"Full Coverage": Solving Quadratic Equations

This worksheet is designed to cover one question of each type seen in past papers, for each GCSE Higher Tier topic. This worksheet was automatically generated by the DrFrostMaths Homework Platform: students can practice this set of questions interactively by going to www.drfrostmaths.com/homework, logging on, *Practise → Past Papers/Worksheets* (or *Library → Past/Past Papers* for teachers), and using the 'Revision' tab.

Question 1

Categorisation: Solve a quadratic equation where x appears only once.

[Edexcel GCSE June2009-1F Q30a, June2009-3H Q8a]

$$2x^2 = 72$$

Find a value of x .

....

Question 2

Categorisation: Solve a quadratic equation in the form $x^2 + bx + c = 0$.

[Edexcel GCSE June2006-3I Q22b, June2006-5H Q10b]

Solve $x^2 + 6x + 8 = 0$

....

Question 3

Categorisation: Solve a quadratic equation where initial expansion/movement of terms is required.

[Edexcel GCSE Jun2016-1H Q22]
Solve $x^2 = 4(x - 3)^2$

....

Question 4

Categorisation: Solve a quadratic equation in the context of functions.

[Edexcel GCSE(9-1) Mock Set 1 Autumn 2016 3H Q20c]
For all values of x

$$f(x) = 2x - 3 \quad \text{and} \quad g(x) = x^2 + 2$$
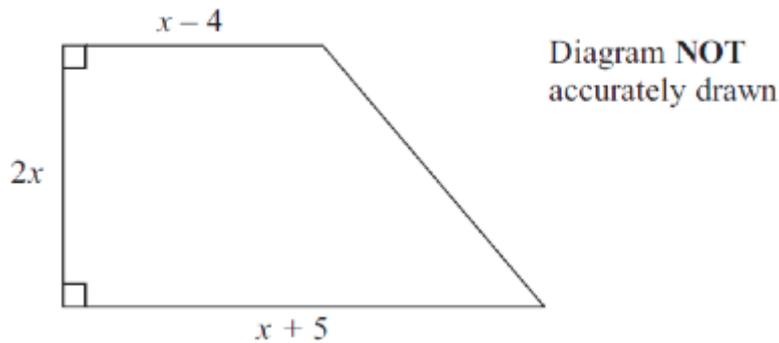
(c) Solve $fg(x) = gf(x)$

....

Question 5

Categorisation: Form and solve a quadratic equation in the context of area.

[Edexcel GCSE Nov2013-2H Q22b Edited]

The diagram shows a trapezium.

All the measurements are in centimetres.

The area of the trapezium is 351 cm².

Show that $2x^2 + x - 351 = 0$, and hence work out the value of x .

....

Question 6

Categorisation: Form and solve a quadratic equation in the context of rectilinear area.

[Edexcel IGCSE Jan2014-4H Q18b Edited]

A rectangular lawn has a length of $3x$ metres and a width of $2x$ metres.

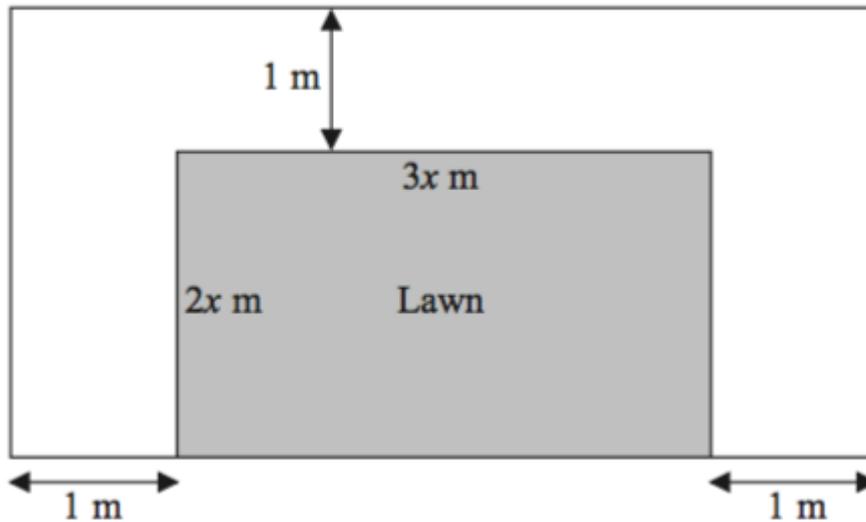The lawn has a path of width 1 metre on three of its sides.

