Divide by a

QE12-V1 · storyboard · QE12 Sum −b/a and product c/a. Read each picture with its sentences.

Picture 1

The roots of $ax^2 + bx + c = 0$.

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$ **divide every term by** a

For $ax^2 + bx + c$**:**

$$r + s = -\frac{b}{a}, \qquad rs = \frac{c}{a}$$

1. Take a x squared, plus b x, plus c, equals 0.
2. Divide every term by a.
3. The roots don't change.
4. Now it is x squared plus b x plus c, with b over a and c over a.
5. So the sum is negative b over a, and the product is c over a.

Picture 2

The sum of the roots of $5x^2 + 59x - 12 = 0$.

$$\boxed{r + s = -\frac{59}{5}}$$

Check: $\frac{1}{5} + (-12) = -\frac{59}{5}$ ✓

6. Find the sum of the roots of 5 x squared, plus 59 x, minus 12, equals 0.
7. The sum is negative b over a: negative 59 over 5.
8. The roots are 1 fifth and negative 12, and they check.

Picture 3

The product of the roots of $35x^2 - 18x = 60$.

$35x^2 - 18x - 60 = 0$ **standard form first**

$$\boxed{rs = \frac{-60}{35} = -\frac{12}{7}}$$

9. Find the product of the roots of 35 x squared, minus 18 x, equals 60.
10. Standard form first: subtract 60.
11. The product is c over a: negative 60 over 35, which is negative 12 over 7.

Picture 4

Trap $35x^2 - 18x = 60$

$\times \; rs = \frac{60}{35}$

$\checkmark \quad rs = -\frac{60}{35}$

12. Watch for the trap: the product is not 60 over 35.
13. In standard form, c is negative 60.

Picture 5

Trap $5x^2 + 59x - 12 = 0$

$\times \; r + s = -59$

$\checkmark \quad r + s = -\frac{59}{5}$

14. Another trap: the sum is not negative 59.
15. Don't forget to divide by a: negative 59 over 5.