

(c)     **Figure 3** shows the small aircraft being used to tow a glider.

**Figure 3**

****

The tension force in the cable can be resolved into a horizontal component and a vertical component.

The tension in the cable is 2000 N

The cable makes an angle of 20° with the horizontal.

Draw a vector diagram to determine the magnitude of the two components of the tension force in the cable.

Magnitude of the horizontal component = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

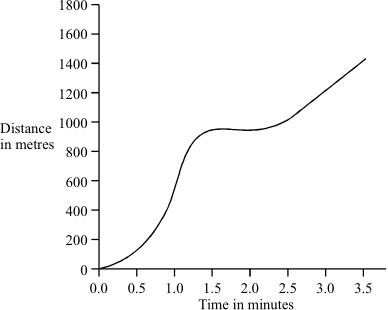
Magnitude of the vertical component = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

**(1)**

**(Total 10 marks)**

**Q4.**

The graph shows how the distance travelled by a car changes with time during a short journey.



(i)      Describe fully the motion of the car during the first **two** minutes of the journey.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(3)**

(ii)      During the last minute of the journey the velocity of the car changes although the speed remains constant. How is this possible?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

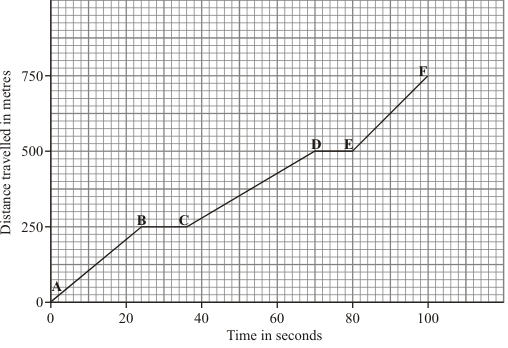
**(1)**

**(Total 4 marks)**

**Q5.**

This question is about a car travelling through a town.

(a)     The graph shows how far the car travelled and how long it took.



(i)      Between which points was the car travelling fastest? Tick ( ) your answer.

|  |  |
| --- | --- |
| **Points** | **Tick ( )** |
| **A – B** |  |
| **B – C** |  |
| **C – D** |  |
| **D – E** |  |
| **E – F** |  |

**(1)**

(ii)     Between which points was the car stationary?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(b)     Complete the sentences by writing the correct words in the spaces.

When a car has to stop, the **overall** stopping distance is greater if:

•        the car is poorly maintained;

•        there are adverse weather conditions;

•        the car is travelling \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ;

•        the driver’s reactions are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

          Also, the greater the speed of the car, then the greater the braking \_\_\_\_\_\_\_\_\_\_\_\_\_

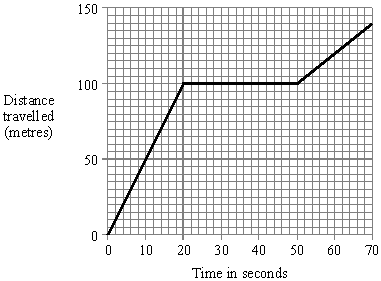
          needed to stop in a certain time.

**(3)**

**(Total 5 marks)**

**Q6.**

A child goes out to visit a friend.  
The graph shows the child’s journey.



(a)     Calculate the child’s average speed for the whole journey.  
[Show your working and give the units in your answer.]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(3)**

(b)     How many times faster is the child travelling in the first part of the journey than in the final part of the journey?  
[You should show how you obtained your answer.]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

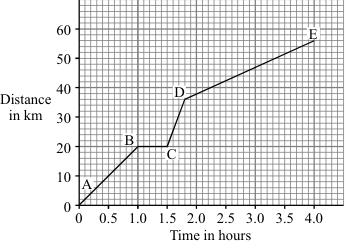
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

**(Total 5 marks)**

**Q7.**

A cyclist goes on a long ride. The graph shows how the distance travelled changes with time during the ride.



(i)      Between which **two** points on the graph was the cyclist moving at the fastest speed?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(ii)      State **one** way cyclists can reduce the air resistance acting on them.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(iii)     How long did the cyclist stop and rest?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(iv)     Write down the equation which links distance, speed and time.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(v)     Calculate, in km/hr, the average speed of the cyclist while moving.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

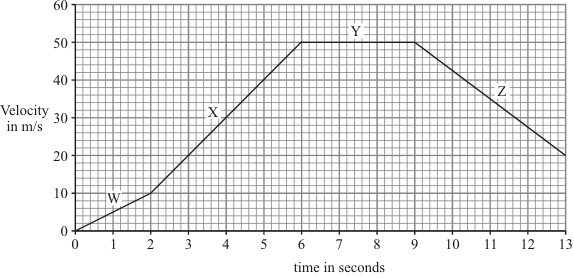
Average speed = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ km/hr

**(3)**

**(Total 7 marks)**

**Q8.**

The graph shows changes in the velocity of a racing car.



