Without Finding the Roots: teacher script

QE13-V1 · QE13 Use the roots without finding them · teachers only. Without a screen, read each Say line and draw each Draw step on the board. About 94 seconds as a video.

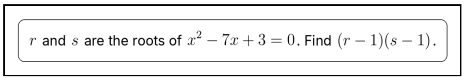
01



Say. Sometimes you can work something out without finding the roots. Rewrite it using only the sum and the product. Then put in negative b over a, and c over a. There is no need for the roots themselves.

Draw. Write the title “Without Finding the Roots” and the steps: 1. Rewrite with r + s and rs; 2. Put in −b/a and c/a; 3. No need for the roots.

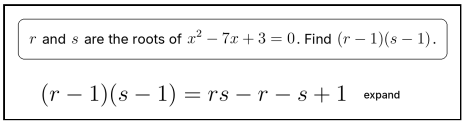
02



Say. r and s are the roots of x squared, minus 7 x, plus 3, equals 0. Find r minus 1, times s minus 1.

Draw. Clear the board. Write “r and s are the roots of x² − 7x + 3 = 0. Find (r − 1)(s − 1).” in a box at the top.

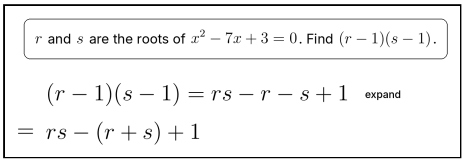
03



Say. Expand: r s, minus r, minus s, plus 1.

Draw. Write (r − 1)(s − 1) = rs − r − s + 1 on the next line. Beside it, write “expand”.

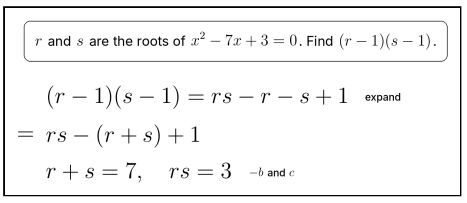
04



Say. That uses only the sum and the product: r s, minus r plus s, plus 1.

Draw. Write = rs − (r + s) + 1 on the next line.

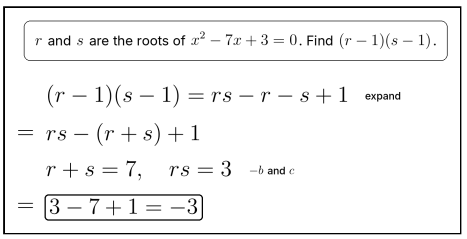
05



Say. Here the sum is 7, and the product is 3.

Draw. Write r + s = 7, rs = 3 on the next line. Beside it, write “−b and c”.

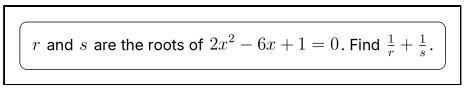
06



Say. So the answer is 3 minus 7 plus 1, which is negative 3.

Draw. Write = 3 − 7 + 1 = −3 and box it on the next line.

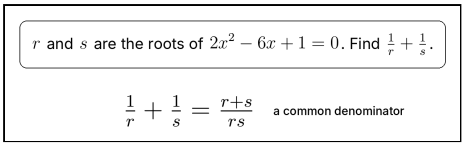
07



Say. r and s are the roots of 2 x squared, minus 6 x, plus 1, equals 0. Find 1 over r, plus 1 over s.

Draw. Clear the board. Write “r and s are the roots of 2x² − 6x + 1 = 0. Find \tfrac1r + \tfrac1s.” in a box at the top.

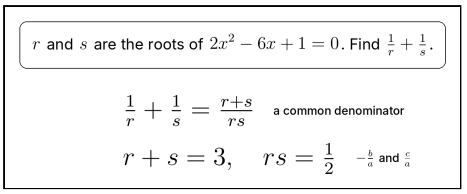
08



Say. Use a common denominator: r plus s, over r s.

Draw. Write \tfrac1r + \tfrac1s = (r + s)/(rs) on the next line. Beside it, write “a common denominator”.

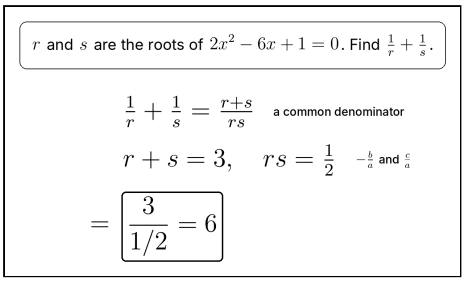
09



Say. The sum is 6 over 2, which is 3. The product is 1 over 2.

Draw. Write r + s = 3, rs = 1/2 on the next line. Beside it, write “−b/a and c/a”.

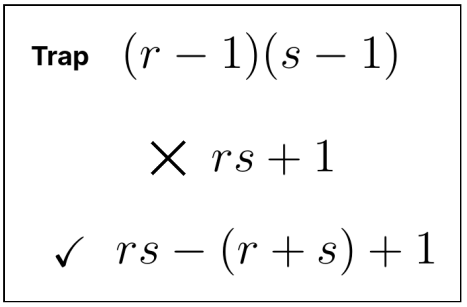
10



Say. So the answer is 3 divided by one half, which is 6.

Draw. Write = 3/(1/2) = 6 and box it on the next line.

11



Say. Watch for the trap: r minus 1, times s minus 1, is not r s plus 1. Don't forget the cross products, minus r and minus s.

Draw. Clear the board. Write “Trap” and (r − 1)(s − 1). Below, write rs + 1 and cross it out ×. Then write rs − (r + s) + 1 with a tick ✓.

12

Trap $\frac{1}{r} + \frac{1}{s}$

$\times \quad \frac{1}{r+s}$

$\checkmark \quad \frac{r+s}{rs}$

Say. Another trap: 1 over r, plus 1 over s, is not 1 over r plus s. Use a common denominator: r plus s, over r s.

Draw. Clear the board. Write “Trap” and \tfrac1r + \tfrac1s. Below, write 1/(r + s) and cross it out ×. Then write (r + s)/(rs) with a tick ✓.

13

Your turn

Rewrite with r + s and rs.

Then put in −b/a and c/a.

Say. Now it is your turn. Rewrite with the sum and the product, then put in negative b over a, and c over a.

Draw. Point to today’s activity: Rewrite with r + s and rs. Then put in −b/a and c/a.