Homework 4, Math 266
Due Tuesday, February 11, 2003

For every exercise, the object is to explain how to solve it. As for style, follow the acronym KISC - Keep it Simple and Correct.

There are 15 problems, each worth 2 points.

(1) Explain the rule of Theorem 4.16 for deciding which is larger, 82123 or 82078. Explain, in a fashion which will generalize, why the rule works in this case.

(2) (a) Write the numeral for the following numbers.
   (i) \(7000 + 500 + 80 + 6\)
   (ii) \(6 \cdot 1000 + 7 \cdot 100 + 3 \cdot 10 + 5\)
   (iii) \(5 \cdot 10 \cdot 10 \cdot 10 + 4 \cdot 10 \cdot 10 + 8 \cdot 10\).

   (b) Express 27043 as a sum of various numbers of products of ten.

(3) Explain the rule of Theorem 4.16 for deciding which is larger, 10345 or 13025. Explain, in a fashion which will generalize, why the rule works in this case.

(4) (a) Which of the following two pictures show \(\frac{4}{7}\)? Explain why they do or do not.

(b) Use a straight edge to draw a square. Divide it into 8 equal parts by using a horizontal line, a vertical line and both diagonals. Shade \(\frac{2}{8}\) of this square.

(c) Arrange the fractions \(\frac{1}{2}\), \(\frac{1}{8}\) and \(\frac{1}{5}\) in increasing order. Use pictures of these fractions to demonstrate the validity of your ordering.

(5) In the picture

(a) What fraction of the circle is shaded? This fraction and what fraction will make 1 whole?

(b) What fraction of the rectangle is shaded? This fraction and what fraction will make 1 whole?
(6) Three-fifths of the people in a bus are children. The rest are adults. There are twice as many children as women. There are 10 more women than men. Find the number of children, women and men on the bus. Show how to use a picture diagram of a line segment or rectangle divided into 5 equal parts to solve this problem.

(7) Each grid square is a unit square. Find the area of each figure.

(8) Describe the standard addition algorithm for calculating $237 + 148$. Give an explanation in terms of soda straws of why this algorithm gives the correct answer.

(9) Explain the scratch addition algorithm for calculating $264 + 859 + 488 + 377$.

(10) Show the addition table needed in base five numeration. Give an expanded explanation of $32_5 + 44_5$.

(11) (a) Sue took 1 hour and 20 minutes to do her homework. She started at 8:50 p.m. When did she finish doing her homework? Explain how the calculation accounts for changing 60 minutes into 1 hour.

   (b) Explain how to add $3.45$ and $2.65$ in the following two ways.

   (i) Use the addition algorithm to find $345 + 265$ and then rewrite it in money notation.

   (ii) Add 3 dollars and 45 cents plus 2 dollars and 65 cents by adding the dollars then adding the cents and then exchanging each 100 cents for 1 dollar.

(12) Demonstrate the algorithm for the computation $83 - 56$. Give an expanded explanation for why it works.

(13) Demonstrate the algorithm for the computation $204 - 57$. Give an explanation of it in terms of soda straws.

(14) Demonstrate the algorithm for the computation $213_5 - 14_5$. Give an explanation of it in terms of soda straws.

(15) A box of cookies costs $4.95. A box of chocolates costs $9.50. How much cheaper is the box of cookies? Explain what calculation must be made and how to make it.