Quadratic Equations - Worksheet

Skill

Group A - Factorising quadratics

Solve each quadratic by factorising:

1) $x^2 + 9x + 18 = 0$ **2)** $x^2 + 10x + 21 = 0$ **3)** $x^2 - 4x - 21 = 0$

4) $x^2 - 10x + 21 = 0$ **5)** $2x^2 + 8x + 6 = 0$ **6)** $2x^2 - 4x - 6 = 0$

7) $2x^2 - 8x + 6 = 0$ **8)** $3x^2 - 12x + 9 = 0$ **9)** $2x^2 - 9x + 9 = 0$

10) $5x^2 + 11x + 2 = 0$ **11)** $6x^2 + 14x + 4 = 0$ **12)** $6x^2 - 23x + 7 = 0$

Group B - The quadratic formula

Solve each equation using the quadratic formula. Round your answers to 1 decimal place:

1) $x^2 + 3x - 5 = 0$ **2)** $x^2 + 5x + 2 = 0$ **3)** $x^2 + 3x - 2 = 0$

4) $x^2 + 6x - 3 = 0$ **5)** $x^2 - 4x - 8 = 0$ **6)** $2x^2 + 5x - 5 = 0$

7) $2x^2 - 3x - 4 = 0$ **8)** $3x^2 - 3x - 4 = 0$ **9)** $3x^2 + 3x - 4 = 0$

10) $3x^2 + 4x - 8 = 0$ **11)** $0.5x^2 + 13x + 58 = 0$ **12) 12)** $\sqrt{3}x^2 + 2x - \sqrt{10} = 0$

Group C - Completing the square

Solve each quadratic by completing the square. Round your answers to 1 decimal place:

1) $x^2 + 4x + 1 = 0$ **2)** $x^2 + 6x + 1 = 0$ **3)** $x^2 - 6x + 1 = 0$

4) $x^2 - 6x + 2 = 0$ **5)** $x^2 - 6x - 2 = 0$ **6)** $2x^2 + 6x + 2 = 0$

7) $x^2 + 5x + 1 = 0$ **8)** $2x^2 - 6x + 2 = 0$ **9)** $3x^2 - 6x + 2 = 0$

10) $3x^2 - 8x - 4 = 0$ **11)** $5x^2 - x - 1 = 0$ **12)** $3x^2 + \frac{1}{2}x - \frac{3}{4} = 0$

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Quadratic Equations - Worksheet

Group D - Mixed practice

Solve each quadratic equation using an appropriate method:

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

2) $2x^2 + 6x = 2$

3) $x^2 = \frac{2-6x}{2}$

4) $4x^2 - 16 = 0$

5) $32 - 8x^2 = 0$

6) $3x^2 - 11x + 9 = 3$

7) $-21 = 16 - (x - 2)^2$

8) $3x = \frac{22x-6}{x}$

9) $\frac{x+1}{2x} = 2x - 1$

10) $\frac{x+1}{x} = 2x - 1$

11) $\frac{x}{x+1} + \frac{1}{2} = x$

12) $\frac{3x}{x+4} + \frac{2}{x+8} = 1$

Quadratic Equations - Worksheet

Applied

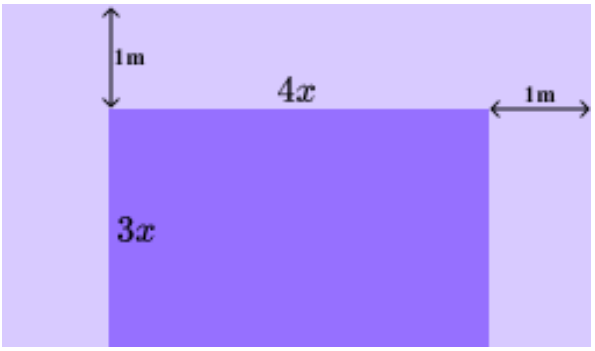
1) The base of the rectangle is $x + 1$ and the height of the rectangle is $x - 4$.
The area of the rectangle is equal to $6m^2$. Calculate the value of x.

