

## Year 10 Term 1 Homework

<b>Student Name:</b> _____	<b>Grade:</b> _____
<b>Date:</b> _____	<b>Score:</b> _____

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## 7 Year 10 Term 1 Week 7 Homework

### 7.1 Quadratic Equations

#### 7.1.1 Quadratic relationships

- A quadratic expression is an expression of the form  $ax^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are constants and  $a \neq 0$ .
- A quadratic equation is an equation of the form  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$  and  $c$  are constants and  $a \neq 0$ .
- The highest power of the variable  $x$  is 2.

**Exercise 7.1.1** State whether or not each of the following is a quadratic expression.

1.  $(2x - 2)^2$

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2.  $3(x^2 - 3)$

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3.  $\frac{1}{x^2+2}$

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**Exercise 7.1.2** Find an equation of the form  $y = x^2 + bx + c$  to describe the relationship between  $x$  and  $y$  values in the table shown below:

$x$	0	1	2	3	4
$y$	-2	2	8	16	26

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**Exercise 7.1.3** Find the solutions for each of these quadratic equations, using guess and check approach.

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

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2.  $x^2 + 2x - 15 = 0$

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3.  $x^2 - 3x - 4 = 0$

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**Exercise 7.1.4** The area of a rectangle is  $120 \text{ cm}^2$  and the length of the rectangle is 7 cm more than the width.

1. If the width of the rectangle is  $x$  cm, find an expression for the length and hence find the expression of the area.

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2. Find the positive integer solution for this quadratic equation, use guess, check and refine approach.

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3. Hence, find the dimensions of the rectangle.

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**7.1.2 Solving quadratic equations using factors**

To solve a quadratic equation by factorising:

- take all terms to one side of the equation such that  $a > 0$
- factorise the quadratic expression
- solve each factor equal to zero.

**Exercise 7.1.5 Solve the following quadratic equations by factorising:**

1.  $2x(x - 4) = 0$

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2.  $(x - 2)(x + 5) = 0$

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3.  $(2x - 4)(3x + 1) = 0$

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4.  $x^2 - 3x - 10 = 0$

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5.  $x^2 + 7x + 12 = 0$

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**7.1.3 Completing the square**

To solve a quadratic equation of the form  $x^2 + bx + c = 0$  by completing the square:

- Take the constant term  $c$  to the other side of the equation.
- Add  $(\frac{b}{2})^2$  to both sides of the equation to make the expression on the LHS a perfect square.
- Take the square root of the both sides of the equation ( $\pm\sqrt{RHS}$ ).
- Solve the two resulting equations.

**Exercise 7.1.6**

1.  $(x + 4)^2 = 16$

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2.  $(x - 2)^2 = 8$

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3.  $x^2 + 4x + 2 = 0$

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4.  $x^2 + 10x - 5 = 0$

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5.  $2x^2 + 8x + 1 = 0$

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**7.1.4 The quadratic formulae**

The solution to the equation  $ax^2 + bx + c = 0$  are given by:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**Exercise 7.1.7** Solve the following equations by using the quadratic formula. Answer correct to 2 decimal places where necessary.

1.  $2x^2 - 11x + 5 = 0$

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2.  $x^2 + 8x - 4 = 0$

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

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4.  $5x^2 - 3x - 4 = 0$

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**Exercise 7.1.8** Use the quadratic formula to solve each of these equations. Give your answer in simplest surd form.

1.  $2x^2 + 6x + 1 = 0$

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2.  $6x^2 + 4x - 1 = 0$

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3.  $x^2 + 6x - 3 = 0$

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4.  $5x^2 - 12x + 3 = 0$

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5.  $x^2 - 2x + 1 = 3x + 6$

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**7.1.5 The discriminant**

The number of solutions for the quadratic equation is determined by  $b^2 - 4ac$ , which is called discriminant. If  $b^2 - 4ac$  is:

- positive then the equation will have 2 solutions.
- zero then the equation will have 1 solution.
- negative then the equation will have no solution.

**Exercise 7.1.9**

1. Solve the equation  $4x^2 + 12x + 9 = 0$  by using the quadratic formula.

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2. How many solutions are there ?

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3. What does this tell about the expression  $4x^2 - 12x + 9$ ?

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**Exercise 7.1.10** By evaluating  $b^2 - 4ac$  for each equation, determine how many solutions it will have.

1.  $4x^2 - 12x + 7 = 0$

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2.  $9x^2 + 6x + 1 = 0$

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**7.1.6 Miscellaneous exercises****Exercise 7.1.11 Find the values of  $m$  for which the equation  $x^2 + (m - 2)x + 4 = 0$  has:**1. *one root,*

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2. *two roots,*

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3. *no roots.*

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**Exercise 7.1.12 Solve the following equations:**

1.  $x^4 - 3x^2 - 10 = 0$

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2.  $(x^2 + 5x)^2 = 6(x^2 + 5x)$

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