

Name: _____

Exam Style Questions

Quadratic Formula



Equipment needed: Calculator, pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Video Tutorial

www.corbettmaths.com/contents

Video 267



Answers and Video Solutions



1. Write down the quadratic formula.

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

(1)

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

Give your answers to one decimal place.

$$\begin{aligned}
 a &= 1 & x &= \frac{-5 \pm \sqrt{25 - 4}}{2} \\
 b &= 5 & x &= \frac{-5 \pm \sqrt{21}}{2} \\
 c &= 1 & x &= \frac{-5 + \sqrt{21}}{2} \quad \text{or} \quad x = \frac{-5 - \sqrt{21}}{2} \\
 x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} & x &= -0.208... \quad \text{or} \quad x = -4.79... \\
 x &= \frac{-5 \pm \sqrt{(5)^2 - 4 \times 1 \times 1}}{2 \times 1} & x &= -0.2 \quad \text{or} \quad x = -4.8
 \end{aligned}$$

(3)

3. Solve the equation $2x^2 + 6x + 1 = 0$

Give your answers to two decimal places.

$$\begin{aligned}
 a &= 2 & x &= \frac{-6 \pm \sqrt{36 - 8}}{4} \\
 b &= 6 & x &= \frac{-6 \pm \sqrt{28}}{4} \\
 c &= 1 & x &= \frac{-6 + \sqrt{28}}{4} \quad \text{or} \quad x = \frac{-6 - \sqrt{28}}{4} \\
 x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} & x &= -0.17712... \quad \text{or} \quad x = -2.82228... \\
 x &= \frac{-6 \pm \sqrt{(6)^2 - 4 \times 2 \times 1}}{2 \times 2} & x &= -0.18 \quad \text{or} \quad x = -2.82
 \end{aligned}$$

(3)

4. Solve the equation $4x^2 + x - 7 = 0$

Give your answers to two decimal places.

$$\begin{aligned}
 a &= 4 & x &= \frac{-1 \pm \sqrt{1 - (-112)}}{8} \\
 b &= 1 \\
 c &= -7 \\
 x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} & x &= \frac{-1 \pm \sqrt{113}}{8} \\
 x &= \frac{-1 \pm \sqrt{1^2 - 4 \times 4 \times (-7)}}{2 \times 4} & x &= \frac{-1 + \sqrt{113}}{8} \quad \text{or} \quad x = \frac{-1 - \sqrt{113}}{8} \\
 & & x &= 1.20376... \quad \text{or} \quad x = -1.4537... \\
 & & x &= \underline{1.20} \dots \quad \text{or} \quad x = \underline{-1.45} \dots
 \end{aligned}$$

(3)

5. Solve the equation $x^2 - 2x - 9 = 0$

Give your answers to two decimal places.

$$\begin{aligned}
 a &= 1 & x &= \frac{2 \pm \sqrt{4 - (-36)}}{2} \\
 b &= -2 \\
 c &= -9 \\
 x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} & x &= \frac{2 \pm \sqrt{40}}{2} \quad \text{or} \quad x = \frac{2 - \sqrt{40}}{2} \\
 x &= \frac{2 \pm \sqrt{(-2)^2 - 4 \times 1 \times (-9)}}{2 \times 1} & x &= 4.1622... \quad \text{or} \quad x = -2.1622... \\
 & & x &= \underline{4.16} \dots \quad \text{or} \quad x = \underline{-2.16} \dots
 \end{aligned}$$

(3)

6. Solve the quadratic equation $7x^2 - 25x + 2 = 0$

Give your answers to two decimal places.

$$\begin{aligned}
 a &= 7 & x &= \frac{25 \pm \sqrt{625 - 56}}{14} \\
 b &= -25 \\
 c &= 2 \\
 x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} & x &= \frac{25 \pm \sqrt{569}}{14} \quad \text{or} \quad x = \frac{25 - \sqrt{569}}{14} \\
 x &= \frac{25 \pm \sqrt{(-25)^2 - 4 \times 7 \times 2}}{2 \times 7} & x &= 3.489... \quad \text{or} \quad x = 0.08187... \\
 & & x &= \underline{3.49} \dots \quad \text{or} \quad x = \underline{0.08} \dots
 \end{aligned}$$