2) The volume of a cuboid is $1000cm^3$.
It has side lengths xcm, $10cm$ and $(2x - 10cm)$.

(a) Show that $x^2 - 5x - 50 = 0$.

(b) Solve the equation in part a) to find x.

3) A rectangular patio has a length of $4x$ and a width of $3x$ metres.
The patio has a grass border with a width of 1 metre on three sides.
The total area of the patio and the grass is $10m^2$.
By showing that $12x^2 + 10x - 8 = 0$, calculate the area of the patio.



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Quadratic Equations - Exam Questions

1) Solve: $4x^2 = 36$

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(2 marks)

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2) **(a)** Factorise: $x^2 - x - 30$

.....

(2)

(b) Hence or otherwise solve the equation: $x^2 - x - 30 = 0$

.....

(1)

(3 marks)

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3) Solve the quadratic equation $3x^2 + 6x - 2 = 0$.
Write your answer in surd form.

.....

(3 marks)

Quadratic Equations - Exam Questions

4) Solve the equation $x^2 = 2(x - 3)^2$.
Give your answer to 3 significant figures.

.....

(3 marks)

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5) Charlie is using the quadratic formula to solve a quadratic equation.
She substitutes values into the formula and correctly works out

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

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

.....

(2 marks)

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Quadratic Equations - Answers

	Question	Answer
	Skill Questions	
Group A	Solve each quadratic by factorising: **1)** $x^2 + 9x + 18 = 0$ **2)** $x^2 + 10x + 21 = 0$ **3)** $x^2 - 4x - 21 = 0$ **4)** $x^2 - 10x + 21 = 0$ **5)** $2x^2 + 8x + 6 = 0$ **6)** $2x^2 - 4x - 6 = 0$ **7)** $2x^2 - 8x + 6 = 0$ **8)** $3x^2 - 12x + 9 = 0$ **9)** $2x^2 - 9x + 9 = 0$ **10)** $5x^2 + 11x + 2 = 0$ **11)** $6x^2 + 14x + 4 = 0$ **12)** $6x^2 - 23x + 7 = 0$	**1)** $x = -3, x = -6$ **2)** $x = -3, x = -7$ **3)** $x = -3, x = 7$ **4)** $x = 3, x = 7$ **5)** $x = -1, x = -3$ **6)** $x = -1, x = 3$ **7)** $x = 3, x = 1$ **8)** $x = 3, x = 1$ **9)** $x = 3, x = 1.5$ **10)** $x = \frac{1}{5}, x = -2$ **11)** $x = -\frac{1}{3}, x = -2$ **12)** $x = \frac{1}{3}, x = \frac{7}{2}$
Group B	Solve each equation using the quadratic formula. Round your answers to 1 decimal place: **1)** $x^2 + 3x - 5 = 0$ **2)** $x^2 + 5x + 2 = 0$ **3)** $x^2 + 3x - 2 = 0$ **4)** $x^2 + 6x - 3 = 0$ **5)** $x^2 - 4x - 8 = 0$ **6)** $2x^2 + 5x - 5 = 0$	**1)** $x = 1.2, x = -4.2$ **2)** $x = -0.4, x = -4.6$ **3)** $x = 0.6, x = -3.6$ **4)** $x = 0.5, x = -6.5$ **5)** $x = 5.5, x = -1.5$ **6)** $x = 0.8, x = -3.3$

