February 5, 1992 WOCOMAL VARSITY MEET

ROUND I: Combinations and permutations

ALL ANSWERS MUST BE EXPRESSED AS POSITIVE INTEGERS

1. How many lines are determined by 7 points, no three of which are collinear?

2. If a registration number consists of 2 letters followed by 4 digits, how many such numbers can be formed if the letters O and I are not used and the digits cannot all be zero?

3. Using each of the 5 letters in the word PRIZE, how many 5-letter permutations can be formed that do not begin with P and do not end with Z?

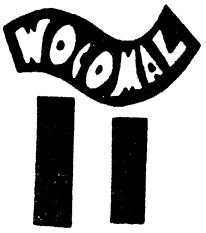
ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Auburn, Clinton, Millbury



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ROUND II: Algebra 1 - open

ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM

1. If $10x - 4 = 8$, then what is the value of $20x - 5$?

2. When the armored truck hit a bump, a bag filled with 220 coins consisting of nickels, dimes, and quarters fell out. If there were twice as many dimes as nickels and thirty fewer quarters than dimes in the bag, what was the total amount of money in the bag? Give your answer in dollars.

3 The quotient of two consecutive, positive even integers can be written as $k + \frac{1}{100}$ where k is an integer. Find the sum of those two consecutive even integers.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. $ _____

(3 pts) 3. _____

St. John's, Tantasqua, West Boylston

February 5, 1992 WOCOMAL VARSITY MEET

ROUND III: Logs, exponents, radicals

ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM

1. $\sqrt{.09} \div \sqrt{.000009} = ?$

2 Solve for a:

$$\log_a 3 + 1 - \log_a 2 - \log_a 9 = 0$$

3. If $2(4^x) + 6^x = 9^x$ and $x = \log_{\frac{2}{3}} y$, find the numerical value of y.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. $a =$ _____

(3 pts) 3. $y =$ _____

Algonquin, Doherty, Leicester

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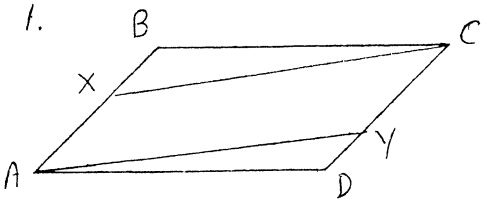
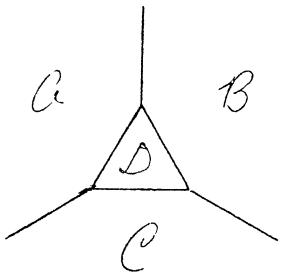
ROUND IV: Parallel lines and polygons

ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM

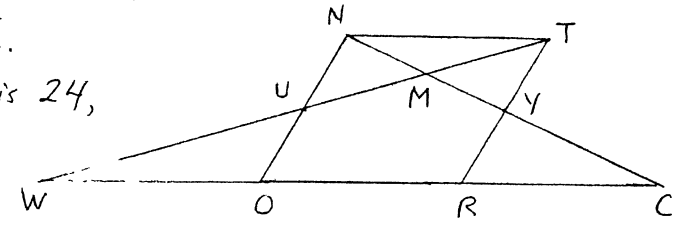
1. 

ABCD is a parallelogram, $\overline{XC} \parallel \overline{AY}$, $m\angle AYC = 116°$ and $m\angle XCB = 14°$. Find $m\angle ADC$.

2. 

A, B, and C are congruent regular polygons and D is an equilateral triangle. How many sides has polygon A ?

3. In parallelogram ORTN, U and Y are midpoints of $\overline{NO}$ and $\overline{TR}$. If the area of $\square ORTN$ is 24, find the area of $\triangle WMC$.



ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

February 5, 1992 WOCOMAL VARSITY MEET

ROUND V: Analytic geometry of straight lines and conics

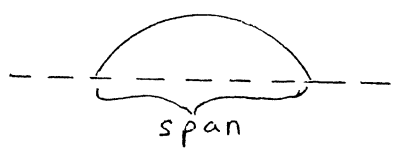
ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM

1. How many pairs of real numbers (x, y) simultaneously satisfy both of these equations?

$$x^2 - 2y = 6$$
$$x^2 + 2y^2 = 18$$

2. Among the lines which have a y-intercept of -5, find the slopes of those which have x-intercept equal to the slope.

3. A parabolic arch spanning level ground has a height of 16 feet and a span of 40 feet. At a point 5 feet along the ground from either end, what is the height of the arch?



ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____ feet

Auburn, Hudson, Leicester

February 5, 1992 WOCOMAL VARSITY MEET

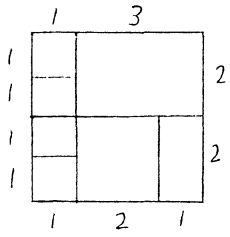
TEAM ROUND: Topics of previous rounds and open

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

1 Find n if $7 \cdot {}_nP_5 = {}_nP_3 \cdot {}_qP_3$.

2. If $\frac{1}{a} + \frac{1}{b} = 2$ and $a+b = 3$, find the value of ab.

3 Find all real values of x for which $(x^2-5x+5)^{x^2-9x+20} = 1$

4. 

Right angles are intended How many rectangles (including squares) are there in this figure?

5 A straight line through (3,2) with negative slope m forms with the coordinate axes a triangle with area 13.5. Find two values of m.

6. In right triangle ACB, $\overline{CM}$ is the median to hypotenuse $\overline{AB}$. If $m\angle A = 60°$ and $AB = 12$, find the distance from point B to the line containing $\overline{CM}$.

7 Find the digit X such that $32.\overline{X56} = \frac{32X2X}{999}$.

8 If $y > 2x$ and $y < 4-x$, in which quadrant(s) will the solution to the system lie?

9. John Doe does not know how many children are in the Jones family. One of the Jones girls says that she has as many brothers as sisters. One of the Jones boys says that he has twice as many sisters as brothers. The Jones children consist of how many girls and how many boys?

Algonquin, Bromfield, Doherty, Marlboro, St. John's, Shrewsbury, Tahanto, Worcester Academy

February 5, 1982 WOCOMAI VARSITY MEET ANSWERS

ROUND I comb, perm

1 pt 1. 21

2 pts 2. ~~5,111,000~~ 6,759,424

3 pts 3. 78

ROUND II alg 1

1 pt 1. 19

2 pts 2. $30.

3 pts 3. 402

ROUND III logs, exp, $\sqrt{}$

1 pt 1. 100

2 pts 2. 6

3 pts 3. $\frac{1}{2}$ or 0.5

ROUND IV ll lines, polygons

1 pt 1. 102°

2 pts 2 12

3 pts 3. 27

ROUND V analytic geom

1 pt 1. 3

2 pts 2. $\sqrt{5}$, $-\sqrt{5}$ or $\pm\sqrt{5}$

3 pts 3 7 ft

TEAM ROUND 2 pts each

1. 12

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

3 $\frac{1}{2}$, .5, .5 for all

4. 15

5. $-\frac{1}{3}$, $-\frac{4}{3}$ in any order

6. $3\sqrt{3}$

7. $\frac{1}{2}$

8. 1, 2, 3

9. 4 sides ...

5 sides