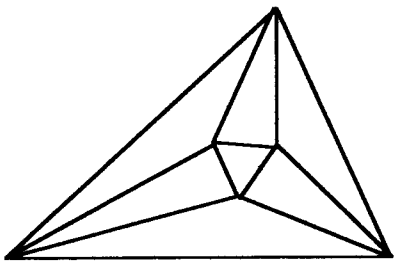


Minnesota State High School Mathematics League

Individual Event

2008-09 Event 1A

The first question is intended to be a quickie and is worth 1 point. Each of the next three questions is worth 2 points. Place your answer to each question on the line provided. You have 12 minutes for this event.

_____ 1. Express $\frac{1}{2}+\frac{1}{4}+\frac{1}{12}$ as the quotient of two relatively prime numbers.

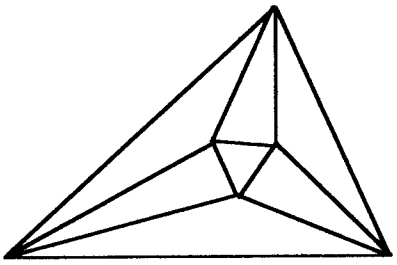
_____ 2. Express 12.5% of $\frac{.0032}{.0018+.0003}$ as the quotient of two relatively prime numbers.

_____ 3. [Here is a slight modification of a problem credited to the well known mathematician, Paul Halmos] A watermelon weighs 500 pounds, 99% of its weight being due to the water it contains. After it sat in a drying room for a while, it lost 250 pounds of water. What percent of its weight was then water?

4. Three positive integers L, M, and N satisfying $L < M < N$, have a greatest common divisor of 12 and a least common multiple of 180. Find all possible triples (L,M,N).

_____

Name_____Team_____



Minnesota State High School Mathematics League

Individual Event

2008-09 Event 1B

The first question is intended to be a quickie and is worth 1 point. Each of the next three questions is worth 2 points. Place your answer to each question on the line provided. You have 12 minutes for this event.

_____ 1. The isosceles ΔABC in Figure 1 has vertex $\angle C = 40°$. A point D is chosen on BC so that $AD = AB$. What is the measure in degrees of $\angle DAC$?

_____ 2. In the right ΔABC, the bisectors of the acute angles B and C meet at D to form an isosceles ΔBCD. What is the measure in degrees of $\angle BDC$?

_____ 3. The vertices of a regular pentagon, labeled in a counterclockwise direction, are $ABCDE$. What is the angle measure of $\angle DAE$?

_____ 4. In quadrilateral ABCD (Figure 4), $\angle ABC = 42°$. Furthermore, if AB is extended to E so that $AB = BE$, then $\angle ACE = 90°$. What is the measure of $\angle AEC$?

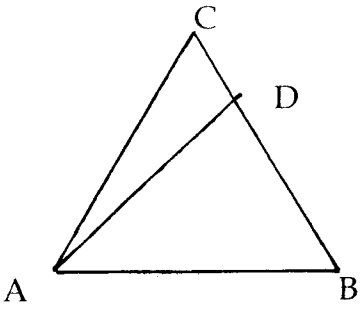


Figure 1

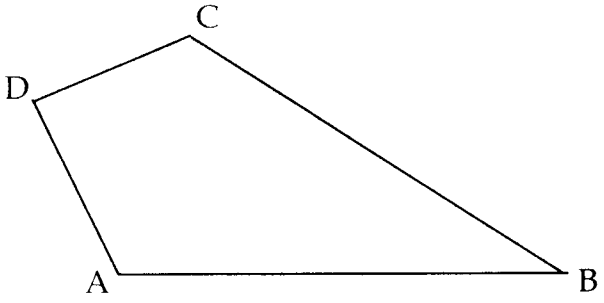


Figure 4

Name_____Team_____

Minnesota State High School Mathematics League

Individual Event

2008-09 Event 1C

The first question is intended to be a quickie and is worth 1 point. Each of the next three questions is worth 2 points. Place your answer to each question on the line provided. You have 12 minutes for this event.

_____ 1. For the second quadrant angle pictured in Figure 1, find $\sin\alpha + \tan\alpha$.

_____ 2. Express as a multiple of π the radian measure of an angle in the third quadrant that has a sine of $-\frac{1}{2}$.

