October 14, 1998 WOCOMAL Varsity Meet

Round I: Arithmetic

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Evaluate, expressing your answer as a reduced fraction:

$$\frac{1.5 - (3/4)^2}{(1/2)^5 + (1/2)^3 + 5(1/2)^2}$$

2. At "Rugs R Us", Mr. and Mrs. Shopper paid $ 2400 for an Oriental rug. If the store had only paid $ 400 for the rug, what was the markup as an exact per cent
   a) of the cost? b) of the selling price?

3. A cow and a goat can eat the contents of a pasture in 40 days, while a cow and a goose can do it in 60 days, and a goose and a goat in 90 days. At these rates,how long should it take all three of them eating together to eat the contents of the pasture? Answer with a mixed number or an improper fraction.

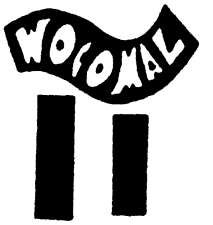
ANSWERS

(1 pt) 1. _____

(2 pts) 2 a) _____ 2b) _____

(3 pts) 3. _____ days

Algonquin, Hudson, Tahanto



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Round II: Algebra 1 - open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Find the sum of the digits of the largest of five consecutive integers whose sum is 1795.

2. On Arbor Day a group of students planted a tree that was 10 feet high. Each year the tree increased its height by x feet. During the sixth year it increased its height by 1/11 of the height it had reached at the end of the fifth year. How many feet high was the tree at the end of the sixth year?

3. Two wine merchants enter Paris, one with 64 casks of wine and the other with 20. Since they do not have enough money to pay the tax, the first pays 5 casks of wine and 40 francs and the second pays 2 casks of wine and receives 40 francs in change. What is the price of one cask of wine and the tax on it , in francs?

ANSWERS

(1 pt) 1._____

(2 pts) 2._____

(3 pts) 3. Price _____fr., Tax_____fr.

Bromfield, Hudson, Tahanto

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Round III: Set Theory

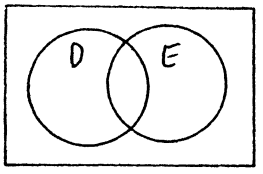
ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. In an election day survey of 100 voters leaving the polls, 52 said that they voted for proposition 1 and 38 said that they voted for proposition 2. If these include 18 who voted for both, how many voted for neither?

2. Using the Venn diagram like this in the answer section, shade

$\overline{(\overline{D} \cup [D \cap E])}$

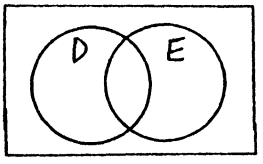
$\overline{D}$ = complement of set D



3. How many subsets containing at least 4 elements can be formed from a set containing 8 elements?

ANSWERS

(1 pt) 1. _____



(2 pts) 2.

(3 pts) 3. _____

Holy Name, St. John's, Westborough

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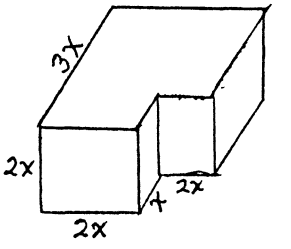
Round IV: Measurement

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

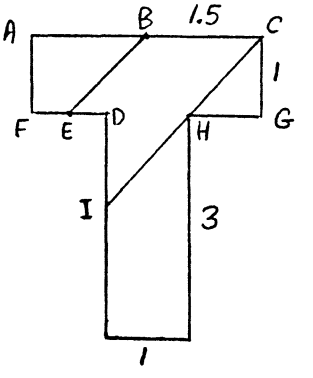
1. One cubic foot of a material weighs 64 pounds. How much will 216 cubic inches of this material weigh?

2. Determine the total surface area and volume of the figure, each in terms of x. All angles are right angles.



not to scale

3. The "T" puzzle is made up of 4 pieces, as shown. What is the area of the largest piece? B and E are midpoints of $\overline{AC}$ and $\overline{FD}$, GH = DF, and all apparent right angles are meant to be so.