(a)     Describe the motion of the racing car during:

(i)      the period labelled **W**; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(ii)     the period labelled **Y**. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(b)     Calculate the acceleration of the racing car during the period labelled **X**.  
Show clearly how you work out your answer and give the unit.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Acceleration = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(4)**

**(Total 6 marks)**

Mark schemes

**Q1.**

(a)     a vector has direction (a scalar does not)

**1**

(b)     accept any vector quantities eg

•        velocity

•        force

•        weight

•        acceleration

•        displacement

**1**

(c)     mass × velocity

*do* ***not*** *accept speed for velocity*

*do* ***not*** *accept symbols*

**1**

(d)     kilogram(s) metre per second

*allow kg m/s*

**1**

(e)     1.8 ms = 0.0018 s

*an answer of 60 (m/s) scores* ***4*** *marks*

**1**

****

**1**

****

**1**

v = 60 (m/s)

*an answer of 60 000 scores* ***3*** *marks*

**1**

(g)     longer the time of contact the greater the change of momentum

*allow the converse*

**1**

since the mass of the golf ball is constant

**1**

the velocity of the golf ball must increase

**1**

increasing the distance the golf ball travels

**1**

**[12]**

**Q2.**

(a)     speed

*must be in correct order*

**1**

direction

**1**

(b)

|  |  |  |
| --- | --- | --- |
| **Quantity** | **Scalar** | **Vector** |
| Momentum |  |  |
| Acceleration |  |  |
| Distance |  |  |
| Force |  |  |
| Time |  |  |

*any three correct scores* ***2*** *marks*

*any two correct scores* ***1*** *mark*

*only one correct scores zero*

**3**

(c)     (i)      16 and 2

*16* ***or*** *2 scores* ***2*** *marks*

*allow 1 mark for correct substitution, ie*

*8 × 2*

***or***

*4 × 0.5*

**3**

kg m / s **or** N s

**1**

(ii)     1.5 (m / s)  
**or**their pA + pB = 12 × v correctly calculated

*allow 2 marks for correct substitution, ie*

*18 = 12 × v*

***or***

*their pA + pB = 12 × v*

*18 or their pA + pB scores 1 mark if no other mark awarded*

**3**

(iii)    14 (kg m / s)  
**or**their pA - pB

**1**

16.5 (J)

**1**

**[14]**

**Q3.**

(a)     arrow vertically down – same size as lift – labelled weight

*judge by eye*

**1**

arrow to the left – same size as drag - labelled thrust

*judge by eye*

*two correct arrows without labels gains* ***1*** *mark*

**1**

(b)     342 – (02) = 2 × 4.0 × s

**1**

****

**1**

s = 144.5

**1**

s = 140 (2 sig figs)

*an answer of 140 scores* ***4*** *marks*

*an answer of 144.5 scores* ***3*** *marks*

**1**

(c)     tension force drawn to a suitable scale and in correct direction

**1**

triangle completed showing correct components

**1**

scale used to determine both component forces

**1**

horizontal component = 1900 N

vertical component = 680 N

*allow 1850 to 1925 inclusive*

*allow 660 to 700 inclusive*

**1**

**[10]**

**Q4.**

(i)      first statement must be accelerated

*if it just accelerated then decelerates award 2 marks*

**1**

          final statement must be stationary

**1**

          interim statement decelerates

**1**

(ii)      direction is changing

**1**

**[4]**

**Q5.**

(a)     (i)      **E-F** (ticked)

**1**

(ii)     **B-C or D-E**

*accept both answers*

**1**

(b)     fast(er)

*accept downhill*

**1**

          slow(er)

**1**

          force

*do* ***not*** *accept distance*

**1**

**[5]**

**Q6.**

(a)     evidence of  
speed =  (travelled)   or      or   

*gains 1 mark*

**but** or any correct calculation of gradient

*(except when zero) gains 2 marks*

   or   2

*gains 1 mark*

*units*   metres per second **or** m/s **or** ms-1

(not mps)

*for 1 mark*

**3**

(b)     *evidence of* calculating the two speeds  
( and  **or**     5   and   2)             (evidence of this may be in (a))

**or**

noting distances travelled in same time (20 secs) i.e. 100m and 40m **but** 2.5

*gains 2 marks*

**2**

**[5]**

**Q7.**

(i)      C and D **or** D and C

*accept CD  
accept DC  
accept answers in terms of time*

**1**

(ii)      any **one** from:

          streamline position streamline clothes

*accept crouched position  
accept tight clothes  
accept design of cycle  
accept cycle slower*

**1**

(iii)     0.5 hours **or** 30 minutes **or** 1800 seconds

***must*** *have unit*

**1**

(iv)     speed = 

*accept any correct rearrangement*

*accept s = d/t* ***or****v  s/t*

*accept velocity for speed*

*accept *

*if**subsequent use of  correct*

**1**

(v)     16

*allow for mark for each of time = 3.5 hours  
distance = 56km  
allow* e.c.f. from *part (a)(iii) if correctly used*

*an answer of 14 gains* ***2*** *marks*

*allow* ***1*** *mark for correct attempt to average the three sections*

**3**

**[7]**

**Q8.**

(a)     (i)      acceleration / speeding up

*do not accept acceleration increases*

**1**

(ii)     constant / steady velocity

*accept constant / steady speed*

**1**

(b)     10

**3**

m/s2 or ms־2

*reject ms2*

*if answer not correct then allow 1 mark for*

*acceleration = *

*and allow 1 mark for *

**1**

**[6]**