Diagram **NOT** accurately drawn

The total area of the lawn and the path is 100 m^2

Show that $6x^2 + 7x - 98 = 0$, and hence calculate the area of the lawn.

.... m ^{2}

Question 7

Categorisation: Solve an equation involving algebraic fractions that leads to a quadratic equation.

[Edexcel IGCSE May2012-4H Q21 Edited]

Solve

$$\frac{5}{(x+2)} + \frac{9}{(x-2)} = 2$$

....

Question 8

Categorisation: Form and solve a quadratic equation in the context of probability.

[Edexcel GCSE Jun2015-1H Q19 Edited]

There are n sweets in a bag. 6 of the sweets are orange.
The rest of the sweets are yellow.

Hannah takes at random a sweet from the bag. She eats the sweet.

Hannah then takes at random another sweet from the bag. She eats the sweet.

The probability that Hannah eats two orange sweets is $\frac{1}{3}$.

Show that $n^2 - n - 90 = 0$, and hence determine the number of sweets n in the bag.

....

Question 9

Categorisation: Solve a quadratic equation in the context of laws of indices.

[Edexcel IGCSE May2014(R)-3H Q20 Edited]
Solve the equation

$$\frac{2^{(n^2)}}{2^n \times 2^6} = 1$$

....

Question 10

Categorisation: Use the quadratic formula to solve a quadratic equation.

[Edexcel IGCSE Jan2013-4H Q18 Edited]

Solve $5x^2 + 2x - 4 = 0$

Give your solutions correct to 3 significant figures.

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Question 11

Categorisation: Use the quadratic formula to solve a quadratic equation (with different combinations of negative/positive terms to Question 10).
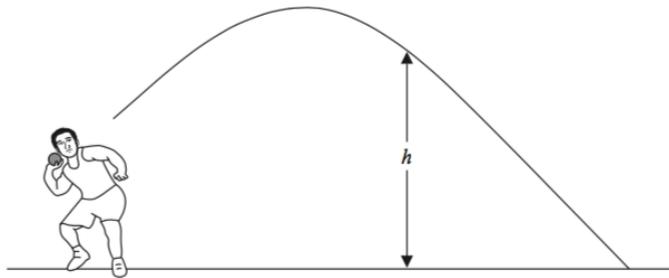
[Edexcel IGCSE May2013-3H Q20b Edited]

Solve $x^2 - 10x + 18 = 0$ Give your solutions correct to 3 significant figures.

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Question 12

Categorisation: Use the quadratic formula in an applied setting.

[Edexcel IGCSE Jan2014(R)-3H Q18ii]

Ivan is a shot putter.

The formula $h = 2 + 6t - 5t^2$ gives the height, h metres, of the shot above the ground t seconds after he has released the shot. The shot hits the ground after T seconds.

Write down the value of T. Give your answer correct to 3 significant figures.

$T = $ .... seconds

Question 13

Categorisation: Form and solve an equation using the quadratic formula, in a geometric setting.

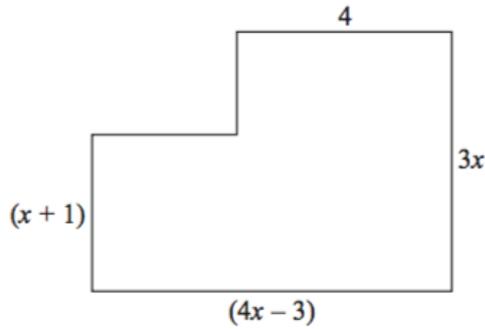*[Edexcel IGCSE May2014(R)-4H Q16 Edited]*

Here is a hexagon.

Diagram **NOT** accurately drawn

In the diagram, all the measurements are in centimetres.

All the corners are right angles.

The area of the hexagon is 40 cm².

a) Show that $4x^2 + 9x - 47 = 0$

b) Solve this equation. Give your solutions correct to 3 significant figures.

....

Question 14

Categorisation: Use the quadratic formula in the context of functions/algebraic fractions.

[Edexcel GCSE(9-1) Mock Set 2 Spring 2017 3H Q21b]

$$f(x) = \frac{1}{x+2} + \frac{1}{x-3}$$

Given that $f(x) = 4$

(c) find the possible values of x .

