Scalar/Vector Past Paper Questions

Jan 2002 to Jan 2009

Q3 Jan 2003

3 A girl kicks a ball along the ground at a wall 2.0 m away. The ball strikes the wall normally at a velocity of 8.0 m s^{-1} and rebounds in the opposite direction with an initial velocity of 6.0 m s^{-1}. The girl, who has not moved, stops the ball a short time later.

(a) Explain why the final displacement of the ball is not 4.0 m.

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(1 mark)

(b) Explain why the average velocity of the ball is different from its average speed.

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(2 marks)

(c) The ball has a mass of 0.45 kg and is in contact with the wall for 0.10 s. For the period of time the ball is in contact with the wall,

(i) calculate the average acceleration of the ball.

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.....

(ii) calculate the average force acting on the ball.

.....

(iii) state the direction of the average force acting on the ball.

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(5 marks)

Q1 Jan 2004

1 (a) (i) State what is meant by a scalar quantity.

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.....

(ii) State **two** examples of scalar quantities.

example 1: .....

example 2: .....

(3 marks)

(b) An object is acted upon by two forces at right angles to each other. One of the forces has a magnitude of 5.0 N and the resultant force produced on the object is 9.5 N.
Determine

(i) the magnitude of the other force,

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(ii) the angle between the resultant force and the 5.0 N force.

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.....

(4 marks)

2 (a) State the difference between vector and scalar quantities. **Q2 Jan 2005**

.....

.....

(1 mark)

(b) State **one** example of a vector quantity (other than force) and **one** example of a scalar quantity.

vector quantity .....

scalar quantity .....

(2 marks)

(c) A 12.0 N force and a 8.0 N force act on a body of mass 6.5 kg at the same time.
For this body, calculate

(i) the maximum resultant acceleration that it could experience,

.....

.....

(ii) the minimum resultant acceleration that it could experience.

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.....

(4 marks)

Q2 Jan 2009

2 (a) (i) State the difference between a scalar quantity and a vector quantity.

.....

.....

(1 mark)

2 (a) (ii) State **two** examples of a scalar quantity and **two** examples of a vector quantity.

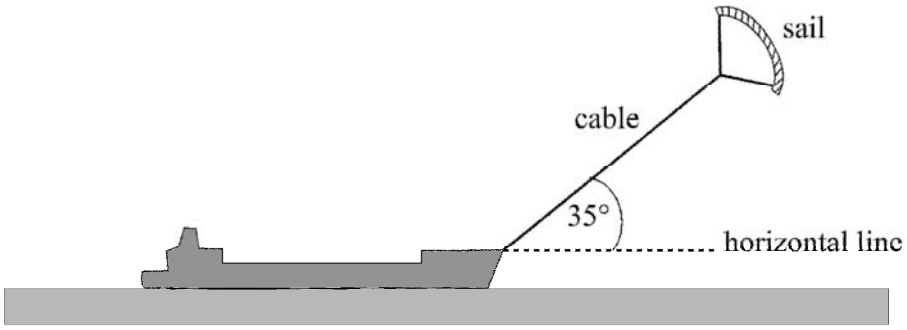
scalar quantities .....

vector quantities .....

(3 marks)

2 (b) **Figure 1** shows a ship fitted with a sail attached to a cable. The force of the wind on the sail assists the driving force of the ship's propellors.

Figure 1



The cable exerts a steady force of 2.8 kN on the ship at an angle of 35° above a horizontal line.

2 (b) (i) Calculate the horizontal and vertical components of this force.

horizontal component of force ..... kN

vertical component of force ..... kN

(2 marks)

Continued...

2 (b) (ii) The ship is moving at a constant velocity of $8.3\,m\,s^{-1}$ and the horizontal component of the force of the cable on the ship acts in the direction in which the ship is moving.
Calculate the power provided by the wind to this ship, stating an appropriate unit.

Answer .....
(3 marks)

2 (c) The cable has a diameter of 0.014 m. Calculate the tensile stress in the cable when it exerts a force of 2.8 kN on the ship, stating an appropriate unit.
Assume the weight of the cable is negligible.

Answer .....
(5 marks)

Q1 Jan 2002

1 (a) (i) Define acceleration.

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(ii) State why acceleration is a vector quantity.

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(2 marks)

(b) State what feature of a velocity-time graph may be used to calculate

(i) acceleration,

.....

(ii) displacement.

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(2 marks)

Continued.....

(c) The graph in **Figure 1** shows how the displacement of a runner from a fixed point, along a straight track, varies with time.

