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 $y = x^2 - 2x - 8$ of 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) √(4) b) √(2) c) √(7) d) √(49) e) √(19)

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

$\longrightarrow$ $(x - 3)^2 - 10$ p = 3 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 ± √(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 integars

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

give your answer in the form p + √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 cm^2 find the height of the photo

18 The area of a rectangle exceeds the area of a square by 24 m^2. Find x

19* A rectangular pond 6m x 4m 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.