Give your answer in the form $\frac{p \pm \sqrt{q}}{r}$ where p , q and r are positive integers.

....

Question 15
Categorisation: Use the quadratic formula to determine the original coefficients of the quadratic.

[Edexcel GCSE Nov2015-2H Q22]

Alison is using the quadratic formula to solve a quadratic equation.
She substitutes values into the formula and correctly gets

$$x = \frac{-7 \pm \sqrt{49 - 32}}{4}$$

Work out the quadratic equation that Alison is solving.
Give your answer in the form $ax^2 + bx + c = 0$, where a, b and c are integers.
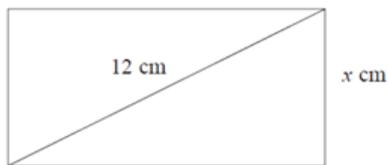
....

Question 16
Categorisation: Use the quadratic formula in the context of Pythagoras' Theorem.

[Edexcel IGCSE Jan2016-3H Q22]

The diagram shows a rectangle.

The width of the rectangle is x cm. The length of a diagonal of the rectangle is 12 cm.

The perimeter of the rectangle is 28 cm.

Find the possible values of x. Give your values correct to 3 significant figures.
Show your working clearly

....

Question 17

Categorisation: Solve an equation where prior multiplication by a term is required.

[Edexcel, GCSE Nov2011-4H Q19]

Find the exact solutions of $x + \frac{3}{x} = 7$

....

Question 18

Categorisation: As above.

[Edexcel GCSE Nov2012-2H Q22b Edited]

Solve $\frac{2}{y^2} + \frac{9}{y} - 7 = 0$

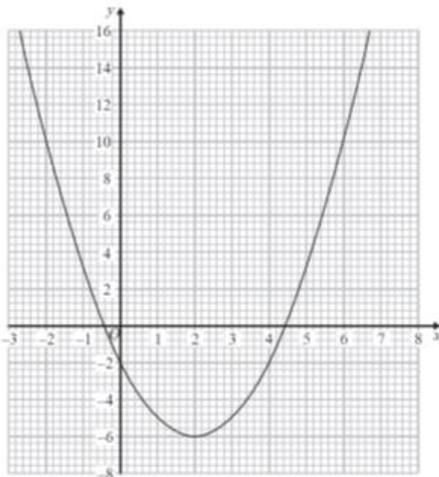Give your solutions correct to 3 significant figures.

....

Question 19

Categorisation: Estimate the solutions to a quadratic equation using a graph.

[Edexcel GCSE Jun2016-1H Q19aii]

