

## IGCSE higher

## Week 4 homework

1 Factorise & solve the following quadratic equations

**Remember that your equation needs to be in the form  $ax + bx + c = 0$**

**You might need to rearrange your equation**

a)  $x^2 - 4x - 21 = 0$

b)  $x^2 + 27x + 50 = 0$

c)  $2x^2 - 8x + 6 = 0$

d)  $x^2 - 11x = -30$

e)  $x^2 + 5x = 36$

f)  $x^2 - 49 = 0$

g)  $x^2 - x = 90$

h)  $x^2 - 3(x+6) = 0$

i)  $x + 5 - 14/x = 0$

2 Now solve these using the Quadratic Formula again you might have to rearrange

a)  $x^2 + 6x + 3 = 0$

b)  $x^2 + 4x + 2 = 0$

c)  $x^2 - 14x + 11 = 0$

d)  $x^2 - 6x - 8 = 0$

e)  $2x^2 - 7x + 4 = 0$

f)  $7x^2 + 6 = 15x$

g)  $2x(x+4) = 1$

h)  $x^2 - 3(x+8) = 0$

i)  $(x+2)(x+3) = 5$

3 How many solutions are there to a quadratic equation if  $b^2 - 4ac = 0$ ?

and when  $b^2 - 4ac =$  a positive number?

and when  $b^2 - 4ac =$  a negative number?

4 Which of these equations have 2 solutions, 1 solution or no solutions

a)  $x^2 + 3x + 1 = 0$

b)  $x^2 + 8x - 5 = 0$

c)  $4x^2 - 4x + 1 = 0$

d)  $x^2 - 2x + 6 = 0$

e)  $4x^2 - 4x + 5 = 0$

f)  $x^2 - 2x - 6 = 0$

5 Factorise these quadratic equations and solve

a)  $3x^2 + 7x + 2 = 0$

b)  $2x^2 + 11x + 12 = 0$

c)  $3x^2 - 17x - 28 = 0$

d)  $6x^2 + 7x - 3 = 0$

6 Complete the square for each expression by writing each one in the form  $(x+a)^2 + b$

a)  $x^2 + 8x$

b)  $x^2 - 12x$

c)  $x^2 + 4x$

d)  $x^2 - 3x$

e)  $x^2 + 4x + 6$

f)  $x^2 - 6x + 8$

g)  $x^2 + 2x - 2$

h)  $x^2 + 9x - 2$

7 Remember how to find the coordinates of a turning point once you've completed the square

For example find the turning point of  $x^2 + 4x - 3$

*start by completing the square*

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

*the turning point has the coordinates  $(-2, -5)$*

*the x coordinate is the opposite sign*

Find the turning points for the equations in the question above

8 a) Factorise the expression  $x^2 - 2x - 8$

b) Hence write down the coordinates of the roots of  $y = x^2 - 2x - 8$

(i.e. the solutions of the equation)

c) where does the graph  $y = x^2 - 2x - 8$  cross the y axis

d) Write  $y = x^2 - 2x - 8$  in completed square form

e) Hence find the coordinates of the turning point

f) Is the turning point a maximum or minimum, explain why

g) Using your answers above sketch the graph of  $y = x^2 - 2x - 8$

9 which of these are a surd

- a)  $\sqrt{4}$       b)  $\sqrt{2}$       c)  $\sqrt{7}$       d)  $\sqrt{49}$       e)  $\sqrt{19}$

10 Write the equation  $x^2 - 6x - 1$  in the form  $(x - p)^2 - q$



$(x - 3)^2 - 10$

$p = 3 \quad q = 10$

Hence solve the equation  $x^2 - 6x - 1 = 0$

make  $(x - 3)^2 - 10$  equal 0

$(x - 3)^2 - 10 = 0$

now solve as you would for a normal equation

$(x - 3)^2 = 10$

$x - 3 = \pm \sqrt{10}$

**$x = 3 \pm \sqrt{10}$**  (answer in surd form)

Now solve these equations by completing the square      leave your answers in surd form

a)  $x^2 - 8x + 11 = 0$

b)  $x^2 + 10x + 18 = 0$

c)  $x^2 - 4x - 5 = 0$

11 Try to solve the equation  $x^2 + 6x + 10 = 0$  by completing the square.

Explain why there are no solutions

12 Solve  $x^2 - 6x = 9$  by completing the square      (remember to make = to 0)

13 Write the following equations in the form  $a(x + b)^2 + c$

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

b)  $3x^2 + 12x + 4$

c)  $2x^2 + 10x + 9$

Now find the turning points for the above equations

14 The expression  $x^2 - 8x + 4$  can be written in the form  $(x - p)^2 + q$  for all values of x

a) Find the value of p and the value of q

The graph of  $y = x^2 - 8x + 4$  has a minimum point

b) write the coordinates of this point

15 a) Write the quadratic expression  $x^2 + 6x + 7$  in the form  $(x + a)^2 - b$

where a and b are integers

b) Hence solve the equation  $x^2 + 6x + 7$

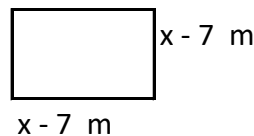
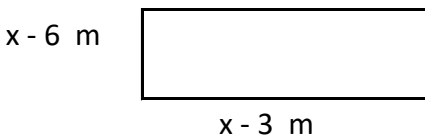
give your answer in the form  $p + \sqrt{q}$  where p and q are integers

**Solve the following by forming a quadratic equation**

16 Two numbers which differ by 3, have a product of 88. Find them

17 The height of a photo exceeds the width by 7cm. If the area is  $60 \text{ cm}^2$  find the height of the photo

18 The area of a rectangle exceeds the area of a square by  $24 \text{ m}^2$ . Find x



19\* A rectangular pond  $6\text{m} \times 4\text{m}$  is surrounded by a uniform path of width x.

The area of the path is equal to the area of the pond. Find x

hint, draw the pond and path first

20\* A stone is thrown in the air. After t seconds it's height, h, above the sea level is given by the formula

$h = 80 + 3t - 5t^2$  Find the value of t when the stone falls into the sea.