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Objective: Review of Integers: Operation on Integers

Verify Skill	Discussion	Example
Procedure		
Simplifying a numerical expression involving more than one operation.		$28 \div (4 - 8)(2) - 12 \div 3 + (-5)^2$
Step 1 Parentheses - Perform the operations within grouping symbols first (parentheses, brackets, fraction bar, etc.) in the order.		$= 28 \div (-4)(2) - 12 \div 3 + (-5)^2$
Step 2 Exponents - Do the operations indicated by the exponents.		$= 28 \div (-4)(2) - 12 \div 3 + 25$
Step 3 Multiplication and Division - Perform multiplication and division in the order of their appearance from left to right.		$= \frac{28}{-4} \cdot (2) - 12 \div 3 + 25$ $= -7(2) - 12 \div 3 + 25$ $= -14 - 4 + 25$
Step 4 Addition and Subtraction - Perform these operations in the order of their appearance from left to right.		$= -(14 + 4) + 25$ $= -18 + 25 = 7$

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Objective: Identify Terms & Numerical Coefficients

Consider the algebraic expression:

$$3x^2 + 4x - 5$$

This expression has three terms.

1st term: $3x^2$ 2nd term: $4x$ 3rd term: (-5)

Each term, except the third term, has two factors or parts: a **number** and a **variable** part. The number is called the **coefficient of the term**. Terms such as the third term, having no variable part are called **constant terms**.

Coefficient Variable Part Coefficient Variable Part Constant

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Objective: Slope of a line

Rise over Run Ratio of change Illustration

To calculate the **slope** of a line, we determine the **ratio of the change** in y (rise) to the change in x (run).

Run: $3 - 0 = 3$ $\frac{x}{3}$ $\frac{y}{3}$ Rise: $3 - 0 = 3$ Slope = $\frac{\text{rise}}{\text{run}} = \frac{3}{3} = 1$ or 1

A slope of 1 means that y increases by 1, every time x increases by 1.

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Objective: Intersecting, Parallel, and Coincident Lines

When we draw the graphs of two *linear equations* or two lines on the same *coordinate system*, we have one of the following three possibilities:

- The two lines intersect
- The lines are parallel
- The lines coincide

If the two lines *intersect* then the point of *intersection* is the only solution of the system.

A system of equations is said to be *independent and consistent* if it has exactly one solution.

The graphs of the *equations* of such a system are *distinct intersecting lines*.

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Objective: Polynomials

A polynomial in a single variable x is the sum of one or more terms of the form ax^n , where a is a real number and n is a positive whole number.

The numerical factor a is called the *coefficient* of the term.

The degree of a term is the value of the exponent on the variable factor.

Coefficient ax^n **Degree**

The term $3x^4$ has

coefficient 3
degree 4.

The degree of the polynomial is the highest of the degrees of its terms.

The polynomial $3x^4 - 2x^2 + 5$ has degree 4.

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Objective: Factoring Trinomials of the Type $ax^2 + bx + c$, where $a \neq 0$ and $a \neq 1$

After adequate practice one can factor trinomials of the type $ax^2 + bx + c$ directly using mental calculations. The thought process is demonstrated in the following illustrations.

For example

Factors of 6

$6x^2 + 7x + 2 = (3x + 2)(2x + 1)$

Factor of 2

Inner product = $4x$

Outer product = $3x$

Inner product + outer product = $7x$

Note The objective is to find a combination of factors of a and c such that the outer and inner products add up to the middle term bx .

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Objective: Adding Rational Expressions With Different Denominators

Verify Skill	Discussion
<p>Procedure</p> <p>To add rational expressions with different denominators, we follow the steps given below:</p> <p>Step 1 Find the least common denominator.</p> <p>Step 2 Rewrite each expression with the LCD as the common denominator.</p> <p>Step 3 Add the fractions in the rewritten form.</p> <p>Step 4 Reduce the result to lowest terms.</p>	<p>Example</p> <p>Find the LCD of $\frac{5}{6x} + \frac{3}{4x}$:</p> $\begin{cases} 6x = 2 \cdot 3 \cdot x \\ 4x = 2^2 \cdot x \end{cases}$ <p>LCD = $2^2 \cdot 3 \cdot x = 12x$</p> $\frac{5}{6x} = \frac{5}{6x} \cdot \frac{2}{2} = \frac{10}{12x}$ $\frac{3}{4x} = \frac{3}{4x} \cdot \frac{3}{3} = \frac{9}{12x}$ $\frac{5}{6x} + \frac{3}{4x} = \frac{10}{12x} + \frac{9}{12x} = \frac{19}{12x}$ <p>The resulting fraction cannot be reduced.</p>

Objective: Rationalizing Denominators with Two Terms

Rationalize the denominator.

Solution :

$$\frac{1}{7 - \sqrt{5}} = \frac{1}{7 - \sqrt{5}} \cdot \frac{7 + \sqrt{5}}{7 + \sqrt{5}} = \frac{1(7 + \sqrt{5})}{(7 - \sqrt{5})(7 + \sqrt{5})} = \frac{7 + \sqrt{5}}{49 - 5} = \frac{7 + \sqrt{5}}{44}$$

- Multiply both the numerator and denominator by the conjugate of the denominator. The conjugate of $7 - \sqrt{5}$ is $7 + \sqrt{5}$.
- $(a - b)(a + b) = a^2 - b^2$
- Simplify.

Objective: Solving $x^2 + bx + c = 0$ using Square Root Property

Verify Skill	Discussion
<p>Procedure</p> <p>Procedure for solving quadratic equations of the form $x^2 + bx + c = 0$.</p> <p>Step 1 Move the constant term to one side and write the equation in the form $x^2 + bx = k$.</p> <p>Step 2 Add $\left(\frac{b}{2}\right)^2$ to both sides to complete the square by using the principle of equality.</p> <p>Step 3 Use the Square Root Property.</p> <p>Step 4 Solve the two linear equations.</p>	<p>Example</p> <p>Solve the equation: $x^2 - 6x + 7 = 0$.</p> $x^2 - 6x = -7$ $x^2 - 6x + \left(\frac{-6}{2}\right)^2 = -7 + \left(\frac{-6}{2}\right)^2 \quad b = -6$ $x^2 - 6x + 9 = -7 + 9$ $(x - 3)^2 = 2$ $(x - 3) = \sqrt{2} \quad \text{or} \quad (x - 3) = -\sqrt{2}$ $x = 3 + \sqrt{2} \quad \text{or} \quad x = 3 - \sqrt{2}$ <p>Therefore, the solutions are $3 \pm \sqrt{2}$.</p>