

October 11, 1995

WOCOMAL VARSITY MEET

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

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. If $x = 3$, evaluate $x + x \cdot x^x$

2. Otto's new Confuz-U calculator has an unusual order of operations. The operations are executed addition and subtraction before multiplication and division (left to right for operations of equal precedence). How will it evaluate this expression?

$$24 \div 6 + 3 \times 5 - 2$$

3. On Planet Q the mathematical symbols @, *, and # follow the order of operation rules of our symbols +, x, and \div , respectively. If their symbols translate to :

$$a @ b = a + b + 3, \quad a * b = a \times b + 1, \quad \text{and} \quad a \# b = a \div b - 2,$$

evaluate: $3 @ 4 * 2 @ 8 \# 2$

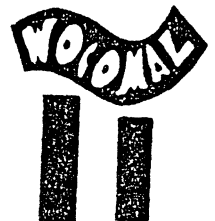
ANSWERS:

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Mass. Academy, Southbridge, Tantasqua



October 11, 1995

WOCOMAL VARSITY MEET

ROUND II: Algebra 1 — OPEN

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. When five consecutive integers are added, their sum is 155. Find the largest one.

2. If $\frac{x+y}{x^2-y^2} = 1$, express y in terms of x .

3. If a car averages X miles per hour for A hours and then averages Y miles per hour for B minutes, express the car's average speed in miles per hour over the time period just described in terms of X, A, Y , and B .

ANSWERS

(1 pt) 1. _____

(2 pts) 2. $y =$ _____

(3 pts) 3. _____

Bancroft, Bromfield, Leicester

October 11, 1995

WOCOMAL VARSITY MEET

ROUND III: Factoring

1. What should fill the blank to make the expression a perfect square trinomial?

$$\frac{81}{64} - 9x + \underline{\hspace{2cm}}$$

2. Express in completely factored form:

$$x^2(x^2 - 4) + \frac{18}{\frac{2}{4 - x^2}} - 8x^3 + 32x$$

3. Express in completely factored form:

$$x^2 - 16 + 10y + 6x - y^2$$

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

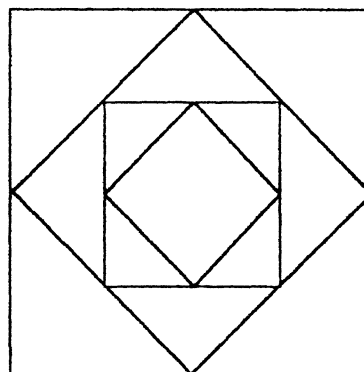
Shrewsbury, Tahanto, Tantasqua

ROUND IV: Perimeters, areas and volumes

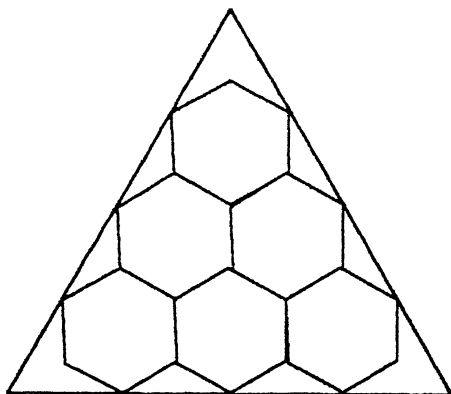
ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO THREE PLACES AFTER THE DECIMAL POINT

1. Find, if possible, the length of an edge of a cube whose surface area and volume are equal (ignoring the different dimensions of their units). If none exists, say so.

2. There are four squares. Three of them have midpoints of the sides of the next larger square as vertices. If the perimeter of the largest square is 64, find the perimeter of the smallest square.



- 3.



Six regular hexagons have nine of their vertices on the sides of an equilateral triangle as shown. Each side of each hexagon has length 2. Find the area of the triangle.

ANSWERS

(1 pt) 1. _____

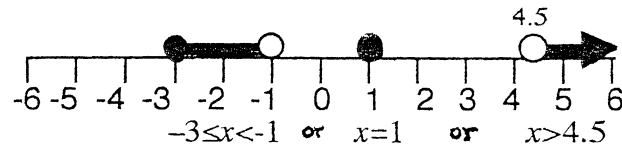
(2 pts) 2. _____

(3 pts) 3. _____

ROUND V: Inequalities and absolute value — answers on the number line

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

USE NOTATION LIKE THIS FOR YOUR GRAPHS:

