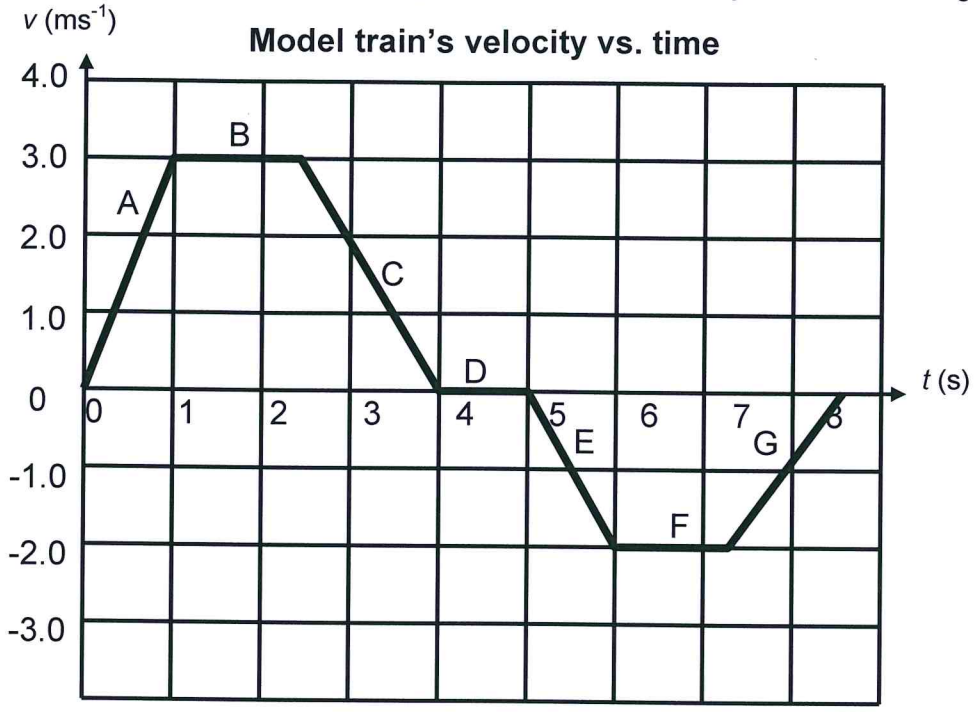
Solution 1

(3 marks)

A model electric train's velocity is graphed as it moves along a section of straight track.



(a) During which section of the graph is the acceleration the greatest? (1 mark)

Circle the correct answer: A B C D E F G

(b) During which section is the train not moving? (1 mark)

Circle the correct answer: A B C D E F G

(c) At the end of the journey, the train's displacement relative to its starting position will be: (1 mark)

Circle the correct answer: Positive Zero Negative

Description	Marks
(a) A	1
(b) D	1
(c) Positive	1
	Total 3

Solution 2

(3 marks)

A sprinter completes one lap of an oval 400 m track in 55.0 s, finishing at the same point he started.

(a) Determine the speed of the sprinter.

Description	Marks
Speed = distance/time = 400/55	1
= 7.27 m s^{-1}	1
Total	**2**

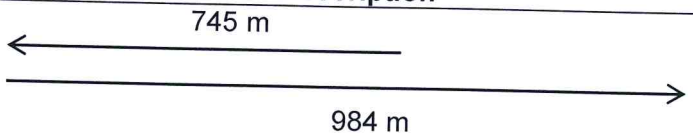
(b) Determine the velocity of the sprinter.

Description	Marks
v = s/t = 0/55 = 0 m s^{-1}	1
Total	**1**

Solution 3

(4 marks)

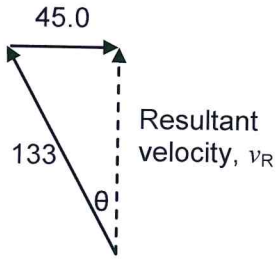
A farmer walked 745 m west from a gate to repair a fence post. When that job was finished he turned around and walked 984 m east to repair another part of the fence. Draw and label a vector diagram of his total journey then calculate his resultant displacement.

Description	Marks
 Labels 1 Direction 1	1–2
984 – 745 = 239 east	1–2
Total	**4**

Solution 4

(5 marks)

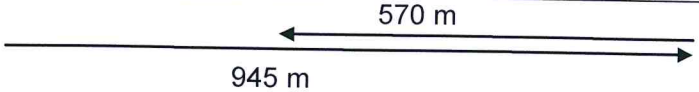
An aircraft attempts to land along a north-south aligned landing strip. It approaches from the south and has an air speed of 133 km hr^{-1}. The wind is blowing from the west at 45.0 km hr^{-1}. Draw a vector diagram to show the direction the aircraft needs to head and calculate its actual velocity, in m s^{-1}, relative to the runway. Show **all** workings.

