

Date:

Name:

HFS Homework One

Total Marks 38

1. Which of the following quantities is a vector?

- A density
- B mass
- C strain
- D weight

(Total 1 mark)

2. Newton's third law tells us that

- A actions usually have a reaction
- B weight and normal contact force are always equal and opposite
- C moving with constant velocity is the same as being at rest
- D forces always arise in pairs

(Total 1 mark)

3. A student was asked the following question: "Describe the variation in energy of a bungee jumper from the moment that the jumper is released to the lowest point that the jumper reaches." As an answer the student wrote the following:
 "Initially the jumper has gravitational potential energy, which is converted into elastic potential energy as the cord stretches. At the lowest point in the jump, all of the gravitational potential energy has been converted to elastic potential energy."

(a) Discuss the student's answer, highlighting any incorrect or missing physics.

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(4)

(b) The bungee jumper has a mass of 80 kg and is in free fall through the air. At a particular instant the force of the air resistance acting on the bungee jumper is 285 N. Calculate the acceleration of the jumper.

Acceleration =

(2)

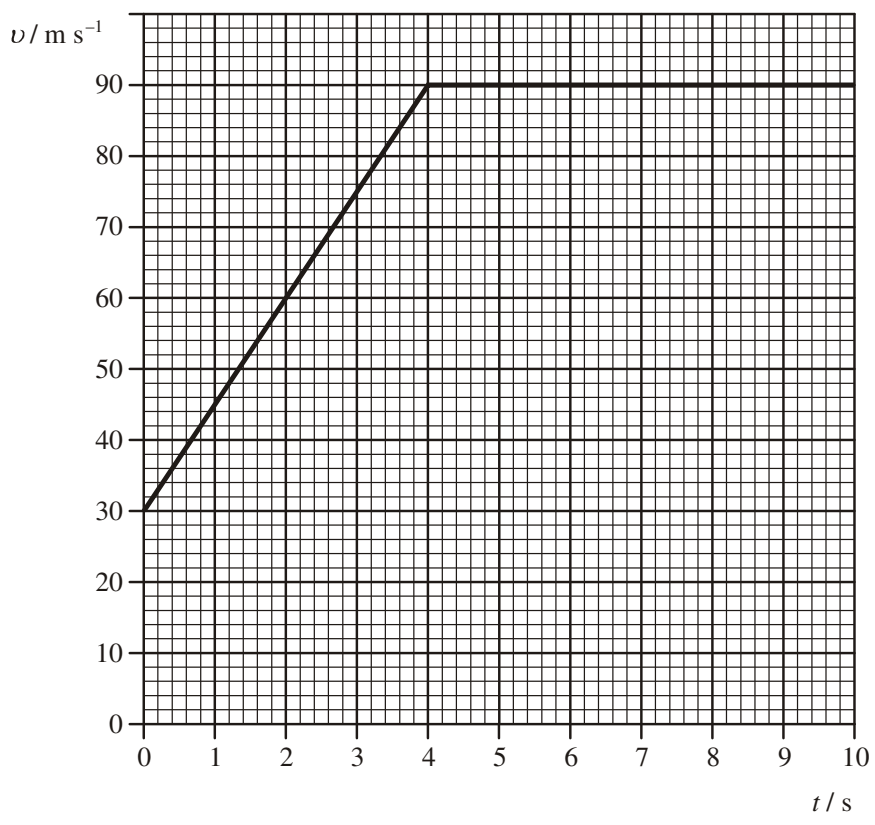
(Total 6 marks)

4. For each of the physical quantities in the table below add the missing information. The first one has been done for you.

Physical quantity	Base units	Vector or scalar
force	kg m s ⁻²	vector
displacement		
gravitational potential energy		
power		

(Total 3 marks)

5. The graph below shows how the velocity of a motorbike varies with time during the final 10 s of a race.



- (a) (i) Describe the motion shown by the graph.

