Challenges of the Week
Spring Semester 2003-2004

Challenge of the Week # 1 - January 23 to January 30: Paper, 1 mm thick, is wrapped around a cylindrical spool 4 cm in diameter to form a cylindrical roll of paper 10 cm in diameter. Estimate the length of the paper. Justify your estimation.

Challenge of the Week # 2 - January 30 to February 6: A short person and a tall person are walking. The short person has steps that are 20% shorter than the steps of the tall person. Each walks for an hour at their own constant rate and, during that hour, the shorter person takes 20% more steps than the tall person. Which of the two people goes faster? Justify your answer.

Challenge of the Week # 3 - February 10 to February 19: Three students, Audie, Bren, and Cam, were discussing their grades on the last test they took. "Isn't it amazing", said the senior, "that we all got different letter grades – an A, a B, and a C – and we all have different first initials." "It surely is", responded both Bren and the student who got a B. Bren went on to note that no one got the same letter grade as their first initial. The senior did not get the highest grade. Which student got which grade? Justify your answer.

Challenge of the Week # 4 - February 20 to February 27: You have 6 weights - two of them are red, two of them are green, and two of them are blue. In each pair of weights of the same color, one of them is heavier than the other. However, the three heavy weights all weigh the same and the three light weights all weigh the same. Show how to determine, in two weighings of a pan balance, which weight of each pair is the heavier one. Justify your answer.

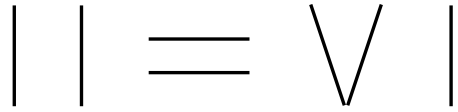
Challenge of the Week # 5 - February 27 to Match 5: You are in a heavily wooded forest. Each tree is in the shape of a right circular cylinder, but the radii of the trees are all different. There is a point, say B, 10 miles away (measured in a straight line) that you want to get to. Show there is path, shorter than 16 miles, from where you are to point B **which does not go through any tree.**

Challenge of the Week # 6 - March 5 to March 12: A 19° *angle is drawn in the plane. With compass and straightedge show how to divide the angle into 19 equal parts.*

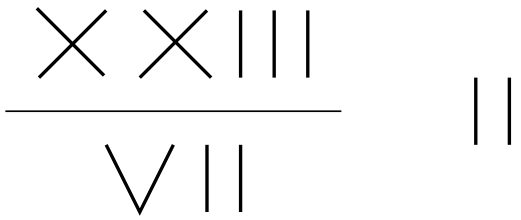
Challenge of the Week # 7 - March 26 to April 2: On an island, each citizen is either a truth teller (and always tells the truth) or a liar (and never tells the truth). Some of the citizens said that the number of truth tellers on the island is an even number and the other citizens said that the number of liars was an odd number. Is the number of citizens on the island an even number or is the number of citizens on the island an odd number? Justify your answer.

Challenge of the Week # 8 - April 2 to April 9: **The Annual April Fool's version of the Challenge of the Week**

1. *Which is heavier, a pound of quarters or a pound of nickels? Justify your answer.*
2. *You are in a room. The wall directly in front of you is covered with a mirror. There is also a mirror on the wall that is behind you. The two walls are parallel. As you look at one mirror, how many reflections do you see?*
3. *Move one stick in the following arrangement of 7 sticks to get a mathematically true statement.*



4. *Move one stick in the following arrangement of sticks to get an arrangement which is accurate to within 0.005.*



Challenge of the Week # 9 - April 9 to April 16: I have 2004 distinct positive integers whose sum is 2,009,011. What are these integers? Justify your answer.

Challenge of the Week # 10 - April 16 to April 23: If a and b are integers such that a divides b evenly, we write $a|b$. Thus, for example, $11|123123$. *Find the smallest integer, x, which is larger than 100 such that all of the following are true (for the same value of x):*

$$2|(x-3);\ 3|(x-2);\ 4|(x-5);\ 5|(x+4);\ 6|(x-5);\ 7|(x+8);\ \textit{and}\ 8|(x+7).$$

Justify your answer.