3.1 Solving Equations Using Addition and Subtraction

Goals:
- Solve linear equations using addition and subtraction.
- Use linear equations to solve real-life problems

Vocabulary:

Equivalent equations – equations with the same solutions as the original equation

Inverse Operations – operations that undo each other
(addition/subtraction, multiplication/division, squares/square roots)

Solution step – the result of applying a transformation to an equation when
solving the equation

Linear equation – equations in which the variable:
1. is raised to the first power
2. does not occur in the denominator
3. does not occur inside a square root symbol
4. does not occur inside an absolute value symbol

TRANSFORMATIONS THAT PRODUCE EQUIVALENT EQUATIONS

	Original Equation		Equivalent Equation
• Add the same number to *each* side.	$x - 3 = 5$ $+3 \mid +3$	Add _3_ .	$x = \underline{8}$
• Subtract the same number from *each* side.	$x + 6 = 10$ $-6 \mid -6$	Subtract _6_ .	$x = \underline{4}$
• Simplify one or both sides.	$x = 8 - 3$	Simplify.	$x = \underline{5}$
• Interchange the sides.	$7 = x$	Interchange.	$x = \underline{7}$

Example 1 *Adding to Each Side*

Solve $x - 9 = -20$.

$+9 \mid +9$

$\boxed{x = -11}$

Check $x - 9 = -20$

$-11 - 9 = -20$

$-20 = -20 \checkmark$

Example 2 — Simplifying First

Solve $n - (-8) = -2$.

clean it up! $n + 8 = -2$
$\quad\quad -8 \quad -8$
$\boxed{n = -10}$

check
$n - (-8) = -2$
$(-10) - (-8) = -2$
$-10 + 8 = -2$
$-2 = -2 \checkmark$

not cleaned up
$n - (-8) = -2$
$+ (-8) \quad + (-8)$
$\boxed{n = -10}$

✓ **Checkpoint** Solve the equation. Check your solution in the original equation.

1. $x - 7 = -15$ $+7 \quad\quad +7$ $\boxed{x = -8}$	**2.** $n - (-6) = 4$ $n + 6 = 4$ $-6 \quad -6$ $\boxed{n = -2}$	**3.** $-7 = 10 + y$ $-10 \quad -10$ $\boxed{-17 = y}$
4. $5 + (+z) = 21$ $5 + z = 21$ $-5 \quad\quad -5$ $\boxed{z = 16}$	**5.** $m - \lvert -3 \rvert = 14$ $m - 3 = 14$ $+3 \quad +3$ $\boxed{m = 17}$	**6.** $-8 = -b + (-2)$ $+(+2) \quad\quad -(-2)$ $-6 = -b$ $\boxed{6 = b}$ *cannot have negative variable* *take opposite of everything.*