October 12, 1994 WOCOMAL VARSITY MEET

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

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. If $x = 3y + 2$, and $y = 5t + 1$, find the value of x when $t = 1/3$.

2. Evaluate: $5^2 - 10^2 \div 2^3 + 2^6 \div 4^3$

3. A multiple choice exam has 20 questions. The scoring is +5 for each correct answer, −2 for each incorrect answer, and 0 for each unanswered question. John's score on the exam is 48. What is the maximum number of questions he could have answered correctly?

ANSWERS
(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Burncoat, Clinton, Leicester

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ROUND II: Algebra 1 - Open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Solve: $3(5x-4) - 4(4x+3) = 8 - (5-2x)$

2. Solve: $\frac{2}{7}x - \frac{1}{6}y = 1$ and $0.3x + 0.07y = 0.84$
Give the exact values of x and y only, no approximations.

3. Four friends bought a boat for $1200. Friend A paid half the sum of the amounts paid by the other three friends. Friend B paid one-third the sum paid by the other three. Friend C paid one-fourth the sum paid by the other three. Friend D paid the rest. How much did friend D pay?

ANSWERS
(1 pt) 1. $x =$ _____

(2 pts) 2. $x =$ _____, $y =$ _____

(3 pts) 3. $ _____

Clinton, St.John's, Shepherd Hill

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ROUND III: Factoring

1. Find the value of C which makes $9x^2 + 42x + C$ a perfect square trinomial.

2. Factor completely: $9 - m^2 + a^2 - 6a$

3. Factor completely: $7(1-x^2) - 2(x^3-1)$

ANSWERS
(1 pt) 1. $C =$ _____

(2 pts) 2. _____

(3 pts) 3. _____

Auburn, Hudson, Leicester

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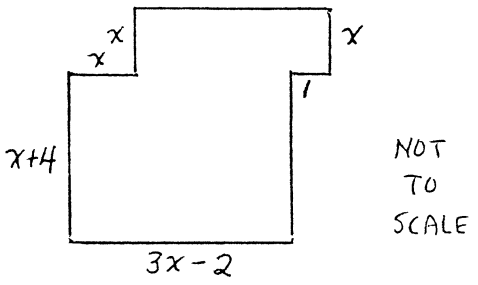
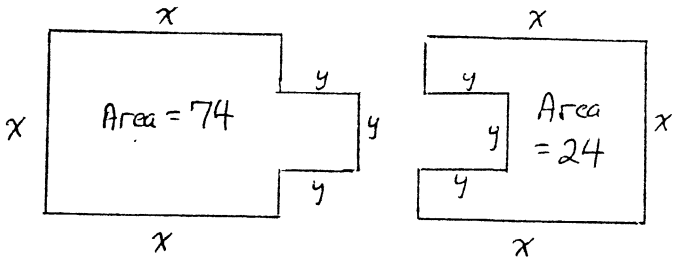
ROUND IV: Perimeter, area, and volume

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM. DO NOT APPROXIMATE $\pi$.

1. Express the perimeter of this octagon in terms of x. All apparent right angles are meant to be so.




2. Solve for x and y. Again all apparent right angles are meant to be so.




3. Find the ratio of the area of a square inscribed in a semicircle to the area of a square inscribed in the entire circle.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. $x =$ , $y =$

(3 pts) 3. _____

Algonquin, Bromfield, West Boylston

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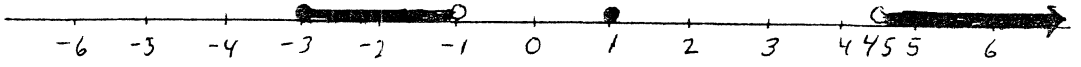
ROUND V: Inequalities and absolute values - answer on number lines

DRAW THE GRAPH FOR EACH INEQUALITY ON THE NUMBER LINE PROVIDED. SPRCIFY ANY NONINTEGER ENDPOINTS.