(3)

7. Solve the equation $3x^2 + 10x + 5 = 7$

Give your answers to two decimal places.

$$3x^2 + 10x + 5 = 7$$

$$\quad -7 \quad -7$$

$$3x^2 + 10x - 2 = 0$$

$$a = 3 \quad b = 10 \quad c = -2$$

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

$$x = \frac{-10 \pm \sqrt{10^2 - 4 \times 3 \times (-2)}}{2 \times 3}$$

$$x = \frac{-10 \pm \sqrt{100 - (-24)}}{6}$$

$$x = \frac{-10 + \sqrt{124}}{6} \quad \text{or} \quad x = \frac{-10 - \sqrt{124}}{6}$$

$$x = 0.18925...$$

$$x = -3.522...$$

$$x = 0.19 \quad \text{or} \quad x = -3.52$$

(3)

8. Solve the equation $11x^2 = 7 - 2x$

Give your answers to two decimal places.

$$11x^2 = 7 - 2x$$

$$\quad -7 \quad -7$$

$$11x^2 - 7 = -2x$$

$$\quad +2x \quad +2x$$

$$11x^2 + 2x - 7 = 0$$

$$a = 11$$

$$b = 2$$

$$c = -7$$

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

$$x = \frac{-2 \pm \sqrt{2^2 - 4 \times 11 \times (-7)}}{2 \times 11}$$

$$x = \frac{-2 \pm \sqrt{4 - (-308)}}{22}$$

$$x = \frac{-2 \pm \sqrt{312}}{22}$$

$$x = \frac{-2 + \sqrt{312}}{22} \quad \text{or} \quad x = \frac{-2 - \sqrt{312}}{22}$$

$$x = 0.7119...$$

$$x = -0.8937...$$

$$x = 0.71 \quad \text{or} \quad x = -0.89$$

(3)

9. Solve the equation $12x^2 - 13x + 4 = 13x^2 - 5x + 1$

Give your answers to one decimal place.

$$12x^2 - 13x + 4 = 13x^2 - 5x + 1$$

$$\quad -12x^2 \quad -12x^2$$

$$-13x + 4 = x^2 - 5x + 1$$

$$\quad +13x \quad +13x$$

$$4 = x^2 + 8x + 1$$

$$\quad -4 \quad -4$$

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

$$a = 1$$

$$b = 8$$

$$c = -3$$

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

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

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

$$x = \frac{-8 \pm \sqrt{76}}{2}$$

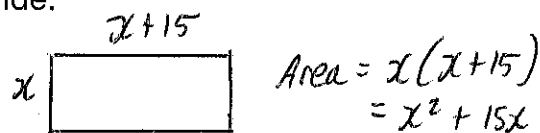
$$x = \frac{-8 + \sqrt{76}}{2} \quad \text{or} \quad x = \frac{-8 - \sqrt{76}}{2}$$

$$x = 0.4$$

$$\text{or} \quad x = -8.4$$

(3)

10. A rectangular field is 15m longer than it is wide.
The area of the field is 800m²



Work out the length of the field.

Give your answer to 1 decimal place.

$$a = 1$$

$$b = 15$$

$$c = -800$$

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

$$x = \frac{-15 \pm \sqrt{225 - (4 \times 1 \times -800)}}{2}$$

$$x = \frac{-15 \pm \sqrt{3425}}{2}$$

$$x = \frac{-15 + \sqrt{3425}}{2} \text{ or } x = \frac{-15 - \sqrt{3425}}{2}$$

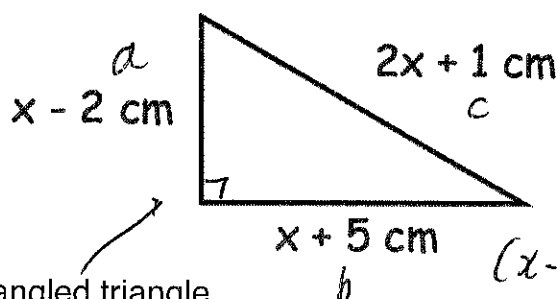
$$x = 21.76... \checkmark \text{ or } x = -36.76 \times$$

this solution does not make sense in this context,
as x is the width of a field

width = 21.8m (to 1 dp)

length is 15m longer so is $\rightarrow 36.8 \dots \text{m}$
(4)

11.



