

Quadratics Review Packet

1. (a) Factorize $3x^2 + 13x - 10$. (2)

(b) Solve the equation $3x^2 + 13x - 10 = 0$. (2)

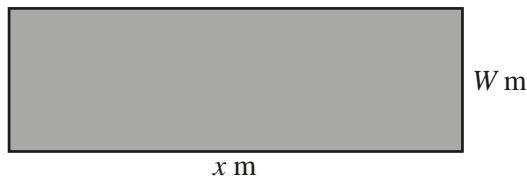
Consider a function $f(x) = 3x^2 + 13x - 10$.

(c) Find the equation of the axis of symmetry on the graph of this function. (2)

(d) Calculate the minimum value of this function. (2)

(Total 8 marks)

2. The perimeter of this rectangular field is 220 m. One side is x m as shown.



(a) Express the width (W) in terms of x .

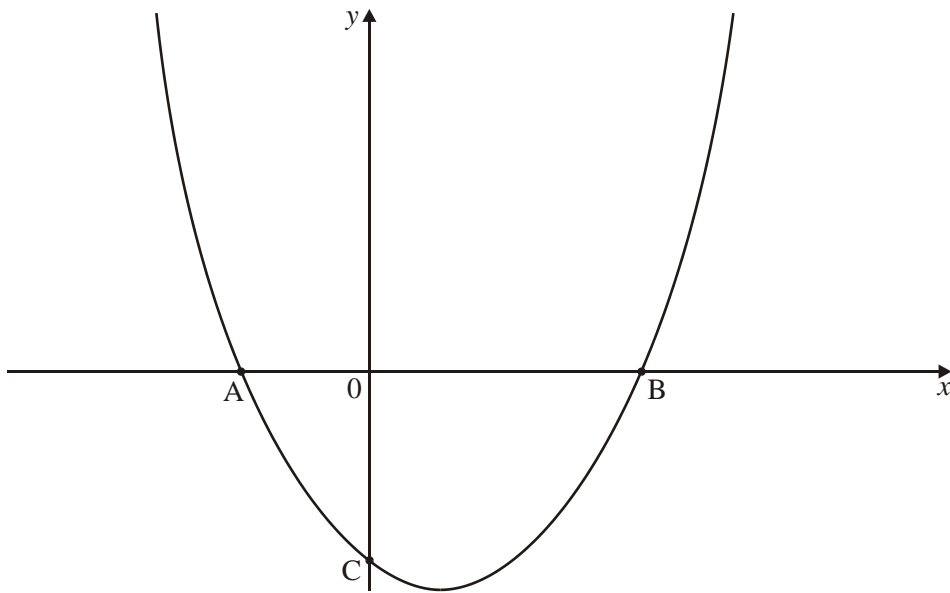
(b) Write an expression, in terms of x only, for the area of the field.

(c) If the length (x) is 70 m, find the area.

<p><i>Working:</i></p>
<p><i>Answers:</i></p> <p>(a)</p> <p>(b)</p> <p>(c)</p>

(Total 4 marks)

3. The graph of the function $y = x^2 - x - 2$ is drawn below.



(a) Write down the coordinates of the point C.

(b) Calculate the coordinates of the points A and B.

Working:

Answers:

(a)

(b)

(Total 8 marks)

4. **Diagram 1** shows a part of the graph of $y = x^2$.

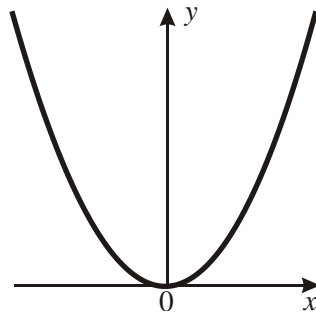


Diagram 1

Diagrams 2, 3 and 4 show a part of the graph of $y = x^2$ after it has been moved parallel to the x -axis, or parallel to the y -axis, or parallel to one axis, then the other.