Description	Marks
Two vectors drawn at an appropriate angle to each other Resultant shown If directions incorrect, max. 1 mark 	1–2
$133^2 = v^2 + 45^2$ v_R = 125 km hr^{-1} North	1
v_R = 125/3.6= 34.7 m s^{-1} North (direction implied, so not required)	1
$\theta=\sin^{-1}(45/133)=19.8°$ (heading)	1
Total	**5**

Solution 5

(3 marks)

A hiker is walking east across a flat desert. After walking for 945 m, he realises he has dropped his water bottle and walks back 570 m to get it. Draw and label a vector diagram showing his path and calculate his resultant displacement.

Description	Marks
 Label 1 direction 1	1–2
945-570= 375 m	1
Total	**3**

Solution 6

(10 marks)

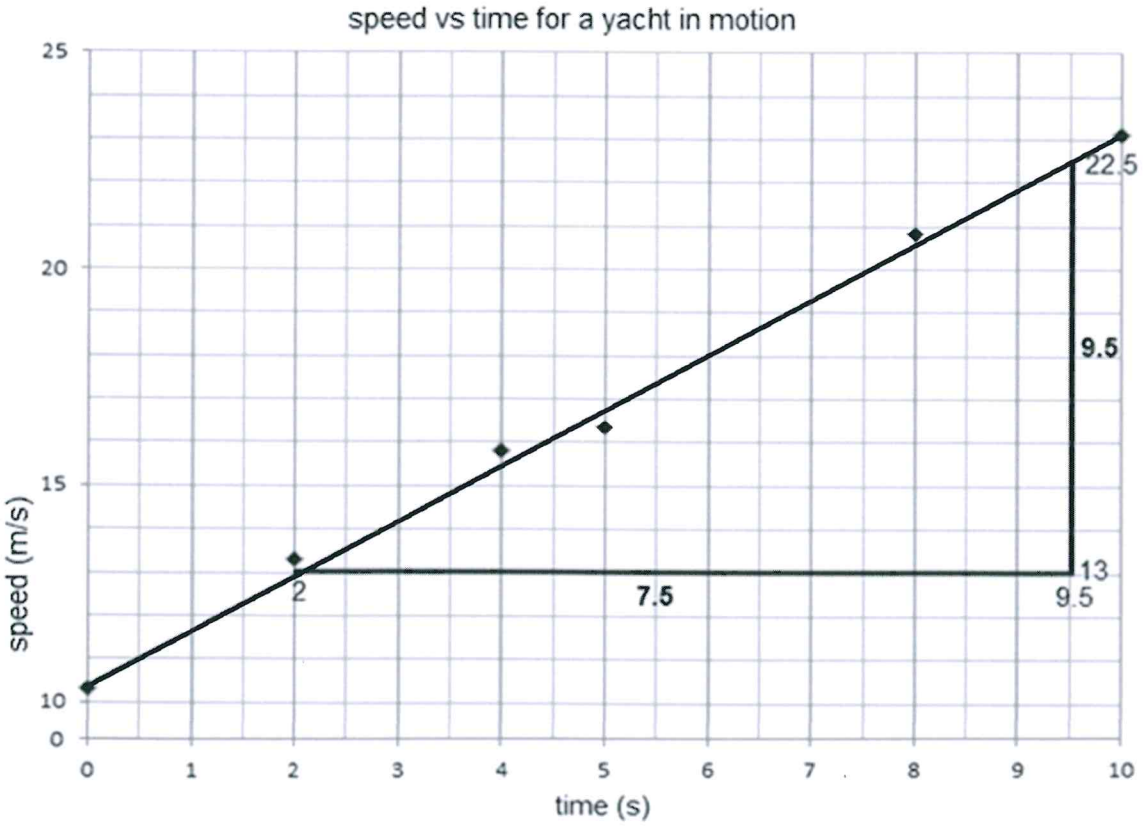
(a) Given that 1 knot equals 0.5144 m s^{-1}, complete the third column of the table below to three significant figures. (2 marks)

Time (s)	speed in knots	speed in m s^{-1}
4.00	30.7	**15.8**
5.00	31.9	**16.4**

Description	Marks
Values correct in third column	1
All answers to three significant figures	1
Total	**2**

(b) Using the grid on page 29, plot a graph of speed (in m s^{-1}) against time and draw a straight line of best fit. (4 marks)

Description	Marks
Time on the x-axis	1
Axis labelled with units	1
Points clearly shown and plotted correctly	1
Line of best fit drawn	1
Total	**4**



(c) Calculate the gradient of the line of best fit, including the correct units. Show **all** workings. (4 marks)

Description	Marks
gradient taken from line of best fit and not data points	1
Gradient = 9.5 / 7.5 = 1.3 range 1.2 to 1.4	1–2
m s^{-2}	1
Total	**4**