Undo the Square

QF01-V1 · storyboard · QF01 Undo the square. Read each picture with its sentences.

Picture 1

Solve $(z+3)^2 = 12$.

$$z + 3 = \pm\sqrt{12}$$ square root, keep $\pm$

$$z + 3 = \pm 2\sqrt{3}$$ $12 = 4 \times 3$

$$\boxed{z = -3 \pm 2\sqrt{3}}$$ subtract 3

1. Solve z plus 3, all squared, equals 12.
2. The square is already on its own.
3. Take the square root of both sides, and keep plus or minus.
4. Root 12 is 2 root 3, because 12 is 4 times 3.
5. Subtract 3 from both sides.
6. z equals negative 3, plus or minus 2 root 3.
7. That is two roots.

Picture 2

Solve $(z+3)^2+9=0$.

$(z+3)^2=-9$ the square on its own

$z+3=\pm 3i$ $\sqrt{-9}=3i$

$\boxed{z=-3\pm 3i}$

8. Now solve z plus 3, all squared, plus 9, equals 0.
9. Subtract 9 from both sides.
10. z plus 3, all squared, equals negative 9.
11. The square root of negative 9 is 3 i.
12. Keep plus or minus.
13. So z equals negative 3, plus or minus 3 i: two imaginary roots.

Picture 3

Trap $(z+3)^2 = 12$

$\times$ $z = 3 \pm 2\sqrt{3}$

✓ $z = -3 \pm 2\sqrt{3}$

14. Watch for the trap: z is not 3, plus or minus 2 root 3.
15. The 3 changes sign as it crosses to the other side, so it is negative 3.

Picture 4

Trap $(z+3)^2 = 12$

$\times$ $z = -3 + 2\sqrt{3}$

✓ $z = -3 \pm 2\sqrt{3}$

16. And don't stop at just one root.
17. Plus or minus gives two roots.