Pythagoras

$$a^2 + b^2 = c^2$$

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

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

Shown is a right angled triangle.

- (a) Show that $x^2 - x - 14 = 0$

$$2a = 2x^2 - 2x + 1$$

$$-2a$$

$$0 = 2x^2 - 2x - 28$$

$$\div 2 \quad \div 2$$

$$0 = x^2 - x - 14$$

QED

$$x^2 - 2x - 2x + 4 + (x^2 + 5x + 5x + 25) = 4x^2 + 2x + 2x + 1$$

$$x^2 - 4x + 4 + x^2 + 10x + 25 = 4x^2 + 4x + 1$$

$$2x^2 + 6x + 29 = 4x^2 + 4x + 1$$

$$-2x^2$$

$$-2x^2$$

$$6x + 29 = 2x^2 + 4x + 1$$

$$-6x$$

$$-6x$$

$$29 = 2x^2 - 2x + 1$$

(3)

- (b) Find x .

$$a = 1$$

$$b = -1$$

$$c = -14$$

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

$$x = \frac{1 \pm \sqrt{(-1)^2 - 4 \times 1 \times (-14)}}{2 \times 1}$$

$$x = \frac{1 \pm \sqrt{1 + 56}}{2} = \frac{1 \pm \sqrt{57}}{2}$$

$$x = \frac{1 + \sqrt{57}}{2} \text{ or } x = \frac{1 - \sqrt{57}}{2}$$

$$x = 4.2749...$$

$$\text{or } x = -3.274...$$

4.27 to (2dp)

(3)

would not make sense in this context,
as the height of the triangle is $x-2$

12. Solve, giving your answers to two decimal places.

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

$$x = \frac{-19 \pm \sqrt{19^2 - 4 \times 1 \times 83}}{2 \times 1}$$

$$x = \frac{-19 \pm \sqrt{361 - 332}}{2}$$

$$x = \frac{-19 \pm \sqrt{29}}{2}$$

$$x = \frac{-19 + \sqrt{29}}{2} \quad \text{or} \quad x = \frac{-19 - \sqrt{29}}{2}$$

$$\frac{7}{m+9} = m+10$$

$$\frac{7}{m+9} = m+10$$

$$x(m+9) \quad x(m+9)$$

$$7 = (m+10)(m+9)$$

$$7 = m^2 + 9m + 10m + 90$$

$$-7 \quad -7$$

$$0 = m^2 + 9m + 10m + 90 - 7$$

$$0 = m^2 + 19m + 83$$

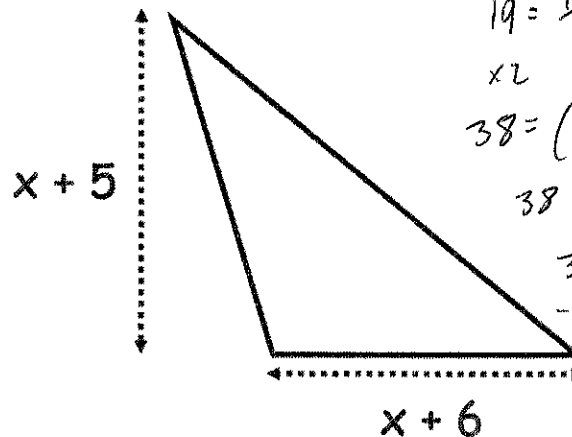
$$a=1 \quad b=19 \quad c=83$$

$$m = \frac{-19 \pm \sqrt{19^2 - 4 \times 1 \times 83}}{2 \times 1}$$

$$m = -6.81 \quad \text{or} \quad m = -12.19$$

(3)

