COMPLETING THE SQUARE

Answer all of these questions. Remember to show your working out in all questions.

MAIN QUESTIONS

1.

$x^2 + 6x + 5$

> $(x + 3)^2 - 4$

2.

$x^2 - 8x + 12$

> $(x - 4)^2 - 4$

3.

$x^2 + 10x - 11$

> $(x + 5)^2 - 36$

4.

$x^2 - 4x - 21$

> $(x - 2)^2 - 25$

5.

$2x^2 + 12x + 10$

> $2(x + 3)^2 - 8$

6.

$3x^2 - 18x + 15$

> $3(x - 3)^2 - 12$

7.

$4x^2 + 16x - 20$

> $4(x + 2)^2 - 36$

8.

$5x^2 - 30x + 25$

> $5(x - 3)^2 - 20$

9.

$x^2 + 7x + 10$

> $(x + 3.5)^2 - 2.25$

10.

$2x^2 - 5x + 3$

> $2(x - 1.25)^2 - 0.125$

MASTER QUESTIONS

M1.

A ball is thrown upwards from a height of 2 metres with initial velocity 20 m/s. The height h after t seconds is given by $h = -5t^2 + 20t + 2$. Find the maximum height reached by completing the square.

> The maximum height is 22 metres

M2.

A rectangular garden has an area of $60m^2$. If the length is 4 metres more than the width, find the dimensions by forming and solving a quadratic equation using completing the square.

The garden is 10 metres by 6 metres

M3.

The profit P in pounds from selling x items is given by $P = -2x^2 + 80x - 600$. Find the number of items that must be sold to maximise profit by completing the square.

20 items must be sold for maximum profit

M4.

A stone is dropped from a cliff. Its height h in metres after t seconds is $h = -5t^2 + 100$. Find when the stone hits the ground by completing the square.

The stone hits the ground after 4.47 seconds

M5.

The sum of two numbers is 16 and the sum of their squares is 146. Find the numbers by forming a quadratic equation and solving using completing the square.

The numbers are 11 and 5