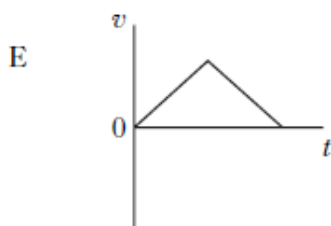
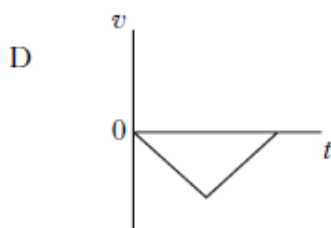
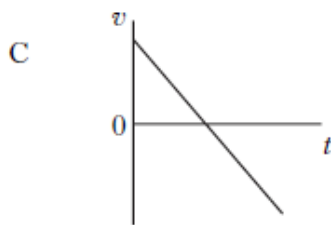
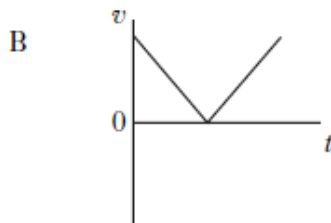
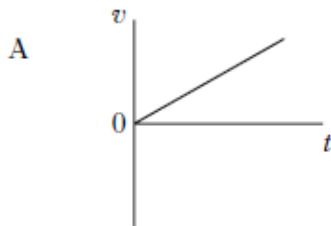


## Exercise 1 - Scalar and Vector

### Past Paper Homework Questions

1. A ball is thrown vertically upwards and falls back to Earth. Neglecting air resistance, which velocity-time graph represents its motion?



2. Which row shows both quantities classified correctly?

	<i>Scalar</i>	<i>Vector</i>
A	weight	force
B	force	mass
C	mass	distance
D	distance	momentum
E	momentum	time

3. Which of the following contains one scalar quantity and one vector quantity?

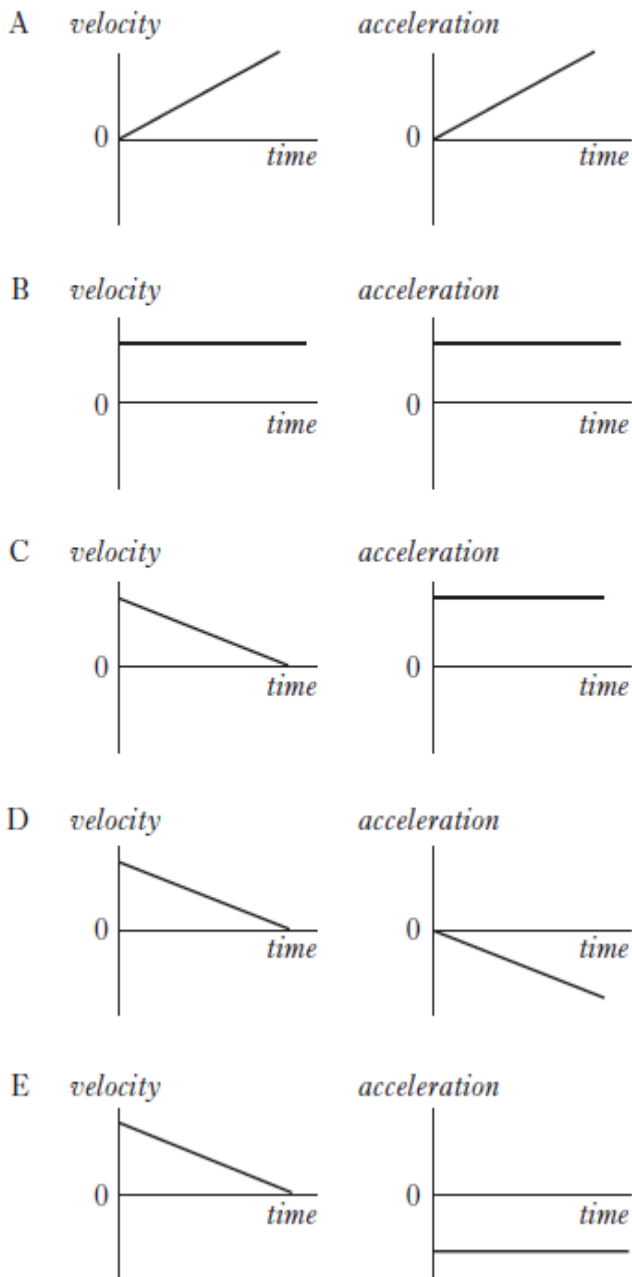
- A acceleration; displacement
- B kinetic energy; speed
- C momentum; velocity
- D potential energy; work
- E power; weight