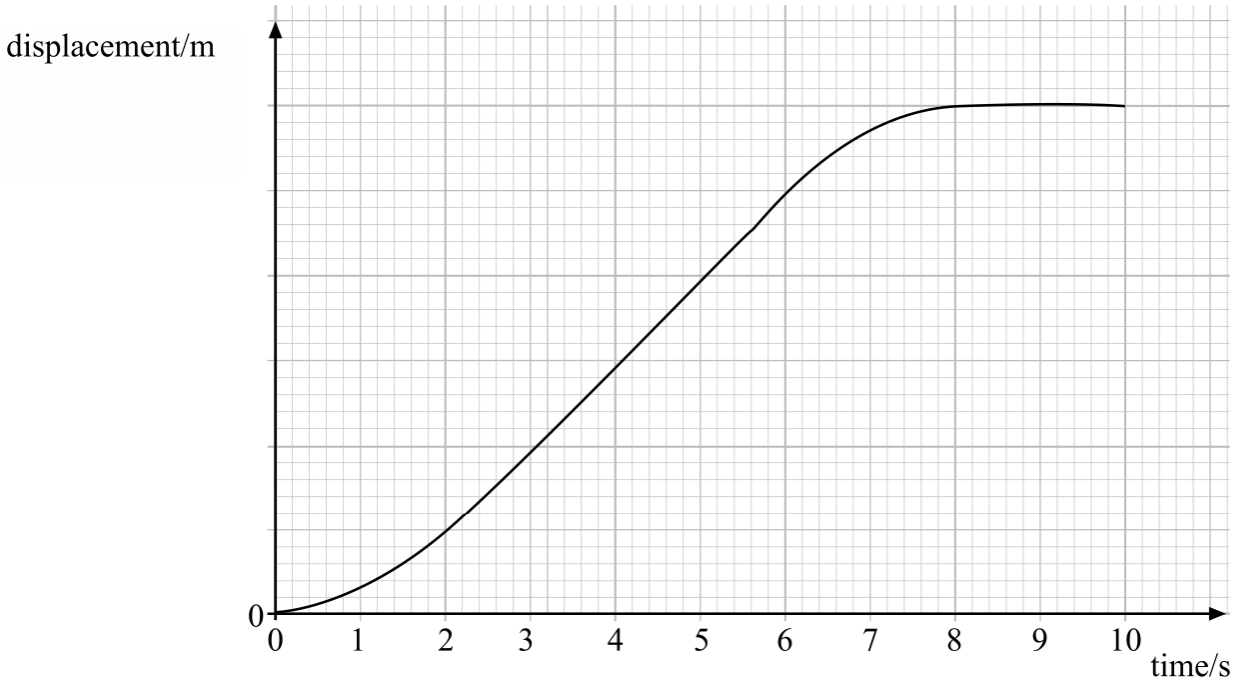

Figure 1

Without calculation, sketch on the grid in **Figure 2** a graph to show how the velocity of the same runner varies over the same period. The time scales are the same on both graphs.

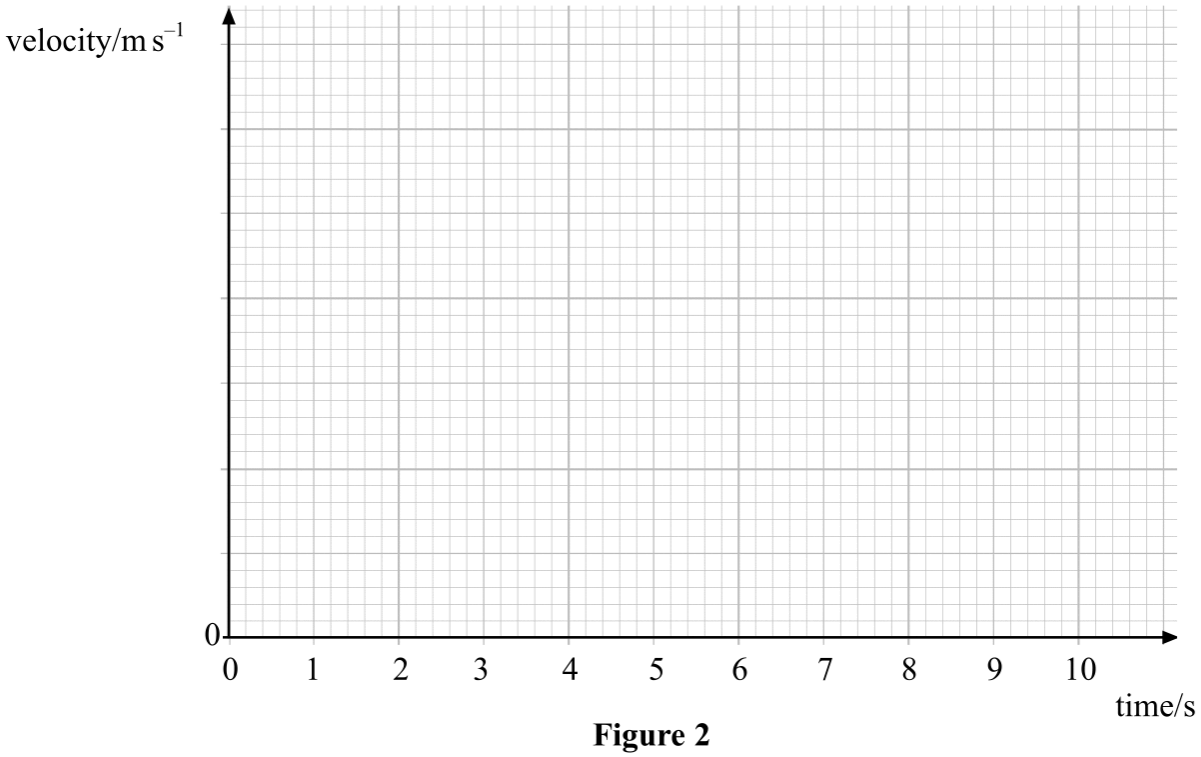

Figure 2

(4 marks)