



5.9F Drawing Quadratic Graphs: Foundation Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Work out the value of y when $x = 0$ for the quadratic function $y = x^2 + 3x + 2$.

(Total for Question 1 is 1 mark)

- 2** Complete the table of values for $y = x^2 - 2x$.

Fill in values for $x = 0$ and $x = 2$.

- (a) Find y when $x = 0$. (1)

- (b) Find y when $x = 2$. (1)

(Total for Question 2 is 2 marks)

- 3** Plot the points for the function $y = x^2 - 1$ for $x = -1, 0$ and 1 . Give the three pairs as (x, y) .

- (a) Find y when $x = -1$. (1)

- (b) Write down the three coordinate pairs for $x = -1, 0, 1$. (1)

(Total for Question 3 is 2 marks)

4 Draw a simple sketch of the graph $y = x^2$. On the sketch, mark and label the points when $x = -2, -1, 0, 1, 2$.

(a) Find the y values for $x = -2, -1, 0, 1, 2$. (2)

.....
(b) Mark and label these five points on the sketch and draw the curve shape. (1)

(Total for Question 4 is 3 marks)

5 The graph of $y = (x - 1)^2 - 2$ is the graph of $y = x^2$ shifted. State the coordinates of the vertex (turning point) of this parabola.

(a) Explain how the graph of $y = (x - 1)^2 - 2$ is shifted from $y = x^2$. (1)

(b) State the coordinates of the vertex. (3)

(Total for Question 5 is 4 marks)

6 Sketch the graph of $y = x^2 - 4$. On your sketch, show where the graph meets the x -axis.

(a) Find the x -intercepts (solutions) of $x^2 - 4 = 0$. (2)

.....
(b) Sketch the parabola and mark the x -intercepts on the x -axis and the vertex. (3)

(Total for Question 6 is 5 marks)

7 The graph of $y = 2x^2$ is narrower than $y = x^2$. Explain why and then find y when $x = 1$ and $x = 2$.

(a) Explain in one sentence why $y = 2x^2$ is narrower than $y = x^2$. (1)

(b) Find y when $x = 1$. (2)

(c) Find y when $x = 2$. (2)

(Total for Question 7 is 5 marks)

8 A student is given the graph of $y = x^2$ and is asked to draw the graph of $y = (x + 2)^2$. Describe how to transform the graph and give the vertex of the new graph.

(a) Describe the transformation from $y = x^2$ to $y = (x + 2)^2$. (2)

(b) Give the vertex (turning point) of $y = (x + 2)^2$. (4)

(Total for Question 8 is 6 marks)

9 A simple real-life context: A small ball is thrown up and its height h metres after t seconds is modelled by $h = -t^2 + 4t + 1$. Find the height after $t = 0$, $t = 1$ and $t = 4$. Then state whether the ball is above the ground at $t = 4$ seconds.

(a) Find h when $t = 0$. (1)

(b) Find h when $t = 1$. (2)

(c) Find h when $t = 4$. (2)

(d) Is the ball above the ground at $t = 4$ seconds? Explain briefly. (1)

(Total for Question 9 is 6 marks)

10 Stretch question for higher foundation: Sketch the graph of $y = -x^2 + 2x + 3$. Give the vertex and the x -intercepts (to the nearest whole number if needed).

(a) Find the vertex (turning point) of $y = -x^2 + 2x + 3$. (3)

(b) Find the x -intercepts (solutions) of $-x^2 + 2x + 3 = 0$. Give answers to the nearest whole number. (3)

(Total for Question 10 is 6 marks)

Mark scheme · 5.9F Drawing Quadratic Graphs: Foundation Tier Practice

Question 1

- **B1** $y = 2$ cao
- **Answer:** 2 [$y = 0^2 + 3(0) + 2 = 2$]

Question 2

- (a) **B1** 0 cao
- (a) **Answer:** 0 [$0^2 - 2(0) = 0$]
- (b) **B1** 0 cao
- (b) **Answer:** 0 [$2^2 - 2(2) = 4 - 4 = 0$]

