Mathematics
Grade 8

TOPIC:
Algebraic Equations

Setting Up and Interpreting Equations

1. Set up an equation for each problem situation. Do not solve.

   a) A number decreased by 12 equals 35.

   b) Three times a number, increased by 8, equals 29.

   c) Sarah has R50 more than twice what John has. If Sarah has R180, write an equation to find how much John has.

2. The equation $\mathbf{3x + 15 = 45}$ describes a situation where Tom earns R15 per day plus R3 for each task he completes. If he earned R45 in one day, what does $\boldsymbol{x}$ represent?

3. Write an equation to represent: "The perimeter of a rectangle is 48 cm. The length is 4 cm more than the width."

4. Interpret the equation $\mathbf{2(n + 5) = 30}$. What situation could this represent?

Identifying Variables and Constants

5. Identify the variables and constants in each formula or equation:

   a) $P = 2l + 2w$ b) $y = 5x - 7$ c) $A = \pi r^2$

Solving Equations by Inspection

6. Solve each equation by inspection:

   a) $x + 9 = 15$

   b) $3y = 24$

   c) $m - 7 = 12$

   d) $2a + 1 = 11$

   e) $18 \div n = 6$

   f) $5p - 5 = 20$

Substitution and Evaluating Expressions

7. Find the value of each expression when $x = 4$ and $y = -2$:

   a) $3x + 5$

   b) $2y - 7$

   c) $x^2 + 3y$

   d) $(4x - y) \div 2$

8. Evaluate each expression when $a = -3$, $b = 4$, and $c = -1$:

   a) $2a + 3b$

   b) $a^2 - 2c$

   c) $3(b - a) + c^2$

Solving Equations Using Inverses

9. Solve the following equations using additive and multiplicative inverses. Show all steps.

   a) $x + 15 = 32$

   b) $m - 18 = 7$

   c) $6y = 42$

   d) $n \div 4 = 9$

   e) $4x + 7 = 31$

   f) $\frac{x}{3} = 8$

   g) $-2x + 5 = 13$

Equations with Fractions

10. Solve the following equations involving fractions. Show all steps.

    a) $\frac{x}{5} + 3 = 7$

    b) $\frac{2x}{3} = 10$

    c) $\frac{x+4}{2} = 9$

    d) $\frac{3}{4x} - 1 = 5$

Solving Equations Using Laws of Exponents

11. Solve for the variable using laws of exponents:

    a) $2^x = 16$

    b) $3^x = 27$

    c) $5^{x+1} = 125$

    d) $2.2^x = 8$

    e) $3^{x-1} = 1$

    f) $3^{2(x-1)} = 81$

    g) $\frac{1}{3}.3^2 = 1$

    h) $3.\left(\frac{1}{3}\right)^{x-1} = \frac{1}{3}$

    i) $\frac{1}{8}.2^{2x} + 8 = 9$

Generating Tables Using Substitution

12.1 Use substitution to complete the table of ordered pairs for the equation $\mathbf{y = 2x - 3}$:

x	-3	-2	-1	0	1	2	3
y							

12.2 Complete the table of ordered pairs for the equation $\boldsymbol{y = x^2 - 4}$:

x	-3	-2	-1	0	1	2	3
y							

Bonus Question

13.1 A taxi charges a base fare of R8 plus R5 per kilometer traveled.

a) Write an equation for the total cost (C) in terms of kilometers (k).

b) How much would a 12 km trip cost?

c) If a trip cost R53, how many kilometers were traveled?

13.2 A mobile phone plan costs R150 per month plus R0,80 per minute for calls. Write an equation for the total cost C in terms of minutes m used. If someone's bill was R230, how many minutes did they use?

Equations involving distributive law

14. Solve the following multi-step equations. Show all working.

a) $3(x + 4) = 27$

b) $2(y - 5) + 8 = 20$

c) $5x - 3(x - 2) = 14$

d) $4(2m + 1) - 3m = 29$

e) $5 + 2(x + 1) = 5(x - 1)$

f) $-4(x + 2) = 3(2 - x) + 1$

g) $\frac{1}{2}(2 + 4x) = 7(x - 1) - 2$

h) $2x^2 - 7 - x(2x+1) = 0$

Equations with Variables on Both Sides

15. Solve each equation by collecting like terms. Show all steps.

a) $5x + 7 = 3x + 19$

b) $8y - 12 = 2y + 24$

c) $4n + 15 = 7n - 6$

d) $8 - 3x = 2x - 27$

e) $-5x - 2 = 6 - 4x$

f) $7x - 3 - 9x = 8 - 4x + 6$

Word Problems Requiring Equation Setup and Solving

16. Set up an equation and solve each problem.

a) The sum of two consecutive numbers is 47. Find the two numbers.

b) A rectangle has a perimeter of 64 cm. The length is 8 cm more than the width. Find the dimensions.

c) Peter is 5 years older than his sister Mary. The sum of their ages is 31. How old is each person?

d) A school bought some calculators for R180 each. If they had bought 3 fewer calculators, they would have spent R540 less. How many calculators did they buy?

e) The sum of three consecutive odd numbers is equal to 39. Determine the three numbers.

Creating Equations from Tables

17. Look at the table below and write an equation in the form $y = mx + c$ that represents the relationship between x and y:

x	1	2	3	4	5
y	5	8	11	14	17

Complex Fraction Equations

18. Solve the following equations involving fractions:

a) $\frac{x-2}{4} = 3$ b) $\frac{x}{2} + \frac{x}{3} = 10$ c) $\frac{2x+1}{5} = \frac{x-3}{2}$

Applied Problems with Formulas

19. Use the given formulas to solve:

a) The formula for the area of a triangle is $A = \frac{1}{2}bh$. If a triangle has an area of 36 cm² and a base of 9 cm, find the height.

b) The formula for converting Celsius to Fahrenheit is $F = \left(\frac{9}{5}\right)C + 32$. If the temperature is 95°F, what is it in Celsius?

c) The formula for the volume of a cylinder is $V = \pi r^2 h$. If a cylinder has a volume of 314 cm³ and a height of 10 cm, find the radius (use $\pi \approx 3.14$).

CAPS CLARIFICATION:

Equations

- **Revise** the following done in Grade 7:
  - set up equations to describe problem situations
  - analyse and interpret equations that describe a given situation
  - solve equations by inspection
  - determine the numerical value of an expression by substitution.
  - identify variables and constants in given formulae or equations
- Extend solving equations to include:
  - Using additive and multiplicative inverses
  - Using laws of exponents
- Use substitution in equations to generate tables of ordered pairs