**CONTEST PROBLEMS** using equations, inequalities, and good problem solving skills.

1. **The average of eight different positive integers is 8. What is the largest possible value of any of these numbers?**

2. **The sum of nine consecutive even natural numbers is 1998. What is the smallest of those nine numbers?**

**3. After four tests (on which possible grades range from 0 through 100), Jon has an average of 78. What is the lowest score that he can get on his fifth test to raise his average grade to at least 80?**

**4. After four tests (on which possible grades range from 0 through 100), Joni has an average of 87. Find the lowest score she could possibly have received on one of these tests.**

**5. Find all real values of x such that **

**6. If m \* n = m3 – 2n, write the value of 3 \* 2.**

**7. Given a # b = 2a + b and a @ b = a/2 + 3b. Evaluate m # (m @ n) if m = 4 and n = 3.**

8. **President Linda received 60% of the vote in a 3-person election for OCTM president. The ratio of votes of her opponent Carl to her opponent David was 5:7. If David received 28 more votes than Carl, how many votes did Linda receive?**

**9. Three candidates ran for president of OCTM. Duane won the election with 64% of the votes. Bill had 750 votes, and Billie had 6% of the votes. Write the number of votes that president Duane received.**

**10. In a 3-way OCTM presidential election, Margie received 350 votes, Bonnie received 5/16 of the votes, and Isaac received 25% of the votes. What exact percentage of the votes did Margie receive?**

**MATHEMATICAL PRACTICES**

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

**OHIO’S LEARNING STANDARDS**

***Grade 6***

***Critical Area 3: Writing, interpreting, and using expressions and equations***

**EXPRESSIONS AND EQUATIONS**

• Apply and extend previous understandings of arithmetic to algebraic expressions.

• Reason about and solve one-variable equations and inequalities.

• Represent and analyze quantitative relationships between dependent and independent variables.

**EXPRESSIONS AND EQUATIONS 6.EE**

**6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers.

**a.** Write expressions that record operations with numbers and with letters standing for numbers.

**b.** Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

**6.EE.3** Apply the properties of operations to generate equivalent expressions*.*

**6.EE.4** Identify when two expressions are equivalent, i.e., when the two expressions name the same number regardless of which value is substituted into them. Reason about and solve one-variable equations and inequalities.

**6.EE.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

***Grade 7***

***Critical Area 2: Developing understanding of operations with rational numbers and working with expressions and linear equations***

**EXPRESSIONS AND EQUATIONS**

• Use properties of operations to generate equivalent expressions.

• Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

**7.EE.2** In a problem context, understand that rewriting an expression in an equivalent form can reveal and explain properties of the quantities represented by the expression and can reveal how those quantities are related.

**7.EE.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

***Grade 8***

***Critical Area 1: Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations***

**Understand the connections between proportional relationships, lines, and linear equations.**

**8.EE.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

**Analyze and solve linear equations and pairs of simultaneous linear equations.**

**8.EE.7** Solve linear equations in one variable.

**a.** Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions.

**NCTM Principles and Standards—2000**

**Algebra Standard—grades 6-8**

**All students should**

* **represent, analyze, and generalize a variety of patterns with tables, graphs, words, and when possible, symbolic rules**
* **relate and compare different forms of representation for a relationship**
* **recognize and generate equivalent forms of simple algebraic expressions**