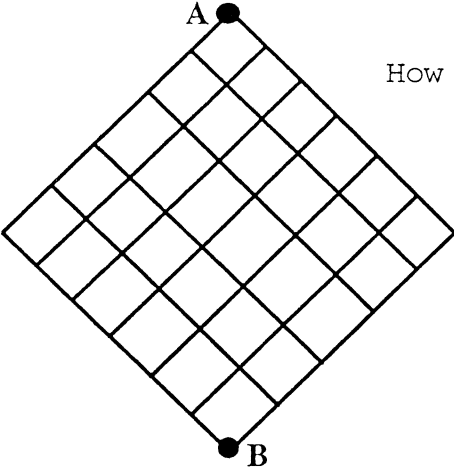


ROUND I: Combinations and Permutations

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM AS POSITIVE INTEGERS

1. Six bands are to march in a parade. In how many different ways may their marching order be selected?
2. Normally there are 8 greyhound dogs in a dog race. In certain races there are 9 dogs. Considering the number of ways that 8 dogs and 9 dogs can finish a race in first, second, or third place, how many more possibilities does a 9 dog race have than an 8 dog race? Assume no ties.

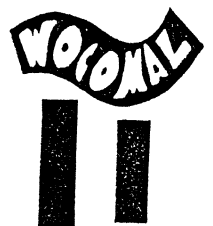
3.  How many distinct paths can a marble take if it drops from *A* to *B* along this grid?

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____



February 1, 1995

WOCOMAL VARSITY MEET

ROUND II: Algebra I - Open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. 20% of y is multiplied by 10% of y .
The result is what % of y^2 ?

2. Simplify: $\frac{15\sqrt{y^5} - 6\sqrt{y^3}}{3\sqrt{y}}$

3. Jeff had a flat tire, after biking $\frac{7}{8}$ of the way home and walked the rest of the way. If Jeff's walking time was half his biking time, his biking speed was how many times his walking speed?

ANSWERS

(1 pt) 1. 7%

(2 pts) 2. _____

(3 pts) 3. _____

Auburn, Clinton, Leicester

February 1, 1995

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ROUND III: Logarithms, exponents, and radicals

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO 4 PLACES AFTER THE DECIMAL POINT

1. Solve: $\sqrt[3]{2x-3} + 5 = 2$

2. If $a \# b = (a^b)^a$ and $a ? b = a^{\frac{1}{b}}$

Evaluate $(3 \# 3) ? 3 + (3 \# 3) ? 9$.

3. Solve for x : $\log_4(4 \log_4(\log_4 x^{-4})) = 1$

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

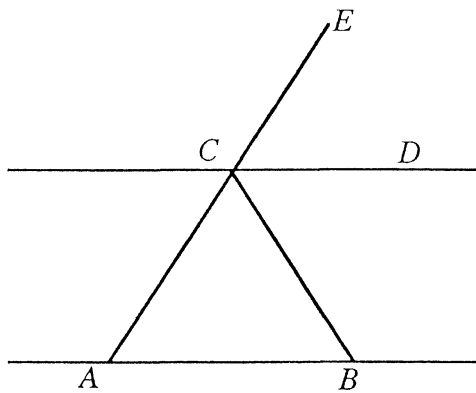
(3 pts) 3. _____

Hudson, Quaboag, Shepherd Hill, Tahanto

ROUND IV: Parallel lines and polygons

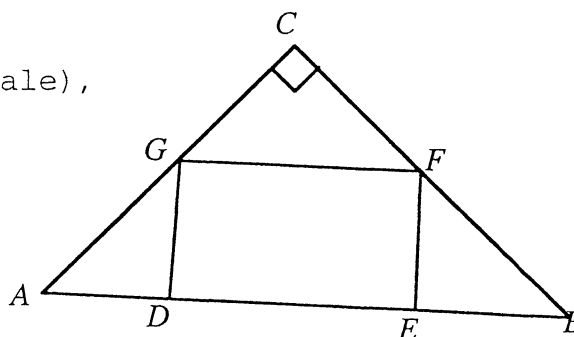
ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED TO 4 PLACES AFTER THE DECIMAL POINT

1. If $\overline{CD} \parallel \overline{AB}$ $m\angle DCA = 115^\circ$
and $m\angle CBA = 40^\circ$, find $m\angle ECB$.