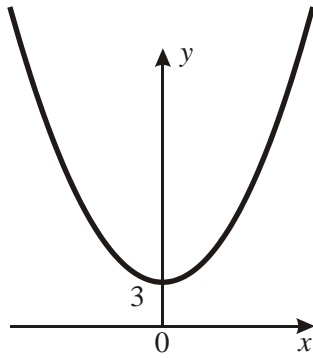


Diagram 2

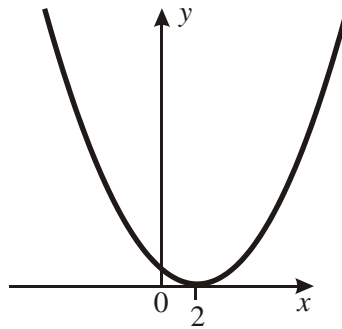


Diagram 3

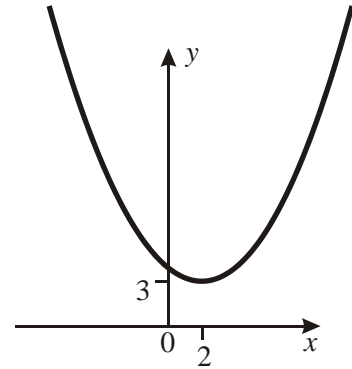


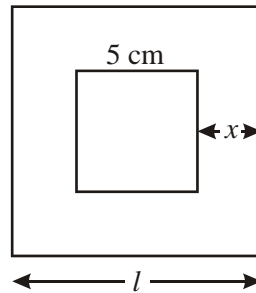
Diagram 4

Write down the equation of the graph shown in

- (a) **Diagram 2;**
- (b) **Diagram 3;**
- (c) **Diagram 4.**

(Total 4 marks)

5. A picture is in the shape of a square of side 5 cm. It is surrounded by a wooden frame of width x cm, as shown in the diagram below.

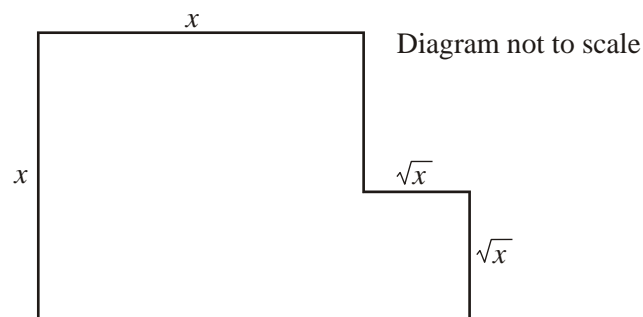


The length of the wooden frame is l cm, and the area of the wooden frame is A cm².

- (a) Write an expression for the length l in terms of x . (1)
- (b) Write an expression for the area A in terms of x . (2)
- (c) If the area of the frame is 24 cm², find the value of x . (4)

(Total 7 marks)

6. A swimming pool is to be built in the shape of a letter L. The shape is formed from two squares with side dimensions x and \sqrt{x} as shown.



- (a) Write down an expression for the area A of the swimming pool surface.
- (b) The area A is to be 30 m². Write a quadratic equation that expresses this information.
- (c) Find both the solutions of your equation in part (b).
- (d) Which of the solutions in part (c) is the correct value of x for the pool? State briefly why you made this choice.

Working:

Answers:

- (a)
- (b)
- (c)
- (d)
-
-
-

(Total 8 marks)

7. The length of one side of a rectangle is 2 cm longer than its width.
- (a) If the smaller side is x cm, find the perimeter of the rectangle in terms of x .

The perimeter of a square is equal to the perimeter of the rectangle in part (a).

- (b) Determine the length of each side of the square in terms of x .

The sum of the areas of the rectangle and the square is $2x^2 + 4x + 1$ (cm^2).

- (c) (i) Given that this sum is 49 cm^2 , find x .
- (ii) Find the area of the square.

Working:

Answers:

(a)

(b)

(c) (i).....

(ii).....

(Total 6 marks)

8. (a) Solve the equation $x^2 - 5x + 6 = 0$.
- (b) Find the coordinates of the points where the graph of $y = x^2 - 5x + 6$ intersects the x -axis.

