



SOUTHEASTERN MASSACHUSETTS CONFERENCE MATH LEAGUE

Meet 1 - October 17, 2007

Round 2: Algebra 1 - Linear Equations

All answers must be in simplest exact form

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1. Solve the following equation for  $x$ :  $2(3x - 5) - 4[2 + 3(x - 1)] = 3(x - 5)$

2. How many watches purchased at 3 for \$20 and sold at 4 for \$30 are required to make a profit of \$40?

3. A tank can be emptied by a drain in  $4\frac{1}{2}$  hours and filled by an inlet pipe in 3 hours. With the tank full at 11:00 am, the drain is opened and left open. At 2:00 pm the inlet pipe is turned on with the drain still open. At exactly what time will the tank be full again? Include am or pm in your answer.

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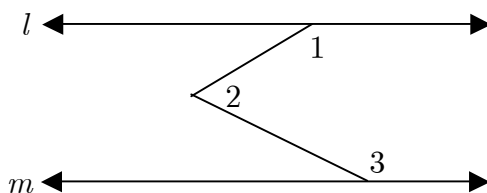
Round 3: Geometry - Angles

All answers must be in simplest exact form

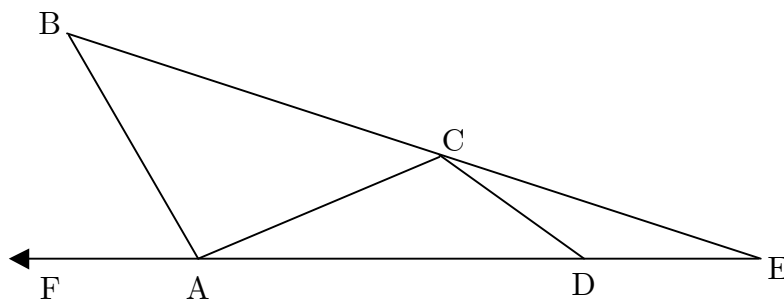
The diagrams are not drawn to scale

1. Three lines are concurrent (that is, they intersect in a single point) forming six angles, three of which have measures of  $(3x + 6)^\circ$ ,  $(7x - 10)^\circ$ , and  $(9x - 6)^\circ$ . If none of these angles have equal measures, find the numerical ratio of the smallest measure to the largest measure. Please express your ratio as a fraction reduced to lowest terms.

2. In the diagram below,  $l \parallel m$ . Find  $\angle 1 + \angle 2 + \angle 3$  in degrees.



3. In the diagram below,  $AB = AC = CD = DE$  and  $\angle E = \frac{1}{10} \angle CDE$ . Find  $\angle BAF$  in degrees.



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Round 4: Algebra 2 - Linear Equations, Inequalities  
and Absolute Value

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1. Find all values of  $x$  such that  $\frac{1}{4}(x-3) - \frac{3x-1}{6} < -\frac{4}{3}$

2. How many integral values of  $x$  make the following inequality true?

$$|2x-1| \geq |3x+12|$$

3. Find all of the values of  $x$  that satisfy the equation  $|1 - |1 - |1 - |1 - x||| = 0$ .

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Round 5: Advanced Topics – Exponents and Logarithms

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1. If  $\log x$  is the arithmetic mean of  $\log 3$  and  $\log 16$ , find the exact value of  $x$  in simple radical form.

2. Determine the positive value of  $A$  if  $15^6 \cdot 30^6 \cdot 18^6 = A^{12}$ .

3. Evaluate  $4^{2\log_8 7}$  in simplest exact form.

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Team Round: Logic Problem Solving

Approved calculators are allowed.

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1. Three goddesses were sitting in a row inside of an old Greek temple. Their names were Truth, Lie and Wisdom. It was known that Truth always told the truth, Lie always lied and Wisdom sometimes told the truth and sometimes lied. You had the following conversation with them:

You asked the one sitting at the left, “Who is sitting next to you?”

“Truth,” she answered.

Then, you asked the middle one, “Who are you?”

“Wisdom,” was her response.

Finally, you asked the rightmost one, “Who is next to you?”

“Lie,” she replied.

Order the three goddesses from left to right.

2. In the addition problem at the right, different letters represent different digits, but each letter represents the same digit each time it appears. If the letter O represents 7, what digit does U represent? Assume that F does not represent zero.

$$\begin{array}{r} T \quad W \quad O \\ + \quad T \quad W \quad O \\ \hline F \quad O \quad U \quad R \end{array}$$

3. Albert and Alice were horse trainers and on one day they decided to quit their job to become shepherds. They went to the market and sold all of their horses. The amount of money (in dollars) they received for each horse was the same as the number of horses they owned. For that money, they bought as many sheep as possible at \$10 each. Then, with the money that was left over, they bought a goat. One their way home they got in an argument and decided to split up. When they divided their sheep, there was one sheep left. So, Alice said to Albert, “I’ll take the remaining sheep and you take the goat.” “That’s not fair,” exclaimed Albert, “a goat costs less than a sheep.” “Okay,” Alice said, “then I will give you one of my dogs and then we’ll be even.” Albert agreed. How much would a dog cost (in dollars)?

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**ANSWER SHEET - TEAM ROUND**

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

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ANSWERS

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Round 1 - Arithmetic

1. 5
2. 8
3. 10221 (or  $10221_4$ )

Round 2 - Algebra 1

1. 1
2. 48
3. 8:00 pm

Round 3 - Geometry

1.  $\frac{3}{7}$
2. 360 (or  $360^\circ$ )
3. 60 (or  $60^\circ$ )

Round 4 - Algebra 2

1.  $x > 3$
2. 11
3. -2, 0, 2, 4 (need all in any order)

Round 5 - Adv. Topics

1.  $4\sqrt{3}$
2. 90
3.  $7 \cdot \sqrt[3]{7} = 7^{\frac{4}{3}}$

Team Round

1. Wisdom, Lie, Truth (only in this order)
2. 3
3. 2 (or \$2)