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(2)

- (ii) Show that during the final 10 s the motorbike travels a distance of approximately 800 m.

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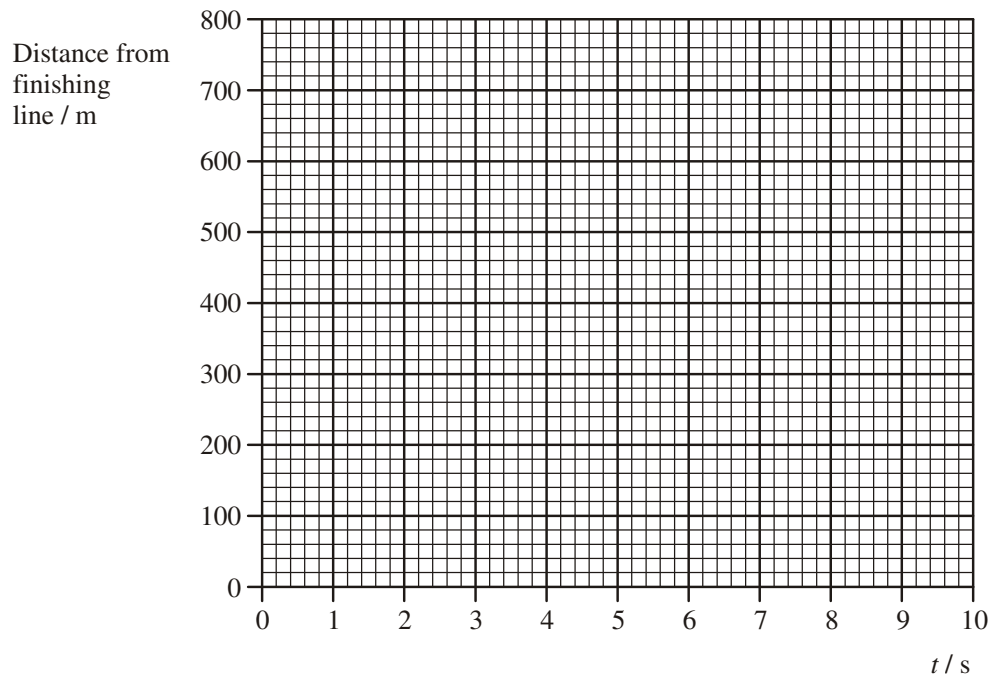
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(3)

- (b) Using the axes below, sketch a graph showing how the distance of the motorbike from the finishing line varies with time during the final 10 s of the race.



(3)

(Total 8 marks)

6. (a) State the difference between distance and displacement.

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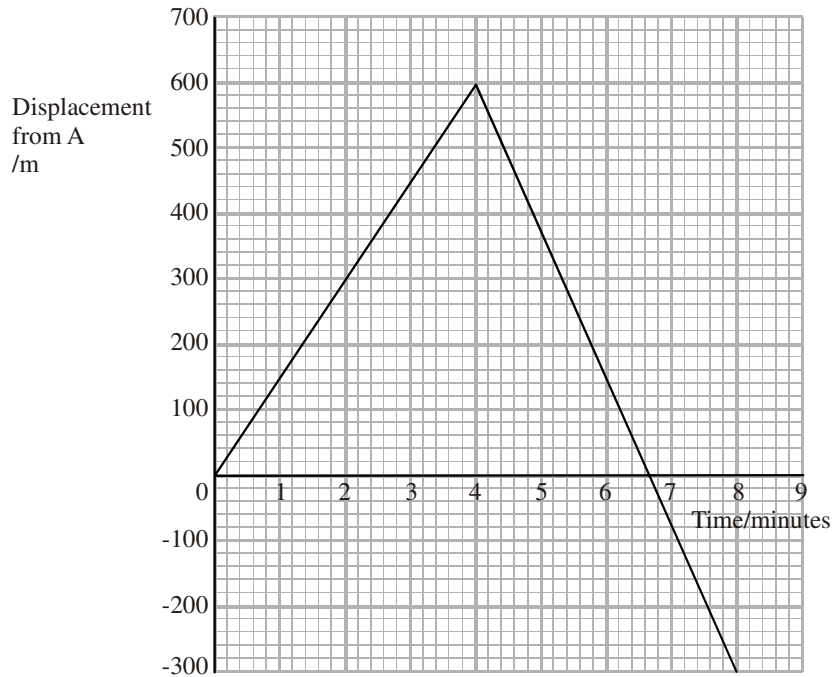
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(1)

