When a Isn’t 1

QF04-V1 · storyboard · QF04 Complete the square when a isn’t 1. Read each picture with its sentences.

Picture 1

Solve $3x^2 + 12x + 1 = 0$.

$$x^2 + 4x + \frac{1}{3} = 0$$ divide every term by 3

$$(x+2)^2 = 4 - \frac{1}{3} = \frac{11}{3}$$ add $2^2 = 4$ to both sides

$$x = -2 \pm \sqrt{\frac{11}{3}}$$ also $-2 \pm \frac{\sqrt{33}}{3}$

1. Solve 3 x squared plus 12 x plus 1 equals 0.
2. Divide every term by 3: x squared plus 4 x plus 1 third equals 0.
3. Move the third across.
4. Half of 4 is 2, and 2 squared is 4: add 4 to both sides.
5. x plus 2, all squared, equals 11 thirds.
6. Undo the square: x equals negative 2, plus or minus root 11 thirds.
7. Root 33 over 3 is the same number, and both are right.

Picture 2

Solve $2(x^2 - 6x) + 3 = 0.$

$$2(x^2 - 6x + 9) + 3 = 2 \cdot 9$$ add 2×9, not 9

$$2(x - 3)^2 = 15$$

$$\boxed{x = 3 \pm \sqrt{\frac{15}{2}}}$$

8. Another way is to factor a out.
9. Solve 2 times x squared minus 6 x, plus 3, equals 0.
10. Inside the bracket, add 9.
11. But that 9 is multiplied by 2, so add 18 on the right.
12. Take away 3 from both sides: 2 times x minus 3, all squared, equals 15.
13. Divide by 2 and undo the square: x equals 3, plus or minus root 15 halves.

Picture 3

Trap $3x^2 + 12x + 1 = 0$

✗ $x^2 + 4x + 1 = 0$

✓ $x^2 + 4x + \frac{1}{3} = 0$

14. Watch for the trap.
15. Don't divide only some of the terms by 3: divide every term.

Picture 4

Trap $2(x^2 - 6x + 9) + 3$

✗ $= 0 + 9$

✓ $= 0 + 18$

16. And after factoring out the 2, add not just 9 on the right: add 9 times the 2, which is 18.