

Name: _____

GCSE (1 – 9)

Quadratic Formula

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

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

Give your solutions correct to 2 decimal places.

$$a = 1 \quad b = 5 \quad c = 3$$

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

$$= \frac{-(5) \pm \sqrt{(5)^2 - 4(1)(3)}}{2(1)}$$

$$= -0.70 \text{ (2dp)} \quad = -4.30 \text{ (2dp)}$$

$$\underline{-0.70 \text{ or } -4.30}$$

(Total for question 1 is 3 marks)

2 Solve $2x^2 + 13x + 7 = 0$

Give your solutions correct to 2 decimal places.

$$a = 2 \quad b = 13 \quad c = 7$$

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

$$= \frac{-(13) \pm \sqrt{(13)^2 - 4(2)(7)}}{2(2)}$$

$$= -0.59 \quad \text{or} \quad -5.91$$

(2dp)

$$\underline{-0.59 \text{ or } -5.91}$$

(Total for question 2 is 3 marks)

3 Solve $3x^2 + 2x - 13 = 0$

Give your solutions correct to 1 decimal place.

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

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-13)}}{2(3)}$$

$$= 1.8 \text{ (1dp)} \quad \text{and} \quad -2.4 \text{ (1dp)}$$

$$\underline{1.8 \text{ and } -2.4}$$

(Total for question 3 is 3 marks)

4 Solve $5x^2 + x - 11 = 0$

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

Give your solutions correct to 3 significant figures.

$$a = 5 \quad b = 1 \quad c = -11$$

$$x = \frac{- (1) \pm \sqrt{(1)^2 - 4(5)(-11)}}{2(5)}$$

$$= 1.39 \text{ (3sf)} \text{ and } -1.59 \text{ (3sf)}$$

$$1.39 \text{ and } -1.59$$

(Total for question 4 is 3 marks)

5 Solve $3x^2 - 11x - 13 = 0$

Give your solutions correct to 3 significant figures.

$$a = 3 \quad b = -11 \quad c = -13$$

$$x = \frac{- (-11) \pm \sqrt{(-11)^2 - 4(3)(-13)}}{2(3)}$$

$$= 4.61 \text{ (3sf)} \text{ and } -0.941 \text{ (3sf)}$$

$$4.61 \text{ and } -0.941$$

(Total for question 5 is 3 marks)

6 Solve $5x^2 = 6x + 3$

Give your solutions correct to 3 significant figures.

$$5x^2 - 6x - 3 = 0$$

$$a = 5 \quad b = -6 \quad c = -3$$

$$x = \frac{- (-6) \pm \sqrt{(-6)^2 - 4(5)(-3)}}{2(5)}$$

$$= 1.58 \text{ (3sf)} \text{ and } -0.380 \text{ (3sf)}$$

$$1.58 \text{ and } -0.380$$

(Total for question 6 is 3 marks)

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

Give your answers in the form $a \pm b\sqrt{c}$.

$$a = 1 \quad b = 2 \quad c = -7$$

$$x = \frac{- (2) \pm \sqrt{(2)^2 - 4(1)(-7)}}{2(1)}$$

$$= -1 \pm 2\sqrt{2}$$

$$-1 \pm 2\sqrt{2}$$

(Total for question 7 is 4 marks)

8 Solve $x^2 - 4x - 1 = 0$

Give your answers in the form $a \pm \sqrt{b}$.

$$a = 1 \quad b = -4 \quad c = -1$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-1)}}{2(1)}$$

$$= 2 \pm \sqrt{5}$$

$$2 \pm \sqrt{5}$$

(Total for question 8 is 4 marks)

9 Solve $x^2 + 6x - 11 = 0$

Give your answers in the form $a \pm b\sqrt{c}$.

$$a = 1 \quad b = 6 \quad c = -11$$

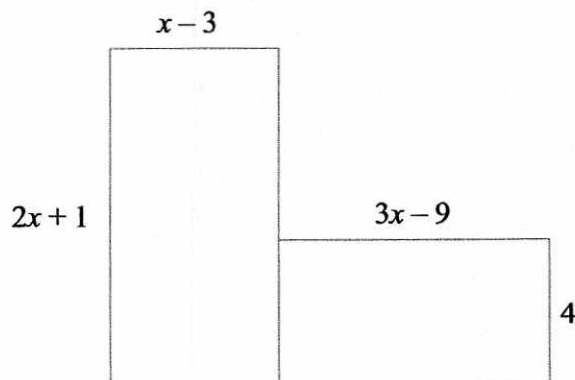
$$x = \frac{- (6) \pm \sqrt{(6)^2 - 4(1)(-11)}}{2(1)}$$

$$= -3 \pm 2\sqrt{5}$$

$$-3 \pm 2\sqrt{5}$$

(Total for question 9 is 4 marks)

- 10 The diagram shows a six sided shape formed from two rectangles.
All measurements are given in centimetres.