4. Acceleration is the change in

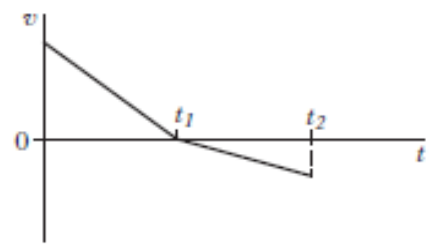
- A distance per unit time
- B displacement per unit time
- C velocity per unit distance
- D speed per unit time
- E velocity per unit time.

5. A vehicle is travelling in a straight line. Graphs of velocity and acceleration against time are shown.

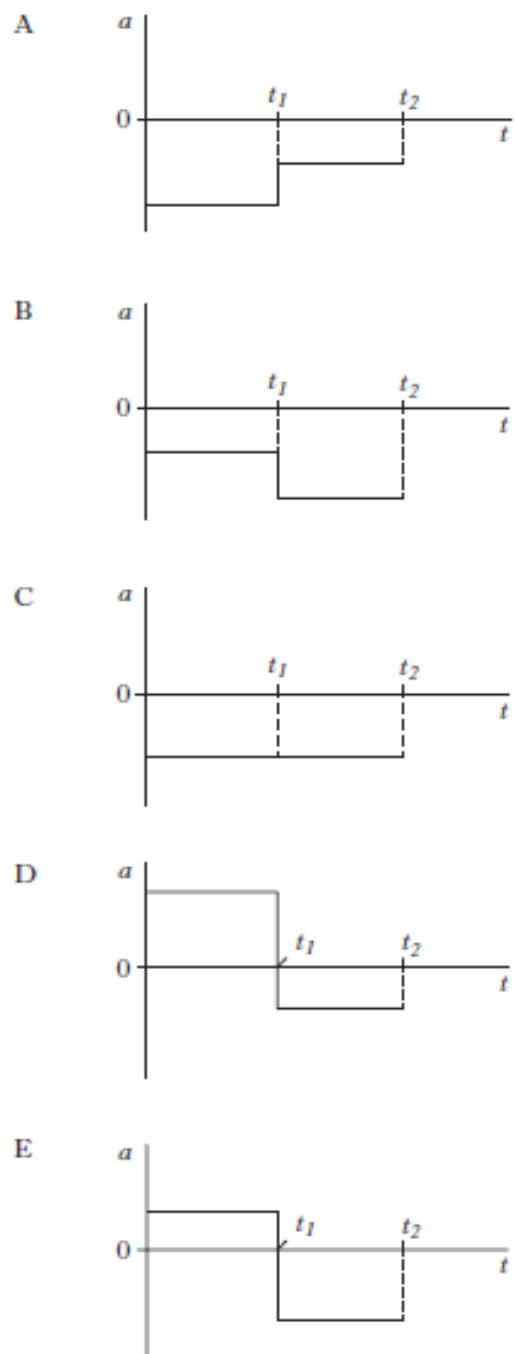
Which pair of graphs could represent the motion of the vehicle?



6. A trolley travels along a straight track. The graph shows how the velocity  $v$  of the trolley varies with time  $t$ .



Which graph shows how the acceleration  $a$  of the trolley varies with time  $t$ ?

