Year 11 HSC Physics
8.4 – Moving About
Worksheet – Velocity Time Graphs

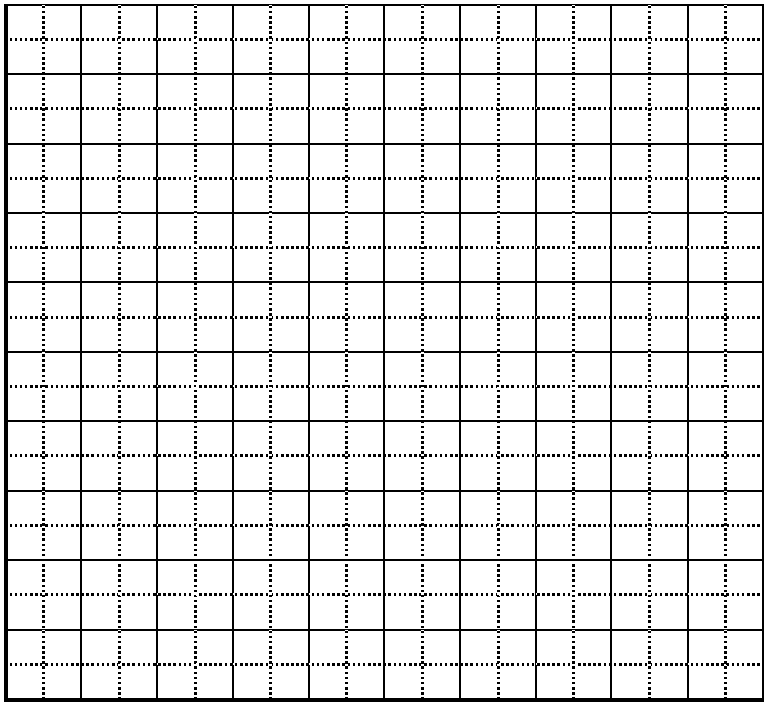
8.4.1.C

Set 1 – Drawing velocity-time graphs

1. The table below is a table of data from an experiment measuring the variation of speed with time for a car.

Time (s)	0	10	20	30	40	50	60	70	80	90	100	110
Speed (ms^{-1})	15	20	25	30	35	39	32	20	8	0	0	10

a) Graph the data on a speed-time graph.



b) Find the speed of the car at 35.0 s.

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c) Find how long the car took to decelerate from 30.0 to 10.0 m s^{-1}.

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d) Determine the acceleration at 70.0 s.

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e) How far did the car travel during the time 110.0 s?

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Set 2 – Definitions and meanings

2. Contrast the terms uniform motion and non-uniform motion.

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3. What is the gradient of a graph? Identify the information the gradient gives us in displacement-time and velocity-time graphs.

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4. Outline why we normally place time along the horizontal axis of a motion graph.

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5. Describe how displacement is determined from a graph.

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6. Explain why we use a 'line of best fit' with a graph.

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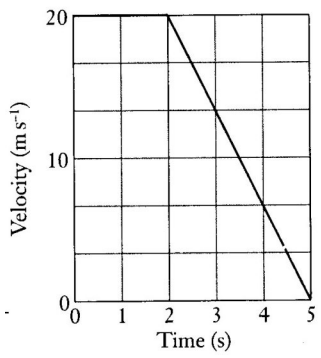
Set 3 - Interpreting velocity-time graphs

7. The diagram shows the velocity-time graph for a car travelling in astraight line along a road.



a) Calculate the acceleration between t = 0 s and t = 2.0 s.

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b) Calculate the acceleration between t = 2.0 s and t = 5.0 s.

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c) Calculate the displacement between t = 0 s and t = 5.0 s.

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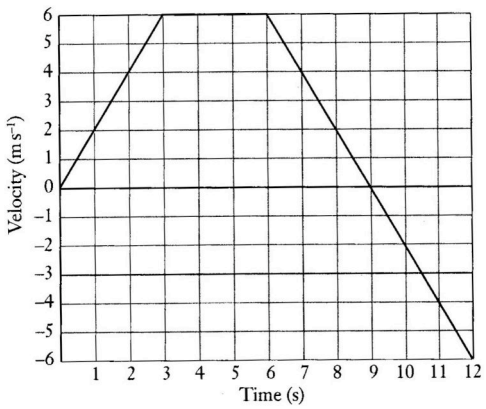
8. The graph shows a velocity-time graph for a student moving in a straight line. From the graph:



a) calculate the acceleration between:

(i) t = 0 s and t = 3.0 s.