ANSWERS

(1 pt) 1. _____

(2 pts) 2. Area _____ Volume _____

(3 pts) 3. _____

Bancroft, Burncoat, Tantasqua

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Round V: Polynomial Equations

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. When the square of a number is added to four times the number, the sum is -5. Find the complex number(s) for which this is true.

2. If p(x) is a polynomial of degree 3, the coefficient of x^3 is 7, p(5), p(-3), and p(1) are all zero, determine the y-intercept of the graph of p(x).

3. Find a polynomial equation in the form $a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0 = 0$ with integer coefficients having no common factor >1 and $a_n > 0$ whose roots are the reciprocals of the roots of $x^3 - 2x^2 - 5x - 6 = 0$.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

St. John's, Tahanto, Tantasqua

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TEAM ROUND: Topics of previous rounds and open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM 2 points each

1. 75% of 115 is what percent greater than 80% of 95? Round your answer to the nearest thousandths of a per cent.

6 times

2. Find all possible 2-digit numbers such that the value of the number is one more than the sum of its digits.

3. For these three sets of real numbers, C = {x: -1< x ≤ 5 }, W = {x: x > 3 }, and L = {x: x ≤ 0 }, specify all numbers x which are in ($\overline{C}$ ∩ L) ∪ (C ∩ $\overline{W}$), where $\overline{C}$ and $\overline{W}$ denote complements.

4. If A = (a_1,a_2) and B = (b_1,b_2), define $\kappa AB = |a_1 - b_1| + |a_2 - b_2|$. Let A = (0,0) in a standard coordinate system. If Γ = {B: $\kappa AB = 5$}, draw Γ. Specify any needed coordinates.

5. If 4 - i is a root of $x^3 - 6x^2 + x + k = 0$, find k.

6. How many integers greater than 4 million and less than 12 million are perfect cubes?

7. Substituting t+3 for x into a polynomial p(x), then expanding and simplifying gives the result $t^2 + 3$. What was the original polynomial p(x)?

8. Mr. S.,on his way home after the math meet shortly after 6 pm, observes that the hands of his watch form a 110° angle. Reaching home before 7 pm, he notices that the hands again form a 110° angle. How many minutes elapsed between these observations?

9. If $\begin{aligned} a+b+c-d &= -4 \\ a+b-c+d &= 10 \\ a-b+c+d &= 0 \\ -a+b+c+d &= 2 \end{aligned}$, then what is the value of a+2b+3c+4d ?

Assabet Valley, Holy Name, Hudson, Mass. Academy, Quaboag, Tahanto, Worcester Academy

October 14, 1998 WOCOMAL Varsity Meet ANSWERS

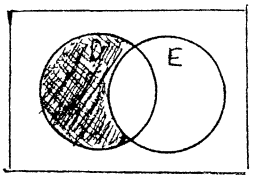
ROUND I arith

1. 1 pt $\frac{2}{3}$
2. 2 pts (1 each) a) 500% b) $83\frac{1}{3}\%$
3. 3 pts $37\frac{17}{19}$ or $\frac{720}{19}$

ROUND II alg 1

1. 1 pt 10
2. 2 pts 20
3. 3 pts (no partial) P 120 T 10

ROUND III sets

1. 1 pt 28
2. 2 pts 

3. 3 pts 163

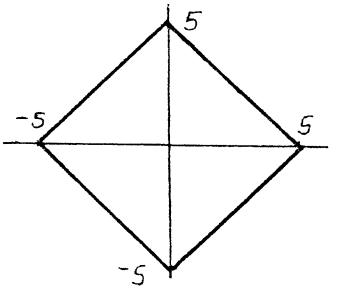
ROUND IV meas

1. 1 pt 8
2. 2 pts (1 each) A $48x^2$, V $20x^3$
3. 3 pts 2.5 or equivalent

ROUND V polys

1. 1 pt $-2 \pm i$ May write separately, but need both.
2. 2 pts 105
3. 3 pts $6x^3+5x^2+2x-1=0$ must have $=0$

TEAM ROUND 2 pts each

1. 13.487 %
2. 43 and 97 need both
3. $\{x: x \leq 3\}$
4. 

need ± 5's
5. 34
6. 70
7. $x^2-6x+12$
8. 40
9. 12