

The Quadratic Formula

Exam Style Questions

1. Solve $x^2 + 7x + 4 = 0$

Give your answers to 3 significant figures.

$$a = 1, b = 7, c = 4$$

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

$$= \frac{-7 \pm \sqrt{49 - 16}}{2}$$

$$= \frac{-7 \pm \sqrt{33}}{2} \Rightarrow x = \frac{-7 + \sqrt{33}}{2} = -0.628$$

$$x = \frac{-7 - \sqrt{33}}{2} = -6.37$$

$$x = -0.628 \text{ or}$$

$$\dots\dots\dots x = -6.37 \dots\dots\dots \text{ (3 marks)}$$

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

Give your answers to 3 significant figures.

$$a = 2, b = 5, c = 1$$

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

$$= \frac{-5 \pm \sqrt{25 - 8}}{4}$$

$$= \frac{-5 \pm \sqrt{17}}{4} \Rightarrow x = \frac{-5 + \sqrt{17}}{4} = -0.219$$

$$x = \frac{-5 - \sqrt{17}}{4} = -2.28$$

$$x = -0.219 \text{ or}$$

$$\dots\dots\dots x = -2.28 \dots\dots\dots \text{ (3 marks)}$$

3. Solve $3x^2 + 7x + 1 = 0$

Give your answers to 3 significant figures.

$a=3, b=7, c=1$

$$x = \frac{-7 \pm \sqrt{7^2 - 4(3)(1)}}{2(3)}$$

$$= \frac{-7 \pm \sqrt{49 - 12}}{6} = \frac{-7 \pm \sqrt{37}}{6} \Rightarrow x = \frac{-7 + \sqrt{37}}{6} = -0.153$$

$$x = \frac{-7 - \sqrt{37}}{6} = -2.18$$

$x = -0.153$ or $x = -2.18$ (3 marks)

4. Solve $x^2 - 8x + 2 = 0$

Give your answers to 3 significant figures.

$a=1, b=-8, c=2$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(2)}}{2(1)}$$

$$= \frac{8 \pm \sqrt{64 - 8}}{2} = \frac{8 \pm \sqrt{56}}{2} \Rightarrow x = \frac{8 + \sqrt{56}}{2} = 7.74$$

$$x = \frac{8 - \sqrt{56}}{2} = 0.258$$

$x = 7.74$ or $x = 0.258$ (3 marks)

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

Give your answers to 3 significant figures.

$a=3, b=-5, c=1$

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

$$= \frac{5 \pm \sqrt{25 - 12}}{6} = \frac{5 \pm \sqrt{13}}{6} \Rightarrow x = \frac{5 + \sqrt{13}}{6} = 1.43$$

$$x = \frac{5 - \sqrt{13}}{6} = 0.232$$

$x = 1.43, x = 0.232$ (3 marks)

6. Solve $x^2 - 7x - 2 = 0$

Leave your answers in surd form.

$$a=1, b=-7, c=-2$$

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

$$= \frac{7 \pm \sqrt{49+8}}{2}$$

$$= \frac{7 \pm \sqrt{57}}{2}$$

$$x = \frac{7 + \sqrt{57}}{2}$$

$$x = \frac{7 - \sqrt{57}}{2}$$

..... (3 marks)

7. Solve $-x^2 - x + 1 = 0$

Leave your answers in surd form.

$$a=-1, b=-1, c=1$$

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

$$= \frac{1 \pm \sqrt{1+4}}{-2} = \frac{1 \pm \sqrt{5}}{-2}$$

$$x = \frac{-1 - \sqrt{5}}{2}$$

..... (3 marks)

8. Solve $7x + x^2 - 1 = 0$

Leave your answers in surd form.

$$x^2 + 7x - 1 = 0$$

$$a=1, b=7, c=-1$$

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

$$= \frac{-7 \pm \sqrt{49+4}}{2} = \frac{-7 \pm \sqrt{53}}{2}$$

$$x = \frac{-7 + \sqrt{53}}{2}$$

$$x = \frac{-7 - \sqrt{53}}{2}$$

..... (3 marks)

9. Solve $2x^2 - 3x = 1$

Give your answers to 3 significant figures.

$$2x^2 - 3x - 1 = 0$$

$$a = 2, b = -3, c = -1$$

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

$$= \frac{3 \pm \sqrt{9 + 8}}{4} = \frac{3 \pm \sqrt{17}}{4}$$

$$x = \frac{3 + \sqrt{17}}{4}$$

$$x = \frac{3 - \sqrt{17}}{4}$$

..... (3 marks)

10. Solve $x^2 = 8x - 4$

Give your answers to 3 significant figures.

