Unit 1: Solving Equations and Inequalities

1-1: Solving Linear Equations

Method 1

$$\frac{2(x+4)}{3} - 8 = 32$$

$$2(x+4) - 24 = 96 \quad \text{Multiply each side by 3 first.}$$

$$2x + 8 - 24 = 96$$

$$2x = 112$$

$$x = 56$$

OR

Method 2

$$\frac{2(x+4)}{3} - 8 = 32$$

$$\frac{2(x+4)}{3} = 40 \quad \text{Add 8 to each side first.}$$

$$2(x+4) = 120$$

$$x + 4 = 60$$

$$x = 56$$

Each solving method yields the same solution. Is one method better than the other?

Look at how the expression on the left side of the original equation is built up from x.

$$x \rightarrow x+4 \rightarrow 2(x+4) \rightarrow \frac{2(x+4)}{3} \rightarrow \frac{2(x+4)}{3} - 8$$

Notice how Method 2 applies these steps in reverse to isolate x. This is often a good strategy and can lead to simpler solution methods.

For more examples, please refer to the book on Savvas.

1-2: Solving Equations with Variables on Both Sides

A. What is the value of x in the equation shown?

$$3x - 10 + 4x = -2(x-4) + 9$$

$$3x - 10 + 4x = -2(x-4) + 9$$

Combine like terms. $\quad 7x - 10 = -2x + 8 + 9 \quad$ Distribute the -2.

$$7x + 2x = 8 + 9 + 10$$

Collect like terms on the same side of the equation.

$$9x = 27$$

$$\frac{9x}{9} = \frac{27}{9}$$

$$x = 3$$

For more examples, please refer to the book on Savvas.

1-4: Solving Inequalities in One Variable

Solve $\frac{7x-3}{-4} < 6$ and graph the solution.

$$\frac{7x-3}{-4} < 6$$

$$(-4)\,\frac{7x-3}{-4} > (-4)\,6$$

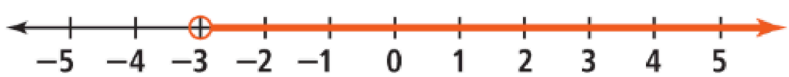
$$7x - 3 > -24$$

$$7x - 3 + 3 > -24 + 3$$

$$7x > -21$$

$$\frac{7x}{7} > -\frac{21}{7}$$

$$x > -3$$



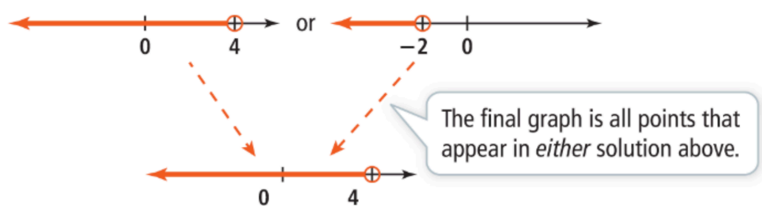
For more examples, please refer to the book on Savvas.

1-5: Compound Inequalities

Solve the compound inequality $5x - 7 < 13$ or $-4x + 3 > 11$. Graph the solution.

Solve each inequality.

$5x - 7 < 13$	or	$-4x + 3 > 11$
$5x - 7 + 7 < 13 + 7$		$-4x + 3 - 3 > 11 - 3$
$5x < 20$		$-4x > 8$
$\frac{5x}{5} < \frac{20}{5}$		$\frac{-4x}{-4} < \frac{8}{-4}$
$x < 4$		$x < -2$



For more examples, please refer to the book on Savvas.

1-6: Absolute Value Equations and Inequalities

Solve the inequality $|-2x - 8| < 6$.

$-2x - 8 < 6$	and	$-2x - 8 > -6$
$-2x - 8 + 8 < 6 + 8$	and	$-2x - 8 + 8 > -6 + 8$
$-2x < 14$	and	$-2x > 2$
$\frac{-2x}{-2} > \frac{14}{-2}$	and	$\frac{-2x}{-2} < \frac{2}{-2}$
$x > -7$	and	$x < -1$

Write the inequality and the absolute value inequality for the solution shown in the graph.

The inequality $-2 \leq x \leq 2$ is equivalent to $|x| \leq 2$.

For more examples, please refer to the book on Savvas.

Unit 2: Linear Equations

2-1: Slope-Intercept Form

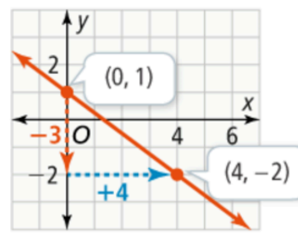
Step 3

Write the equation in the form $y = mx + b$.

Substitute $-\frac{3}{4}$ for m and 1 for b.

The equation of the line in slope-intercept form is $y = -\frac{3}{4}x + 1$.

What is the equation of the line in slope-intercept form?



