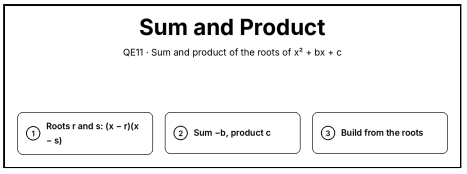
Sum and Product: teacher script

QE11-V1 · QE11 Sum and product of the roots of x² + bx + c · teachers only. Without a screen, read each Say line and draw each Draw step on the board. About 113 seconds as a video.

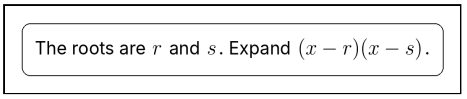
01



Say. The roots and the coefficients. If the roots are r and s, the quadratic is x minus r, times x minus s. So the sum of the roots is negative b, and the product is c. That lets you build a quadratic from its roots.

Draw. Write the title “Sum and Product” and the steps: 1. Roots r and s: (x − r)(x − s); 2. Sum −b, product c; 3. Build from the roots.

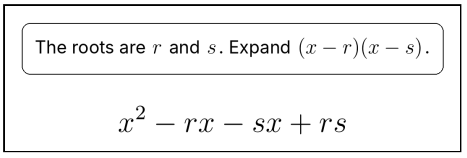
02



Say. Suppose the roots are r and s. Expand x minus r, times x minus s.

Draw. Clear the board. Write “The roots are r and s. Expand (x − r)(x − s).” in a box at the top.

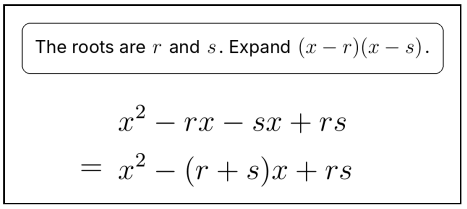
03



Say. The four products: x squared, minus r x, minus s x, plus r s.

Draw. Write x² − rx − sx + rs on the next line.

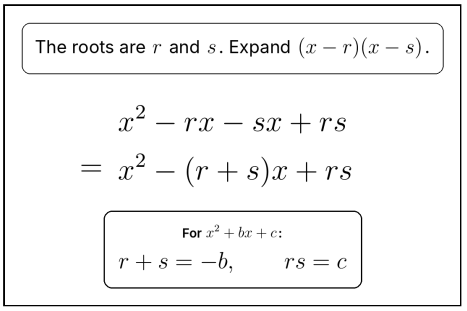
04



Say. Take out x from the middle terms: x squared, minus r plus s times x, plus r s.

Draw. Write = x² − (r + s)x + rs on the next line.

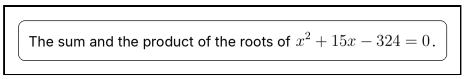
05



Say. So for x squared plus b x plus c, the sum of the roots is negative b, and the product is c.

Draw. Write the rule in a box: r + s = −b, rs = c.

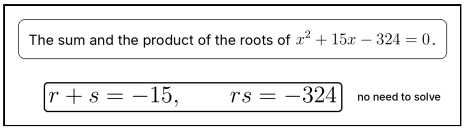
06



Say. Find the sum and the product of the roots of x squared, plus 15 x, minus 324, equals 0.

Draw. Clear the board. Write “The sum and the product of the roots of x² + 15x − 324 = 0.” in a box at the top.

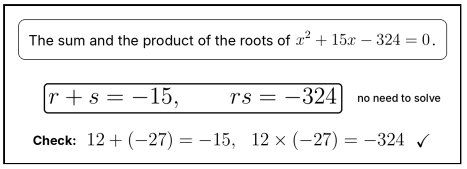
07



Say. There is no need to solve: the sum is negative 15, and the product is negative 324.

Draw. Write r + s = −15, rs = −324 and box it on the next line. Beside it, write “no need to solve”.

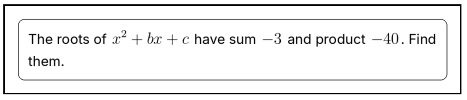
08



Say. The roots are 12 and negative 27, and they check.

Draw. Below, write “Check: 12 + (−27) = −15,\ \ 12 × (−27) = −324” and tick it ✓.

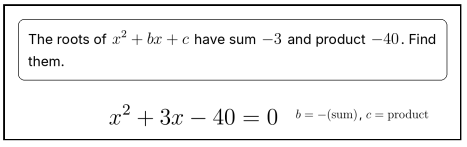
09



Say. The roots of x squared plus b x plus c have sum negative 3 and product negative 40. Find them.

Draw. Clear the board. Write “The roots of x² + bx + c have sum −3 and product −40. Find them.” in a box at the top.

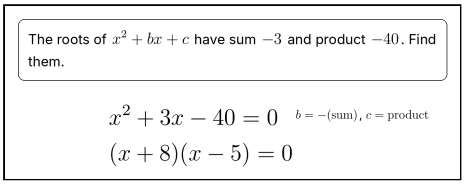
10



Say. b is the opposite of the sum, so b is 3. c is the product, negative 40.

Draw. Write x² + 3x − 40 = 0 on the next line. Beside it, write “b = −(sum), c = product”.

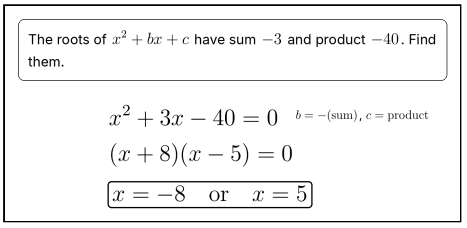
11



Say. Factor: product negative 40, sum 3: 8 and negative 5.

Draw. Write (x + 8)(x − 5) = 0 on the next line.

12



Say. The roots are negative 8 and 5.

Draw. Write x = −8 or x = 5 and box it on the next line.

13

Trap $x^2 + 15x - 324$

$\times\ r + s = 15$

$\checkmark\ \ r + s = -15$

Say. Watch for the trap: the sum is not 15. The sum is negative b: negative 15.

Draw. Clear the board. Write “Trap” and $x^2 + 15x - 324$. Below, write $r + s = 15$ and cross it out ×. Then write $r + s = -15$ with a tick ✓.

14

Trap roots -3 and 7

$\times\ (x - 3)(x + 7)$

$\checkmark\ \ (x + 3)(x - 7)$

Say. Another trap: roots negative 3 and 7 do not give x minus 3, times x plus 7. The root r comes from x minus r: x plus 3, times x minus 7.

Draw. Clear the board. Write “Trap” and roots −3 and 7. Below, write (x − 3)(x + 7) and cross it out ×. Then write (x + 3)(x − 7) with a tick ✓.

15

Your turn

Sum of the roots: −b. Product: c.

Root r: the factor x − r.

Say. Now it is your turn. The sum of the roots is negative b, the product is c, and a root r comes from the factor x minus r.

Draw. Point to today’s activity: Sum of the roots: −b. Product: c. Root r: the factor x − r.