13. Shown is a triangle with area 19cm^2 .



$$\text{Area} = \frac{1}{2} \text{base} \times \text{height}$$

$$19 = \frac{1}{2}(x+6)(x+5)$$

$$\times 2 \quad \times 2$$

$$38 = (x+6)(x+5)$$

$$38 = x^2 + 5x + 6x + 30$$

$$38 = x^2 + 11x + 30$$

$$-38 \quad -38$$

$$0 = x^2 + 11x - 8$$

$$a=1 \quad b=11 \quad c=-8$$

Find the value of x

$$x = \frac{-11 \pm \sqrt{11^2 - 4 \times 1 \times (-8)}}{2 \times 1}$$

$$x = \frac{-11 \pm \sqrt{153}}{2}$$

$$x = \frac{-11 + \sqrt{153}}{2} \quad \text{or} \quad x = \frac{-11 - \sqrt{153}}{2}$$

$$x = 0.684 \dots \quad \text{or} \quad x = -11.68 \dots$$

$\uparrow$ x

$x = 0.6847$ to 4 dp.

(4)

as the height is $x+5$,
 $x = -11.68 \dots$ would lead to
 a negative height.

14. Jack is solving a quadratic equation in the form $x^2 + bx + c = 0$



He has got to this point in his working out

$$x = \frac{5 \pm \sqrt{53}}{2}$$

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

Find the values of b and c .

$$b = -5$$

$$b^2 - 4ac = 53$$

$$(-5)^2 - 4 \times 1 \times c = 53$$

$$25 - 4c = 53$$

$$25 = 53 + 4c$$

$$-28 = 4c$$

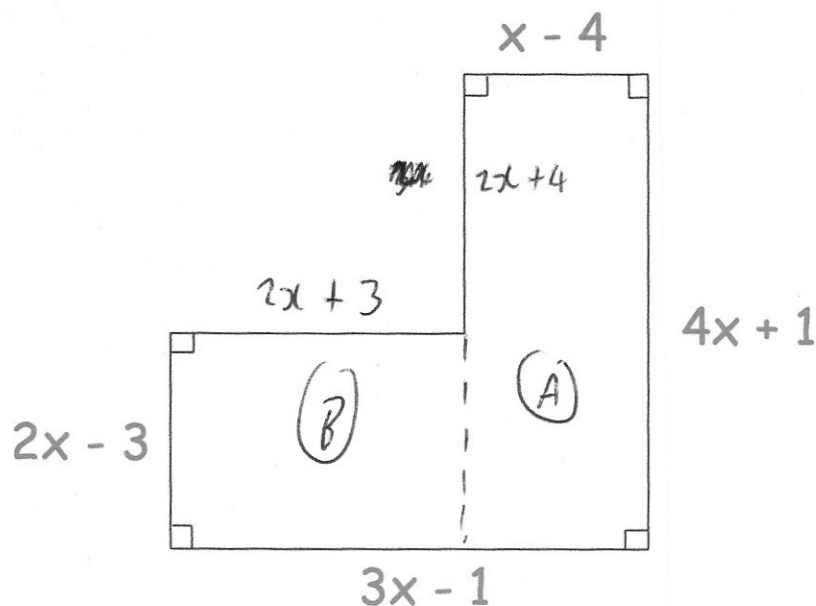
$$-7 = c$$

$$c = -7$$

$$b = \dots -5 \dots \quad c = \dots -7 \dots$$

(3)

15. The area of the shape below is 100cm^2



- (a) Show that $8x^2 - 15x - 113 = 0$

$$\begin{aligned} \text{(A)} \quad (x-4)(4x+1) &= 4x^2 - 15x - 4 \\ \text{(B)} \quad (2x-3)(2x+3) &= 4x^2 - 9 \end{aligned} \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{add} \quad 8x^2 - 15x - 13$$

$$8x^2 - 15x - 13 = 100$$

$$8x^2 - 15x - 113 = 0$$

(3)

- (b) Find the perimeter of the shape

$$a = 8 \quad b = -15 \quad c = -113$$

$$x = \frac{15 \pm \sqrt{225 - (4 \times 8 \times -113)}}{16}$$

$$x = \frac{15 \pm \sqrt{225 + 3616}}{16}$$

$$x = 4.8109 \dots \checkmark$$

or

$$x = -2.9359 \dots \times$$

$$\text{Perimeter} = 14x$$

$$14x$$

$$14 \times 4.8109 \dots = 67.3538 \dots$$

$$\underline{\underline{67.354}} \text{ cm}$$

(5)