3.2 Lesson

Key Vocabulary
linear expression, *p. 175*

A **linear expression** is an algebraic expression in which the exponent of each variable is 1.

no exponent with variable

Linear Expressions	$-4x$	$3x + 5y$	$5 - \frac{1}{6}x$
Nonlinear Expressions	$\frac{1}{2}x^2$	$-7x^3 + x$	$x^5 + 1$

You can use either a vertical or a horizontal method to add linear expressions.

Example 1 Adding Linear Expressions

Find each sum.

a. $(x - 2) + (3x + 8)$

Vertical method: Align like terms vertically and add.

$$\begin{array}{r} x - 2 \\ +\ 3x + 8 \\ \hline 4x + 6 \end{array}$$

Linear expressions are usually written with the variable term first.

▶ The sum is $4x + 6$.

b. $(-4y + 3) + (11y - 5)$

Horizontal method: Use properties of operations to group like terms and simplify.

$$\begin{aligned} (-4y + 3) + (11y - 5) &= -4y + 3 + 11y - 5 && \text{Rewrite the sum.} \\ &= -4y + 11y + 3 - 5 && \text{Commutative Property of Addition} \\ &= (-4y + 11y) + (3 - 5) && \text{Group like terms.} \\ &= 7y - 2 && \text{Combine like terms.} \end{aligned}$$

▶ The sum is $7y - 2$.

Try It **Find the sum.**

1. $(x + 3) + (2x - 1)$ $\quad x+3$, $+2x-1$, $3x+2$ $\quad 3x+2$

2. $(-8z + 4) + (8z - 7)$ $\quad -3$

3. $(4.5 - n) + (-10n + 6.5)$ $\quad -1n+4.5$, $+-10n+6.5$, $-11n+11$

4. $\left(\frac{1}{2}w - 3\right) + \left(\frac{1}{4}w + 3\right)$ $\quad \frac{3}{4}w$

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To subtract one linear expression from another, add the opposite of each term in the expression. You can use a vertical or a horizontal method.

Example 2 Subtracting Linear Expressions

Find each difference.

a. $(5x + 6) - (-x + 6)$

Vertical method: Align like terms vertically and subtract.

$$\begin{array}{r} (5x + 6) \\ -\,(-x + 6) \end{array} \quad \xrightarrow{\text{Add the opposite.}} \quad \begin{array}{r} 5x + 6 \\ +\quad x - 6 \\ \hline 6x \end{array}$$

▶ The difference is $6x$.

Common Error

When subtracting an expression, make sure you add the opposite of each term in the expression, not just the first term.

b. $(7.5y + 5) - (8.5y - 6)$

Horizontal method: Use properties of operations to group like terms and simplify.

$$\begin{aligned} (7.5y + 5) - (8.5y - 6) &= (7.5y + 5) + (-8.5y + 6) && \text{Add the opposite.} \\ &= 7.5y + (-8.5y) + 5 + 6 && \text{Commutative Property of Addition} \\ &= [7.5y + (-8.5y)] + (5 + 6) && \text{Group like terms.} \\ &= -y + 11 && \text{Combine like terms.} \end{aligned}$$

▶ The difference is $-y + 11$.

Try It **Find the difference.**

5. $(m - 3) - (-m + 12)$

$1m - 3$
$-\,-1m + 12$
$2m - 15$

6. $(-2c + 5) - (6.3c + 20)$

$-8.3c - 15$

In-Class Practice

1 I don't understand yet. 2 I can do it with help. 3 I can do it on my own. 4 I can teach someone else.

7. WRITING Describe how to distinguish a linear expression from a nonlinear expression. Give an example of each.