The Discriminant: teacher script

QF07-V1 · QF07 Discriminant · teachers only. Without a screen, read each Say line and draw each Draw step on the board. About 97 seconds as a video.

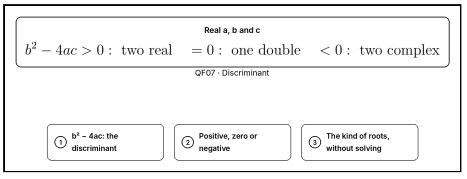
01



Say. The discriminant. b squared minus 4 a c, the part under the root, is called the discriminant. Whether it is positive, zero or negative tells you the kind of roots, without solving.

Draw. Write the title “The Discriminant” and the steps: 1. b² − 4ac: the discriminant; 2. Positive, zero or negative; 3. The kind of roots, without solving.

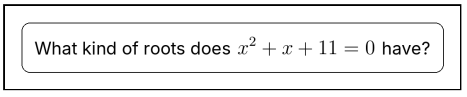
02



Say. 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.

Draw. Write the rule in a box: b² − 4ac > 0:\ two real = 0:\ one double < 0:\ two complex.

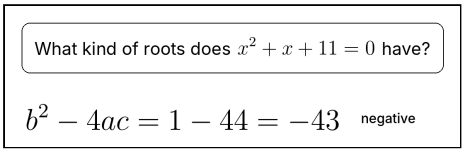
03



Say. What kind of roots does x squared plus x plus 11 equals 0 have?

Draw. Clear the board. Write “What kind of roots does x² + x + 11 = 0 have?” in a box at the top.

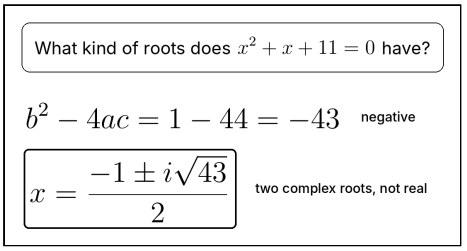
04



Say. The discriminant is 1 minus 44, which is negative 43.

Draw. Write b² − 4ac = 1 − 44 = −43 on the next line. Beside it, write “negative”.

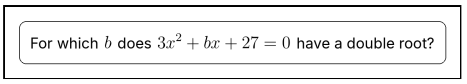
05



Say. Negative, so two complex roots, not real. Anyone who finds two real roots has made a mistake. Here they are: negative 1, plus or minus i root 43, all over 2.

Draw. Write x = (−1 ± i√43)/2 and box it on the next line. Beside it, write “two complex roots, not real”.

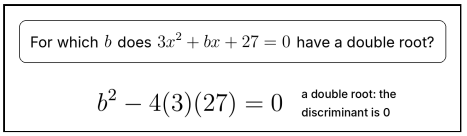
06



Say. For which b does 3 x squared plus b x plus 27 equals 0 have a double root?

Draw. Clear the board. Write “For which b does $3x^2 + bx + 27 = 0$ have a double root?” in a box at the top.

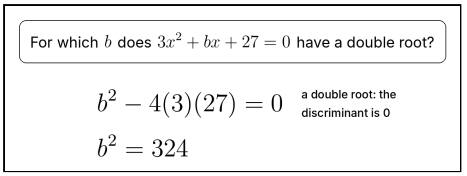
07



Say. A double root means the discriminant is 0.

Draw. Write $b^2 - 4(3)(27) = 0$ on the next line. Beside it, write “a double root: the discriminant is 0”.

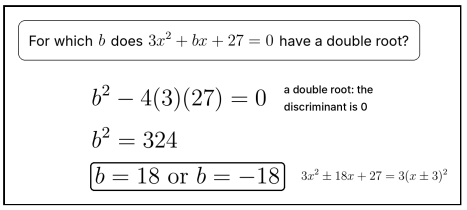
08



Say. 4 times 3 times 27 is 324, so b squared is 324.

Draw. Write $b^2 = 324$ on the next line.

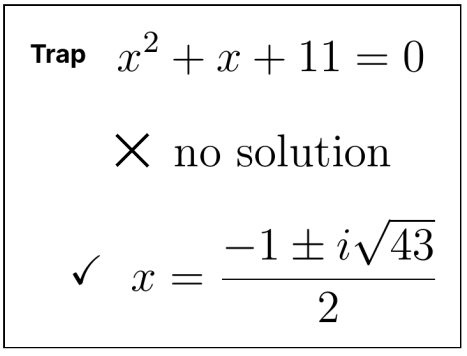
09



Say. So b is 18 or negative 18: both. 3 x squared plus 18 x plus 27 is 3 times x plus 3, all squared.

Draw. Write b = 18 or b = −18 and box it on the next line. Beside it, write “$3x^2 \pm 18x + 27 = 3(x \pm 3)^2$”.

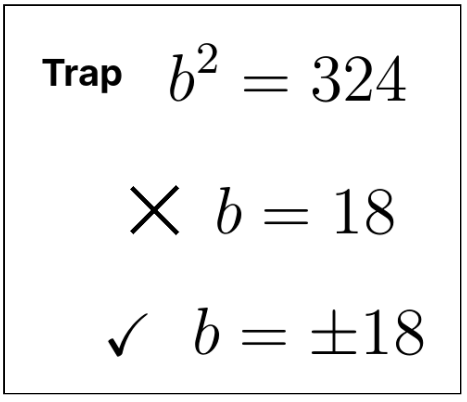
10



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

Draw. Clear the board. Write “Trap” and $x^2 + x + 11 = 0$. Below, write no solution and cross it out ×. Then write $x = (-1 \pm i\sqrt{43})/2$ with a tick ✓.

11



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

Draw. Clear the board. Write “Trap” and $b^2 = 324$. Below, write b = 18 and cross it out ×. Then write b = ± 18 with a tick ✓.

12

Your turn

Work out $b^2 - 4ac$.

Positive, zero or negative?

A double root: set it to 0.

Say. Now it is your turn. Work out b squared minus 4 a c. Is it positive, zero or negative? And for a double root, set it to 0.

Draw. Point to today's activity: Work out $b^2 - 4ac$. Positive, zero or negative? A double root: set it to 0.