

Equations vs Expressions
↓
Solve for the
variable.

↓
Simplify
or
factor

Worksheet 3-6: Solving Quadratic Equations by Factoring**Basic Skills/Knowledge Required for Solving Quadratic Equations:****1. Factoring**

- Common Factoring
- Factoring Trinomials as Binomial Factors

2. Zero Product Property

- When a number is multiplied by zero, the result is always zero.
- The zero product property states that, if the product of two numbers is zero, then one or both of the numbers must be zero.
- Thus, if $ab = 0$, then $a = 0$, or $b = 0$,
or $a = 0$, and $b = 0$.

Apply factoring and the Zero Product Property to solve quadratic equations in the form $ax^2 + bx + c = 0$ algebraically:

Step 1: Writing the given equation in the form $ax^2 + bx + c = 0$

Step 2: Factor $ax^2 + bx + c$

Step 3: Set each factor equal to zero (Zero Product Property)

Step 4: Solve for x for each factor

Practice:

1. Solve.

(a) $x^2 + 5x = 0$

Gcf = x

$x(x+5)$

$$x\left(\frac{x^2}{x} + \frac{5x}{x}\right) = 0$$

$$\rightarrow x(x+5) = 0$$

$$x = 0 \quad \text{or} \quad x + 5 = 0$$

$$\begin{array}{r} -5 \quad -5 \\ \hline \end{array}$$

$$x = 0 \quad \checkmark$$

or

$$x = -5 \quad \checkmark$$

Check:

$$\begin{array}{l} (-5)^2 + 5(-5) \\ = 25 + (-25) \quad \checkmark \\ = 0 \end{array}$$

$$\begin{array}{l} \hline 0^2 + 5(0) \\ = 0 + 0 \quad \checkmark \\ = 0 \end{array}$$

$$(b) x^2 + 7x + 12 = 0$$

$$(x+3)(x+4) = 0$$

$$\begin{array}{r} x+3=0 \quad \text{or} \quad x+4=0 \\ \underline{-3 \quad -3} \qquad \underline{-4 \quad -4} \\ x=-3 \quad \text{or} \quad x=-4 \end{array}$$

x^2	$12 = c$
x	3
x	4
$7 = b$	

Difference of Squares

$$(c) x^2 - 121 = 0 \quad a=1, b=0, c=-121$$

$$(x+11)(x-11)=0$$

$$\begin{array}{r} x+11=0 \text{ or } x-11=0 \\ -11 \quad -11 \qquad +11 \quad +11 \\ \hline x = -11 \text{ or } x = 11 \end{array}$$

$$\begin{array}{r|l} x^2 & -121 \\ \hline x & -11 \\ x & 11 \\ \hline & 0 \end{array}$$

$$a^2 - b^2 = (a-b)(a+b)$$

$$(d) 2x^2 - 8x - 10 = 0 \quad \text{GCF} = 2$$

$$2\left(\frac{2x^2}{2} - \frac{8x}{2} - \frac{10}{2}\right) = 0$$

$$2(x^2 - 4x - 5) = 0 \quad \checkmark$$

$$2(x-5)(x+1) = 0 \quad \checkmark$$

$$x-5=0 \quad \text{or} \quad x+1=0 \quad \checkmark$$

$$\begin{array}{r} x-5=0 \\ +5 \quad +5 \\ \hline x=5 \end{array} \quad \checkmark \quad \text{or} \quad \begin{array}{r} x+1=0 \\ -1 \quad -1 \\ \hline x=-1 \end{array} \quad \checkmark$$

$$\begin{array}{r|l} x^2 & -5 = c \\ \hline x & -5 \\ x & 1 \\ \hline & -4 = b \end{array}$$

$$\begin{array}{r} \text{(e) } x^2 = 49x \\ -49x \quad -49x \\ \hline x^2 - 49x = 0 \quad \checkmark \end{array}$$

$$x(x - 49) = 0 \quad \checkmark$$

$$x = 0 \quad \text{or} \quad \begin{array}{r} x - 49 = 0 \\ +49 \quad +49 \\ \hline x = 49 \quad \checkmark \end{array}$$

$$x = 0 \quad \checkmark \quad \text{or}$$

$$x = 49 \quad \checkmark$$

$$(f) m^2 = 10m - 24$$

$$m^2 - 10m + 24 = 0$$

$$(m-6)(m-4) = 0$$

$$m-6=0$$

$$m=6$$

or

$$m-4=0$$

$$m=4$$

m^2	$24 = c$
m	-6
m	-4
$-10 = b$	

$$(g) y(y+1)=12$$

$$y^2 + y = 12$$

$$y^2 + y - 12 = 0$$

$$(y-3)(y+4) = 0$$

$$y-3=0 \text{ or } y+4=0$$

$$y=3 \text{ or } \underline{y=-4}$$

$$\begin{array}{r|l} y^2 & -12 = c \\ y & -3 \\ y & 4 \\ \hline & +1 = b \end{array}$$

$$(h) (a-5)(a-8) = 28$$

2. The area of the rectangle can be modelled by $x(x-7)=44$. The length is x metres. The width is $(x-7)$ metres. Find the dimensions of the rectangle.

$$\text{Area: } x(x-7)=44$$

$$x^2 - 7x = 44$$

$$x^2 - 7x - 44 = 0$$

$$(x-11)(x+4) = 0$$

$$x-11=0 \quad \text{or} \quad x+4=0$$

$$x=11 \quad \text{or} \quad x=-4$$

$$\therefore x=11$$

**(rejected!)*

\(\therefore\) side length can't be negative!!

$$\text{length} = 11$$

$$\text{width} = 11-7=4$$

The dimensions are 11 m by 4 m.

$$\begin{array}{r|l} x^2 & -44 = c \\ x & -11 \\ x & 4 \\ \hline & -7 = b \end{array}$$