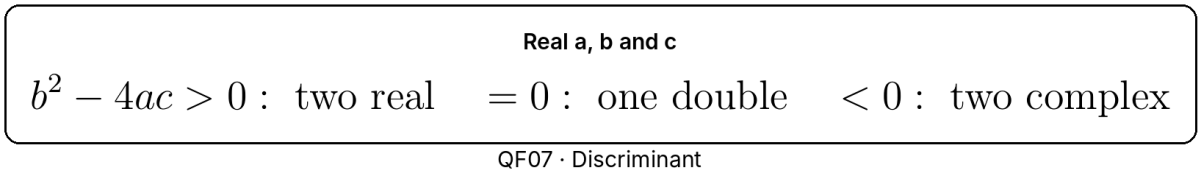
The Discriminant

QF07-V1 · storyboard · QF07 Discriminant. Read each picture with its sentences.

Picture 1



QF07 · Discriminant

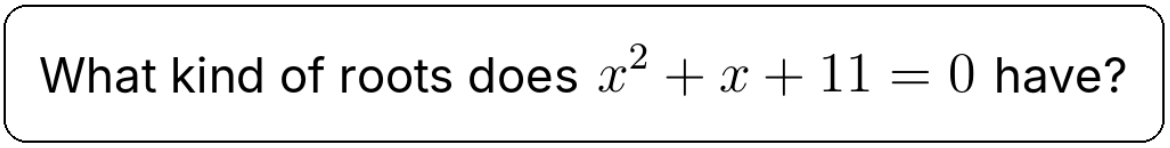
① b² – 4ac: the discriminant

② Positive, zero or negative

③ The kind of roots, without solving

1. With real a, b and c: positive gives two different real roots, 0 gives one double root, and negative gives two complex roots, not real.

Picture 2



$$b^2 - 4ac = 1 - 44 = -43$$ negative

$$x = \frac{-1 \pm i\sqrt{43}}{2}$$ two complex roots, not real

2. What kind of roots does x squared plus x plus 11 equals 0 have?
3. The discriminant is 1 minus 44, which is negative 43.
4. Negative, so two complex roots, not real.
5. Anyone who finds two real roots has made a mistake.
6. Here they are: negative 1, plus or minus i root 43, all over 2.

Picture 3

For which b does $3x^2 + bx + 27 = 0$ have a double root?

$$b^2 - 4(3)(27) = 0$$

a double root: the discriminant is 0

$$b^2 = 324$$

$$\boxed{b = 18 \text{ or } b = -18}$$

$3x^2 \pm 18x + 27 = 3(x \pm 3)^2$

7. For which b does 3 x squared plus b x plus 27 equals 0 have a double root?
8. A double root means the discriminant is 0.
9. 4 times 3 times 27 is 324, so b squared is 324.
10. So b is 18 or negative 18: both.
11. 3 x squared plus 18 x plus 27 is 3 times x plus 3, all squared.

Picture 4

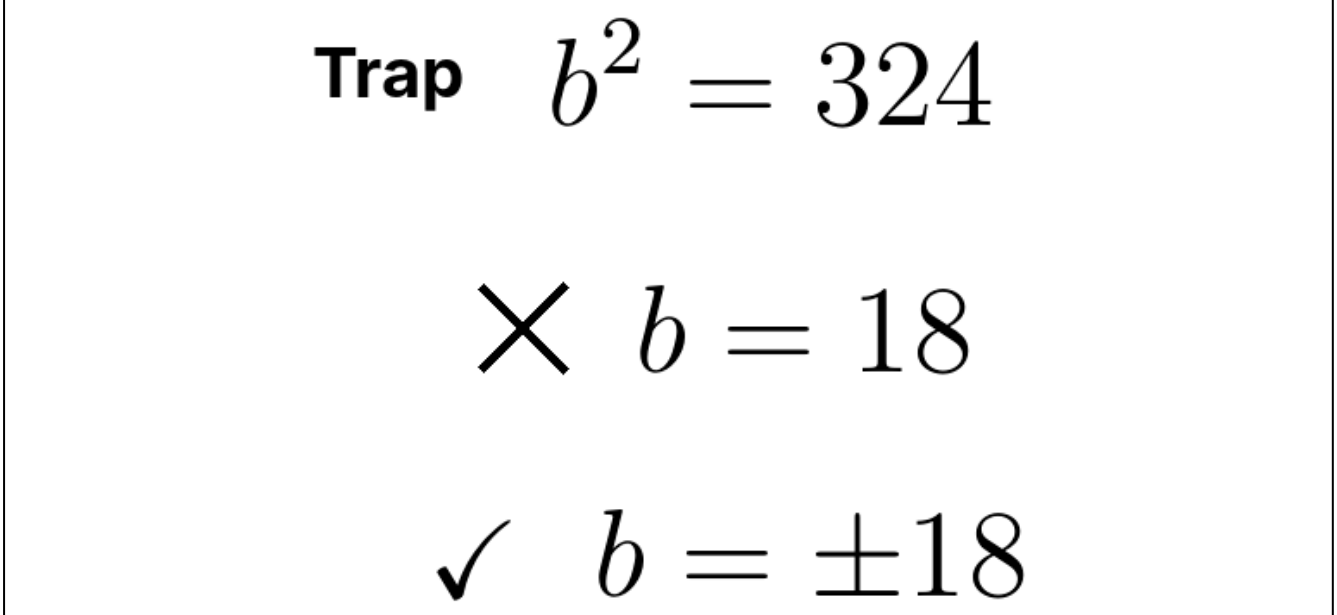
Trap $x^2 + x + 11 = 0$

$\times$ no solution

✓ $x = \dfrac{-1 \pm i\sqrt{43}}{2}$

12. Watch for the trap.
13. A negative discriminant isn't no solution: it means two complex roots.

Picture 5



14. And negative 18 squared is 324 too: keep both values.