- (b) Figure 1 shows an idealised displacement-time graph for the journey of a train along a straight horizontal track, from the moment when it passes a point A on the track. Initially the train moves in an easterly direction away from A.

Figure 1



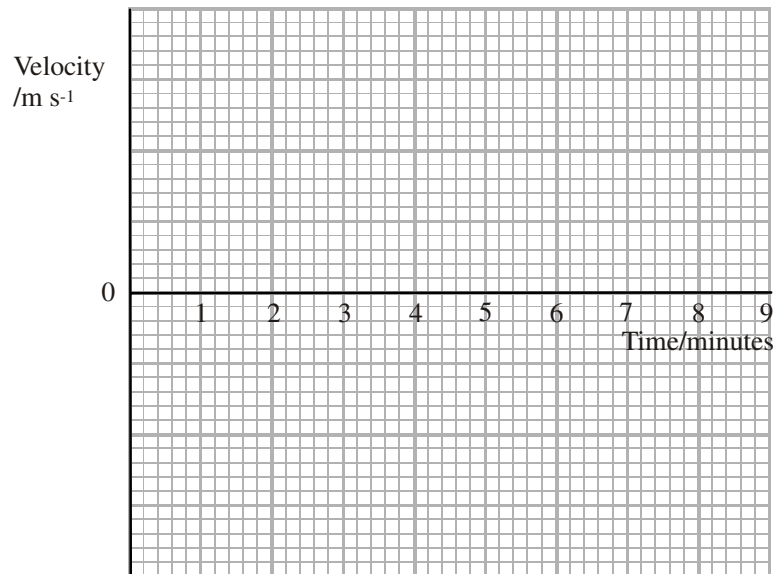
- (i) Describe the position of the train relative to A at the end of the 8 minutes covered by the graph.

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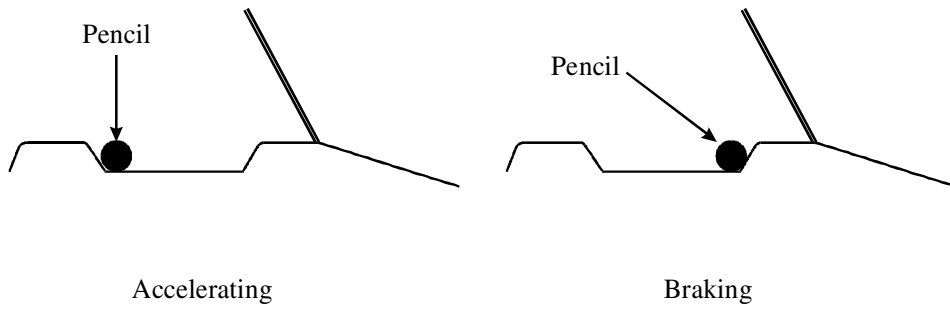
(2)

- (ii) Use the grid, Figure 2, to plot a velocity against time graph of the journey shown in Figure 1. Do the calculations that are required on the lines below the grid.

Figure 2



A pencil has been left on the shelf. Whenever the car accelerates forwards, the pencil is against the rear edge of the shelf. Whenever the car is braking the pencil is against the front edge.



Explain these observations. You may be awarded a mark for the clarity of your answer.

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(5)
(Total 12 marks)