

Student Name:	Class:
Student ID:	Date:
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### **Assessment Details**

<b>Duration:</b> 30 minutes	Total Marks: 100	
Topics Covered:	<ul><li> Variables and Constants</li><li> Basic Operations</li><li> Linear Equations</li><li> Algebraic Expressions</li></ul>	

# **Instructions to Students:**

- 1. Read all questions carefully before attempting.
- 2. Show all working out marks are awarded for method.
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- 4. Write your answers in the spaces provided.
- 5. If you need more space, use the additional pages at the end.
- 6. Time management is crucial allocate approximately 1 minute per mark.

# Section A: Multiple Choice [20 marks]

**Question 1** 

[2 marks]

What is the value of x in the equation 2x + 5 = 11?

A) 
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B) 
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C) 
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D) 
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**Question 2** 

[2 marks]

Simplify the expression: 3x + 2 + 2x - 1

A) 
$$5x + 1$$

C) 
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**Question 3** 

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What is the difference between a variable and a constant?

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**Question 4** 

[2 marks]

Solve the equation: x - 2 = 7

A) 
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B) 
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C) 
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$$x = 12$$

Question 5	[2 marks]
Simplify the expression: $2x + 3 + 4x - 2$	
A) 6x + 1	B) 6x - 1
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# Section B: Short Answer Questions [40 marks]

Question 6	[8 marks]
Simplify the expression: 2x + 3 + 4x - 2	
Question 7	[8 marks]
Solve the equation: x - 2 = 7	
Question 8	[8 marks]
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# Rubric

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# Implementation Guidelines The assessment will be administered in a 30-minute class period. The teacher will provide clear instructions and examples before each section. Students will be allowed to use a calculator and algebraic formula sheet during the assessment.

# **Differentiation Options**

To accommodate diverse learners, the following differentiation options will be available:

- For students with learning difficulties:
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# Multiple Intelligence Approaches

The assessment is designed to incorporate multiple intelligence approaches, including:

- Linguistic (reading and writing algebraic expressions and equations)
- Logical-mathematical (solving algebraic problems and puzzles)
- Visual-spatial (using graphs and charts to visualize algebraic concepts)
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- Intrapersonal (reflecting on own understanding and application of algebraic concepts)

# Clear Success Criteria

The clear success criteria for this assessment are:

- Students will be able to define and identify variables and constants.
- Students will be able to apply basic operations to simplify algebraic expressions.
- Students will be able to solve linear equations with one variable.
- Students will be able to apply algebraic concepts to solve real-world problems.

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The evidence of student learning will be collected through:

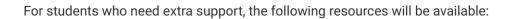
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The feedback opportunities for this assessment will include:

- Immediate feedback on multiple-choice questions
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# Additional Resources



- Algebraic formula sheet
- Graphic organizer for problem-solving
- Online resources and tutorials for algebra

# Glossary

The following terms will be used in this assessment:

- Variable: a letter or symbol that represents a value
- Constant: a number
- Linear equation: an equation in which the highest power of the variable is 1
- Algebraic expression: a combination of variables, constants, and mathematical operations

# Assessment Tips

The following tips will help you succeed on this assessment:

- Read each question carefully and make sure you understand what is being asked.
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- Use a calculator and algebraic formula sheet to help with calculations.
- Write your answers in the spaces provided.
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- Time management is crucial allocate approximately 1 minute per mark.

### Conclusion

This assessment is designed to evaluate your understanding of basic operations and equations in algebra. It is a 30-minute formative assessment that consists of multiple-choice, short-answer, and essay questions. The assessment is designed to align with Bloom's Taxonomy and incorporates multiple intelligence approaches. The clear success criteria for this assessment are that you will be able to define and identify variables and constants, apply basic operations to simplify algebraic expressions, solve linear equations with one variable, and apply algebraic concepts to solve real-world problems.

# **Advanced Concepts**

As students progress in their understanding of algebra, they will encounter more advanced concepts that build upon the foundational knowledge they have acquired. One such concept is the use of quadratic equations to model real-world phenomena. Quadratic equations are polynomial equations of degree two, which means the highest power of the variable is two. These equations can be used to describe a wide range of situations, including the trajectory of a projectile, the growth of a population, and the design of electronic circuits.

# **Example: Quadratic Equation**

The equation  $x^2 + 4x + 4 = 0$  is a quadratic equation. To solve for x, we can use the quadratic formula:  $x = (-b \pm \sqrt{b^2 - 4ac}) / 2a$ , where a, b, and c are the coefficients of the quadratic equation. In this case, a = 1, b = 4, and c = 4. Plugging these values into the formula, we get  $x = (-4 \pm \sqrt{4^2 - 4^4 + 4}) / 2^4$ , which simplifies to  $x = (-4 \pm \sqrt{16 - 16}) / 2$ , and further simplifies to  $x = (-4 \pm \sqrt{0}) / 2$ , resulting in x = -2.

### Case Study: Projectile Motion

A ball is thrown upwards from the ground with an initial velocity of 20 m/s. The height of the ball above the ground can be modeled using the quadratic equation  $h(t) = -4.9t^2 + 20t$ , where h is the height in meters and t is the time in seconds. To find the maximum height reached by the ball, we can use the vertex formula: t = -b / 2a, where a = -4.9 and b = 20. Plugging these values into the formula, we get t = -20 / (2\*(-4.9)), which simplifies to t = -20 / -9.8, resulting in t = 2.04 seconds. Substituting this value back into the equation  $h(t) = -4.9t^2 + 20t$ , we get  $h(2.04) = -4.9(2.04)^2 + 20(2.04)$ , which simplifies to h(2.04) = -4.9(4.16) + 40.8, and further simplifies to h(2.04) = -20.38 + 40.8, resulting in h(2.04) = 20.42 meters.