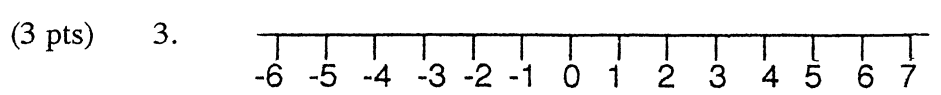
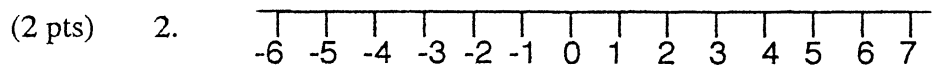
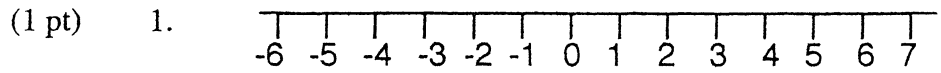


1. $|2x - 1| > 7$

2. $x^3 - 5x^2 - 6x \geq 0$

3. $\left| 3 + \frac{4}{x} \right| > 2$

ANSWERS



October 11, 1995

WOCOMAL VARSITY MEET

TEAM ROUND: Topics of previous rounds and open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM
OR AS DECIMALS ROUNDED TO 3 PLACES AFTER THE
DECIMAL POINT AND ON THE TEAM ANSWER SHEET.

2 points each

1. Let $a \clubsuit b$ = the sum of the Factors of the prime Factorization of the quotient $a \div b$.

(Example: $36 \clubsuit 3 = 7$ because $12 = 2 \cdot 2 \cdot 3$.) Evaluate:

$$4(30 \clubsuit 5)^2 + 2(180 \clubsuit 9) \div (4 + 15 \cdot 3 \div 9)^{1/2}$$

2. If $x^2 + y^2 = 34$ and $xy = 10.5$, evaluate $2(x + y)^2 + (x - y)^2$.

3. Factor completely: $x^3 + 10x^2 + 29x + 20$

4. In a triangle with sides of lengths 3, 25, and 26, find the length of the shortest altitude.

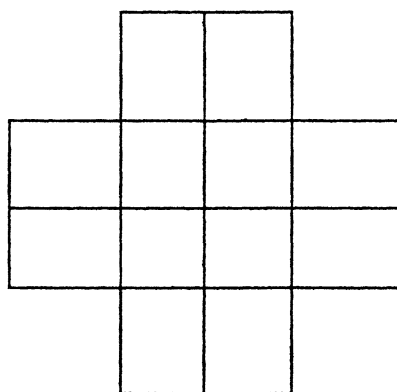
5. Graph the solution of $3 \leq |x + 2| < 2x - 1$ on the number line provided.

6. All of 120 pennies are to be distributed among 27 children. If no child may receive more than 11 pennies and each child gets at least one, what is the minimum number of children who must get 3 or more pennies?

7. How long does it take a clock's hour hand to move through 1 degree of arc? Answer in minutes or seconds of time, with units.

8. If a googol is 10^{100} , how many zeros would a googol of googols have if it were written out?

9.



How many rectangles (including squares) are in this figure?

Algonquin, Bromfield, Burncoat, Quaboag, St. John's, Southbridge, Tantasqua

October 11, 1995

WOCOMAL VARSITY MEET ANSWERS

TEAM ROUND 2 pts each

- ROUND I
1. 1 pt 84
- Arith
2. 2 pts 8
3. 3 pts 20

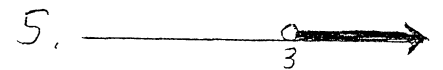
1. 106
2. 123

- ROUND II
1. 1 pt 33
- Alg 1
2. 2 pts $y = x - 1$
3. 3 pts $\frac{60AX + BY}{60A + B}$
- ← either → $A + \frac{B}{60}$

3. $(x+1)(x+4)(x+5)$

4. $\frac{36}{13}$ OR $2\frac{10}{13}$ OR 2.769

- ROUND III
1. 1 pt $16x^2$
- Factoring
2. 2 pts $(x+2)(x-2)(x+1)(x-9)$
3. 3 pts $(x+y-2)(x-y+8)$

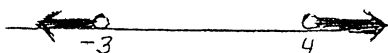
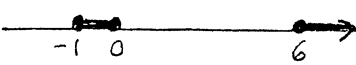
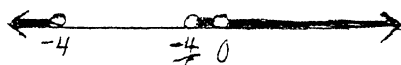


6. 8

- ROUND IV
1. 1 pt 6
- Perim
area
vol
2. 2 pts $16\sqrt{2}$ OR 22.627
3. 3 pts $48\sqrt{3}$ OR 83.138

7. 2 minutes OR 120 seconds

8. 200

- ROUND V
- # line graphs
1. 1 pt 
2. 2 pts 
3. 3 pts 

9. 52