The area of the shape is 24cm^2

- (a) Show that $2x^2 + 7x - 63 = 0$

$$\begin{aligned}(2x+1)(x-3) + 4(3x-9) &= 24 \\ 2x^2 - 6x + x - 3 + 12x - 36 &= 24 \\ 2x^2 + 7x - 39 &= 24 \\ 2x^2 + 7x - 63 &= 0\end{aligned}$$

- (b) Find the value of x
Give your answer to 3 significant figures

(2)

$$a = 2 \quad b = 7 \quad c = -63$$

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(-63)}}{2(2)}$$

$$= 4.13 \text{ or } -7.63 \quad (3\text{sf})$$

x cannot be negative or the lengths would be negative $\therefore x = 4.13$

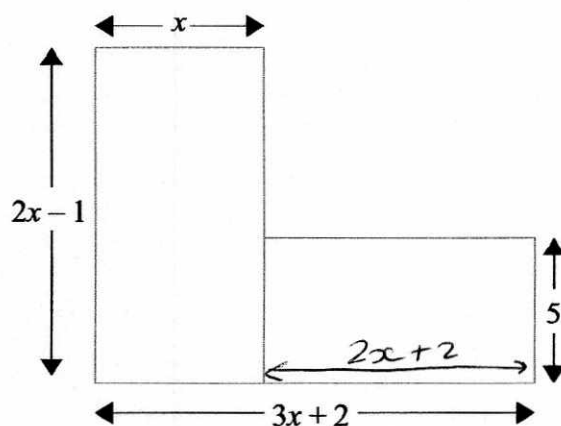
(3sf)

4.13

(3)

(Total for question 10 is 5 marks)

- 11 The diagram shows a six sided shape formed from two rectangles. All measurements are given in centimetres.



The area of the shape is 35cm^2

- (a) Show that $2x^2 + 9x - 25 = 0$

$$x(2x-1) + 5(2x+2) = 35$$

$$2x^2 - x + 10x + 10 = 35$$

$$2x^2 + 9x + 10 = 35$$

$$2x^2 + 9x - 25 = 0$$

- (b) Find the value of x

(2)

Give your answer to 3 significant figures

$$a = 2 \quad b = 9 \quad c = -25$$

$$x = \frac{-(9) \pm \sqrt{(9)^2 - 4(2)(-25)}}{2(2)}$$

$$= 1.94 \text{ or } -6.44$$

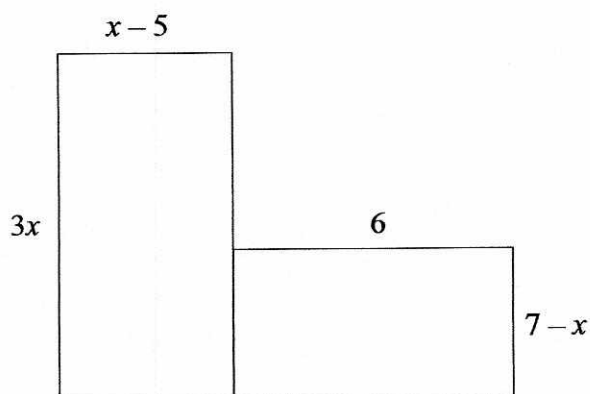
x cannot be negative $\therefore x = 1.94$ (3sf)

1.94

(3)

(Total for question 11 is 5 marks)

- 12 The diagram shows a six sided shape formed from two rectangles.
All measurements are given in centimetres.



The area of the shape is 26cm^2

- (a) Show that $3x^2 - 21x + 16 = 0$

$$\begin{aligned} 3x(x-5) + 6(7-x) &= 26 \\ 3x^2 - 15x + 42 - 6x &= 26 \\ 3x^2 - 21x + 42 &= 26 \\ 3x^2 - 21x + 16 &= 0 \end{aligned}$$

(2)

- (b) Find the value of x
Give your answer to 3 significant figures

$$a = 3 \quad b = -21 \quad c = 16$$

$$x = \frac{-(-21) \pm \sqrt{(-21)^2 - 4(3)(16)}}{2(3)}$$

$$= 6.13 \quad \text{or} \quad 0.870 \quad (3 \text{ s.f.})$$

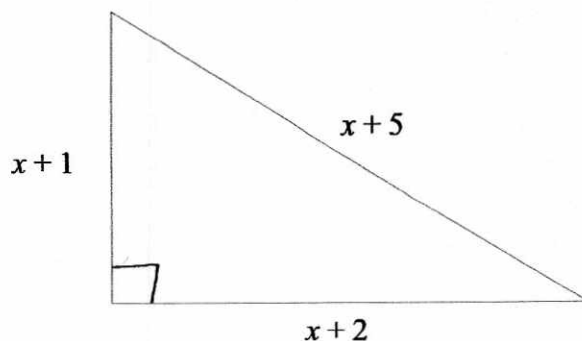
x cannot be $0.870 \rightarrow$ This would make
 $(x-5)$ negative $\therefore x = 6.13$

6.13

(3)

(Total for question 12 is 5 marks)

- 13 The diagram shows a right angled triangle.
All measurements are given in centimetres.



- (a) Show that $x^2 - 4x - 20 = 0$

$$\begin{aligned}
 (x+1)^2 + (x+2)^2 &= (x+5)^2 \\
 (x+1)(x+1) + (x+2)(x+2) &= (x+5)(x+5) \\
 x^2 + x + x + 1 + x^2 + 2x + 2x + 4 &= x^2 + 5x + 5x + 25 \\
 2x^2 + 6x + 5 &= x^2 + 10x + 25 \\
 x^2 - 4x - 20 &= 0
 \end{aligned}$$

- (b) Find the value of x

(3)

Give your answer in the form $a \pm b\sqrt{c}$.

$$\begin{aligned}
 a &= 1 \quad b = -4 \quad c = -20 \\
 x &= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-20)}}{2(1)} \\
 &= 2 \pm 2\sqrt{6}
 \end{aligned}$$

$$\begin{aligned}
 &2 \pm 2\sqrt{6} \\
 &\text{.....} \\
 &(3)
 \end{aligned}$$

(Total for question 13 is 6 marks)