

COMPLETING THE SQUARE

[ESTIMATED TIME: 60 minutes]

GCSE

(+ IGCSE) EXAM QUESTION PRACTICE

1.

[2 marks]

Write $x^2 + 4x + 5$ in the form $(x + a)^2 + b$ where a and b are integers.

.....

2.

[2 marks]

For all values of x , $x^2 - 10x + 7 = (x - p)^2 - q$

Find the value of the constants p and q .

$p =$

$q =$

3.

[2 marks]

Solve the equation $(x - 7)^2 - 5 = 0$

Write your answer in the form $a \pm \sqrt{b}$ where a and b are integers.

.....

4.

[4 marks]

By completing the square, solve the equation $x^2 + 10x - 3 = 0$

Give your answer in the form $p \pm \sqrt{q}$ where p and q are integers.

.....

5.

[3 marks]

(a) Write $x^2 + 14x - 9$ in the form $(x + a)^2 + b$ where a and b are integers.

.....

(2)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph $y = x^2 + 14x - 9$

(..... ,)

(1)

6.

[3 marks]

$6x - 7 - x^2 = p - (x + q)^2$ where p and q are integers.

Find the value of p and the value of q .

$p = \dots\dots\dots$

$q = \dots\dots\dots$

7.

[4 marks]

Write $x^2 - 6x - 3$ in the form $(x + a)^2 + b$ where a and b are integers.

$\dots\dots\dots$
(2)

(b) Hence, or otherwise, solve the equation $x^2 - 6x - 3 = 0$

Write your answers in the form $p \pm \sqrt{q}$ where p and q are integers.

$\dots\dots\dots$
(2)

8.

[3 marks]

Write $2x^2 + 8x + 13$ in the form $a(x + b)^2 + c$ where a , b and c are integers.

.....

9.

[4 marks]

(a) Write $2x^2 - 12x + 17$ in the form $a(x - b)^2 + c$ where a , b and c are integers.

.....

(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph $y = 2x^2 - 12x + 17$

(..... ,)

(1)

10.**[3 marks]**

$$x^2 + hx + 15 = (x + 3)^2 + k$$

Find the value of the constants h and k .

$$h = \dots\dots\dots$$

$$k = \dots\dots\dots$$

11.**[3 marks]**

$$2x^2 - 20x + 10 = p(x - q)^2 - r$$

Find the value of the constants p , q and r .

$$p = \dots\dots\dots$$

$$q = \dots\dots\dots$$

$$r = \dots\dots\dots$$

The expression $x^2 - 8x + 21$ can be written in the form $(x - a)^2 + b$ for all values of x .

(a) Find the value of a and the value of b .

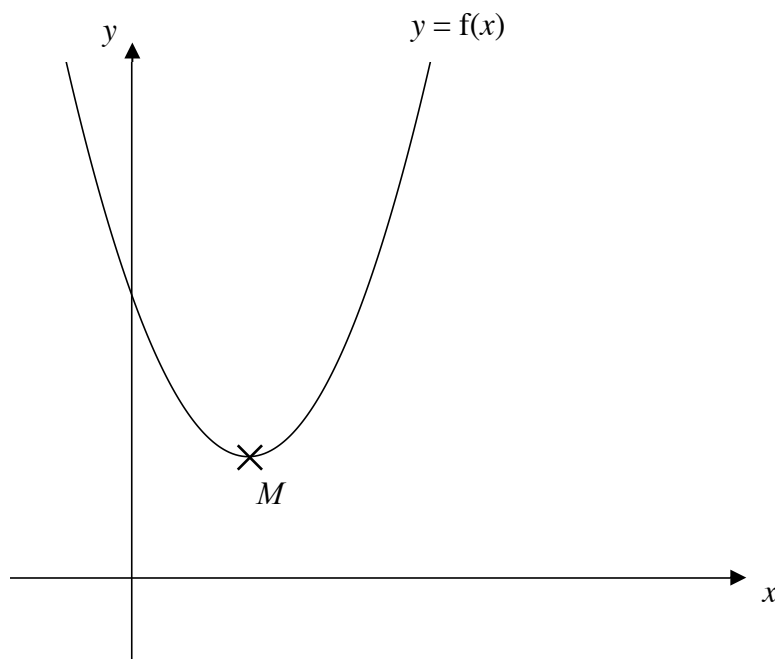
$a = \dots\dots\dots$

$b = \dots\dots\dots$

(2)

The equation of a curve is $y = f(x)$ where $f(x) = x^2 - 8x + 21$

The diagram shows part of a sketch of the graph of $y = f(x)$.



