October 13, 1993 WOCOMAL VARSITY MEET

ROUND I: Arithmetic - Order of operations and evaluation of algebraic expressions

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Evaluate $-3^2-(-2)^3+(-1)^2$

2. Evaluate $\left[1.1^2-a^2\right] \div \left[0.2b\right]^2$ for $a = 0.7$ and $b = 0.3$

3. Define ternary operations $\oplus$ and $*$ by:

$$(a,b,c)\oplus = a-b+c \quad \text{and}$$

$$(a,b,c)* = \frac{ab}{c}$$

Evaluate $\left((5,-4,3)\oplus, (2,0,4)\oplus, (1,-1,5)\oplus\right)*$

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Quaboag, St.Peter-Marian, Tahanto

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ROUND II: Algebra 1 - Open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FROM

1. Express $6^6 + 6^6 + 6^6 + 6^6 + 6^6 + 6^6$ as a single power of 6.

2. Several women are walking their dogs. If the total number of legs is 20 more than twice the number of heads, find the number of dogs.

3 If M men can do a job in D days, then M+R men can do the same job in ___?___ days.

ANSWERS
(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Bromfield, Burncoat, H udson

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ROUND III: Factoring

Factor completely and combine any terms which may be combined.

1. $2(p-3)+5(p-3)^2$

2. $12ax-10by+8bx-15ay$

3. $3x^4-4x^3-2x^2+4x-1$

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Quaboag, Shepherd Hill, West Boylston

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ROUND IV: Perimeter, area, and volume

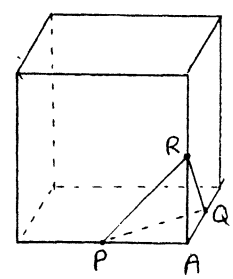
ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM. DO NOT APPROXIMATE π.

1.

A 45	B 25
D	C 30

The figure shown is composed of rectangles A, B, C, and D, each having whole number values for length and width, though not drawn to scale. The numbers are areas of the regions A, B, and C. Find the area of region D.

2. Each edge of this cube is 6 inches long. P, Q, and R are edge midpoints. The pyramid with vertices P, A, Q, and R is removed. A congruent pyramid is removed from each vertex. Find the volume of the remaining solid.



3. The circumference of the rear wheel of an unusual bicycle is 3 ft more than the circumference of the front wheel. The rear wheel makes 100 fewer revolutions than the front in traveling 6000 ft. Find the circumference of the rear wheel.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____ in^3

(3 pts) 3. _____ ft

Auburn, Burncoat, Doherty

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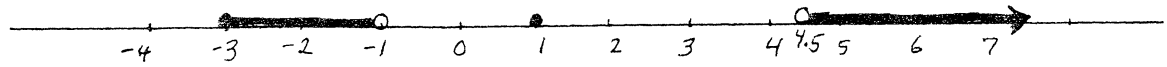
ROUND V: Inequalities and absolute values - answer on number lines

DRAW THE GRAPH FOR EACH PROBLEM ON THE NUMBER LINE PROVIDED. SPECIFY ANY NONINTEGER ENDPOINTS.

USE NOTATION LIKE THIS FOR YOUR GRAPHS:



$-3 \le x < -1$ or $x = 1$ or $x > 4.5$

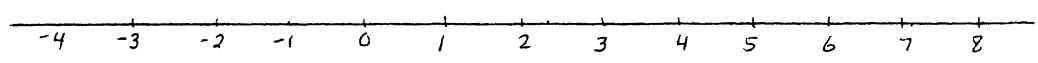
1. Graph the set of x-values which simultaneously satisfy both $2x - 1 > 5$ and $3x + 1 < 16$.

2. Graph $0 < |x - 1| \le 3$

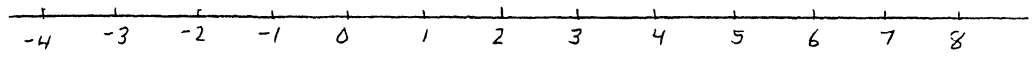
3. If $f(x) = |x + 3| + |x - 5|$, find and graph all values of x for which $f(x) = 8$.

