LO: Solve complex equations and complete the square.

30/09/2024

1.

Solve these pairs of simultaneous equations.

a $2x + y = 7$

$3x - y = 8$

2.

Solve (round your answer to 3sf)

$3x^2 - 7x - 1 = 0$

Prerequisite Retrieval	Prerequisite Problem Solving

3. Solve:

c $2x - y = 9$

$x^2 + y^2 = 17$

4.

Worked Examples – I do

Solve the following.

$$\frac{x+2}{6} = \frac{x-6}{2}$$

Worked Examples – We do

Solve the following.

$$\frac{x+2}{6} + 3 = \frac{x}{5}$$

Independent Practice- You do

Test Your Understanding

⑤ $\frac{3p+2}{2} - \frac{p-1}{5} = 3$

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

Show Me

Completing the Square

"Completing the square" means putting a quadratic in the form $(\boldsymbol{x+a})^{\boldsymbol{2}}+\boldsymbol{b}$ or $\boldsymbol{a(x+b)^2+c}$

a. Solving Quadratics

If we have a completed square:

$$(x+4)^2-7=0$$

Using the quadratic formula is actually solving the quadratic by completing the square – it's just someone has done the work for us already.

b. Sketching Quadratics

We'll see later that if $y=(x+a)^2+b$, then the minimum point is $(-a,b)$

Examples – I do

Completing the Square Recap

$x^2 + 12x$

$x^2 + 8x$

$x^2 - 2x$

Examples – I do

Completing the Square Recap

Complete the square:
$x^2 - 6x + 7$

Express $2x^2 + 12x + 7$ in the form $a(x + b)^2 + c$

Express $5 - 3x^2 + 6x$ in the form $a - b(x + c)^2$

Examples - I do

⑩ Work out the values of a, b and c such that $3x^2 - bx + 1 = a(x - 4)^2 + c$.

⑬ (i) Work out the values of a and b such that $x^2 - 8x + 20 = (x - a)^2 + b$.

(ii) Hence make x the subject of $y = x^2 - 8x + 20$

Independent Practice- You do

Test Your Understanding

Express $3x^2 - 18x + 4$ in the form $a(x + b)^2 + c$

$$= 3(x^2 - 6x) + 4$$
$$= 3\big((x - 3)^2 - 9\big) + 4$$
$$= 3(x - 3)^2 - 27 + 4$$
$$= 3(x - 3)^2 - 23$$

Express $20x - 5x^2 + 3$ in the form $a - b(x + c)^2$

$$= -5x^2 + 20x + 3$$
$$= -5(x^2 - 4x) + 3$$
$$= -5\big((x - 2)^2 - 4\big) + 3$$
$$= -5(x - 2)^2 + 20 + 3$$
$$= 23 - 5(x - 2)^2$$

Examples – I do

Solving by Completing the Square

Solve by completing the square:

$$3x^2 - 18x + 4 = 0$$

$$x^2 - 6x + \frac{4}{3} = 0$$

$$(x-3)^2 - 9 + \frac{4}{3} = 0$$

$$(x-3)^2 = \frac{23}{3}$$

$$x - 3 = \pm\sqrt{\frac{23}{3}}$$

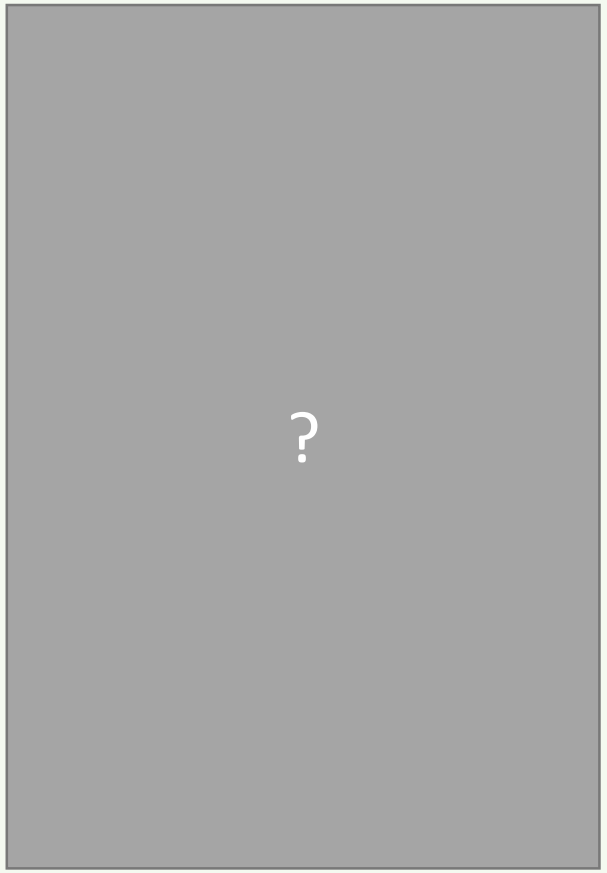
$$x = 3 \pm \sqrt{\frac{23}{3}}$$

Previously we factorised out the 3. This is because $3x^2 - 18x + 4$ on its own is an **expression,** so dividing by 3 (instead of factorising) would change the expression.

However, in an equation, we can divide both sides by 3 without affecting the solutions

Proving the Quadratic Formula

If $ax^2 + bx + c = 0$, prove that $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$



Just use exactly the same method as you usually would!

Plenary

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Exercise 2F

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