MATH 4123 HISTORY OF MATHEMATICS Problem Set 1 Name:
PROF. PAUL BAILEY September 26, 2008

Due Date: Friday, October 3,2008.
Write your solutions neatly on separate pieces of paper and attach this sheet to the front.

In Problem 1, recall that $(123)_5$ is the numeral 123 in base 5, which is 38 in base 10. Thus, $(123)_5 = (38)_{10}$.

In the constructions of Problem 3 and 4, describe each step, and draw all steps with a straight-edge and compass, labeling each point significant for the construction. Explain why your construction works. You may use propositions one through five in the notes (when constructing a midpoint or a perpendicular via these propositions, you may use a ruler or protractor to get a more accurate picture).

Problem 1. Solve the following equations for the positive integers n and b.

(a) $n = (13425)_b = (4115)_{2b}$

(b) $n = (1234)_b = (532)_{2b-1}$

(See Eves Problem Study 1.8.)

Problem 2. A *Pythagorean triple* is and ordered triple (a, b, c) of positive integers such that $a^2 + b^2 = c^2$.

(a) Show that there exists a Pythagorean triple (a, b, c) for every integer $a \geq 3$.

(b) Show that there exist only finitely many Pythagorean triples (a, b, c) for each integer $a \geq 3$.

(See Eves Problem Study 3.6 and discussion on pp. 81-82)

Problem 3. Given line segment $\overline{AB}$ of length 11 and $\overline{CD}$ of length 3, construct a point C on $\overline{AB}$ such that $|CB| = x$, where x is a solution to the quadratic equation

$$x^2 - 11x + 9 = 0.$$

State the exact value of x. (See Eves Problem Study 3.10a and discussion on pp. 88-89)

Problem 4. Given a two points A and B, construct a point Z such that $\angle BAZ = \angle ABZ = 75°$.