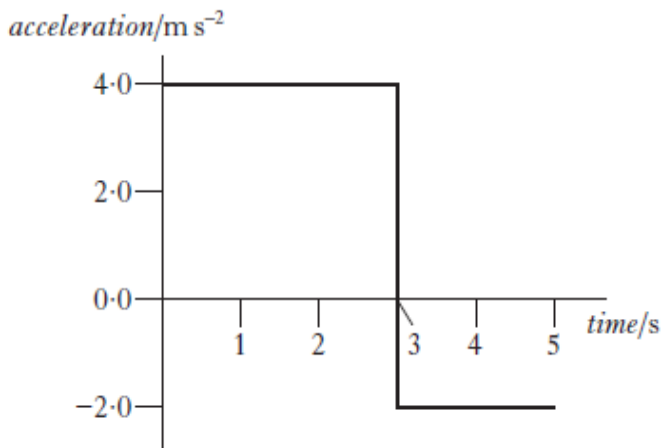


7. Which of the following is a vector quantity?

- A distance
- B time
- C speed
- D energy
- E weight

8. An object starts from rest and accelerates in a straight line.

The graph shows how the acceleration of the object varies with time.



The speed of the object at 5 seconds is

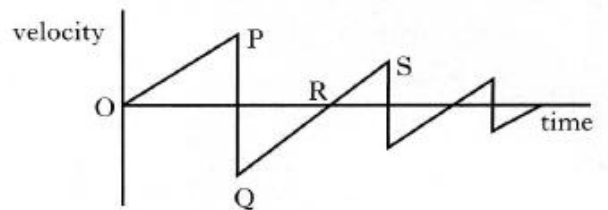
- A  $2 \text{ m s}^{-1}$
- B  $8 \text{ m s}^{-1}$
- C  $12 \text{ m s}^{-1}$
- D  $16 \text{ m s}^{-1}$
- E  $20 \text{ m s}^{-1}$ .

9. A woman walks 12 km due North. She then turns round immediately and walks 4 km due South. The total journey takes 4 hours.

Which row in the following table gives the correct values for her average velocity and average speed?

	<i>Average velocity</i>	<i>Average speed</i>
A	4 km h <sup>-1</sup> due N	4 km h <sup>-1</sup>
B	4 km h <sup>-1</sup> due N	2 km h <sup>-1</sup>
C	3 km h <sup>-1</sup> due N	4 km h <sup>-1</sup>
D	2 km h <sup>-1</sup> due N	4 km h <sup>-1</sup>
E	2 km h <sup>-1</sup> due N	3 km h <sup>-1</sup>

10. The following velocity-time graph describes the motion of a ball, dropped from rest and bouncing several times.



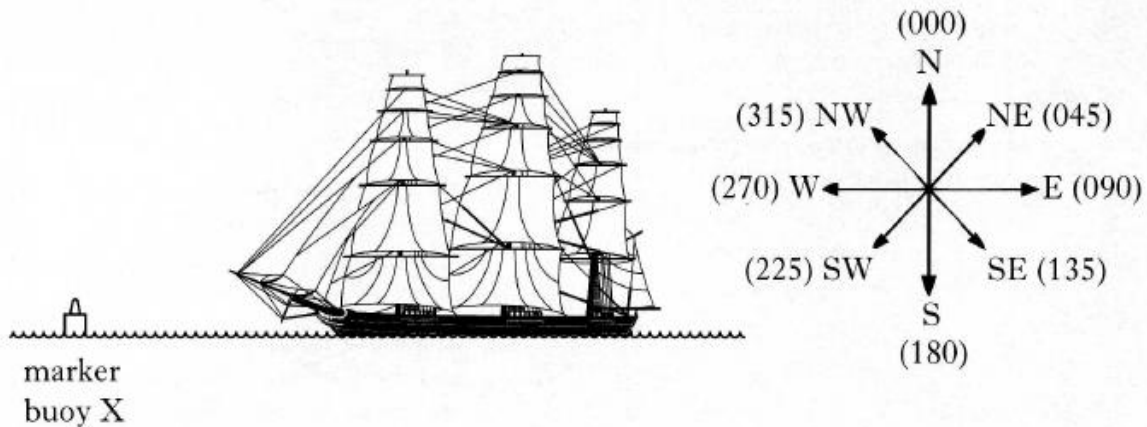
Which of the following statements is/are true?

