

SENIOR HIGH MATH LEAGUE
April 2001

GROUP I Emphasis on ALGEBRA I

TEST A

Unless otherwise stated, all answers should be given as a simplified fraction.

SECTION I: ONE POINT EACH

1. Which of the following is always true?
 - I. The product of two rational numbers is always defined, and always a rational number.
 - II. The product of two irrational numbers is always defined, and always an irrational number.
 - III. The quotient of two rational numbers is always defined, and always a rational number.
2. Evaluate $-(a \div b)^3 + b \cdot (2c^2 - a)$ given $a = 6, b = -2, c = 1$.
3. Find the quotient when $8x^3 + 1$ is divided by $2x + 1$.
4. Simplify $\frac{1}{x+y} - \frac{1}{x-y} - \frac{2y}{y^2 - x^2}$ as much as possible, assuming the expression is defined.
5. Solve for x : $\frac{x+2}{x+3} - 1 = \frac{1}{3-2x-x^2}$
6. Solve for z : $2z - 5 = 3\{2 + [z - (4z - 1)]\}$

SECTION II: TWO POINTS EACH

1. Solve for x : $(2x + 3)^2 = (2x + 3)$
2. A survey of 420 people showed that 250 owned an automobile, 150 owned a house, and 100 owned both an automobile and a house.
 - a) To the nearest percent, what percent of people owned neither an automobile or a house?
 - b) To the nearest percent, what percent of people owned an automobile only?
3. Solve for x : $|7x - 3| + 4 = 29$
4. Define $x \otimes y = \begin{cases} xy & \text{if } xy > 0 \\ 0 & \text{otherwise} \end{cases}$.

Find a) $-5 \otimes -2 \otimes 1$ and b) indicate by yes or no whether or not the operation $\otimes$ is associative.
5. Fill in the blank: The sum of five consecutive integers is always _____ times the third integer.
6. An investor has 100 shares total of two kinds of stock: Dot.Com and Big Blue Corp. Dot.Com sells for \$20 per share and Big Blue sells for \$50 per share. If the investor has \$2900 total in stock, how many shares of each does he own?
7. A college student is going home for Thanksgiving. The student takes a helicopter from the dorm to the airport and a plane from the airport home. The helicopter averages 70 mph and the plane travels at a rate of 500 mph. The total time spent on the helicopter and plane was 2 hours and the total distance travelled by helicopter and plane is 785 miles. Find the distance from the dorm to the airport.

SCHOOL NAME _____

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Answer Form A

SECTION I: ONE POINT EACH

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

SECTION II: TWO POINTS EACH

1. _____
2. a) _____
 b) _____
3. _____
4. a) _____
 b) _____
5. _____
6. Dot.Com) _____
 Big Blue) _____
7. _____miles

SCHOOL NAME _____

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GROUP I Emphasis on Algebra I

Answer Form B

SECTION I: ONE POINT EACH

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ square feet

SECTION II: TWO POINTS EACH

1. _____
2. _____
3. _____
4. _____
5. _____
6. a) _____
 b) _____
7. _____

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TEST B

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SECTION I: ONE POINT EACH

1. Evaluate $\frac{\sqrt[3]{y^2} - \sqrt{x}}{z^2}$ given $x = 169, y = -8, z = -3$.
2. Assuming a, b, c are positive real numbers, simplify leaving no negative exponents: $\left(\frac{a^2 b^3 c^0}{a^2 b^{-2} c^{-3}}\right)^2$
3. Solve for x : $2 + 5x - 2(4x + 1) = 1$
4. Solve for x : $\frac{(x+2)^2(x-4)}{(x+2)(x-3)} = 0$
5. Find the smallest integer x such that $|5 - 2x| \leq 6$.
6. 210 feet of fence is used to make a rectangular pen whose length is twice the width. What is the area of the pen?

SECTION II: TWO POINTS EACH

1. Phone plan A charges 7 cents a minute for all long distance calls. Phone plan B charges a \$5 fixed monthly charge but then just 5 cents a minute for all long distance calls. How many minutes of phone calls must I make in order to make Phone plan B as cost effective as plan A?
2. A number n is added to the numerator and the denominator of the fraction $3/5$ and the result is a fraction with value $4/5$. Find the number n .
3. A buffet meal offers the choice of 3 different entrees, 2 different kinds of salad, 3 varieties of potatoes, and 4 choices of dessert. How many different meals (consisting of entree, salad, potato, and dessert) could a person have?
4. One whole number is three more than another whole number. The sum of the two numbers is 61. Find the numbers.
5. The owner of a gourmet nut store wants to mix peanuts with 20 pounds of cashews to create a mixture that will sell for \$6 a pound. The cashews sell for \$12 a pound and peanuts for \$3 a pound. How many pounds of peanuts must be mixed with the cashews?
6. A recent survey of w shoppers showed that x shopped at Sears, y shopped at J.C. Penney's, and z shopped at both.
 - a) How many people shopped only at Sears?
 - b) How many people shopped at neither Sears or J.C. Penney's?
7. A password for the new computer system at CofO will require a letter followed by three digits (digits may be repeated). How many passwords are possible under this system?