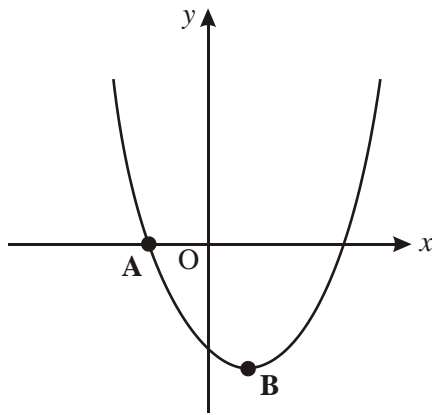
Working:

Answers:

- (a)
- (b)

(Total 4 marks)

9. The diagram shows the graph of $y = x^2 - 2x - 8$. The graph crosses the x -axis at the point A, and has a vertex at B.



- (a) Factorize $x^2 - 2x - 8$.
- (b) Write down the coordinates of each of these points
- (i) A;
- (ii) B.

Working:

Answers:

(a)

(b) (i)

(ii)

(Total 4 marks)

10. Consider the graphs of the following functions.

(i) $y = 7x + x^2$;

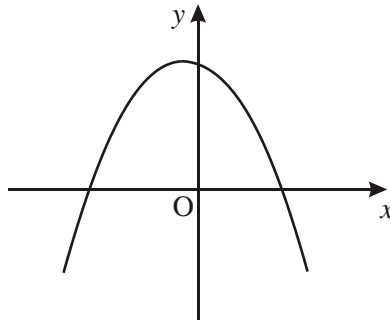
(ii) $y = (x - 2)(x + 3)$;

(iii) $y = 3x^2 - 2x + 5$;

(iv) $y = 5 - 3x - 2x^2$.

Which of these graphs

- (a) has a y -intercept below the x -axis?
- (b) passes through the origin?
- (c) does not cross the x -axis?
- (d) could be represented by the following diagram?



Working:

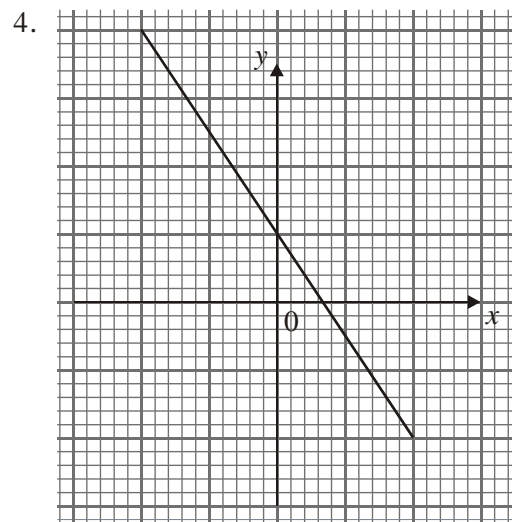
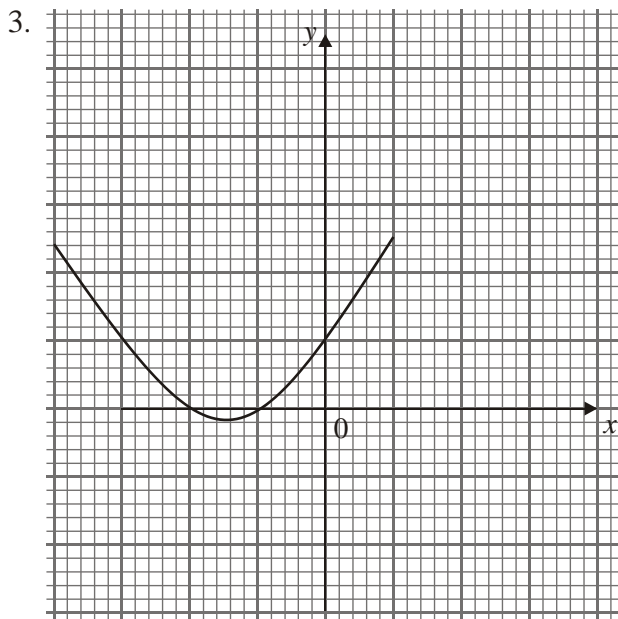
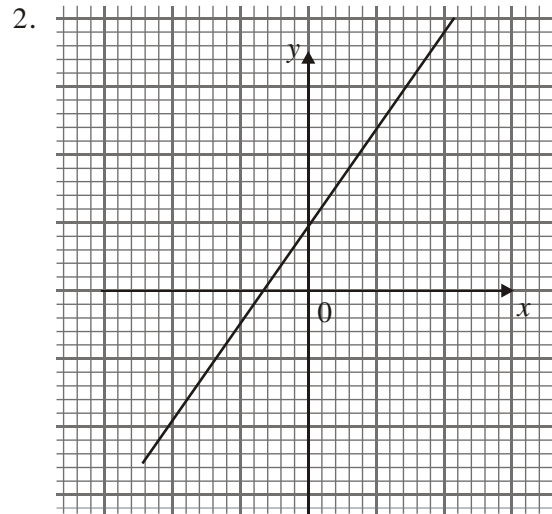
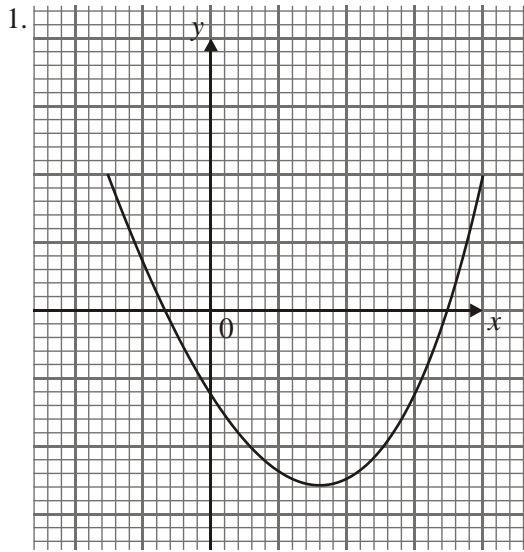
Answers:

