Quadratics in Disguise

QE14-V1 · storyboard · QE14 Quadratics in disguise. Read each picture with its sentences.

Picture 1

Solve $t^4 - 11t^2 + 18 = 0.$

$$u^2 - 11u + 18 = 0 \quad u = t^2, \text{ so } t^4 = u^2$$

$$(u - 2)(u - 9) = 0$$

$$u = 2 \quad \text{or} \quad u = 9$$

$$t^2 = 2 \quad \text{or} \quad t^2 = 9 \quad \text{go back to } t$$

$$\boxed{t = \pm\sqrt{2} \quad \text{or} \quad t = \pm 3} \quad \text{four roots}$$

1. Solve t to the fourth, minus 11 t squared, plus 18, equals 0.
2. Let u equal t squared.
3. Then t to the fourth is u squared, and the equation is u squared, minus 11 u, plus 18, equals 0.
4. Product 18, sum negative 11: negative 2 and negative 9.
5. So u equals 2 or u equals 9.
6. Go back to t: t squared equals 2, or t squared equals 9.
7. Each gives two roots, so there are four roots: plus or minus root 2, and plus or minus 3.

Picture 2

Solve $x^4 + 3x^2 - 4 = 0$.

$$(u+4)(u-1) = 0 \quad u = x^2$$

$$x^2 = -4 \quad \text{or} \quad x^2 = 1$$

$$\boxed{x = \pm 1}$$

8. Solve x to the fourth, plus 3 x squared, minus 4, equals 0.
9. Let u equal x squared: u squared, plus 3 u, minus 4, factors as u plus 4, times u minus 1.
10. So x squared equals negative 4, which has no roots, or x squared equals 1.
11. The roots are only plus or minus 1.

Picture 3

Factor $a^2 - 6ad + 8d^2$, treating d as a number.

$$\boxed{(a-2d)(a-4d)}$$ product $8d^2$, sum $-6d$

12. Now two letters.
13. Factor a squared, minus 6 a d, plus 8 d squared, treating d as a number.
14. We need product 8 d squared, and sum negative 6 d: negative 2 d and negative 4 d.

Picture 4

Trap $u = 2 \text{ or } u = 9$

$\times \; t = 2 \text{ or } t = 9$

$\checkmark \quad t = \pm\sqrt{2} \text{ or } t = \pm 3$

15. Watch for the trap: don't stop at u.
16. The question is about t, so go back: t squared equals 2 or 9.

Picture 5

Trap $x^2 = -4$

$\times \; x = \pm 2$

$\checkmark \quad \text{no roots}$

17. Another trap: x squared equals negative 4 does not give plus or minus 2.
18. A square is never negative, so there are no roots from this one.