Question 3

- (a) **B1** 0 cao
- (a) **Answer:** 0 [$(-1)^2 - 1 = 1 - 1 = 0$]
- (b) **B1** (-1, 0), (0, -1), (1, 0) cao
- (b) **Answer:** (-1, 0), (0, -1), (1, 0)

Question 4

- (a) **M1** correct method to square the x values shown or listed
- (a) **A1** y values 4, 1, 0, 1, 4 cao
- (a) **Answer:** y = 4, 1, 0, 1, 4
- (b) **A1** curve sketched through the five labelled points with correct U shape
- (b) **Answer:** Sketch with points plotted at (-2,4), (-1,1), (0,0), (1,1), (2,4) and a U-shaped curve through them.

Question 5

- (a) **B1** shift right 1 and down 2 oe
- (a) **Answer:** Shifted right 1 and down 2.
- (b) **M1** identify $h = 1$ and $k = -2$ or show (1, -2)
- (b) **A1** vertex (1, -2) cao
- (b) **A1** reason: vertex from completing square/form sign applied oe
- (b) **Answer:** (1, -2)

Question 6

- (a) **M1** method: factorise or take square root, show $x^2 = 4$
- (a) **A1** $x = 2$ and $x = -2$ cao
- (a) **Answer:** $x = 2$ and $x = -2$
- (b) **M1** correct U-shape sketched with symmetry and intercepts marked at -2 and 2
- (b) **A1** vertex at (0, -4) indicated
- (b) **A1** curve passes through intercepts and has correct vertical position
- (b) **Answer:** Sketch with x-intercepts at (-2,0) and (2,0) and vertex at (0,-4).

Question 7

- (a) **B1** because the coefficient 2 makes y grow faster for a given x oe
- (a) **Answer:** Because the factor 2 multiplies x^2 so y increases faster for each x, making the parabola steeper.
- (b) **M1** substitute $x = 1$ into $2x^2$
- (b) **A1** $y = 2$ cao
- (b) **Answer:** 2 [$2(1)^2 = 2$]
- (c) **M1** substitute $x = 2$ into $2x^2$
- (c) **A1** $y = 8$ cao
- (c) **Answer:** 8 [$2(2)^2 = 2 \times 4 = 8$]

Question 8

- (a) **M1** state shift left or right with sign identified
- (a) **A1** shift left 2 oe
- **(a) Answer: The graph is shifted 2 units to the left.**
- (b) **M1** identify $h = -2$ and $k = 0$ or state $(-2, 0)$
- (b) **A1** vertex $(-2, 0)$ cao
- (b) **A1** brief reason: because $(x + 2)^2$ has minimum at $x = -2$
- (b) **A1** correct coordinates and reason given
- **(b) Answer: $(-2, 0)$**

Question 9

- (a) **B1** $h = 1$ cao
- **(a) Answer: 1 [$h = 0 + 0 + 1 = 1$]**
- (b) **M1** substitute $t = 1$ into $-t^2 + 4t + 1$
- (b) **A1** $h = 4$ cao
- **(b) Answer: 4 [$-(1)^2 + 4(1) + 1 = -1 + 4 + 1 = 4$]**
- (c) **M1** substitute $t = 4$ into $-t^2 + 4t + 1$
- (c) **A1** $h = 1$ cao
- **(c) Answer: 1 [$-(4)^2 + 4(4) + 1 = -16 + 16 + 1 = 1$]**
- (d) **B1** yes, because $h = 1 > 0$ oe
- **(d) Answer: Yes. At $t = 4$, $h = 1$ metre, so the ball is 1 m above the ground.**

Question 10

- (a) **M1** complete the square or use formula $x = -b/(2a)$
- (a) **A1** x-coordinate 1 cao
- (a) **A1** y-coordinate 4 cao
- **(a) Answer: (1, 4)**
- (b) **M1** use quadratic formula or factorise correctly
- (b) **A1** $x = -1$ and $x = 3$ shown to 1 d.p or whole numbers given
- (b) **A1** both intercepts stated $(-1, 0)$ and $(3, 0)$ cao
- **(b) Answer: x-intercepts at $(-1, 0)$ and $(3, 0)$**