- I The ball hits the ground at P.
  - II The ball is moving upwards between Q and R.
  - III The ball is moving upwards between R and S.
- A I only
  - B II only
  - C III only
  - D I and II only
  - E I and III only

11. (a) State the difference between speed and velocity.

1

(b) During a tall ships race, a ship called the Mir passes a marker buoy X and sails due West (270). It sails on this course for 30 minutes at a speed of  $10.0 \text{ km h}^{-1}$ , then changes course to  $20^\circ$  West of North (340). The Mir continues on this new course for  $1\frac{1}{2}$  hours at a speed of  $8.0 \text{ km h}^{-1}$  until it passes marker buoy Y.



- (i) Show that the Mir travels a total distance of 17 km between marker buoys X and Y.
- (ii) By scale drawing or otherwise, find the displacement from marker buoy X to marker buoy Y.
- (iii) Calculate the average velocity, in  $\text{km h}^{-1}$ , of the Mir between marker buoys X and Y.

6

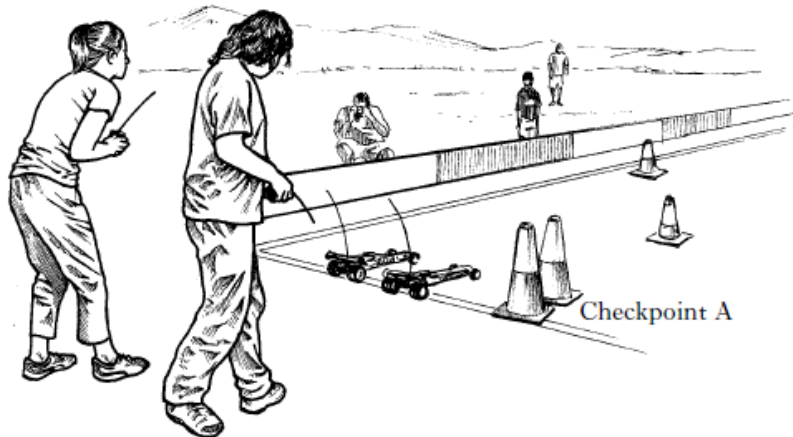
(c) A second ship, the Leeuvin, passes marker buoy X 15 minutes after the Mir and sails directly for marker buoy Y at a speed of  $7.5 \text{ km h}^{-1}$ .

Show by calculation which ship first passes marker buoy Y.

2

(9)

12. Competitors are racing remote control cars. The cars have to be driven over a precise route between checkpoints.



Each car is to travel from checkpoint A to checkpoint B by following these instructions.

“Drive 150 m due North, then drive 250 m on a bearing of  $60^\circ$  East of North (060).”

Car X takes 1 minute 6 seconds to follow these instructions exactly.

- (a) By scale drawing or otherwise, find the displacement of checkpoint B from checkpoint A. 2
- (b) Calculate the average velocity of car X from checkpoint A to checkpoint B. 2
- (c) Car Y leaves A at the same time as car X.  
Car Y follows exactly the same route at an average speed of  $6.5 \text{ m s}^{-1}$ .  
Which car arrives first at checkpoint B?  
Justify your answer with a calculation. 2
- (d) State the displacement of checkpoint A from checkpoint B. 1
- (7)**

13. A helicopter is flying at a constant height above the ground. The helicopter is carrying a crate suspended from a cable as shown.



- (a) The helicopter flies 20 km on a bearing of 180 (due South). It then turns on to a bearing of 140 ( $50^\circ$  South of East) and travels a further 30 km.

The helicopter takes 15 minutes to travel the 50 km.

- (i) By scale drawing (or otherwise) find the resultant displacement of the helicopter. 2
- (ii) Calculate the average velocity of the helicopter during the 15 minutes. 2
- (4)**

**30 marks**