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Florida Invitational--Vero Beach
February 7, 1998

Algebra 2 Team

1. How long will it take Mary, Ryan and Joe to row upstream together if:

   a. The stream is 6 miles long.
   b. Mary can row downstream in 1 hour.
   c. Ryan and Joe can row upstream together in 8 hours.
   d. The current of the stream is 3 miles per hour.

2. A horse is attached to the corner of a house by a cord measuring 9 yards. The house is square with an area of 225 yds^2. What is the area in which the horse can graze? (Give units)

3. Combine the values in parenthesis according to the following rule: if the accompanying statement is true, add in the parenthetical value, if false, add 0.

   (1) The roots of $4x^2 + 7x - 5 = 0$ are $\frac{-7+\sqrt{129}}{8}$ and $\frac{-7-\sqrt{129}}{8}$

   (-2) The eccentricity of a parabola is always greater than 1.

   (10) $\sum_{x=1}^{\infty} (\frac{3}{n})^x = 1$, when n = 5.

   (-6) The circle with the equation $\frac{x^2}{9} + \frac{y^2}{9} = 1$ has a circumference of 6π..

   (6) A sphere is half full of water. The volume of water is equal to 18π when r = 3.

4. For what set of values of k is the following system inconsistent:

$$2y - x = 10$$
$$\frac{7}{5}kx - \frac{14}{5}ky = 17$$

5. If

   A= sum of the roots of $x^2-8 = 0$
   B = the value of 10101_2 in base 10
   C = ln (e)
   D = $f^{-1}(g(3)), f(x) = 2x+3, g(x) = 2x$

   find $\frac{A+B}{C-D}$

6. Rebecca and David are one of four couples sitting around a circular table. In how many ways can they be seated, if David sits first and Rebecca must sit to David's right, and they must sit boy-girl-boy-girl....?

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7. Four boys bought a boat for $60. The first boy paid one-half of the sum of the amounts paid by the other boys. The second boy paid one-third of the sum of the amounts paid by the other boys. The third boy paid one-fourth of the sum of the amounts paid by the other boys. How much did the fourth boy pay?

8. #28 Warrick Dunn had 771 rushing yards through the 14th game of the season. If he averaged 61 yards per game over the entire season of 16 games, how many more rushing yards did he accumulate in the last two games?

9. In math bowl competition, if every other question starting with the first slid to the 2nd minute, and the remaining questions were answered correctly in the first minute, what would be the maximum score possible for a team that knows they got the 3rd question wrong and answered the last three questions in the first minute? (The competition consisted of 12 questions)

10. An auditorium has 12 rows of seats and there are 15 seats in the back row. What is the maximum number of students that will fit in the auditorium if they must sit one seat apart, and each row has one seat less than the row behind it?

11. If $t = \frac{1}{1-\sqrt[4]{2}}$, then, in simplest form, t = ?

12. How many real numbers x satisfy the equation

$$3^{2x+2} - 3^{x+3} - 3^x + 3 = 0$$

13. How many ways can Beth order her key ring if she has 10 keys?

14. The area of a rectangle remains unchanged when it is made $2\frac{1}{2}$ inches longer and $\frac{2}{3}$ inch narrower or when it is made $2\frac{1}{2}$ inches shorter and $\frac{4}{3}$ inches wider. What is its area in square inches?

15. The population growth of the United States, after the year 1900 when there were 40,000 people, can be explained by the equation $y = 10x + 10$, x = time in years and y = population. The amount of food consumed by the population can be explained by the equation $5x-3y = -1000$, x = population and y = food consumed. In what year will the population consume all of the 100,000 units of food available per year?