

Online practice assessment task for AS91028 (1.3)

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Investigate relationships between tables, equations and graphs

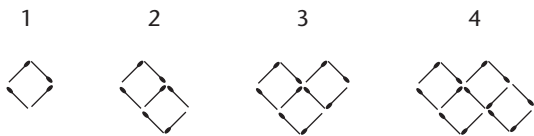
Chapter 3

Externally assessed
4 credits

Practice assessment task

Question 1

- a. Jake uses matchsticks to make a sequence of joined diamond patterns, as shown.

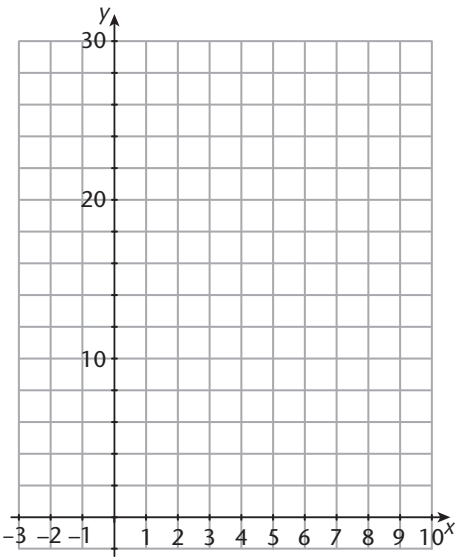


He draws up a table showing the number of matchsticks needed for each pattern.

Diamonds (n)	Matchsticks (m)
1	4
2	7
3	
4	
5	

- i. Complete the table and work out the rule for the number of matchsticks m Jake needs for a pattern with n joined diamonds.

- ii. On the grid below, sketch a graph showing the number of matchsticks required for up to the 8th pattern.



- iii. Give the rule for the *total* number of matchsticks T that Jake would need if he continued the pattern up to n joined diamonds. Use this rule to work out the total number of matchsticks Jake would need to complete his first 12 patterns.

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- b.** Sam makes a different sequence of diamond patterns. Sam also starts with 1 diamond, but he continues his pattern by adding diamonds as shown below.



- i.** Give the rule for the number of matchsticks needed to make the n th diamond pattern in Sam's sequence.

- ii.** Use this rule to find out which of Sam's patterns would use 100 matchsticks.

- iii.** Describe how the graph for the number of matchsticks Sam uses would relate to Jake's graph.

- a.** How far do the Browns live from the beach?

- b.** At what speed (in kilometres per hour) do the Abbots drive?

- c.** How long did it take the Browns to get to the beach?

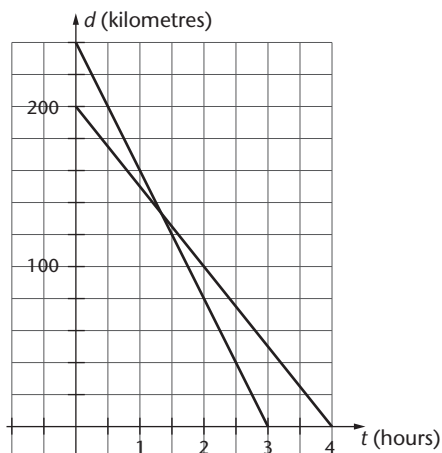
- d.** Write the equation for the Abbots' distance, d , from the beach at time t .

- e.** Both families leave home at 10 am. Which family is closer to the beach by midday?

- f.** The Chen family drives away from the beach at 10 am, driving at same speed as the Abbot family drives. Draw the graph of the Chen family's journey on the grid and work out when the Abbots and the Chens are both the same distance from the beach.

Question 2

- 2.** The Abbot family and the Brown family drive to the same beach for their holidays. The Abbot family drives more quickly than the Brown family. The graph shows the distance from the beach, d , plotted against time in hours (t).



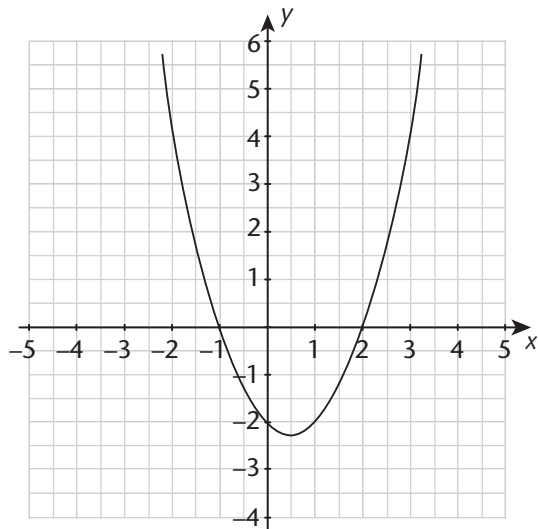
Question 3

- a.** For the parabola drawn below give:

- i.** the intercepts

- ii.** the equation of the curve

- iii.** the coordinates of the vertex



The parabola is reflected in the x -axis then translated 2 units right.