ANSWERS

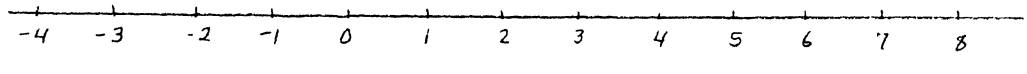
(1 pt) 1.



(2 pts) 2.



(3 pts) 3.



St. John's, South, Tantasqua

October 13, 1993 WOCOMAL VARSITY MEET

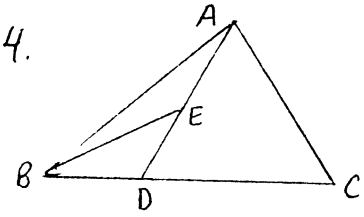
TEAM ROUND: Topics of previous rounds and open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO FOUR DECIMAL PLACES. 2 points each

1. Simplify $\left(\dfrac{\frac{1}{2}+\frac{1}{3}+\frac{1}{4}}{\frac{1}{2}\cdot\frac{1}{3}\cdot\frac{1}{4}}\right)^2$

2. Find all two digit positive integers such that the result of subtracting the product of its digits from the integer is 13.

3. Factor $2x^2 + xy - y^2 + 5x - 4y - 3$ into two trinomials.

4. 

$AD = 5$
$BD = 2$
$BC = 8$
$AE = 3$

Find the ratio of the area of $\triangle BDE$ to the area of $\triangle ADC$

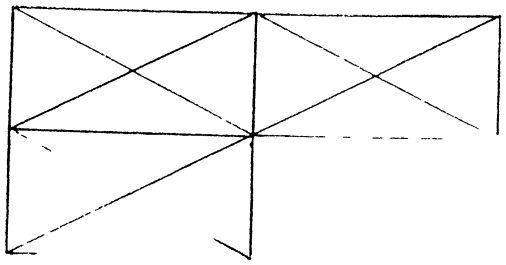
5. Graph the integer solutions only of $-|3x-2| + 5 > -3$

6. The sum of five different whole numbers (positive integers) is 90. The second largest of these five numbers can be at most ___?___.

7. If $\sqrt{\frac{3}{2}\,\frac{4}{3}\cdot\frac{5}{4}\cdot\frac{6}{5}\cdot\ldots\cdot\frac{a}{b}} = 3$, evaluate $a+b$.

8. Find the product of the values of 8^x if $\left(\frac{1}{25}\right)^{x-4} = 125^{(x^2)}$.

9. How many triangles are in this figure ?



Burncoat, Doherty, Hudson, St. John's, Shrewsbury, Tahanto, Tantasqua

Mu Alpha Theta 1993

ROUND I

4 pts — 1 pt — 1. 0

2 pts — 2. 360

3 pts — 3. $\frac{72}{7}$ or $10\frac{2}{7}$ or $10.\overline{285714}$

ROUND II

Alg 1

1 pt — 1. 6^7

2 pts — 2. 10

3 pts — 3. $\frac{MD}{M+R}$

ROUND III

Factoring

1 pt — 1. $(p-3)(5p-13)$

2 pts — 2. $(4x-5y)(3a+2b)$

3 pts — 3. $(3x-1)(x+1)(x-1)^2$

ROUND IV

Perim
area
vol

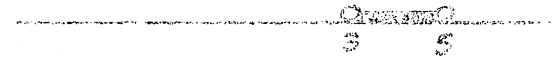
1 pt — 1. 54

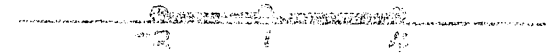
2 pts — 2. 180 in^3

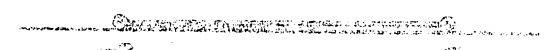
3 pts — 3. 15 ft

ROUND V

$\leq$ ||
line
graphs

1 pt — 1. 

2 pts — 2. 

3 pts — 3. 

TEAM ROUND

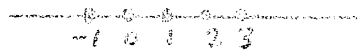
2 pts each

1. 676

2. 27 and 49
need both

3. $(2x-y-1)(x+y+2)$

4. $\frac{2}{15}$ or 2:15

5. 

6. 41

7. 35

8. $\frac{1}{4}$ or 0.25

9. 24