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.