The minimum point of the curve is M .

(b) Write down the coordinates of M .

(..... ,)

(1)

(a) Write $x^2 + 6x + 13$ in the form $(x + a)^2 + b$ where a and b are integers.

.....

(2)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph $y = x^2 + 6x + 13$

(..... ,)

(1)

(c) Using your answer to part (b) state the number of solutions to the equation $x^2 + 6x + 13 = 0$
Give a reason for your answer.

Number of solutions

Reason:

.....

.....

.....

(1)

(a) Write $3x^2 - 12x - 1$ in the form $a(x - b)^2 + c$ where a , b and c are integers.

.....
(3)

(b) Hence, or otherwise, find the minimum value of $y = 3x^2 - 12x - 1$

.....
(1)

(c) Using your answer to part (b) find the equation of the line of symmetry of the curve $y = 3x^2 - 12x - 1$

.....
(1)

15.**[2 marks]**

Write $x^2 + 5x + 9$ in the form $(x + a)^2 + b$

.....

16.**[3 marks]**

$$x^2 + px + 4 = (x + q)^2 - 5$$

Find the value of the constants p and q .

$$p = \dots\dots\dots$$

$$q = \dots\dots\dots$$

17.**[3 marks]**

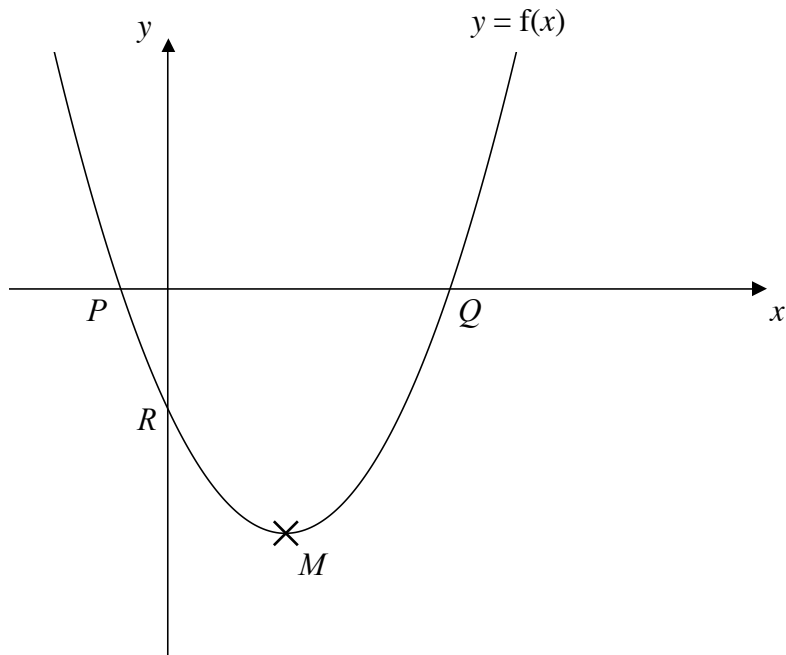
$$x^2 + 4x + p = (x + 2)^2 + 3p$$

Find the value of p .

$$p = \dots\dots\dots$$

$$f(x) = x^2 - 4x - 5$$

The diagram show a sketch of the graph of $y = f(x)$



The minimum point of the curve is M .

The points at which the curve crosses the x -axis and the y -axis are P , Q and R .

Find the coordinates of the points M , P , Q and R .

M (.....,))

P (.....,))

Q (.....,))

R (.....,))