- (a)
- (b)
- (c)
- (d)

(Total 8 marks)

11. (a) Sketch the graph of the function $y = 2x^2 - 6x + 5$.

13. The diagrams below include sketches of the graphs of the following equations where a and b are positive integers.



Complete the table to match each **equation** to the correct **sketch**.

	Equation	Sketch
(i)	$y = ax + b$	
(ii)	$y = -ax + b$	
(iii)	$y = x^2 + ax + b$	
(iv)	$y = x^2 - ax - b$	

Working:

(Total 8 marks)

14. (a) Solve the following equation for x

$$3(2x + 1) - 2(3 - x) = 13.$$

(2)

- (b) Factorize the expression $x^2 + 2x - 3$.

(2)

- (c) Find the **positive** solution of the equation

$$x^2 + 2x - 6 = 0.$$

(2)

Working:

Answers:

(a)

(b)

(c)

(Total 6 marks)

15. (a) Factorize the expression $x^2 - 25$.
- (b) Factorize the expression $x^2 - 3x - 4$.
- (c) Using your answer to part (b), or otherwise, solve the equation $x^2 - 3x - 4 = 0$.

Working:

Answers:

(a)

(b)

(c)

(Total 8 marks)

16. Mrs. Harvey wants to put a 50 m long fence around her rectangular garden. She only needs to fence in 3 sides because the other side is alongside her house.

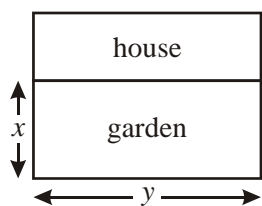


Diagram not to scale

The width of the garden is denoted by x , and the length by y .

- (a) Write an expression for y in terms of x .
- (b) Write an expression for the area, A , of the garden, in terms of x .
- (c) If the area is 200 m^2 , find the dimensions of the garden.

