

Math 221C
Fall 1999

Name _____
Group _____

Test 1 – In Class Part

Instructions. Answer the questions below on the paper provided. **Do not do any work on the test paper.** You may take the test paper with you at the end of the hour.

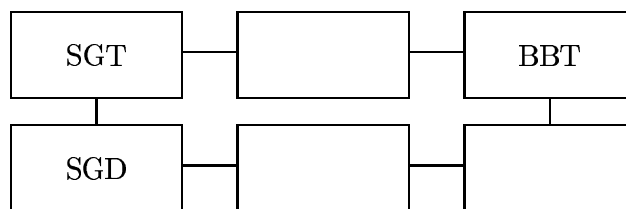
Each sheet should be clearly labeled with your name and the question(s) being answered. Please use only one side of each sheet of paper. When you are finished, put your sheets in order and bring them up to be stapled together.

All of the questions are either short answer or mathematical tasks. In grading **short answer** questions I will generally be looking for answers that are true, accurate, concise, coherent, important, and supported, but if I ask for a list, you can simply give a list without explanation.

Be sure to show all of your work on the **mathematical tasks**, explaining your reasoning as you go. If you are unable to get a complete solution, be sure to present the work you have done clearly, to explain any things you have tried (or would have tried given more time), and to list any partial results you have gotten.

1. POLYA’S FOUR STEPS. What are the four stages of Polyá’s general outline for solving problems? [5]
2. PROBLEM SOLVING STRATEGIES. Make a list of at least 5 problem solving strategies (heuristics). [5]
3. SOME PATTERNS. For each of the following patterns, (a) fill in the blanks, (b) express a “rule” for the pattern using words, (c) decide if it is repeating or “growing” (your answer should indicate why you have classified it the way you have), and (d) determine the *50th* item in the list (show your work). [10]
 - a) 4, 9, 14, 19, 24, 29, _____, _____
 - b) 4, 9, 7, 4, 9, 7, _____, _____
4. PROBLEMS AND EXERCISES. Be sure to show your work even if you do not get a full solution. Make your reasoning clear as you work and identify problem solving strategies as you use them. [20]
 - a) What is the last digit of 2^{2222} ?
 - b) Matt Mattox is making a set of structured attribute materials for his mathematics classes. He decides to draw little people on 3 by 5 cards. So far he has made three cards: a short woman in a green shirt and red pants; a tall man in a yellow shirt and blue pants; and a tall woman in a purple shirt and red pants. About now he is getting sick of drawing little people. How many more must he make in order to have a complete set?
 - c) SIMPLIFIED FOOTBALL. In simplified football every touchdown is worth 7 points, every field goal is worth 3 points and there are no other ways to score points. It is impossible for a team to have a final score 1 point or 2 points (since every score gives at least 3 points), but it is possible to have a final score of 3 points. So some final scores are possible, but others are not. Which scores are possible and which are impossible?
 - d) For each of the preceding three tasks (items ??, ??, and ??) tell whether for you the task was an exercise or a problem (using Van de Walle’s definitions of problem and exercise)? *Make sure your answer makes it clear that you know the difference between the two.*

5. NCTM STANDARDS. What are the five “process” or “theme” standards of the NCTM *Standards 2000 Draft*? [5]
6. CLASSROOM SHIFTS. The NCTM *Professional Standards* lists five shifts in classroom environment (each shift has a “toward” part and a “away” part.) For **one** of these shifts, give the “toward” and “away” parts and cite specifically how this shift was present in the classroom scene in the video *Double-Column Addition*. [5]
7. ATTRIBUTE BLOCKS. The attribute blocks we used in class had three attributes: size (big, small); color (red, blue, green, yellow); and shape (square, diamond, triangle, circle). Using the notation we developed in class (e.g., big red triangle = BRT), do the following: [10]
- a) Complete the 1-difference loop below (be sure you do not use any attribute blocks more than once).



- b) Some students made three loops of string and placed all of the blue blocks in loop *A*, all of the squares in loop *B* and all of the large blocks in loop *C*.
- i. **Describe** (with words) and **list** the blocks in region shaded below.

ii. Draw a Venn diagram and shade in the region where you would find the small red circle.

8. SETS. Let $A = \{1, 3, 5, 7\}$, $B = \{2, 3, 6, 7\}$, and $C = \{5, 6, 7, 8\}$. [10]
- a) Is $5 \in A \cap C$? (Give more than a one word answer.)
- b) What is $A \cup B$? (Use list notation.)
- c) What is $(A \cup B) \cap C$? (Use list notation.)
- d) Draw a Venn Diagram representing $(A \cup B) \cap C$.