# **Graphing and Functions**

Graphing and functions are essential components of algebra, as they provide a visual representation of the relationships between variables. A graph is a pictorial representation of a function, which is a relation between a set of inputs (called the domain) and a set of possible outputs (called the range). Functions can be represented in various forms, including graphs, tables, and equations.

### **Example: Linear Function**

The equation y = 2x + 1 is a linear function, where y is the dependent variable and x is the independent variable. To graph this function, we can use the slope-intercept form: y = mx + b, where m is the slope and b is the y-intercept. In this case, m = 2 and b = 1.

The graph of this function is a straight line with a slope of 2 and a y-intercept of 1.

# Case Study: Cost-Benefit Analysis

A company is considering two different production methods for a new product. Method A has a fixed cost of \$10,000 and a variable cost of \$5 per unit, while Method B has a fixed 6681 6681 6681 variable cost of \$10 per unit. The total cost of each method can be represented by the equations:  $C_A = 10,000 + 5x$  and  $C_B = 5,000 + 10x$ , where x is the number of units produced. To determine which method is more cost-effective, we can graph the two functions and compare their intersection points.

# **Systems of Equations**

Systems of equations are a fundamental concept in algebra, as they allow us to model and solve complex problems that involve multiple variables. A system of equations is a set of two or more equations that have the same variables. These equations can be linear or nonlinear, and they can be solved using various methods, including substitution, elimination, and graphing.

# **Example: System of Linear Equations**

The system of equations x + y = 4 and 2x - 2y = -2 can be solved using the substitution method. We can solve the first equation for x: x = 4 - y. Substituting this expression into the second equation, we get 2(4 - y) - 2y = -2, which simplifies to 8 - 2y - 2y = -2, and further simplifies to 8 - 4y = -2. Solving for y, we get -4y = -10, resulting in y = 2.5. Substituting this value back into the first equation, we get x + 2.5 = 4, which simplifies to x = 1.5.

# Case Study: Resource Allocation

A company has two machines that produce two different products. Machine A produces 200 units of Product X and 100 units of Product Y per hour, while Machine B produces 100 units of Product X and 200 units of Product Y per hour. The company has a limited capacity of 800 units of Product X and 600 units of Product Y per day. The production levels of the two machines can be represented by the equations: 200x + 100y = 800 and 100x + 200y = 600, where x is the number of hours Machine A operates and y is the number of hours Machine B operates. To determine the optimal production levels, we can solve this system of equations using the graphical method.

# **Inequalities and Systems of Inequalities**

Inequalities and systems of inequalities are used to model and solve problems that involve constraints and limitations. An inequality is a statement that one expression is greater than, less than, or equal to another expression. Systems of inequalities are sets of two or more inequalities that have the same variables. These inequalities can be linear or nonlinear, and they can be solved using various methods, including graphing and substitution.

### **Example: Linear Inequality**

The inequality 2x + 3 > 5 can be solved by isolating the variable x. Subtracting 3 from both sides, we get 2x > 2. Dividing both sides by 2, we get x > 1. This inequality can be graphed on a number line, with the solution set being all values of x greater than 1.

# Case Study: Budgeting

A person has a budget of \$1,000 per month for rent and utilities. The rent is \$600 per month, and the utilities cost \$0.10 per kilowatt-hour. The total cost of rent and utilities can be represented by the inequality: 600 + 0.10x ≤ 1000, where x is the number of kilowatt-hours used. To determine the maximum number of kilowatt-hours that can be used, we can solve this inequality using the graphical method.

# **Polynomials and Rational Expressions**

Polynomials and rational expressions are used to model and solve problems that involve complex relationships between variables. A polynomial is an expression consisting of variables and coefficients combined using only addition, subtraction, and multiplication. A rational expression is the ratio of two polynomials. These expressions can be added, subtracted, multiplied, and divided using various methods, including factoring and simplifying.

# **Example: Polynomial Expression**

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The expression x<sup>2</sup> + 4x + 4 is a polynomial expression. To factor this expression, we can look for two numbers whose product is 4 and whose sum is 4. These numbers are 2 and 2, so we can write the expression as (x + 2)(x + 2) or (x + 2)<sup>2</sup>.

### Case Study: Electrical Circuit

An electrical circuit consists of two resistors connected in series. The total resistance of the circuit can be represented by the equation: R\_total = R1 + R2, where R1 and R2 are the resistances of the individual resistors. If the resistances are 2 ohms and 3 ohms, the total resistance can be calculated using the formula: R\_total = 2 + 3, resulting in R\_total = 5 ohms.

# **Exponents and Logarithms**

Exponents and logarithms are used to model and solve problems that involve exponential growth and decay. An exponent is a shorthand way of writing repeated multiplication, while a logarithm is the inverse operation of an exponent. These operations can be used to solve problems involving population growth, chemical reactions, and financial transactions.

### **Example: Exponential Growth**

The population of a city is growing exponentially at a rate of 2% per year. If the current population is 100,000, the population in 10 years can be calculated using the formula: P = 100,000(1 + 0.02)^10, resulting in P = 121,919.

### Case Study: Chemical Reaction

A chemical reaction involves the decomposition of a substance at a rate that is proportional to the concentration of the substance. The concentration of the substance can be represented by the equation: C = C0e<sup>(-kt)</sup>, where C0 is the initial concentration, k is the rate constant, and t is time. To determine the concentration of the substance after 10 minutes, we can use the formula: C = 0.5e<sup>(-0.1\*10)</sup>, resulting in C = 0.335.



# **Algebra Assessment**

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# Assessment Details Duration: 30 minutes Total Marks: 100 • Variables and Constants • Basic Operations • Linear Equations • Algebraic Expressions

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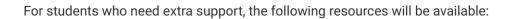
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