$$x^2 - 8x + 4 = 0$$

$$a = 1, b = -8, c = 4$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(4)}}{2(1)}$$

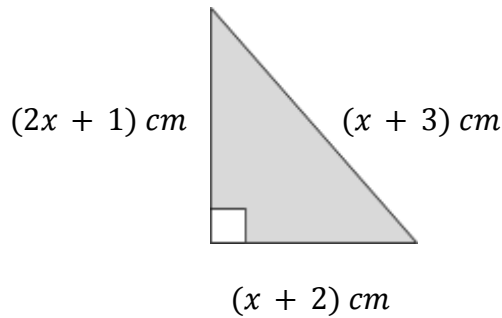
$$= \frac{8 \pm \sqrt{64 - 16}}{2} = \frac{8 \pm \sqrt{48}}{2}$$

$$\Rightarrow x = \frac{8 + \sqrt{48}}{2} = 7.46$$

$$x = \frac{8 - \sqrt{48}}{2} = 0.536$$

 $x = 7.46, x = 0.536$
..... (3 marks)

11. Below is a right-angled triangle with lengths $(2x + 1)\text{cm}$, $(x + 2)\text{cm}$ and $(x + 3)\text{cm}$.



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

Using Pythagoras,

$$(2x+1)^2 + (x+2)^2 = (x+3)^2$$

$$\Rightarrow 4x^2 + 4x + 1 + x^2 + 4x + 4 = x^2 + 6x + 9$$

$$\Rightarrow 5x^2 + 8x + 5 = x^2 + 6x + 9$$

$$\Rightarrow 4x^2 + 2x - 4 = 0$$

$$\Rightarrow \underline{\underline{2x^2 + x - 2 = 0}}$$

(2)

(b) Find the area of the triangle, giving your answer to 3 significant figures.

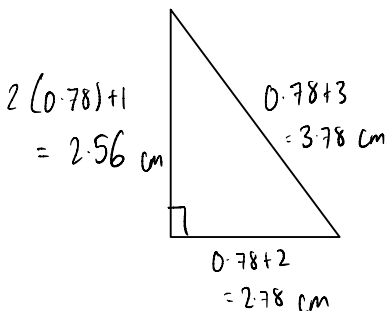
$$2x^2 + x - 2 = 0$$

$$a = 2, b = 1, c = -2$$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(2)(-2)}}{2(2)} = \frac{-1 \pm \sqrt{1+16}}{4}$$

$$= \frac{-1 \pm \sqrt{17}}{4} \Rightarrow x = \frac{-1 + \sqrt{17}}{4} = \underline{\underline{0.78}}$$

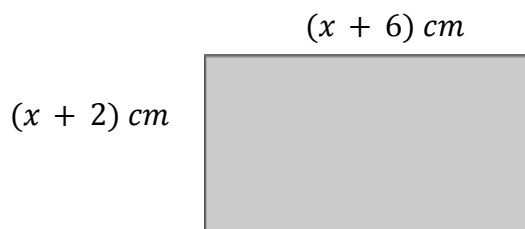
$$x = \frac{-1 - \sqrt{17}}{4} = -1.28 \text{ (not possible)}$$



$$\begin{aligned} \text{Area} &= \frac{1}{2} \times 2.56 \times 2.78 \\ &= 3.5584 \end{aligned}$$

$$\underline{\underline{3.56 \text{ cm}^2}} \quad (3)$$

12. The area of the below rectangle is 9 cm^2 .



(a) Show that $x^2 + 8x + 3 = 0$

$$A = bh \Rightarrow (x+6)(x+2) = 9$$

$$\Rightarrow x^2 + 8x + 12 = 9$$

$$\Rightarrow x^2 + 8x + 3 = 0$$

(2)

(b) Hence, find the perimeter of the rectangle, giving your answer to 1 decimal place.

$$x^2 + 8x + 3 = 0$$

$$a=1, b=8, c=3$$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(1)(3)}}{2(1)}$$

$$= \frac{-8 \pm \sqrt{64 - 12}}{2}$$

$$= \frac{-8 \pm \sqrt{52}}{2} \Rightarrow$$

$$x = \frac{-8 + \sqrt{52}}{2} = -0.394$$

$$x = \frac{-8 - \sqrt{52}}{2} = -7.606 \text{ (not possible)}$$

$$-0.394 + 6 = 5.606 \text{ cm}$$



$$\begin{aligned} p &= 2(5.606) \\ &+ 2(1.606) \\ &= 14.424 \end{aligned}$$

$$\underline{\underline{14.4 \text{ cm}}} \quad (3)$$