February 2, 1994 WOOCMAL VARSITY MEET

ROUND I: Combinations and permutations

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM AS POSITIVE INTEGERS

1. In how many ways can the five positions on a basketball team be assigned among 7 players?

2. In a league of 10 teams, how many league games will be played in a season if each team plays two games with every other team?

3. Three couples go to the movies and sit together in a row of six seats. In how many ways can these people arrange themselves if each couple sits together?

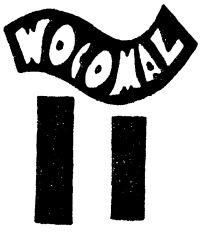
ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Auburn, Doherty, Notre Dame



February 2, 1974 WOCOMAL VAR SITY MEET

ROUND II: Algebra 1 - open

ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO FOUR DECIMAL PLACES

1. Solve: $\frac{3a}{5} - \frac{a}{2} = \frac{1}{20}$

2. If $\frac{1}{x^3} - \frac{1}{x^2} - \frac{1}{x} - 1 = 0$, what is the value of

$x^3 + x^2 + x + 1$?

3. Find the value of $x + y + z$ given that:

$x + y = z$

$x + z = y + 10$

$y + z = x - 4$

ANSWERS

(1 pt) 1. $a =$ _____

(2 pts) 2. _____

(3 pts) 3. _____

Notre Dame, West Boylston, Tahanto

February 2, 1994 WOCOMAL VARSITY MEET

ROUND III: Logarithms, exponents and radicals

ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO FOUR DECIMAL PLACES

1. Simplify: $\dfrac{2^{-4} + 2^{-3} + 2^{-2}}{2^{-1} + 2^{0} + 2^{1}}$

2. Solve: $\log_2 x + \log_2 (x-2) = 2$

3. a) Find all integers x such that
$$(\sqrt{x} - 1)(\sqrt{x})(\sqrt{x} + 1) = 6$$

b) How many real, non-integer roots does the equation in a) have?

Both parts must be correct for 3 points - no part credit.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. a) _____ b) _____

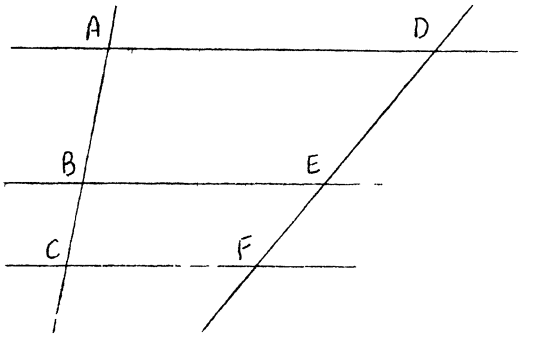
Algonquin, Bancroft, Burncoat, Mass. Academy

February 2, 1964 NOCTURNAL VARSITY MEET

ROUND IV Parallel lines and polygons

ALL ANSWERS TO BE EXPRESSED IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO FOUR DECIMAL PLACES

1. If $\overline{AD} \parallel \overline{BE} \parallel \overline{CF}$, AC = 18, DE = 15 and EF = 12, find AB.



2. Find the degree measure of the angle formed by extending sides $\overline{AB}$ and $\overline{ED}$ of regular nine-sided polygon ABCDEFGHI until these extensions meet.

3. In parallelogram ABCD, the bisector of ∠ABC intersects $\overline{AD}$ at P. If PD = 5, BP = 6, and CP = 6, find CD.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Clinton, South, Tarango

February 2, 1994 NOCOMAL VARSITY MEET

ROUND V: Analytic geometry of lines and conic sections

ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO FOUR DECIMAL PLACES

1. Write an equation in $ax + by = c$ form for the line whose y-intercept is -7 and whose x-intercept is 10.

2. Find the coordinates of the upper or right hand, whichever is appropriate, endpoint of the minor axis of the ellipse with equation $(x+1)^2 + 4(y+3)^2 = 9$.

3. A circle of radius 3 with center at (0,5) is drawn. A tangent to the circle which passes through the origin intersects the circle at (a,b) in the first quadrant. Find a and b.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. (,)

(3 pts) 3. a = b = _____

Bartlett, Notre Dame, St.John's, South

February 2, 1994 WOCOMAL VARSITY MELT

TEAM ROUND: Topics of previous rounds and open

2 points each

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

1. U.S. radio stations use an ordered set of three or four letters for their call letters. The first letter must be W or K. How many more different call letter sets are possible if letters may be repeated within a set than if no letter may be repeated within a set?

2. If $x = \frac{y-z}{1+yz}$, where $y = \frac{1}{t-1}$ and $z = \frac{1}{t+1}$, find x in terms of t.

3. If $\log_{10} 25 = 1.39794$, find the number of digits in 25^{100} when it is multiplied out.

4. Each interior angle of a certain regular polygon has a measure of 25° more than that of an interior angle of a regular octagon. How many more sides does this regular polygon have than the regular octagon?

5. Find the coordinates of the focal point of the parabola with equation $x^2-4x-12y+16 = 0$.

6. Find the sum of all solutions of $\cos 2x + \cos x = 0$, with $0 \leq x \leq 2\pi$.

7. Find the polynomial square root of $x^4-6x^3+13x^2-12x+4$ which has a constant term of +2.

8. Consider a set of four noncoplanar points.
Let P = the number of lines determined by the points of the set.
Let Q = the number of planes determined by the same points.
Let R = the number of pairs of skew lines determined by the same points.
Let S = the number of triangles determined by the same points.
Evaluate: P + Q + R - S

9. If $x_0 = 1$ and $x_1 = 3$ and the relation $x_n^2 - x_{n-1}x_{n+1} = (-1)^n$ is true for $n \geq 1$, find x_3.

Auburn, Bancroft, Bromfield, Buncoat, Clinton, Quaboag, St.John's, Worcester Academy

February 2, 1994 REGIONAL VARSITY BOWL ANSWERS

ROUND I	1.	1pt	2,520
comb, geom.	2.	2pts	90
	3.	3pts	48
ROUND II	1.	1pt	$\frac{1}{2}$ or 0.5
alg I	2.	2pts	2
	3.	3pts	6
ROUND III	1.	1pt	$\frac{1}{8}$ or 0.125
logs exp radicals	2.	2pts	$1+\sqrt{3}$ or 3.2361
	3.	3pts	a) 4 b) 0 or none (both must be correct)
ROUND IV	1.	1pt	10
circles polygons	2.	2pts	60°
	3.	3pts	4
ROUND V	1.	1pt	$7x - 10y = 70$ or opposite signs
analytic geom	2.	2pts	$(-1, -1\frac{1}{2})$ all 3 items ok
	3.	3pts	$a = 2\frac{1}{3}$, $b = 3\frac{1}{3}$ all items ok

1. 7.704

2. $\frac{2}{t^2}$ or $2t^{-2}$

3. 140

4. 10

5. (2, 4)

6. 3π [illegible]

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

8. 17

9. [illegible]