



## Essential GCSE Maths 29.2

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Express the following in completed square form:

### Part A Complete the square

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$$x^2 - x - 5$$

- ☐  $(x + 1)^2 - 6$
  - ☐  $(x - 1)^2 - 4$
  - ☐  $(x - 1)^2 - 6$
  - ☐  $(x - \frac{1}{2})^2 - \frac{21}{4}$
- 

### Part B Complete the square

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$$x^2 - 5x + 4$$

- ☐  $(x - 5)^2 - 21$
  - ☐  $(x - \frac{5}{2})^2 - \frac{9}{4}$
  - ☐  $(x - \frac{5}{2})^2 + \frac{13}{2}$
  - ☐  $(x - 5)^2 + 4$
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## Essential GCSE Maths 29.3

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Express the following in completed square form:

Give your answers in the form  $b(x + a)^2 + c$ , use improper (top heavy) fractions rather than mixed fractions in your answers.

### Part A   Complete the square

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$$2x^2 - 8x + 2$$

The following symbols may be useful: x

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### Part B   Complete the square

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$$3x^2 - 18x - 7$$

The following symbols may be useful: x

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## Essential GCSE Maths 29.1

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Express the following in completed square form:

### Part A   Complete the square

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$$x^2 - 2x - 8$$

- ☐  $(x - 1)^2 - 6$
  - ☐  $(x + 1)^2 - 8$
  - ☐  $(x - 1)^2 - 9$
  - ☐  $(x - 2)^2 - 12$
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### Part B   Complete the square

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$$x^2 + 6x - 5$$

- ☐  $(x - 3)^2 - 14$
  - ☐  $(x + 3)^2 - 14$
  - ☐  $(x + 6)^2 - 5$
  - ☐  $(x + 6)^2 - 41$
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## Essential GCSE Maths 27.4

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Without drawing graphs, find for each function:

(i) the  $y$ -intercept   (ii) where the graph crosses the  $x$ -axis.

### Part A   Find information about the curve

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$$y = x^2 + x - 2$$

(i) Find the  $y$ -intercept

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(ii) Where does the graph cross the  $x$ -axis?

Enter the lower value.

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Enter the higher value.

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**Part B** Find information about the curve

$$y = x^2 + 6x + 5$$

(i) Find the  $y$ -intercept

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(ii) Where does the graph cross the  $x$ -axis?

Enter the lower value.

---

Enter the higher value.

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**Part C** Find information about the curve

$$y = x^2 - 8x + 15$$

(i) Find the  $y$ -intercept

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(ii) Where does the graph cross the  $x$ -axis?

Enter the lower value.

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Enter the higher value.

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## Essential GCSE Maths 27.11

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The formula  $s = ut + \frac{1}{2}at^2$  is used to calculate the height  $s$  of projectiles (such as balls) as a function of time.

Plot a graph of  $s$  against  $t$  for  $0 \leq t \leq 7$ , given that  $u = 29.43 \text{ m/s}$  and  $a = -9.81 \text{ m/s}^2$ .

### Part A What is the maximum height?

What is the maximum height reached? Give your answer to 3 s.f..

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### Part B How long to return to its starting height?

How long does a projectile modelled by this graph take to return to its starting height? You may assume the projectile was launched at  $t = 0$ . Give your answer to 3 s.f..

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### Part C What is the relative position of the projectile?

At  $t = 7 \text{ s}$ , what is the height of the projectile relative to its starting position? Give your answer to 3 s.f..

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## Quadratics: Graphs and Discriminants 3ii



### Part A Roots of equation

Find the roots of the equation  $x^2 + 8x + 10 = 0$ . Give your answer in the form  $a \pm b$ , where  $a$  and  $b$  are in simplified surd form.

The following symbols may be useful:  $\pm$

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### Part B Sketch the curve

Sketch the curve  $y = x^2 + 8x + 10$ , giving the coordinates of the points where the curve crosses the axes.

Give the  $y$  coordinate of the point at which the curve crosses the  $y$ -axis.

The following symbols may be useful:  $y$

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Solve the inequality  $x^2 + 8x + 10 \leq 0$ .

What form does your answer take? Choose from the list below, where  $a$  and  $b$  are constants and  $a < b$ , and then find  $a$  and/or  $b$ .

- ☐  $x < a$
  - ☐  $x \leq a$
  - ☐  $x > a$
  - ☐  $x \geq a$
  - ☐  $a < x < b$
  - ☐  $a \leq x \leq b$
  - ☐  $x < a$  or  $x > b$
  - ☐  $x \leq a$  or  $x \geq b$
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Write down the value of  $a$ .

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Write down the value of  $b$  (or if your chosen form has no  $b$ , write "n").

The following symbols may be useful: n

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## Quadratics: Graphs and Discriminants 2ii

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The quadratic equation  $x^2 + kx + k = 0$  has no real roots for  $x$ .

### Part A   Find discriminant

Write down the discriminant of  $x^2 + kx + k$  in terms of  $k$ .

The following symbols may be useful:  $k$

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Hence find the set of values  $k$  can take.

What form does your answer take? Choose from the list below, where  $a$  and  $b$  are constants and  $a < b$ , and then find  $a$  and/or  $b$ .

- ☐  $k < a$
  - ☐  $k \leq a$
  - ☐  $k > a$
  - ☐  $k \geq a$
  - ☐  $a < k < b$
  - ☐  $a \leq k \leq b$
  - ☐  $k < a$  or  $k > b$
  - ☐  $k \leq a$  or  $k \geq b$
- 

Write down the value of  $a$ .

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Write down the value of  $b$  (or if your chosen form has no  $b$ , write "n").

The following symbols may be useful: n

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Physics. *You work it out.*

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# Quadratics: Graphs and Discriminants 1ii

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**Part A** Find discriminant

Calculate the discriminant of  $-2x^2 + 7x + 3$ .

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Hence choose the correct option that gives the number of *distinct* real roots to the equation

$$-2x^2 + 7x + 3 = 0$$

☐ Zero

☐ Two

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**Part B**    **Possible values of  $p$**

The quadratic equation  $2x^2 + (p + 1)x + 8 = 0$  has equal roots. Find the possible values of  $p$  and enter the greatest possible value of  $p$ .

The following symbols may be useful:  $p$

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