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(ii) t = 3.0 s and t = 6.0 s

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(iii) t = 6.0 s and t = 9.0 s

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(iv) t = 9.0 s and t = 12.0 s

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b) calculate the displacement during the following time intervals:

(i) t = 0 s and t = 6.0 s

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(ii) t = 0 s and t = 9.0 s

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(iii) t = 0 s and t = 12.0 s

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c) calculate the distance travelled between t = 0 s and t = 12.0 s

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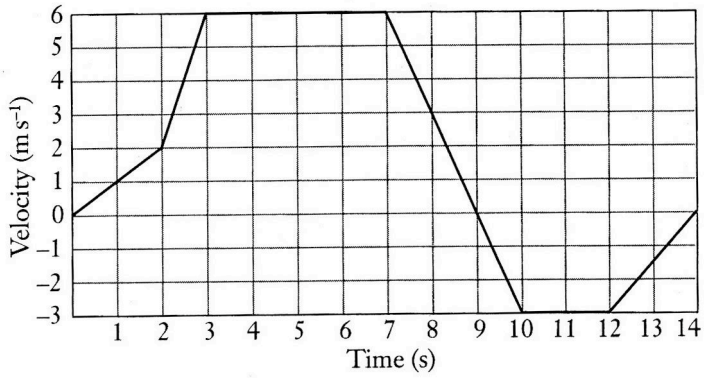
d) sketch the displacement-time graph for the motion.

9. The graph shows a velocity-time graph for a soccer player moving in a straight line during part of a match.



a) Calculate the acceleration between t = 0 sand t = 2.0 s.

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b) Calculate the instantaneous acceleration at t = 8.0 s.

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c) Calculate the acceleration between t = 4.0 s and t = 7.0 s.

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d) Calculate the instantaneous accelerationat t = 9.0 s.

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e) Determine the distance the player travels between t = 0 s and t = 6.0 s.

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f) What is the total distance covered by the player between t = 0 s and t = 14.0 s?

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g) What is the displacement between t = 0 s and t = 14.0 s?

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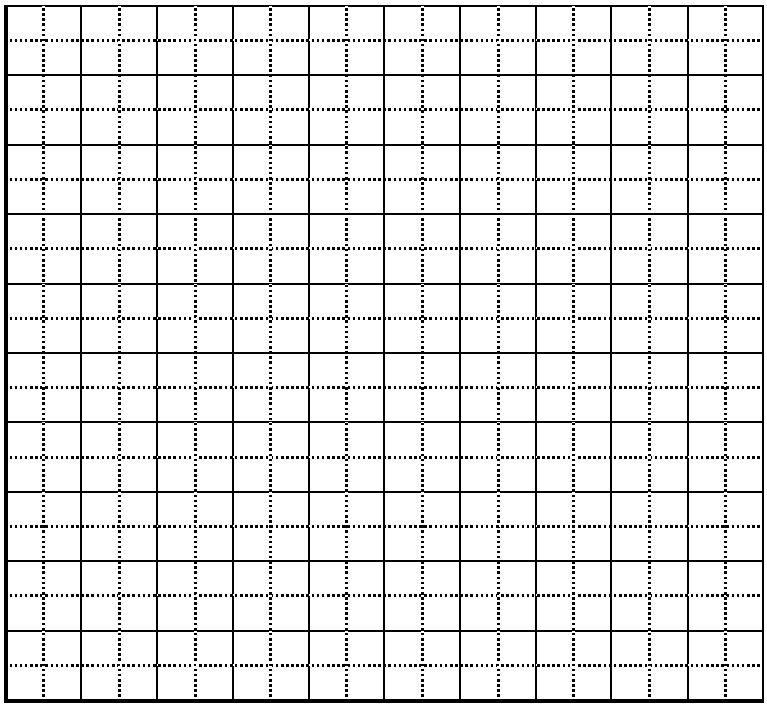
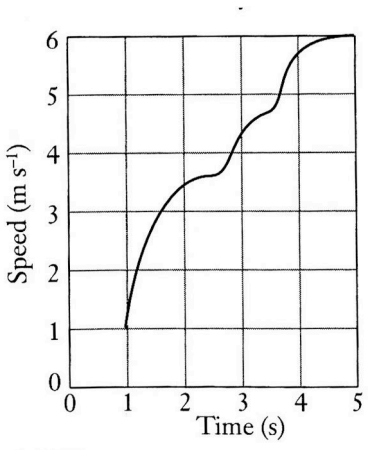
10. A motor bike moves in a straight line, accelerating uniformly at 3.0 ms^{-2} for 10.0 s, moving at a constant speed of 30.0 m s^{-1} for afurther 20.0 s, and finally decelerating at a constant rate of 2.0 ms^{-2} until coming to rest. Draw a velocity-time graph for this motion and hence determine the total distance travelled during the entire journey.



