WORCESTER COUNTY MATHEMATICS LEAGUE

1

Freshman Meet 1 – November 5, 2008

Round 1: Evaluation of Algebraic Expressions and Order of Operations

All answers must be in simplest exact form in the answer section

NO CALCULATOR ALLOWED

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1. Following the proper order of operations, evaluate:

$$2 \div 3 + 2 \times 3 - 2 \div 3 + 2 \times 3 - 2$$

2. If $K = 3$, $R = 5$, and $N = 4$, find the simplified value of $\dfrac{K(R+3N)^2(R+K)}{2R^2 - 4K^2 + N^2 - 6}$.

3. Let $a * b = \dfrac{a+b}{ab}$ and $a \# b = \dfrac{a+b}{a-b}$. Find the simplified value of the following expression: $(3 * 4) \# (5 * 6)$

ANSWERS

(1 pt.) 1._____

(2 pts.) 2._____

(3 pts.) 3._____

Bromfield, Tantasqua, Doherty

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Round 2: Solving Linear Equations

2

All answers must be in simplest exact form in the answer section

NO CALCULATOR ALLOWED

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1. Solve for x: $12x-(4x-6)=3x-(9x-27)$

2. Solve for y: $y-\Big(2-\Big[3y+2(y-3)\Big]\Big)=10y$

3. Solve for x: $\frac{2}{3}\left(x-\frac{1}{4}\right)-\frac{1}{6}\left(x+2\right)=\frac{3}{2}$

ANSWERS

(1 pt.) 1._____

(2 pts.) 2._____

(3 pts.) 3._____

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Round 3: Logic Problems

3

All answers must be placed in the answer section at the bottom

NO CALCULATOR ALLOWED

1. Three boxes are presented to you. Once contains gold; the other two are empty. Imprinted on each box is a clue as to its contents. If one clue is true and the other two clues are false, which box contains the gold?

Box #1	Box #2	Box #3
The gold is in Box #2	**The gold is not here**	**The gold is not here**

2. I am thinking of a number that is a three-digit prime palindrome. If the sum of its digits is 14, what number am I thinking of? (Note: A *palindrome* is a number that reads the same left to right as it does from right to left.)

3. Find the values of the digits C, A and T in the following addition problem:

$$\begin{array}{r} C\ \ A\ \ T \\ +\ C\ \ T\ \ A \\ \hline T\ \ A\ \ C \end{array}$$

ANSWERS

(1 pt.) 1. BOX #_____

(2 pts.) 2. _____

(3 pts.) 3. C = _____ A = _____ T = _____

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Round 4: Ratio, Proportion and Variation

4

All answers must be in simplest exact form in the answer section

NO CALCULATOR ALLOWED

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1. A basketball team scores 45 points in the first 24 minutes of a game. Assuming that the team continues to score points at the same rate, how many points will they score in a 40-minute game?

2. In a certain restaurant the number of hamburgers sold per day varies inversely as their price. If 70 burgers are sold at \$1.50 each, how many would be sold at \$1.25 each?

3. The quantity A varies directly as the square root of B and inversely as the square of C. If $A = 400$ and $B = 100$ when $C = 5$, find the value of B when $A = 250$ and $C = 10$.

ANSWERS

(1 pt.) 1._____ points

(2 pts.) 2._____ burgers

(3 pts.) 3._____

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TEAM ROUND

All answers must *either* be in simplest exact form *or* as decimals rounded correctly to at least three decimal places (3 pts. each)

APPROVED CALCULATORS ALLOWED

1. Suppose $N = 1 + 11 + 101 + 1001 + 10001 + ... + 1000...0001$, where the last number in the sum contains 50 zeros. When N is calculated and written as a single integer, find the sum of its digits.

2. Solve the following equation for x: $5\Big(x - 4(1 - 2x) - 6\Big) - 3(x + 10) = 40x - 12$

3. Let $a * b = ab$ and $a \,\&\, b = a + b$. If "*" is commutative, then Q = 2; otherwise Q = 5. If "&" is associative, then R = 5; otherwise R = 7. Finally, if $a * (b \,\&\, c) = (a * b) \,\&\, (b * c)$, then S = 15; otherwise S = 13. Find the value of Q + R + S.

4. Find the value of k so that the line passing through the points $(2, 3k)$ and $(-2, k)$ has a slope of $k + 2$.

5. On a recent trip to the nursery, Joe purchased 3 trays of strawberry plants for $16.47. He also purchased 10 trays of ivy plants. If the ratio of the price per tray of strawberry plants to the price per tray of ivy plants is 3 to 2, find the total price that Joe paid at the nursery (in dollars and cents).

6. Two positive integers a and b have the property that if a is increased by 25%, the result will be greater than 5 times the value of b. Find the minimum possible value for $a + b$.

7. Quadrilateral ABCD is a square. Points P and Q are outside of the square such that triangles ABP and BCQ are both equilateral. Find the measure of $\angle PQB$ (in degrees).

8. A crossnumber puzzle is like a crossword puzzle except that the answers are numbers with one digit in each square. In the crossnumber puzzle to the right, which odd digit does **not** appear in the solution?

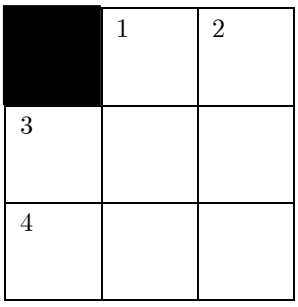
CLUES

Across (A)

3. A Cube
4. A Cube

Down (D)

1. A Cube
2. A Square
3. A Cube



QSC (1, 6, 8), Bartlett, Assabet Valley, Sutton, St. Peter-Marian, Algonquin

WORCESTER COUNTY MATHEMATICS LEAGUE

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ANSWER SHEET – TEAM ROUND

All answers must *either* be in simplest exact form *or* as decimals rounded correctly to at least three decimal places (3 pts. each)

1. _____

2. _____

3. _____

4. _____

5. $_____

6. _____

7. _____

8. _____

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ANSWERS

Round 1

1. 10

2. 289

3. $\frac{57}{13} = 4\frac{5}{13}$

Round 2

1. $\frac{3}{2} = 1\frac{1}{2} = 1.5$

2. –2

3. 4

Round 3

1. Box #3

2. 383

3. $C = 4 \quad A = 5 \quad T = 9$

Round 4

1. 75

2. 84

3. 625

Team Round

1. 58

2. 34

3. 20

4. –4

5. $53.07

6. 6

7. 15 (or 15°)

8. 3