Step 1

Find the slope between two points on the line.

The line passes through $(0,\ 1)$ and $(0,\ 1)$ $(4,\ -2)$.

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3}{4}$$

Step 2

Find the y-intercept.

The line intersects the y-axis at $(0,\ 1)$, so the y-intercept is 1.

For more examples, please refer to the book on Savvas.

2-2: Point-Slope Form

A. A line with a slope of $\frac{1}{2}$ passes through the point $(3, -2)$. What form can you use to write the equation of the line? What is the equation in that form?

The slope and a point on the line are known, so use point-slope form.

$$y - y_1 = m(x - x_1)$$

$$y - (-2) = \frac{1}{2}(x - 3)$$ Substitute 3 for x_1, -2 for y_1, and $\frac{1}{2}$ for m.

$$y + 2 = \frac{1}{2}(x - 3)$$

The equation in point-slope form is $y + 2 = \frac{1}{2}(x - 3)$.

For more examples, please refer to the book on Savvas.

2-4: Parallel and Perpendicular Lines

The constant of proportionality is the ratio of the two quantities in a proportional relationship. It is represented as the value of k in the equation y = kx.

Example: If y = 10 when x = 2, then the constant of proportionality is k = 10/2 = 5. The equation is y = 5x.

For more examples, please refer to the book on Savvas.

2-4: Parallel and Perpendicular Lines

Step 2

Start with point-slope form. Use the given point and the slope of the parallel line.

$$y - y_1 = m(x - x_1)$$

$$y - 9 = \frac{3}{4}(x - 8)$$

$$y - 9 = \frac{3}{4}x - 6$$

Change point-slope form to slope-intercept form.

$$y = \frac{3}{4}x + 3$$

The equation of the line is $y = \frac{3}{4}x + 3$.

What is the equation of the line in slope-intercept form that passes through the point $(8, 9)$ and is parallel to the graph of $y = \frac{3}{4}x - 2$?

Parallel lines are lines in the same plane that never intersect. Nonvertical lines that are parallel have the same slope but different *y*-intercepts.

Step 1

Identify the slope of the given line.

$$y = \frac{3}{4}x - 2$$

The slope is $\frac{3}{4}$. The slope of a parallel line will be the same.

For more examples, please refer to the book on Savvas.

Unit 3: Linear Functions

3-1: Relations and Functions

What are the domain and the range of the function?

x	1	2	3	4	5
y	11	12	13	13	13

inputs

outputs

A **relation** is a set of ordered pairs. A **function** is a relation in which each input is assigned to exactly one output. The **domain** of a function is the set of inputs. The **range** of a function is the set of outputs. By convention, inputs are *x*-values and outputs are *y*-values.

The domain of this function is the set of *x*-values, $\{1, 2, 3, 4, 5\}$. The range is the set of *y*-values, $\{11, 12, 13\}$.

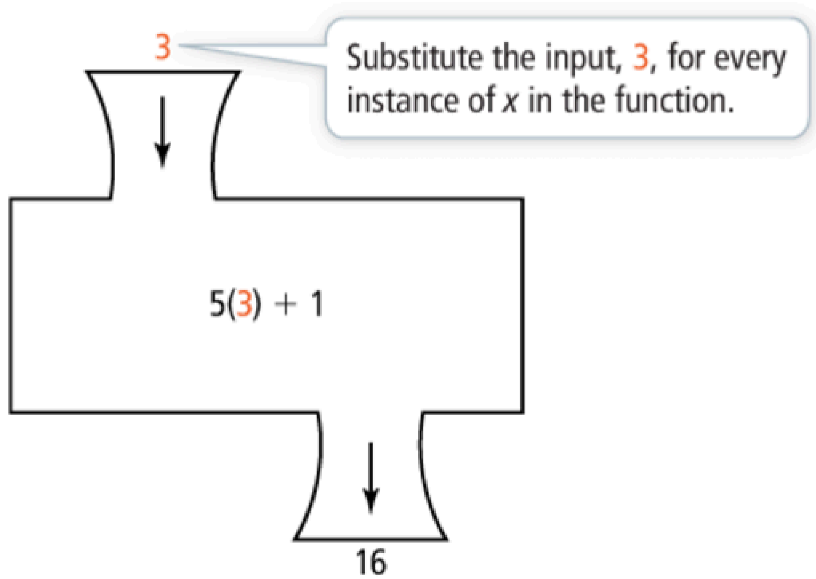
Even though 3, 4, and 5 all map to 13, the relation is still a function since each element in the domain maps to exactly one output.

For more examples, please refer to the book on Savvas.

3-2: Linear Functions

B. What is the value of $g(x) = 5x + 1$ when $x = 3$?

Evaluate $g(x) = 5x + 1$ for $x = 3$.



If $g(x) = 5x + 1$, then $g(3) = 16$.
$g(3)$ means the value of the function g when $x = 3$.