Quadratic Equations - Answers

Group B contd	**7)** $2x^2 - 3x - 4 = 0$ **8)** $3x^2 - 3x - 4 = 0$ **9)** $3x^2 + 3x - 4 = 0$ **10)** $3x^2 + 4x - 8 = 0$ **11)** $0.5x^2 + 13x + 58 = 0$ **12)** $\sqrt{3}x^2 + 2x - \sqrt{10} = 0$	**7)** $x = 2.4,\ x = -0.9$ **8)** $x = 1.8,\ x = -0.8$ **9)** $x = -1.8,\ x = 0.8$ **10)** $x = 1.1,\ x = -2.4$ **11)** $x = -5.7,\ x = -20.3$ **12)** $x = 0.9,\ x = -2.0$
Group C	Solve each quadratic by completing the square. Round your answers to 1 decimal place: **1)** $x^2 + 4x + 1 = 0$ **2)** $x^2 + 6x + 1 = 0$ **3)** $x^2 - 6x + 1 = 0$ **4)** $x^2 - 6x + 2 = 0$ **5)** $x^2 - 6x - 2 = 0$ **6)** $2x^2 + 6x + 2 = 0$ **7)** $x^2 + 5x + 1 = 0$ **8)** $2x^2 - 6x + 2 = 0$ **9)** $3x^2 - 6x + 2 = 0$ **10)** $3x^2 - 8x - 4 = 0$ **11)** $5x^2 - x - 1 = 0$ **12)** $3x^2 + \frac{1}{2}x - \frac{3}{4} = 0$	**1)** $x = -0.3,\ x = -3.7$ **2)** $x = -0.2,\ x = -5.8$ **3)** $x = 0.2,\ x = 5.8$ **4)** $x = 0.4,\ x = 5.6$ **5)** $x = -0.3,\ x = 6.3$ **6)** $x = -2.6,\ x = -0.4$ **7)** $x = -0.2,\ x = -4.8$ **8)** $x = 2.6,\ x = 0.4$ **9)** $x = 0.4,\ x = 1.6$ **10)** $x = 3.1,\ x = -0.4$ **11)** $x = 0.6,\ x = -0.4$ **12)** $x = 0.4,\ x = -0.6$

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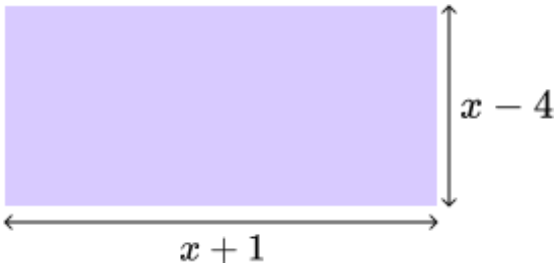
Quadratic Equations - Answers

Group D	Solve each quadratic equation using an appropriate method: **1)** $x^2 + 3x = 1$ **2)** $2x^2 + 6x = 2$ **3)** $x^2 = \frac{2-6x}{2}$ **4)** $4x^2 - 16 = 0$ **5)** $32 - 8x^2 = 0$ **6)** $3x^2 - 11x + 9 = 3$ **7)** $-21 = 16 - (x-2)^2$ **8)** $3x = \frac{22x-6}{x}$ **9)** $\frac{x+1}{2x} = 2x - 1$ **10)** $\frac{x+1}{x} = 2x - 1$ **11)** $\frac{x}{x+1} + \frac{1}{2} = x$ **12)** $\frac{3x}{x+4} + \frac{2}{x+8} = 1$	**1)** $x = 0.3,\ x = -3.3$ **2)** $x = 0.3,\ x = -3.3$ **3)** $x = 0.3,\ x = -3.3$ **4)** $x = 2,\ x = -2$ **5)** $x = 2,\ x = -2$ **6)** $x = \frac{2}{3},\ x = 3$ **7)** $x = 8.1,\ x = -4.1$ **8)** $x = 0.3, x = 7.0$ **9)** $x = 1,\ x = -\frac{1}{4}$ **10)** $x = 1.4,\ x = -0.4$ **11)** $x = -\frac{1}{2}, x = 1$ **12)** $x = 1.4,\ x = -8.4$

