March 5, 1997 WOCOMAL FRESHMAN MEET

ROUND I: Algebraic word problems

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Find three consecutive even integers such that half of the smallest is 8 less than the largest.

2. A helicopter traveling at an average speed of 225 km/hr left San Jose one hour after a train that had departed at 7 a.m. If the helicopter overtook the train in 48 minutes, find the train's average speed in km/hr.

3. Scott has some pennies and nickels. He has two more than three times as many nickels as pennies. One-fourteenth the number of nickels he has equals one-fourth the number of pennies. Find the total value of his coins in cents.

ANSWERS

(1 pt) 1._____

(2 pts) 2._____ km/hr

(3 pts) 3._____ ¢

Bancroft, Bartlett, Notre Dame

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ROUND II: Operations on polynomials

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Multiply $(x^n - 3)$ by $(x^n + 1)$

2. Expand and simplify to polynomial form: $(x - 6)^3$

3. Find the result of dividing $(x^6 - 1)$ by $(x - 1)$

ANSWERS

(1 pt) 1._____

(2 pts) 2._____

(3 pts) 3._____

Bartlett, St. John's, South

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ROUND III: Ratio, proportion and variation

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Find the ratio of 6 minutes 40 seconds to 1 hour, in simplest fractional form.

2. The time required to empty a tank varies inversely as the rate of pumping. A pump can empty a tank in 45 minutes at the rate of 600 kiloliters per minute. How long in minutes will it take a pump to empty the tank at a rate of 1500 kiloliters per minute?

3. Points P and Q are both on segment $\overline{AB}$ and on the same side of its midpoint M. P divides AB in the ratio 2:3 and Q divides AB in the ratio 3:4. If PQ = 2, find AB.

ANSWERS

(1 pt) 1._____

(2 pts) 2._____

(3 pts) 3._____

Auburn, Hudson, Southbridge

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ROUND IV: Perimeter, area, and volume

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. If the number giving the perimeter of a square in furlongs also gives its area in square furlongs, find the length of a side of the square, with units.

2. An isosceles trapezoid has base angles of 45° and base lengths 6 and 13. Find the area of the trapezoid.

3. A rectangular box is 4 cm longer and 3 cm narrower than a certain cube. The box and the cube have equal heights and equal surface areas. Find the length and width of the box.

ANSWERS

(1 pt) 1._____

(2 pts) 2._____

(3 pts) 3. length _____cm width_____cm

Bromfield, Doherty, St. John's, West Boylston

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TEAM ROUND: Topics of previous rounds and open

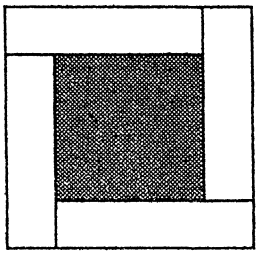
ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM AND ON THE SEPARATE TEAM ANSWER SHEET 3 points each

1. Find all sets of three consecutive integers such that the square of twice the first is 30 more than 3 times the product of the second and third.

2. Factor $2A^2 - 2 - 2B^2 - 4B$ completely.

3. The ratio of length to width is 4:3 for each of two rectangles. The length of the larger rectangle is in the ratio 7:5 to that of the smaller one. Find the ratio of the areas of the two rectangles, larger to smaller.

4. The tiles for a floor look like this diagram. Each is a square 9 inches on a side with the middle dark section a square 6 inches on a side. How many square feet of white tile will there be in a floor that is a 9 foot by 12 foot rectangle?



5. Find the smallest whole number with each of the integers from 1 through 10 as a factor.

6. Solve $(x-7)^3 + 7 = x$

7. Sue and John were on a seesaw. Sue, who weighs 120 pounds, was 5 feet from the fulcrum and John was 4 feet from the fulcrum. Jane, who weighs 80 pounds, came to sit with Sue. How far towards the fulcrum did Sue and Jane have to move to rebalance the seesaw?

8. French perfume in a fancy bottle sells for $74. If the perfume itself costs $50 more than an empty bottle, what is the cost of the bottle?

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ROUND I 1 pt 1. 8, 10, 12

alg word prob 2 pts 2. 100 km/hr

3 pts 3. 74 ¢

ROUND II 1 pt 1. $x^{2m} - \frac{2}{5}x^m - 3$

polys 2 pts 2. $x^3 - 18x^2 + 108x - 216$

3 pts 3. $x^5 + x^4 + x^3 + x^2 + x + 1$

ROUND III 1 pt 1. $\frac{1}{9}$

ratio prop var 2 pts 2. 18

3 pts 3. 70

ROUND V 1 pt 1. 4 furlongs NEED UNITS

perim area vol 2 pts 2. $33\frac{1}{4}$

3 pts 3. 10 3 NEED BOTH

TEAM ROUND 3 pts each

1. $\{-3, -2, -1\}, \{12, 13, 14\}$ NEED BOTH

2. $2(A+B+1)(A-B-1)$

3. $\frac{49}{25}$ or 49:25

4. ~~TOOTH~~ 60

5. 2520

6. $x = 6, 7, 8$ NEED ALL 3, but need not mention x

7. 2 feet or 24 inches NEED UNITS

8. $12