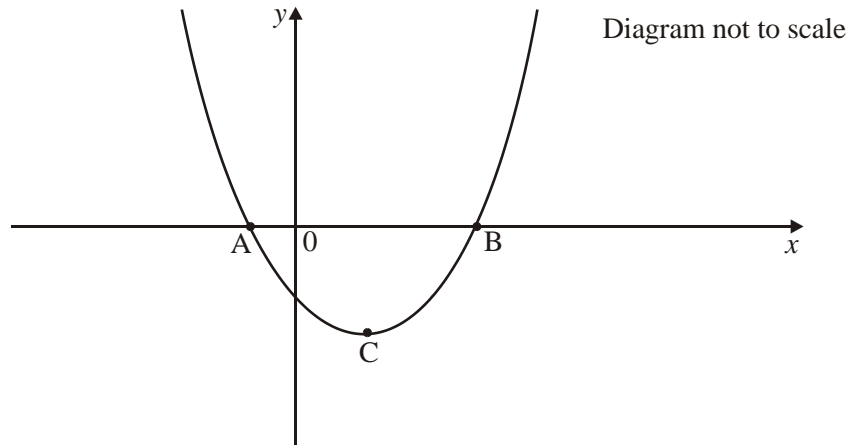
Working:

Answers:

- (a)
- (b)
- (c)

(Total 8 marks)

17. The graph of the function $f(x) = x^2 - 2x - 3$ is shown in the diagram below.



- (a) Factorize the expression $x^2 - 2x - 3$.
- (b) Write down the coordinates of the points A and B.
- (c) Write down the equation of the axis of symmetry.
- (d) Write down the coordinates of the point C, the vertex of the parabola.

Working:

Answers:

- (a)
- (b)
- (c)
- (d)

(Total 8 marks)

18. The perimeter of a rectangle is 24 metres.
- (a) The table shows some of the possible dimensions of the rectangle. Find the values of a , b , c , d and e .

Length (m)	Width (m)	Area (m ²)
1	11	11
a	10	b
3	c	27
4	d	e

(2)

(b) If the length of the rectangle is x m, and the area is A m², express A in terms of x only.

(1)

(c) What are the length and width of the rectangle if the area is to be a maximum?

(3)

(Total 6 marks)

19. (a) Factorize the expression $2x^2 - 3x - 5$.

(b) Hence, or otherwise, solve the equation $2x^2 - 3x = 5$.

Working:

Answers:

(a)

(b)

(Total 4 marks)

20. A small manufacturing company makes and sells x machines each month. The monthly cost C , in dollars, of making x machines is given by

$$C(x) = 2600 + 0.4x^2.$$

The monthly income I , in dollars, obtained by selling x machines is given by

$$I(x) = 150x - 0.6x^2.$$

- (a) Show that the company's monthly profit can be calculated using the quadratic function

$$P(x) = -x^2 + 150x - 2600.$$

(2)

- (b) The maximum profit occurs at the vertex of the function $P(x)$. How many machines should be made and sold each month for a maximum profit?

(2)

- (c) If the company does maximize profit, what is the selling price of each machine?

(4)

- (d) Given that $P(x) = (x - 20)(130 - x)$, find the smallest number of machines the company must make and sell each month in order to make **positive** profit.

(4)

(Total 12 marks)

21. The profit (P) in Swiss Francs made by three students selling homemade lemonade is modelled by the function

$$P = -\frac{1}{20}x^2 + 5x - 30$$

where x is the number of glasses of lemonade sold.

- (a) **Copy** and complete the table below

x	0	10	20	30	40	50	60	70	80	90
P		15			90			75	50	

(3)

- (b) On graph paper draw axes for x and P , placing x on the horizontal axis and P on the vertical axis. Use suitable scales. Draw the graph of P against x by plotting the points. Label your graph.

(5)

- (c) **Use your graph** to find

(i) the maximum possible profit;

(1)

(ii) the number of glasses that need to be sold to make the maximum profit;

(1)

(iii) the number of glasses that need to be sold to make a profit of 80 Swiss Francs;

(2)

(iv) the amount of money initially invested by the three students.

(1)

- (d) The three students Baljeet, Jane and Fiona share the profits in the ratio of 1:2:3 respectively. If they sold 40 glasses of lemonade, calculate Fiona's share of the profits.

(2)

(Total 15 marks)