3. Figure 3 shows the graph of $y = 2\sin\frac{4}{3}x$. No scale markings are shown on the axes, but certain points on the graph have been labeled. Write the label of the point on the graph having an x-coordinate of

(a) π _____ (b) $\frac{\pi}{2}$ _____

_____ 4. Round to the nearest multiple of 50 the number of x intercepts on the graph of $y = \sin\frac{1}{x}$ when $0.0001 < x < 0.001$. That is, to the nearest 50, how many times will the graph of $y = \sin\frac{1}{x}$ cross the x-axis between 0.0001 and 0.001?

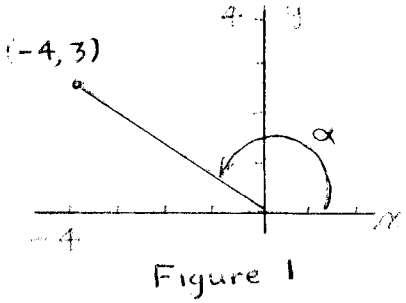


Figure 1

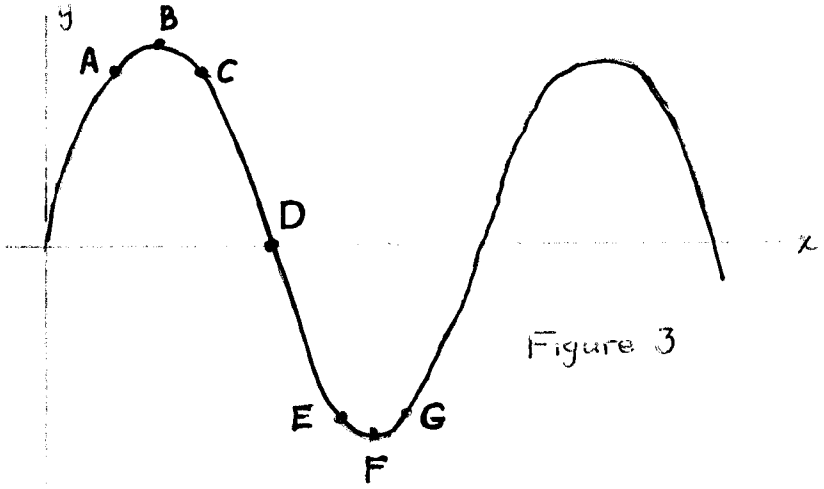
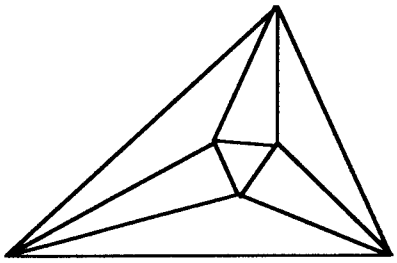


Figure 3

Name_____ Team_____



Minnesota State High School Mathematics League

Individual Event

2008-09 Event 1D

The first question is intended to be a quickie and is worth 1 point. Each of the next three questions is worth 2 points. Place your answer to each question on the line provided. You have 12 minutes for this event.

NO CALCULATORS ON THIS EVENT

_____ 1. Find all the solutions to $x^2 + 4x + 4 = 9$.

_____ 2. Find all the solutions to $(2x - 3)(x + 1) = 42$.

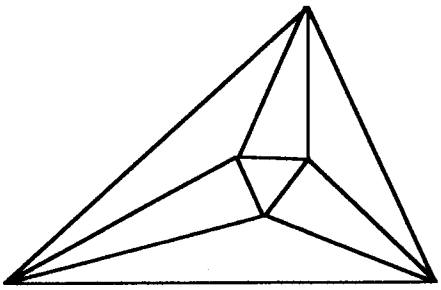
3. Write the equation of the parabola passing through (3,7), (1,4) and (5,4). Write your answer in the form $y = ax^2 + bx + c$ OR $x = ay^2 + by + c$, whichever form fits the situation.

