

Solve $x^2 - 6x = 16$

$$x^2 - 6x - 16 = 0 \quad (\text{set quadratic equal to } 0)$$

$$a = 1, b = -6, c = -16 \quad (\text{identify } a, b, c)$$

- Find pair of numbers that multiply to 16.
- Because c is negative, the sign of the pair will be different.
- We have to make the bigger number it appear to be the same sign as $b = -6$.
- Then we find the pair that works up to b by $16 = 15 \cdot -8$ and ...

$$\begin{array}{ll} 1 & -16 \\ 2 & -8 \\ 4 & -4 \end{array}$$

$$\begin{array}{ll} x^2 - 8x + 2x - 16 = 0 & (\text{rewrite the middle term with the pair}) \\ (x^2 - 8x) + (2x - 16) = 0 & (\text{group}) \\ x(x - 8) + 2(x - 8) = 0 & (\text{factor each group}) \\ (x - 8)(x + 2) = 0 & (x - 8) \text{ is common factor} \end{array}$$

To finish, we use the

Zero-factor property:
If $A \cdot B = 0$ then either $A = 0$ or $B = 0$

$$\begin{array}{l} x - 8 = 0 \quad \text{or} \quad x + 2 = 0 \\ x = 8 \quad \text{or} \quad x = -2 \\ \text{are solutions} \end{array}$$