October 14, 1992 WOOMAL VARSITY MEET

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

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. $$1+2-3\cdot 4\div 5 = \ ?$$

2. Using the following definition

$$a\,\underset{c}{\Big|}\,b = \frac{ab}{c}+\frac{bc}{a}+\frac{ca}{b},$$

Evaluate $3\,\underset{4}{\Big|}\,12$

3. Let $\boxed{N}$ be the number of positive divisors of a positive integer N, including 1 and N. Let $\textcircled{N}$ be the sum of those divisors of N.

Determine $\dfrac{\textcircled{42}-\boxed{42}}{\textcircled{42}+\boxed{42}}$ as a reduced fraction.

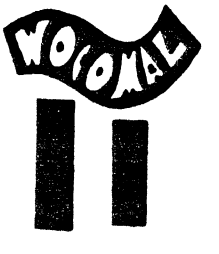
ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Leicester, Marlboro, Shepherd Hill



October 14, 1992 WOCOMAL VARSITY MEET

ROUND II: Algebra 1 - Open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Remove all signs of grouping and combine terms in

$$x + y - \left[-(x-y) + \{x-(x-y)-x\}\right].$$

2. If $a = \frac{b+2}{2}$, $b = \frac{c-3}{2}$, and $d = \frac{c}{3} + 1$,

find the value of $b-(c-d)$ given that $a = 2$.

3. How many possible triples of consecutive positive even integers are there such that 10 times the largest integer exceeds the product of the other two by more than 40?

Also list the triple of this type having the largest largest integer.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____ (, ,)

Auburn, Hudson, Westboro

October 14, 1992 WOCOMAL VARSITY MEET

ROUND III: Factoring

1 Factor over the integers:

$$8x^2 + 26x + 15$$

2 If $x^9 - x$ is factored completely over the set of integers, how many factors are there?

3. Factor over the integers:

$$x^3 - 3 - 2x - 2x^2$$

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

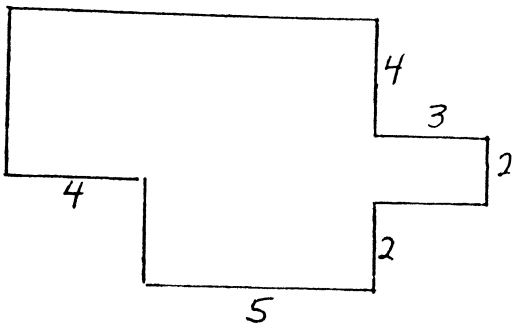
Algonquin, Bromfield, Millbury

October 14, 1992 WOCOMAL VARSITY MEET

ROUND IV: Perimeter, area, and volume

ALL ANSWERS MUST BE IN SIMPLEST FORM

1. Find the perimeter of this figure which has all right angles but is not drawn to scale.



2. The total surface area of a closed right circular cylinder that is 5 inches tall and 4 inches in diameter is $A\pi$ sq. inches. Find the value of A.

3 IN THIS PROBLEM USE $\frac{22}{7}$ TO APPROXIMATE π.
The original inside circumference of a water pipe was 44 inches. A uniform deposit of minerals has reduced the cross-sectional area to $\frac{4}{9}$ of what it was originally. How thick is this mineral deposit?

ANSWERS
(1 pt) 1. _____

(2 pts) 2. _____

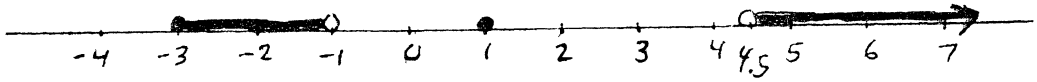
(3 pts) 3. _____ inches

October 14, 1992 WOOSMAL VARSITY MEET

ROUND V: Inequalities and absolute value - answers 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 $x > 4.5$

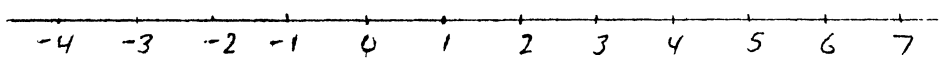
1. $6(1-2x) + 7x < -9$

2. $|x+1| \le |x|$

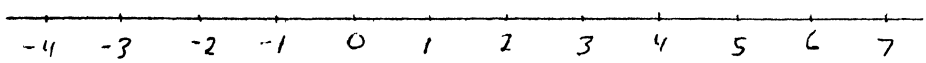
3 $x^3 + 30 \ge 4x^2 + 11x$

ANSWERS

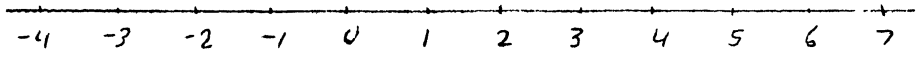
(1 pt) 1.



(2 pts) 2.



(3 pts) 3.



Auburn, Leicester, Notre Dame

October 14, 1995 WORCESTER VARSITY MEET

TEAM ROUND: Topics of previous rounds and open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM AND ON THE SEPARATE TEAM ANSWER SHEET. 2 points each

1 Evaluate $\dfrac{2^x \cdot 3^{-y} + 2^{xy}}{x^2 y^5}$ for $x = -2$ and $y = -1$. Give your answer in fraction form

2. If $A = x - y$, $B = x^2 y^2$, and $C = x^2 + y^2$, express C in terms of A and B.

3 Factor over the integers. $x^4 - 3x^2 + 1$

4. A cube is circumscribed by a sphere, which in turn is circumscribed by a cube, which in turn is circumscribed by a sphere, which, finally, is circumscribed by a cube. (There are 3 cubes and 2 spheres) What is the ratio of the volume of the smallest cube to that of the largest cube?

5. Graph the solution of $|x| + |x-2| = 2$ on the number line provided. You must supply relevant coordinates.

6. Find all real numbers x for which $\dfrac{3^{\sqrt{12x}} + 3}{4} = 3^{\sqrt{3x}}$.

7 Find the least integer n for which $\dfrac{12}{n+1}$ represents an integer

8. If $\left(a + \frac{1}{a}\right)^2 = 3$, then $a^3 + \frac{1}{a^3} = ?$

9 If $f(x+y) = f(x) + f(y) + xy + 1$ for all real numbers x and y, and if $f(1) = 1$, what is the value of $f(10)$?

ROUND I Arith

1. $\frac{3}{5}$ or 0.6
2. 26
3. $\frac{11}{13}$

ROUND II

1. $3x-y$
2. $-\frac{5}{3}$ or $-1\frac{2}{3}$
3. 3 (6, 8, 10)

Need both

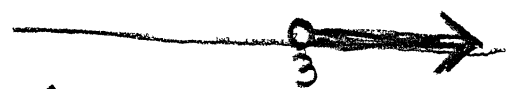
ROUND III

1. $(4x+3)(2x+5)$
2. 5
3. $(x-3)(x^2+x+1)$

ROUND IV

1. 40
2. 28
3. $2\frac{1}{3}$ or $\frac{7}{3}$ or $2.\overline{3}$

ROUND V

1. 

2. 

3. 

TEAM ROUND

1. $-\frac{19}{16}$
2. $A^2+2\sqrt{B}$
3. $(x^2+x-1)(x^2-x-1)$
4. 1:27 or $\frac{1}{27}$
5. 

6. $0, \frac{1}{3}$
7. -13
8. 0
9. 64