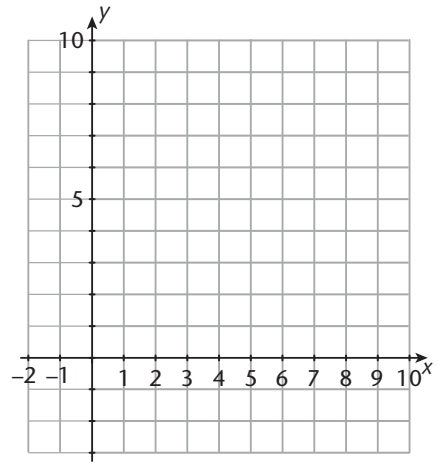
- iv. What is the equation of the parabola now?

- v. What is the y -intercept of the parabola now?

- vi. What is the vertex of the parabola now?

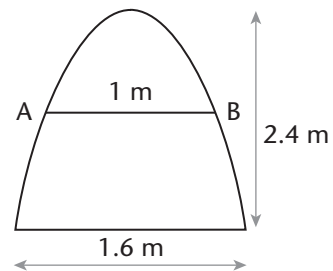
- b. Water from a fountain makes a parabolic arch which can be modelled by the function $h = (x + 1)(5 - x)$, where h metres is the height of the water x metres horizontally from the fountain head.

- i. Draw the graph of the part of the function that models the water coming out of the fountain and hitting the ground.



- ii. What is the maximum height the water from the fountain reaches?

- c. Bobbitts live in villages with doors in the shape of parabolas, as shown. Bobo the bobbitt has a door which is 1.6 m wide and 2.4 m high. A 1-m-wide support brace AB is attached horizontally part-way up the door. Find the distance AB is below the top of the door.



Answers

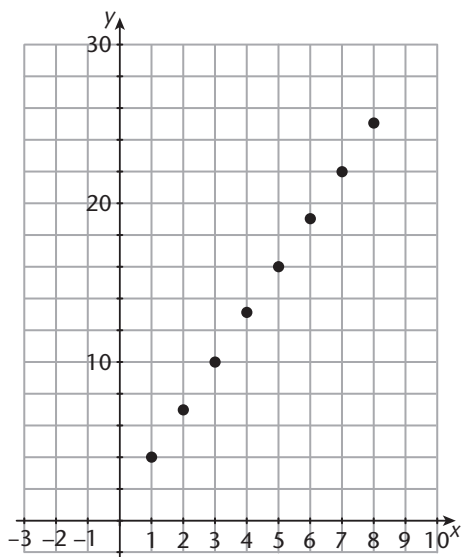
Question 1 (page 129)

a.

Diamonds (n)	Matchsticks (m)
1	4
2	7
3	10
4	13
5	16

i. $m = 3n + 1$

ii.



iii. $T = 1.5n^2 + 2.5n$

b. i. $m = 4n$

ii. 25th pattern

iii. Same first point, but line of points is steeper after that.

Question 2 (page 130)

a. 200 km

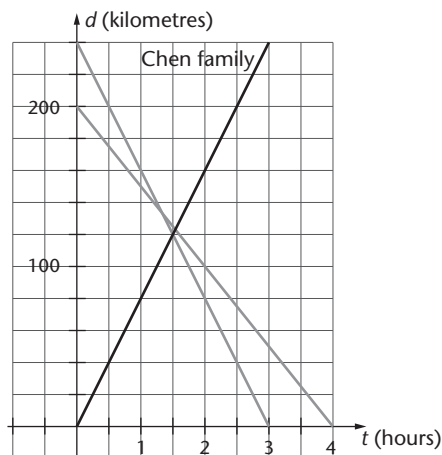
b. 80 kilometres per hour

c. 4 hours

d. $d = -80t + 240$

e. Abbot family

f.



Same distance at 11.30 am.

Question 3 (page 130)

a. i. $(-1, 0)$, $(2, 0)$, $(0, -2)$

ii. $y = (x + 1)(x - 2)$

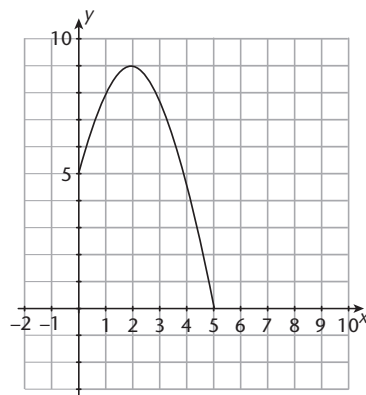
iii. $(0.5, -2.25)$

iv. $y = -(x - 1)(x - 4)$ or $y = -x^2 + 5x - 4$

v. $(0, -4)$

vi. $(2.5, 2.25)$

b. i.



ii. 9 metres

c. 0.9375 m