EB Education Revision Guide

BELIEVE YOU CAN
and you're halfway there

Theodore Roosevelt
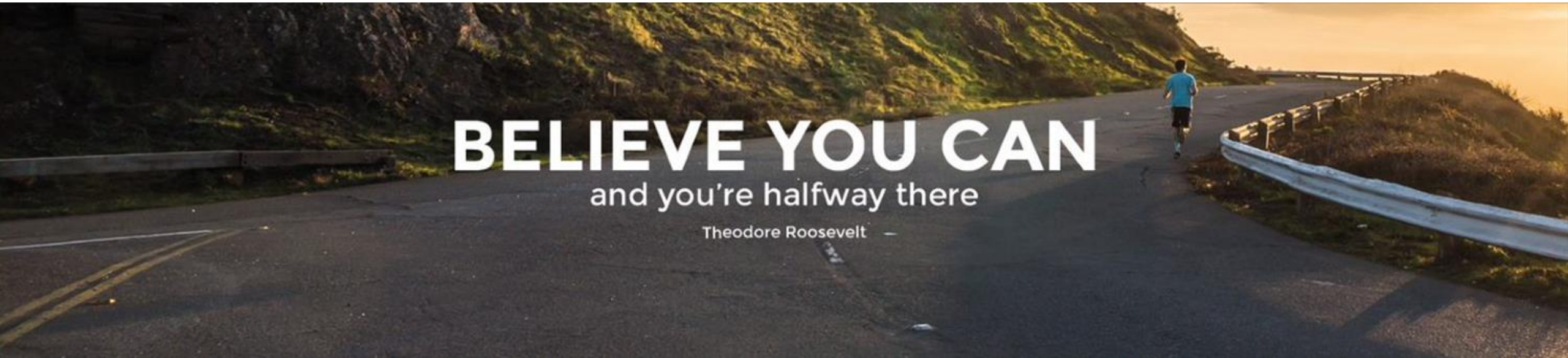
How to work with the Quadratic Formula

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The Quadratic Formula

What is it?

You can work out the solutions to any quadratic equation **ax^2 + bx + c** by using the quadratic formula.

You would use this formula if:
- You are given a quadratic equation which will not factorise easily.
- You are asked to give your answer to a number of decimal places, or significant figures.
- You are asked to give exact answers or surds.

You do need to learn this formula off by heart!

The formula

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

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Example:

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

1. Identify what a, b and c are, They are the coefficient of terms in the equation.

2. Put the values into the equation.

3. Taking care, complete the calculations in stages.

4. Remember you should get two solutions.

Solve $x^2 + 11x + 16 = 0$ to 3 s.f.

a = 1   b = 11   c = 16

$x = \frac{-11 \pm \sqrt{11^2 - 4 \times 1 \times 16}}{2 \times 1}$

$x = \frac{-11 \pm \sqrt{121 - 64}}{2}$

$x = \frac{-11 \pm \sqrt{57}}{2}$

$x = \frac{-11 + \sqrt{57}}{2}$ OR $\frac{-11 - \sqrt{57}}{2}$

$x = -1.73$ OR -9.27

TOP TIPS:
You should not get a negative number for b². Whether b is +ve or –ve, when you square it - you will get a positive number.

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1. Solve $2x^2 + 3x – 7 = 0$
Show your working clearly, and give your solutions correct to 3 significant figures.

2. Sandra is solving a quadratic equation using the quadratic formula. She substitutes values into the formula, and correctly gets

$$\frac{-5 \pm \sqrt{25 - 12}}{6}$$

What is the quadratic equation that she is solving?
Give your answer in the from $ax^2 + bx + c = 0$, where a, b and c are integers.
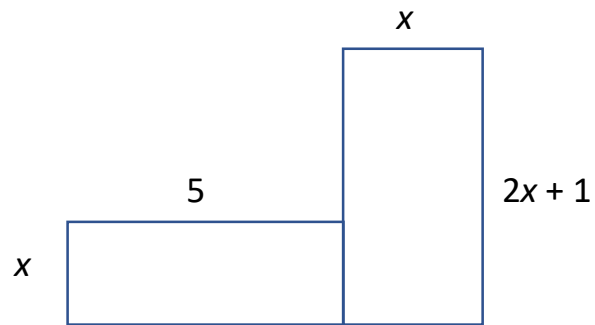
3. Solve $x^2 -7x + 3= 0$
Show your working clearly, and give your solutions correct to 3 significant figures.

4. Solve $2x^2 – 8 = 3x + 5$
Show your working clearly, and give your solutions correct to 3 significant figures.

5. The diagram below is not drawn accurately.

x

5

2*x* + 1

x

The area of the shape is 95cm^2.
a) Show that $2x^2 + 6x - 95 = 0$
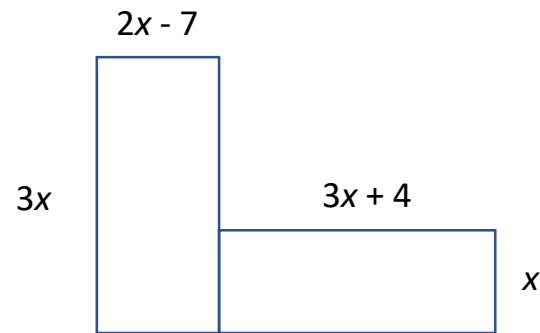
b) Solve the equation
$$2x^2 + 6x - 95 = 0$$
Give your solutions to 3 significant figures.

6. The diagram below is not drawn accurately.

$2x - 7$

$3x$ $3x + 4$

x

The area of the shape is 85cm^2.
a) Show that $9x^2 - 17x - 85 = 0$

b) Solve the equation
$$9x^2 - 17x - 85 = 0$$
Give your solutions to 3 significant figures.