Quadratic Equations - Answers

	Question	Answer
	Applied Questions	
1)	The base of the rectangle is $x + 1$ and the height of the rectangle is $x - 4$. The area of the rectangle is equal to $6m^2$. Calculate the value of x. 	$x = 5m$ only, if $x \neq -2$ as the lengths of the rectangle would be negative.
2)	The volume of a cuboid is $1000cm^3$. It has side lengths xcm, $10cm$ and $(2x - 10cm)$. **(a)** Show that $x^2 - 5x - 50 = 0$.	**(a)** $x \times 10 \times (2x - 10) = 1000$ $10x(2x - 10) = 1000$ $20x^2 - 100x = 1000$ $20x^2 - 100x - 1000 = 0$ $2x^2 - 10x - 100 = 0$ $x^2 - 5x - 50 = 0$
	(b) Solve the equation in part a) to find x.	**(b)** $2x^2 - 10x - 100 = 0$ $x^2 - 5x - 50 = 0$ $x^2 - 5x = 50$ $(x - 10)(x + 5) = 50$ $x = 10$ *or* -5 so x must be 10 as it cannot be a negative number.

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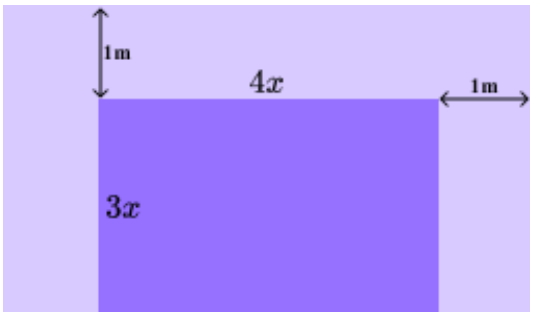
Quadratic Equations - Answers

3)	A rectangular patio has a length of $4x$ and a width of $3x$ metres. The patio has a grass border with a width of 1 metre on three sides. The total area of the patio and the grass is $10m^2$. By showing that $12x^2 + 10x - 8 = 0$, calculate the area of the patio.  	$(4x + 2)(3x + 1) = 10$ $12x^2 + 4x + 6x + 2 = 10$ $12x^2 + 10x - 8 = 0$ $x = 0.5$ or $x = -\frac{4}{3}$. x cannot be negative and so $x = 0.5\ m$ Area of patio $= 4(0.5) \times 3(0.5)$ $= 2 \times 1.5$ $= 3\ m^2$

Quadratic Equations - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	Solve: $4x^2 = 36$	$x^2 = 9$ $x = \pm 3$	**(1)** **(1)**
2) (a)	Factorise: $x^2 - x - 30$	**(a)** $(x \pm 5)(x \pm 6)$ $(x - 5)(x + 6)$	**(1)** **(1)**
(b)	Hence or otherwise solve the equation: $x^2 - x - 30 = 0$	**(b)** $x = 5$ or $x = -6$	**(1)**
3)	Solve the quadratic equation $3x^2 + 6x - 2 = 0$. Write your answer in surd form:	Substitution into the quadratic formula Attempt to simplify $\frac{-3-\sqrt{3}}{3}$ **and** $\frac{-3+\sqrt{3}}{3}$	**(1)** **(1)** **(1)**
4)	Solve the equation $x^2 = 2(x - 3)^2$. Give your answer to 3 significant figures.	Expanding and simplifying to give an equation in the form $ax^2 + bx + c$. Substitution into the quadratic formula. $x = 6 - 3\sqrt{2} = 1.76$, $x = 6 + 3\sqrt{2} = 10.2$	**(1)** **(1)** **(1)**
5)	Charlie is using the quadratic formula to solve a quadratic equation. She substitutes values into the formula and correctly works out $x = \frac{-(-4)-\sqrt{(-4)^2-4(3)(-2)}}{2(3)}$ What is the quadratic equation that Charlie is solving? Give your answer in the form $ax^2 + bx + c = 0$, where a, b and c are integers.	**Any two of** $a = 3, b = -4, c = -2$ $3x^2 - 4x - 2 = 0$ **oe**	**(1)** **(1)**

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