

# 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 represent real-world situations using linear equations.
2. Solve linear equations and interpret the solutions in context.
3. Graph linear equations and understand the significance of the slope and y-intercept.
4. Solve systems of linear equations using substitution and elimination methods.

## Worked Examples

{'examples': [{'problem': 'A car rental company charges a flat fee of \$50 plus \$0.20 per mile driven. Write a linear equation to represent the total cost (C) based on the number of miles driven (m). Then calculate the total cost for driving 150 miles.', 'steps': ['Identify the fixed cost and variable cost: Fixed cost = \$50, Variable cost = \$0.20 per mile.', 'Write the equation:  $C = 50 + 0.20m$ .', 'Substitute  $m = 150$  into the equation:  $C = 50 + 0.20(150)$ .', 'Calculate:  $C = 50 + 30 = \$80$ .'], 'answer': '\$80', 'explanation': 'The total cost is calculated by adding the fixed fee to the variable cost based on the miles driven.'}, {'problem': 'Two friends, Alex and Jamie, are saving money for a concert. Alex saves \$15 each week, while Jamie saves \$10 each week. If Alex has already saved \$30, write a system of equations to represent their savings after 'w' weeks. Determine after how many weeks they will have saved the same amount.', 'steps': ['Write the equations: Alex's savings:  $A = 30 + 15w$ , Jamie's savings:  $J = 10w$ .', 'Set the equations equal to each other:  $30 + 15w = 10w$ .', 'Solve for w:  $30 = 10w - 15w$ ,  $30 = -5w$ ,  $w = -6$  (not possible).', 'Recheck equations: They will never have the same savings if they continue saving at these rates.'], 'answer': 'They will never have the same amount saved.', 'explanation': 'The system of equations shows that Alex's savings grow faster than Jamie's, so they will not meet.'}]}

## Practice Questions

Q1. A mobile phone plan costs \$25 per month plus \$0.10 per text message. Write an equation for the total cost (C) based on the number of text messages (t) sent. Calculate the total cost if 200 messages are sent. [2 marks]

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

Q2. A local gym charges a \$50 registration fee and \$30 per month. Write a linear equation to represent the total cost (C) for 'm' months. How much will it cost for 6 months? [2 marks]

*Hint: Use the equation  $C = 50 + 30m$ .*

Q3. Solve the system of equations:  $2x + 3y = 12$  and  $x - y = 3$ . Interpret the solution in the context of a real-world scenario. [4 marks]

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

Q4. A store sells pencils for \$0.50 each and erasers for \$1.00 each. If a student buys a total of 10 items for \$6.50, set up a system of equations to represent this situation and solve for the number of pencils (p) and erasers (e). [4 marks]

*Hint: You will have two equations: one for the total number of items and another for the total cost.*

Q5. The temperature in a city is expected to rise by 2 degrees each hour. If the current temperature is 15 degrees, write an equation to represent the temperature (T) after 'h' hours. What will the temperature be after 5 hours? [2 marks]

*Hint: Use  $T = 15 + 2h$ .*

Q6. A taxi charges a base fare of \$3 plus \$2 per mile. Write an equation for the total fare (F) based on the distance traveled (d). Calculate the fare for a 10-mile trip. [2 marks]

*Hint: Remember to add the base fare to the variable cost.*

## Quick Reference

{'definitions': [{'term': 'Linear Equation', 'definition': 'An equation that makes a straight line when graphed, typically in the form  $y = mx + b$ .'}, {'term': 'Slope', 'definition': 'The rate of change of a line, represented as 'm' in the equation  $y = mx + b$ .'}, {'term': 'Y-intercept', 'definition': 'The point where the line crosses the y-axis, represented as 'b' in the equation  $y = mx + b$ .'}], 'formulas': [{'name': 'Equation of a Line', 'expression': ' $y = mx + b$ '}, {'name': 'Slope Formula', 'expression': ' $m = (y_2 - y_1) / (x_2 - x_1)$ '}], 'key\_facts': ['A linear equation can be solved using various methods including graphing, substitution, and elimination.', 'The solution to a system of equations is the point where the lines intersect on a graph.']}