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.

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

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

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

$= -0.70$ (2dp) $\quad = -4.30$ (2dp)

-0.70 or -4.30

(Total for question 1 is 3 marks)

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

Give your solutions correct to 2 decimal places.

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

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

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

$= -0.59$ or -5.91 (2dp) $\quad -0.59$ or -5.91

(Total for question 2 is 3 marks)

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

Give your solutions correct to 1 decimal place.

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

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

$= 1.8$ (1dp) and -2.4 (1dp)

1.8 and -2.4

(Total for question 3 is 3 marks)

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

Give your solutions correct to 3 significant figures.

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

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

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

$= 1.39$ (3sf) and -1.59 (3sf)

1.39 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.

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

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

$= 4.61$ (3sf) and -0.941 (3sf)

4.61 and −0.941

(Total for question 5 is 3 marks)

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

Give your solutions correct to 3 significant figures.

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

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

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

$= 1.58$ (3sf) and -0.380 (3sf)

1.58 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)

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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)

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

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

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

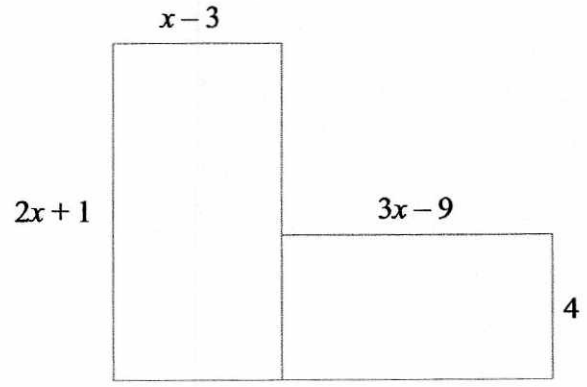
$$x = \frac{-(6) \pm \sqrt{(6)^2 - 4(1)(-11)}}{2(1)}$$

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

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

(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 $2x^2 + 7x - 63 = 0$

$$(2x+1)(x-3) + 4(3x-9) = 24$$
$$2x^2 - 6x + x - 3 + 12x - 36 = 24$$
$$2x^2 + 7x - 39 = 24$$
$$2x^2 + 7x - 63 = 0$$

(2)

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

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

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

$= 4.13$ or -7.63 (3sf)

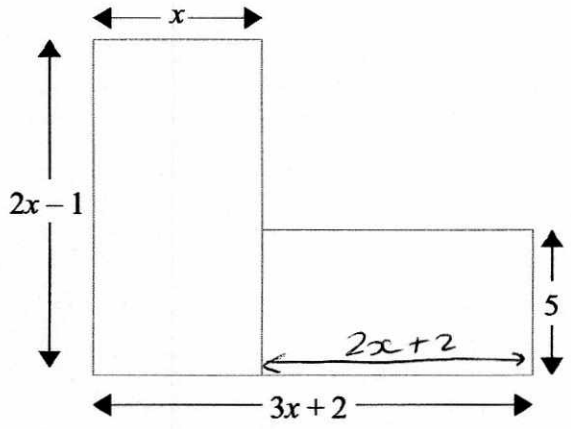
x cannot be negative or the lengths would be negative $\therefore x = 4.13$ (3sf)

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

$$x(2x-1) + 5(2x+2) = 35$$
$$2x^2 - x + 10x + 10 = 35$$
$$2x^2 + 9x + 10 = 35$$
$$2x^2 + 9x - 25 = 0$$

(2)

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

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

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

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

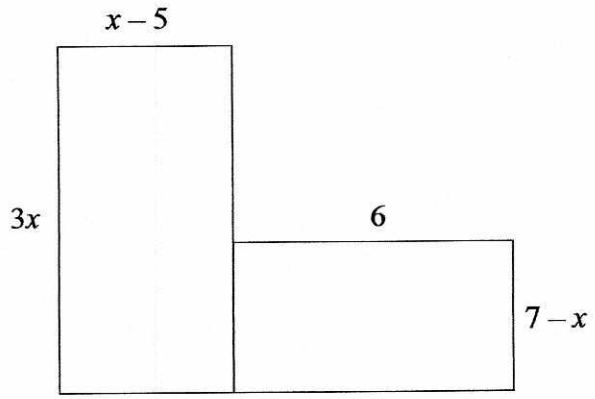
x cannot be negative $\therefore \quad x = 1.94$ (3sf)

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 $3x^2 - 21x + 16 = 0$

$3x(x-5) + 6(7-x) = 26$

$3x^2 - 15x + 42 - 6x = 26$

$3x^2 - 21x + 42 = 26$

$3x^2 - 21x + 16 = 0$

(2)

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

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

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

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

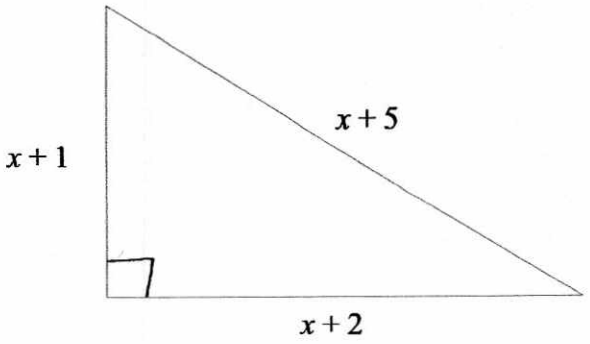
x cannot be $0.870 \rightarrow$ This would make $(x-5)$ negative $\therefore \quad x = 6.13$

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 $x^2 - 4x - 20 = 0$

$$(x+1)^2 + (x+2)^2 = (x+5)^2$$

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

$$x^2 + x + x + 1 + x^2 + 2x + 2x + 4 = x^2 + 5x + 5x + 25$$

$$2x^2 + 6x + 5 = x^2 + 10x + 25$$

$$x^2 - 4x - 20 = 0$$

(3)

(b) Find the value of x

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

$$a = 1 \quad b = -4 \quad c = -20$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-20)}}{2(1)}$$

$$= 2 + 2\sqrt{6}$$

$2 + 2\sqrt{6}$

(3)

(Total for question 13 is 6 marks)