USE NONATION LIKE THIS FOR YOUR GRAPHS:




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

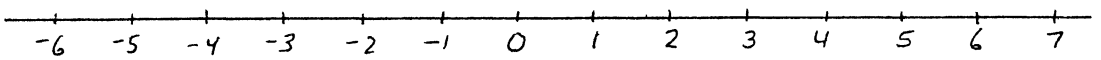
1. $x^2 \leq 1$

2. $|x| \leq \frac{1}{x}$

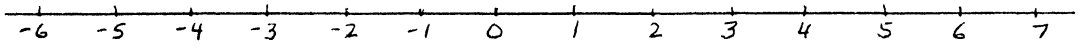
3. $|x + 1| + |x + 3| < |x + 8|$

ANSWERS

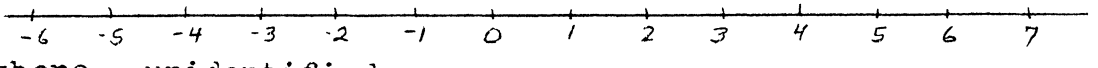
(1 pt) 1.




(2 pts) 2.




(3 pts) 3.




Auburn, Westboro, unidentified

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TEAM ROUND: Topics of previous rounds and open 2 points each

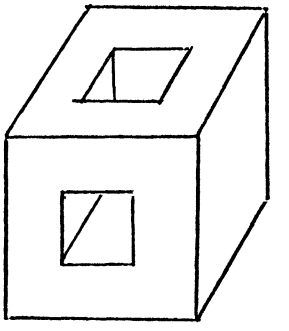
ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM AND ON THE SEPARATE TEAM ANSWER SHEET

1. If $a\Delta b$ means $2ab+5$ when $a<b$ and $2b-a$ when $a \geq b$, evaluate $(3\Delta 9)\Delta 5$.

2. The square of the sum of two consecutive odd integers is 16 times the sum of the integers. Find all such integer pairs.

3. Find all the integer values of b for which the trinomial $x^2 + bx - 18$ can be factored over the integers.

4. A cube has edges of length 6. Two "holes" are drilled completely through and their volume is removed. If the holes are centered and 2 by 2 square, find the volume of material remaining in the "cube".



5. Show on a number line the x-values which satisfy $1-4x < 3x+10 < 7x+8$. Label relevant coordinates.

6. We define $[x]$ to mean the greatest integer which is not greater than x itself. Evaluate $[y] + [1-y]$ for $y = -6.38$.

7. For $N \geq 2$, if the sum of N consecutive counting numbers is 45, find all possible values for N.

8. In a rectangular coordinate system, find the area of the region specified by $|x| + |y-1| \leq 2$

9. Points A, B, C, and D lie on a straight line, but not necessarily in that order. If AB = 3, BC = 4, and CD = 5, what is the smallest possible value of AD?

Algonquin, Bartlett, Marlboro, Tahanto, Tantasqua, West Boylston, Worcester Academy

1994

## ROUND I

1 pt 1. 10

2 pts 2. $13\frac{1}{2}$ or 13.5 or $\frac{27}{2}$

3 pts 3. 12

## II

1 pt 1. −9

2 pts 2. $x=3$, $y=-\frac{6}{7}$ no approx! $=-.\overline{857142}$

3 pts 3. #260

## III

1 pt 1. 49

2 pts 2. $(a-3+m)(a-3-m)$ or ...

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

## IV

1 pt 1. $10x+6$ or factored

2 pts 2. $x=7$, $y=5$

3 pts 3. $\frac{2}{5}$ or 2:5

## V

1 pt 1. 


2 pts 2. 


3 pts 3. 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2 pt each

1. −49

2. $-1, 1$ & $7, 9$

3 $\pm 3, \pm 7, \pm 17$ in any order

4. 176

5. 


6 0

7. 2, 3, 5, 6, 9 need all five

8. 8

9. 2