_____

4. Find the smallest root of $6x^3 - 13x^2 - 19x + 12 = 0$.

_____

Name_____Team_____



Minnesota State High School Mathematics League

Team Event

2008-09 Meet 1

Each question is worth 4 points. Team members may cooperate in any way, but at the end of twenty minutes, one set of answers is to be submitted. Put answers on the lines provided.

_____ 1. Isosceles ΔABC (Figure 1) has base angles $\angle A = \angle B = 70°$. AE makes an angle of θ with AB, and θ varies as E moves up and down BC. DE is parallel to AB, and of course it too moves up or down with E. The extensions of DE to DF and AE to AG form angles $\alpha = \angle FEG$ and $\beta = \angle GEC$. What will be the measure of θ when $\alpha = \beta$? [AHSME, 1968, Number 18]

_____ 2. Having purchased 200 shares of a stock at one price, and another 200 shares at a higher price, Mr. Gotbucks later sold all 400 shares for \$30 each. He thereby gained 20% on the first 200 shares, but lost 20% on the other 200 shares. How much did he gain or lose at the time of the sale?

Lost OR Gained

_____ 3. How many ordered pairs (a,b) of positive integers exist such that $\frac{1}{a}+\frac{5}{b}=\frac{1}{2}$?

_____ 4. Find the measure in degrees of the sum of angles A, B, C, D, E and F in Figure 4. [AHSME, 1972, Number 21]

_____ 5. Consider the set of composite positive integers between 47 and the next largest prime. Let L be the least common multiple of this set, and let S be the largest integer such that S^2 is a factor of L. What is the value of $\frac{L}{S^2}$?

_____ 6. In ΔADE, $\angle ADE = 140°$, points B and C lie on sides AD and AE respectively, and point A, B, C, D, and E, are distinct. If $AB = BC = CD = DE$, what is the measure of $\angle EAD$? [AHSME, 1978, Number 12]

Team_____

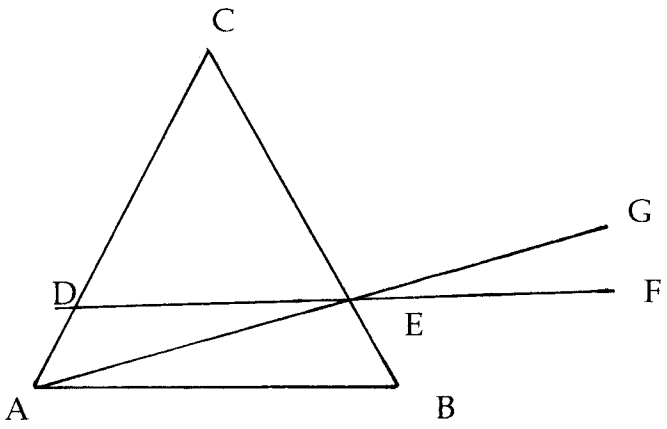


Figure 1

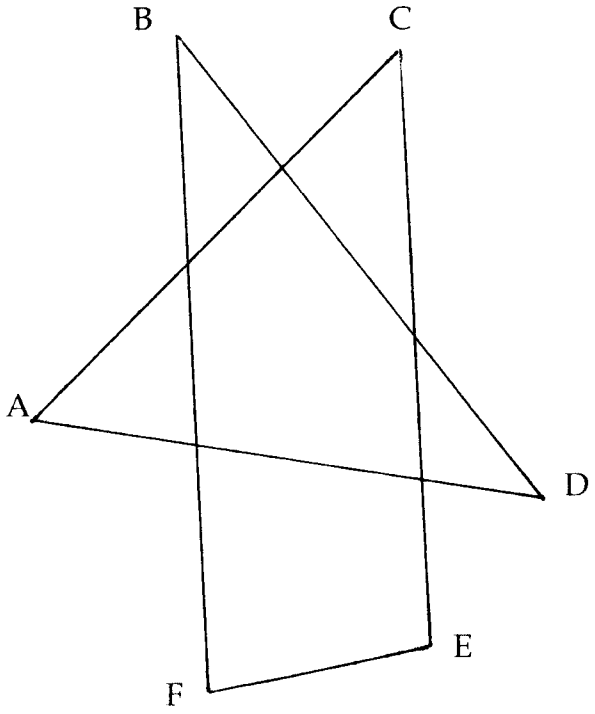


Figure 4