Mathematics 414, Problem Set #2
(due by 1:00, September 22)

Problem 1. Yolande has \$77 more than Xavier, and Zoë has \$77 more than Yolande. Between them, they have \$777. How much money does each of them have? Solve the problem (preferably in more than one interesting way) without using formal algebra.

Problem 2. Some positive integers n have the property that $1/n$ has a terminating decimal expansion. For example, $1/40$ has the terminating decimal expansion 0.025. (a) How many such integers are there that are less than or equal to 10^6? (b) What is the sum of the reciprocals of *all* the positive integers n such that $1/n$ has a terminating decimal expansion? So we want

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{5} + \frac{1}{8} + \frac{1}{10} + \frac{1}{16} + \frac{1}{20} + \frac{1}{25} + \frac{1}{32} + \frac{1}{40} + \cdots .$$

Problem 3. Find all ordered pairs (x, y) of integers (where x and y need not be positive) such that $xy - 2x + 3y = 2010$.

Problem 4. "Invent" and solve a problem inspired by the 2010 Euclid competition. Even though the Euclid is in principle a grade 12 contest, the solution(s) should be as concrete and low-level as possible. A link to the CEMC can be found on the Math 414 web site.

Problem 5. "Invent" a grade 8–10 workshop problem. Take as source of inspiration a non-trivial problem from the 2010 Math Challengers competition (either the Regional or the Provincial). A link to these problems can be found on the Math 414 web site. Write out a solution or solutions.

Assignment: Begin to read carefully the 2009–2010 UBC workshop problems and solutions. These will be used in our workshops until enough new problems have been developed for 2010-2011. Start with the grade 6–7 problems, since probably the elementary schools will be first in requesting workshops.