There are 8 problems on this exam. Only those problems that say “explain” require explanations. Answers that require explanations will be given at most half credit without the required explanation. Be sure to follow all directions.

1. Four cars are entered in the Math Race. The drivers of the cars are ADDITA, MINUS, FACTORIA, and DIVIDA. Each car has a different number: 12, 15, 30, and 45. Use the following clues to determine who drove which car and in what position they finished the race. Use colors to code how you used the clues. (12 points)

   Clue 1: MINUS noticed that her car number was the sum of two of the other car numbers.

   Clue 2: FACTORIA finished next to last and drove a car whose number has 5 as a factor.

   Clue 3: ADDITA finished after FACTORIA and drove the car whose number is a multiple of both 5 and 6.

   Clue 4: If W is the set of letters in the winning driver’s name, then n(W) = 4.
2. Using the set $U = \{ 12, 16, 20, 24, \ldots, 60 \}$, place the elements of $U$ in the following Venn diagram where set $A$ is the set of numbers in $U$ that have a 6 as a digit and set $B$ is the set of numbers in $U$ that are multiples of 3. (8 pts)

3. Use your Venn diagram from problem 2 to list the elements in each of the following sets. Briefly explain how you decided what elements were in each set. (4 points each)

(a) $A \cap B$

(b) $A \cup B$

(c) $\overline{B}$

(d) $A - B$

(e) $\overline{A} \cap \overline{B}$
4. Fill in the missing terms in each of the following sequences. Briefly explain how you determined the missing terms. (6 points each)

(a) 2, 6, 8, 14, 22, _______, _______, _______, . . .

(b) 1, 5, 14, 30, 55, _______, _______, _______, . . .

(c) 1, 5, 9, 13, 17, _______, _______, _______, . . .

5. One of the sequences in problem 4 is an arithmetic sequence. Indicate which one is arithmetic, find a formula for the nth term in this sequence, and determine the 100th term in this sequence. (10 points)
6. Sally spent most of the day running errands. She began the day by buying $20 worth of gasoline. Her favorite boutique was having a sale and she purchased a dress and purse for $32.50. She then stopped at the bank and cashed a $50 check. Her final stop was at the grocery store where she spent $43.80. When she returned home she had $12.30 left in her purse. If all of her transactions were paid for in cash, how much money did she have in her purse when the day started? Explain. (8 points)

7. Consider the arithmetic sequence 11, 16, 21, 26, . . . .

(a) 1001 is a term in this sequence. What is the term number of 1001? (4 points)

(b) Use Gauss’s trick to find the sum 11 + 16 + 21 + 26 + · · · + 1001. Explain your answer without using variables. (10 points)
8. Consider the following figures made from squares. The length of each side of the squares is 1 centimeter. Figures are not drawn to scale.

(a) Determine the perimeter of each of these figures. (6 points)

Figure 1: _______  Figure 2: _______  Figure 3: _______

(b) Cut out the next figure in this sequence of figures from the graph paper provided and glue or tape it in the space below. (4 points)

BONUS  (c) Determine the perimeter of the 100th figure in this sequence of figures. Explain.