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1. Solve $2x^2 + 3x - 7 = 0$
Show your working clearly, and give your solutions correct to 3 significant figures.

1. It asks for 3sf – so you know you need to use the formula:

$$a = 2 \quad b = 3 \quad c = -7$$

$$\frac{-3\pm\sqrt{3^2-(4 \times 2 \times -7)}}{2 \times 2} \qquad \frac{-3\pm\sqrt{9+56}}{4}$$

$$\frac{-3+\sqrt{65}}{4} \quad \text{or} \quad \frac{-3-\sqrt{65}}{4}$$

$$= 1.27 \text{ or } -2.77$$

2. Sandra is solving a quadratic equation using the quadratic formula. She substitutes values into the formula, and correctly gets

$$\frac{-5 \pm \sqrt{25 - 12}}{6}$$

What is the quadratic equation that she is solving?
Give your answer in the from $ax^2 + bx + c = 0$, where a, b and c are integers.

2. $2a = 6$ Therefore $a = 3$
$b = 5$
$4ac = 12$ Therefore $4 \times 3 \times c = 12$
$c = 1$

$$3x^2 + 5x + 1 = 0$$

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

Show your working clearly, and give your solutions correct to 3 significant figures.

4. Solve $2x^2 - 8 = 3x + 5$

Show your working clearly, and give your solutions correct to 3 significant figures.

3. It asks for 3sf – so you know you need to use the formula:

$$a = 1 \quad b = -7 \quad c = 3$$

$$\frac{--7 \pm \sqrt{-7^2 - (4 \times 1 \times 3)}}{2 \times 1} \qquad \frac{7 \pm \sqrt{49 - 12}}{2}$$

$$\frac{7 + \sqrt{37}}{2} \quad \text{or} \quad \frac{7 - \sqrt{37}}{2}$$

= 6.54 or 0.459

4. $2x^2 - 8 = 3x + 5$

-3x, -5 both sides

$$2x^2 - 8 - 5 - 3x = 0 \qquad 2x^2 - 3x - 13 = 0$$

$$a = 2 \quad b = -3 \quad c = -13$$

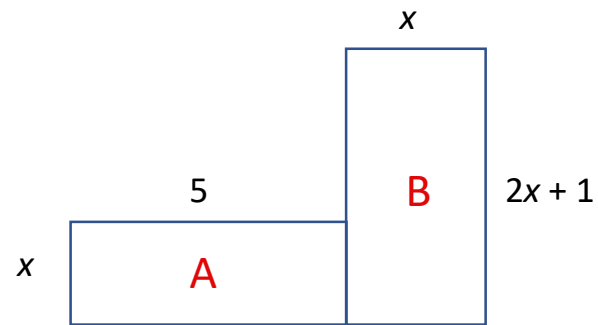$$\frac{--3 \pm \sqrt{3^2 - (4 \times 2 \times -13)}}{2 \times 2} \qquad \frac{3 \pm \sqrt{9 + 104}}{4}$$

$$\frac{3 + \sqrt{113}}{4} \quad \text{or} \quad \frac{3 - \sqrt{113}}{4}$$

= 3.41 or -1.91

5. The diagram below is not drawn accurately.

The area of the shape is 95cm^2.
a) Show that $2x^2 + 6x - 95 = 0$

b) Solve the equation
$$2x^2 + 6x - 95 = 0$$
Give your solutions to 3 significant figures.

a)   Area A = 5x
Area B = $x(2x+1)$
       = $2x^2 + x$

Total area = 5x + $2x^2$ + x
so $2x^2 + 5x + x = 95$
    $2x^2 + 6x - 95 = 0$
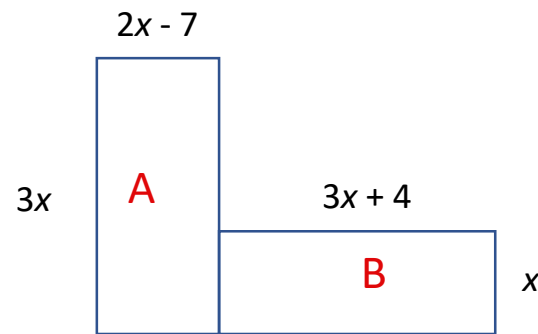
b)

a = 2 b = 6 c = -95

$$\frac{-6 \pm \sqrt{6^2 - (4 \times 2 \times -95)}}{2 \times 2} \qquad \frac{-6 \pm \sqrt{36 + 760}}{4}$$

$$\frac{-6 + \sqrt{796}}{4} \quad \text{or} \quad \frac{-6 - \sqrt{796}}{4}$$

= 5.55 or -8.55

6. The diagram below is not drawn accurately.

The area of the shape is 85cm^2.
a) Show that $9x^2 - 17x - 85 = 0$

b) Solve the equation
$9x^2 - 17x - 85 = 0$
Give your solutions to 3 significant figures.

a) Area A = $3x(2x-7) = 6x^2 - 21x$

Area B = $x(3x + 4) = 3x^2 + 4x$

Total area = $9x^2 - 17x$

$9x^2 - 17x = 85$

$9x^2 - 17x - 85 = 0$

b)

a = 9 b = -17 c = -85

$$\frac{--17 \pm \sqrt{-17^2 - (4 \times 9 \times -85)}}{2 \times 9}$$

$$\frac{17 \pm \sqrt{289 + 3060}}{18}$$

$$\frac{17 + \sqrt{3349}}{18} \quad \text{or} \quad \frac{17 - \sqrt{3349}}{18}$$

4.16   -2.27

For more help and resources, or to work with us as a tutor, please contact us

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