THE PROBLEM POTPOURRI - 2008

Here is a set of problems entitled the Problem Potpourri. What does that mean and what should you do about it?

75% of the final exam will consist of a set of problems each of which is modeled **extremely** closely on one of the problems in the Potpourri. If you really, thoroughly understand every one of these problems by exam day, then the final will be easy to the point that it risks being boring.

In class today you will simply work on them in groups, with extremely little by way of hints and suggestions from either instructor. **Bear in mind that this is a group learning exercise.** You will not be turning anything in, so there is absolutely no point in rushing through.

If you see a solution instantly, help your groupmates find their way through it—don't destroy it for them by simply handing them an answer.

If you are not certain that you get it, get someone to help you until you are certain. They will benefit, too.

And if you are tempted to take the line of least resistance and leave the work to your groupmates, **resist that temptation**. I guarantee that on exam day you would regret having succumbed.

The remaining 25% of the exam will be short-answer questions – mostly computations involving place value (non-decimal bases, for instance) or fractions.

One additional use of the Problem Potpourri

It also serves as an emergency back-up, as follows: before the exam begins, you may turn in a complete set of solutions, neatly written out in your own handwriting. If your grade on the final is above passing, I won't be looking at what you turned in. But if your grade is just **slightly** below passing, I will look for the turned-in set, and if it is there and clear and correct, it will take you over the margin.

Concerning solution format: Any solution, either on the turned-in set or the final itself, must have a clear justification. This can take the form of words, equations or diagrams, so long as we can **easily** follow your train of thought. I will not at any point require a diagram for a fraction problem. On the other hand, I think I should mention that I always include one problem to which I have yet to see a correct solution that did not involve a diagram.

Problems on the final will be modeled quite closely on these, but will NOT be identical to them. REMINDER: Questions from Mini-test 2 are also fair game.

1) Joe works every day in one of his four pet stores, with a regular rotation pattern: one day he works at the Anteater; the next at the Bear; the next at the Caterpillar; and the next at the Dogfish.
   a) If he works at the Bear on March 8, where will he work on March 25?
   b) If he works at the Bear on the first day after his vacation, where will he work on the 253rd day after his vacation?

2) I have made 3 3/4 pounds of candied orange rind, which I intend to put in jars each of which holds 3/5 of a pound. When I have filled as many jars as I can, I will eat the leftovers. How much orange rind will I eat?

3) All the fruit I own either is a banana or is overripe or is an overripe banana. $5\frac{3}{4}$ pounds of my fruit collection is bananas, $3\frac{1}{2}$ pounds of it is overripe, and $2\frac{1}{8}$ pounds of it is overripe bananas. How many pounds of fruit do I have?

4) Annabelle made an apple pie. To check its flavor, she ate an eighth of it. Then, while it was cooling, her teen-age brother ate 2/3 of what was left. What portion of the pie was left to serve the rest of the family?

5) Gina can swim fifty yards in twenty-three and a quarter seconds. If she keeps up the same rate, how long will it take her to swim eighty yards?

6) Diophantus was an algebraist who lived in Alexandria in the third century A.D. Most of what is known about his life comes from an epigram about him (which I have simplified very slightly.) His boyhood lasted a sixth of his life; his beard grew after another twelfth; he married after a seventh more and his son was born nine years later. When he died, he had been a father for half of his life. How long did he live?

7) Sally has just baked a batch of chocolate chip cookies when she sees Dick approaching the door. She hastily eats one of the cookies, then watches as Dick eats half of the rest. After he leaves, she munches another, finishing it just before the arrival of Pedro, who eats half of the rest of the cookies. As he leaves, she sees Chung approaching, so she hastily consumes another cookie. Sure enough, Chung eats half of her remaining cookies, and when he leaves, she has only three. How many did she bake?