The diagram shows the graph of $y = x^2 - 4x - 2$

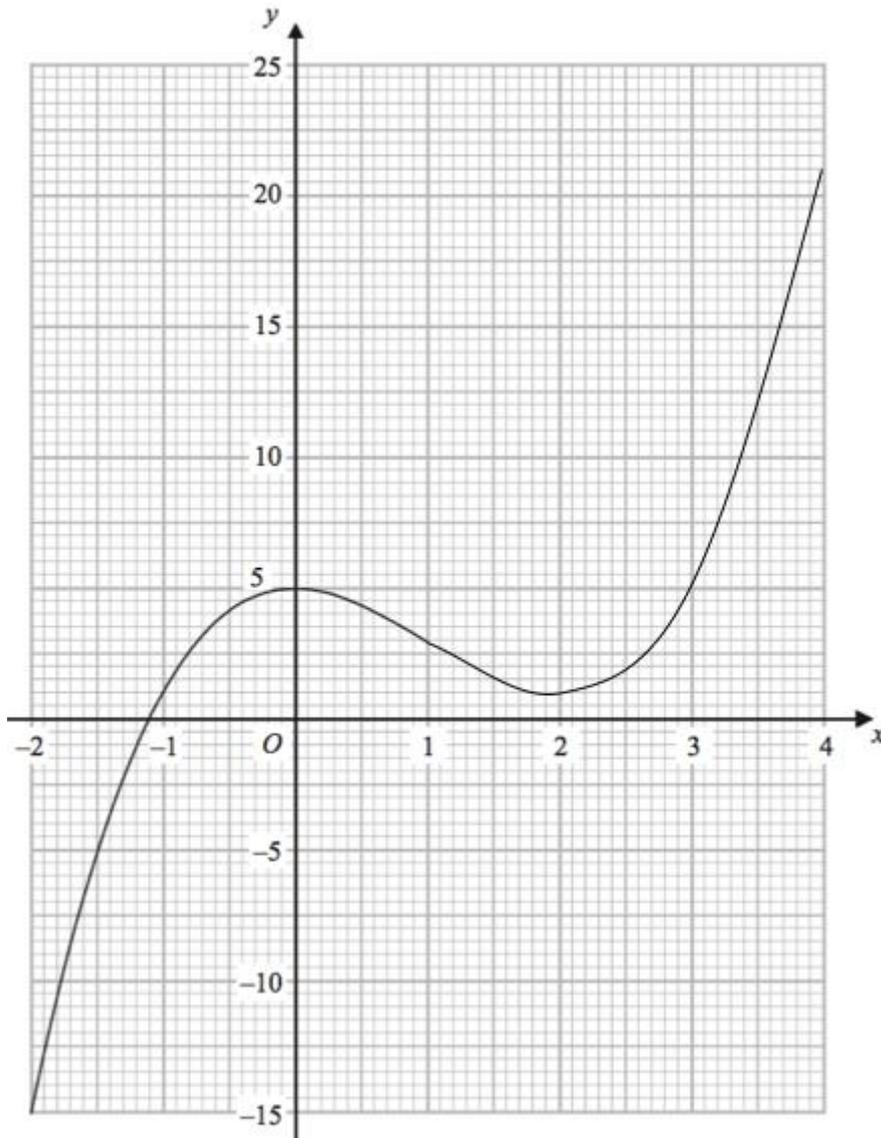Use the graph to find estimates for the solutions of $x^2 - 4x - 6 = 0$

$x =$ ....

$x =$ ....

Question 20

Categorisation: Estimate the solutions to a quadratic equation using a graph, where an additional line must be drawn.

[Edexcel IGCSE May2015(R)-4H Q15d Edited]

The graph of $y = x^3 - 3x^2 + 5$ is drawn below.

By drawing a suitable straight line on the grid, find an estimate for the solution of the equation $x^3 - 3x^2 + 2x + 4 = 0$

$$x = \text{.........................}$$

Answers

Question 1

"6 OR -6"

Question 2

$x = -2$ or $x = -4$

Question 3

$x = 2$ or $x = 6$

Question 4

$x = 1$ or $x = 5$

Question 5

$$\frac{x - 4 + x + 5}{2} \times 2x = 351$$
$$\frac{2x + 1}{2} \times 2x = 351$$
$$2x^2 + x = 351$$
$$2x^2 + x - 351 = 0$$

$$x = 13$$

Question 6

$$(2x + 1)(3x + 2) = 100$$
$$6x^2 + 7x + 2 = 100$$
$$6x^2 + 7x - 98 = 0$$

73.5 m ^{2}

Question 7

$x = -1$ or $x = 8$

Question 8

$$\frac{6}{n} \times \frac{5}{n - 1} = \frac{1}{3}$$
$$\frac{30}{n^2 - n} = \frac{1}{3}$$
$$90 = n^2 - n$$
$$n^2 - n - 90 = 0$$

$n = 10$

Question 9

$n = -2$ or $n = 3$

Question 10

$x = -1.12$ or $x = 0.717$

Question 11

$x = 2.35$ or $x = 7.65$

Question 12

$T = $ 1.47 seconds

Question 13

$$4(3x) + (4x - 7)(x + 1) = 40$$
$$12x + 4x^2 - 3x - 7 = 40$$
$$4x^2 + 9x - 47 = 0$$

$x = 2.48$ or $x = -4.73$

Question 14

$$\frac{3 \pm \sqrt{101}}{4}$$

Question 15

$$2x^2 + 7x + 4 = 0$$

Question 16

$x = 11.8$ or $x = 2.20$

Question 17

$x = \frac{7 + \sqrt{37}}{2}$ or $x = \frac{7 - \sqrt{37}}{2}$

Question 18

$y = 1.48$ or $y = -0.193$

Question 19

any value in the range $x = -1.2$ to $x = -1.0$ and any value in the range $x = 5.0$ to $x = 5.2$

Question 20

any value in the range $x = -0.9$ to $x = -0.7$