11. The graph shows at speed-time graph of the motion of a cyclist.



a) Determine the speed at 5.0 s.

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b) At what time is the speed 4.0 m s^{-1}?

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c) Determine between which times the speed is constant.

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d) Calculate the acceleration at 4.0 s.

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e) What distance has the cyclist travelled between 3.0 s and 5.0 s?

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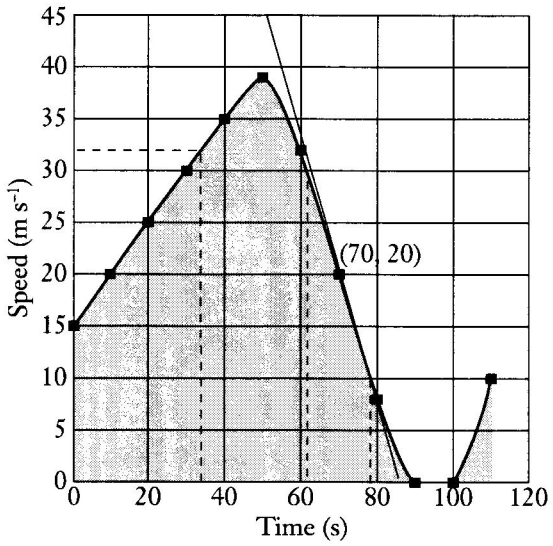
Answers

Set 1 – Drawing velocity-time graphs

1 a) See graph below.



b) Approximately 32 ms^{-1}

c) 16 s

d) -1.3 ms^{-1}

e) 2350 m

Set 2 – Definitions and meanings

2 Uniform motion occurs when the magnitude of the acceleration is constant. Non-uniform motion occurs when the magnitude of the acceleration is not constant.

3 The gradient of the graph is the gradient of a tangent drawn at any given point along the line or curve. The gradient of a displacement-time graphs is the velocity of an object at a given time while the gradient of a velocity-time graph is the acceleration of the object at any given time.

4 Time is the independent variable and it is usual to graph the independent variable on the x-axis.

5 In the case of a displacement-time graph, displacement is read as the value on the vertical axis. In the case of a velocity-time graph, displacement is the area under the graph.

6 A line of best fit may reduce measurement errors and allow us to find an algebraic equation to describe the motion.

Set 3 - Interpreting velocity-time graphs

7 a) 0

b) 6.67 ms^{-2}

c) 70 m

8 a) i) 2 ms^{-2}

ii) 0

iii) -2 ms^{-2}

iv) – 2 ms^{-2}

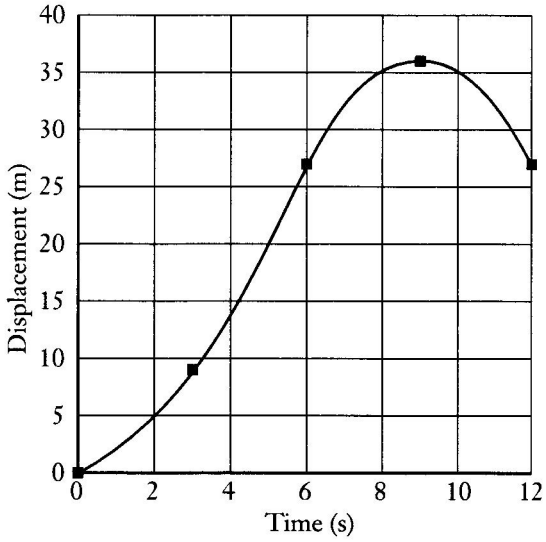
b) i) 27 m

ii) 36 m

iii) 27 m

c) 45 m

d)



9 a) 1 ms-2

b) -3 ms^{-2}

c) 0

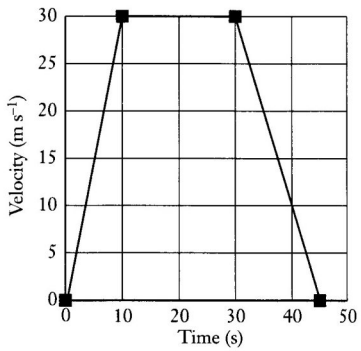
d) -3 ms^{-2}

e) 24 m

f) 46.5 m

g) 25.5 m

10 See graph below. The total distance travelled was 975 m.



11 a) 6 ms^{-1}

b) 2.8 s

c) Best estimation between $2.2 < t < 2.6$ s

d) 1.1 ms-2

e) Best estimation is about 10.75 m