8) Astronauts searching for evidence about the inhabitants of the planet Sagloxia find an abandoned classroom with a series of blackboards.
a) On the first board is the equation 10 x 100 = 1000. What conclusions can they draw about the number of fingers the Sagloxians have?
b) On the next board they see 13+15 = 31. "Ah ha!", they say, "Now we know!" How many fingers have they now figured the Sagloxians to have?
c) The next board has an equation that allows them to check their conclusion. It starts 6 x 3 = . How should it end?

9) Driving straight from her house to Omigosh, Suzabelle passes first through Podunk, and then through Mugglethorpe. It is twice as far from Podunk to Mugglethorpe as it is from Suzabelle's house to Podunk, and it is three times as far from Mugglethorpe to Omigosh as it is from Suzabelle's house to Podunk. Suzabelle's total drive is 90 miles. How far is it from her house to Mugglethorpe?

10) An airline passenger fell asleep halfway to her destination. When she woke up, the distance remaining was half the distance traveled while she was asleep. What portion of the trip was she asleep?

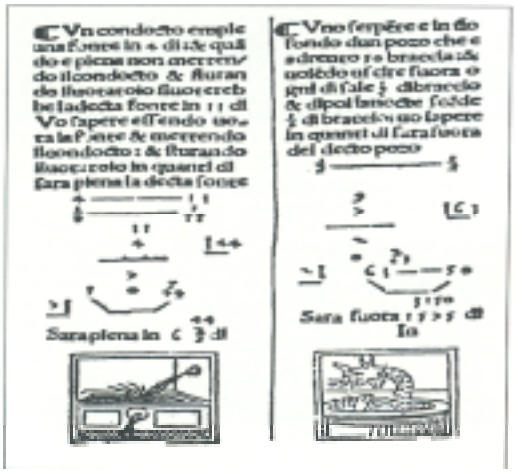
11) Fred and Joe left two towns 55 miles apart and met after 2 hours. Each bicycled at a steady rate. Fred traveled at 15 miles per hour. How fast did Joe travel?

12) Annie and Suzy together made 5 pounds of Christmas cookies. Suzy made a half pound more than Annie. How much did each one make?

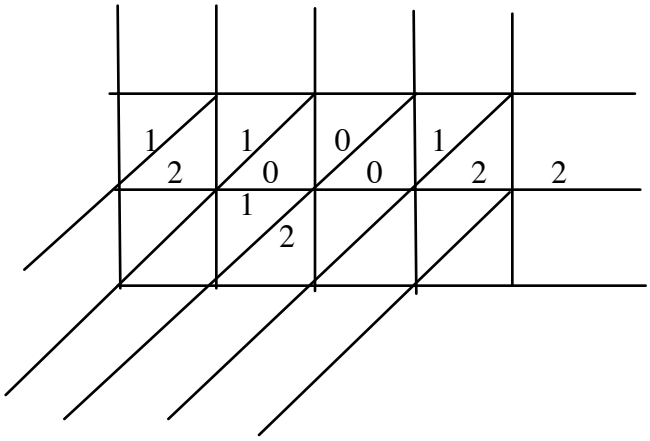
13) In base ten, you can tell whether a number is even (i.e., a multiple of 2) simply by looking at its last digit. Can you recognize an even number by its last digit in base 2? in base 3? in base 4? In each case, either say why you can, or show both an even and an odd number with the same last digit.

14) Above this you see the start of the local zoo's annual turtle and penguin parade, led by the turtle with the flag. Judging by the beginning, would you predict that the 145th animal in the parade would be a penguin or a turtle? [Convince me you're not guessing!]

15) The problems below are from *Aritmetici*, published in 1518 by Philippi Calandri. The left-hand question, translated and slightly paraphrased: How long does it take to fill a trough or tub if water enters at a rate such that it would be full in 4 days if it weren't leaking at a rate that would empty it in 11 days?
[Hint: Start with a single day. What fraction of a tubful would have flowed in? What fraction of a tubful would have flowed out?]



16) The lattice below represents a partially solved problem in base four. Complete it.



PROBLEM AND SOLUTION:_____X_____ = _____