2. Find the degree measure of an acute angle formed by two diagonals of a regular pentagon which do not have a common endpoint.

3. In the figure (not drawn to scale), \overline{DEFG} is a square, $m\angle C = 90^\circ$, $\overline{AD} = 8$ and $\overline{EB} = 18$. Find the area of $\triangle ABFG$.



ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

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WOCOMAL VARSITY MEET

ROUND V: Analytic geometry of straight lines and conic sections

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM OR AS DECIMALS ROUNDED
TO 4 PLACES AFTER THE DECIMAL POINT

1. Determine y if the points $(0,-4)$, $(2,0)$, and $(3,y)$ are collinear.

2. Find the equation for the ellipse with foci $(-3,0)$ and $(3,0)$ which passes through the point $(-3,8)$ which is in the form having 1 to the right of the $=$ sign.

3. Find the sum of the radii of all circles which pass through the point $(-1,-2)$ and are tangent to both axes.

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

St. John's, Southbridge, Tantasqua

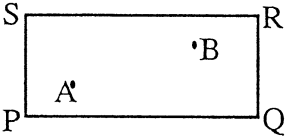
February 1, 1995

WOCOMAL VARSITY MEET

TEAM ROUND: Topics of previous rounds and open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM OR AS DECIMALS
ROUNDED TO 4 PLACES AFTER THE DECIMAL POINT OR AS DIRECTED
IN THE PROBLEM AND ON THE SEPARATE TEAM ANSWER SHEET.

2 points each.

1. A committee is being formed from a group of twelve Republicans and ten Democrats. How many different committees of six are possible if at least four are Democrats?
2. Euclid and Dilcue have only one horse. Euclid rides for an agreed-on distance and then ties up the horse for Dilcue, who has been walking from the same starting point. Meanwhile Euclid walks on ahead. They alternate walking and riding along the same route. If they walk at 4 miles per hour and ride at 12 miles per hour, for what fraction of the time is the horse resting?
3. Solve for x : $\log_{10}(x^2 - 16) = \log_{10}(x - 4) + \frac{1}{2}$
4. Square $ABCD$ and regular pentagon $ABEFG$ share side \overline{AB} . Does a regular polygon exist that could share sides \overline{BC} and \overline{BE} ? If so, how many sides has it?
5. A line with slope 3 passes through point $(a, 2a)$ in the first quadrant. If the product of the x and y intercepts of the line is -6 , find the value of a .
6. Two dice are rolled. What is the probability that the product of the numbers shown on the tops of the dice is 12? Give your answer as a reduced fraction.
7. Rectangle $PQRS$ has interior points A and B . Point A is 5 units vertically from horizontal \overline{PQ} and point B is 10 units vertically from \overline{PQ} . A and B are 15 units apart horizontally. Point C is somewhere on \overline{PQ} . Find the smallest value of the sum $\overline{AC} + \overline{BC}$.
8. A sequence of numbers starts at 1 and ends at 50. The terms in between are determined by doing one of these operations to the previous term- (1) adding one, (2) adding 2, or (3) tripling. The maximum number of terms in such a sequence is 50. Find the minimum number.
9. Solve:
$$\begin{cases} |x| + |y| = 10 \\ y = |x + 2| \end{cases}$$
 Give your answer as an ordered pair or ordered pairs (x, y) .

Burncoat, Hudson, Leicester, Mass. Academy, St. John's,
Shrewsbury, West Boylston, Worcester Academy

February 1, 1995

I 1 720
 2 168
 3 462

II 1 2%
 2 $5y^2 - 2y$ or $y(5y-2)$
 3 $3\frac{1}{2}$ or...

III 1 -12
 2 $\frac{10}{27}$ or .370 or .3704
 3 $\frac{1}{4}$ or .25

IV 1 105°
 2 72°
 3 300

V 1 2
 2 $\frac{x^2}{81} + \frac{y^2}{72} = 1$
 3 6

Team

1. 17,094

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

3. no values
(accept \emptyset)

4. yes 20

5. $3\sqrt{2}$ or 4.2426

6. $\frac{1}{9}$

7. $15\sqrt{2}$ or
21.2132

8. 7

9. (4, 6), (-6, 4)
need both