# Linear Equations Practice Worksheet (Teacher Version)

## Document Information

**Topic:** Algebra and graphs

**Grade Level:** 9

**Difficulty:** medium

**Estimated Duration:** 45 minutes

**Detail Level:** 6

## Learning Objectives

1. Understand how to set up and solve linear equations.

2. Apply linear equations to real-world problems.

3. Graph linear equations and interpret the results.

4. Solve systems of linear equations using substitution and elimination.

## Worked Examples

**Example 1:** A car rental company charges a flat fee of $50 plus $0.20 per mile driven. Write an equation to represent the total cost (C) based on the number of miles driven (m). Then, find the total cost if 150 miles are driven.

**Solution Steps:**

1. Identify the fixed cost: $50.

2. Identify the variable cost: $0.20 per mile.

3. Set up the equation: C = 50 + 0.20m.

4. Substitute m = 150 into the equation: C = 50 + 0.20(150).

5. Calculate: C = 50 + 30 = 80.

**Answer:** $80

**Explanation:** The equation C = 50 + 0.20m represents the total cost of renting a car based on the miles driven. By substituting 150 miles into the equation, we find that the total cost is $80.

**Example 2:** Solve the system of equations: 2x + 3y = 12 and x - y = 2.

**Solution Steps:**

1. From the second equation, express x in terms of y: x = y + 2.

2. Substitute x in the first equation: 2(y + 2) + 3y = 12.

3. Expand and simplify: 2y + 4 + 3y = 12.

4. Combine like terms: 5y + 4 = 12.

5. Subtract 4 from both sides: 5y = 8.

6. Divide by 5: y = 8/5.

7. Substitute y back into x = y + 2: x = 8/5 + 2 = 18/5.

**Answer:** x = 18/5, y = 8/5

**Explanation:** By solving the system of equations, we find the values of x and y that satisfy both equations simultaneously.

## Practice Questions

Q1. A phone plan costs $30 per month plus $0.10 per text message. Write an equation for the total cost (C) based on the number of text messages (t). Calculate the total cost if 200 messages are sent. [3 marks]

**Answer:** Answer = 5

**Hint:** Remember to include both the fixed monthly fee and the variable cost per message.

Q2. You are saving for a new laptop that costs $800. You currently have $200 and plan to save $50 each week. Write an equation to represent your savings over time (S) based on the number of weeks (w). How many weeks will it take to save enough? [4 marks]

**Answer:** Solution requires step-by-step working (see full solution guide)

**Hint:** Set up the equation and solve for w.

Q3. Graph the equation y = 2x + 1. Identify the y-intercept and the slope. [3 marks]

**Answer:** See graph with key points marked

**Hint:** The y-intercept is where the line crosses the y-axis.

Q4. Solve the following system of equations: 3x + 4y = 24 and x - 2y = -1. [5 marks]

**Answer:** x = 6

**Hint:** You can use substitution or elimination to solve this system.

Q5. A store sells notebooks for $2 each and pens for $1 each. If you buy a total of 10 items and spend $16, set up a system of equations to represent this situation and solve for the number of notebooks and pens purchased. [5 marks]

**Answer:** Solution requires step-by-step working (see full solution guide)

**Hint:** Let x be the number of notebooks and y be the number of pens.

Q6. The perimeter of a rectangle is 50 meters. If the length is twice the width, find the dimensions of the rectangle. [4 marks]

**Answer:** Answer = 30

**Hint:** Use the perimeter formula P = 2(l + w) and express l in terms of w.

## Quick Reference

**Key Definitions:**

• Linear Equation: An equation that makes a straight line when graphed.

• Slope: The steepness of a line, calculated as the change in y over the change in x.

• Y-intercept: The point where the line crosses the y-axis.

**Key Formulas:**

• Slope-Intercept Form: y = mx + b

• Perimeter of a Rectangle: P = 2(l + w)

**Key Facts:**

• The slope of a line is calculated as (y2 - y1) / (x2 - x1).

• To solve a system of equations, you can use substitution or elimination.