Problems, October 2006

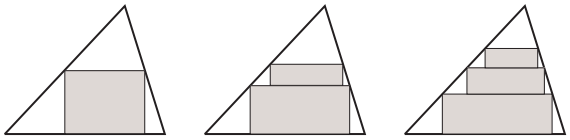
Problem 1. Find exact expressions for the real solutions of the equation

$$(x+1)(x+2)(x+3)(x+4) = 99.$$

Problem 2. In a mathematics competition, the top five people get medals (gold, silver, bronze, plastic, cardboard). Medals were given to the five people, but because of an unfortunate mixup they were given out at random. What is the probability that exactly two of the people got the right medal?

Problem 3. Alicia started going up the Grouse Grind trail at 4:30. Fred and Janet started 30 minutes later. Janet passed Alicia halfway up the Grind, and Fred passed Alicia 16 minutes afterwards. Janet got to the top 12 minutes before Fred. Everyone climbed at unvarying speed. At what time did Alicia reach the top?

Problem 4. In the figure below, each of the three large triangles has area 1, the base angles are each less than or equal to a right angle, and the shapes that look like rectangles *are* rectangles. What is the largest possible shaded area in (i) the left-hand picture; (ii) the middle picture; (iii) the right-hand picture?



Problem 5. Consider the arithmetic sequence 8, 31, 54, 77, 100, and so on. The first term of this sequence is a perfect cube. Find three other perfect cubes in the sequence.

http://www.pims.math.ca/education/math_problems/
http://www.math.ubc.ca/~adler/problems/