Math5900 Final Review

1. Find the formula to predict any term in this sequence and then find the 425th number in this sequence

   -3, 3, 9, 15, ...

2. Write a mathematically convincing argument to explain the formula

   $$1+2+3+...+n=\frac{n(n+1)}{2}$$

3. Convert these numbers to a different base as indicated.
   - (a) 2304_5 to base 10

   - (b) 762_8 to base 10

   - (c) 143 to base 3

   - (d) 111100001_2 to base 10

   - (e) 419 to base 6

4. Draw a Venn Diagram for all the number systems (including fractions) and place these numbers in the proper place in the Venn Diagram.
   - (a) 21%
   - (b) $\frac{4}{4}$
   - (c) -20
   - (d) $\frac{1}{3}$
   - (e) 0
   - (f) -3.16
   - (g) 6.090090009...
   - (h) $\frac{-5}{9}$
   - (i) 8
   - (j) 3π
   - (k) $5.\overline{9}$
   - (l) $\frac{-14}{7}$
   - (m) $\sqrt{169}$
   - (n) $\sqrt{7}$
   - (o) 0.76
   - (p) $2.11\overline{34}$

5. Order these numbers and then place them on a number line.

(a) $\dfrac{3}{40}$

(b) 69%

(c) $\dfrac{8}{5}$

(d) 0.5

(e) 0.2

(f) $\dfrac{1}{4}$

(g) $1.\overline{9}$

(h) 0

(i) $\dfrac{2}{3}$

(j) 1.6

6. Convert these numbers into a fraction (or mixed number).

(a) $24.1\overline{35}$

(b) 46%

(c) $5.113\overline{4}$

7. Simplify these expressions.

(a) $2\dfrac{3}{5} \div \dfrac{2}{15}$

(b) $5^4 5^{-2} 5^0 (5^2)^3$

(c) $\dfrac{1}{7} \div \dfrac{6}{14} \cdot 3\dfrac{3}{4}$

(d) $\dfrac{1}{3}\left(\dfrac{9}{20}\right) + \dfrac{5}{6}$

8. Find the GCF and LCM of the following pairs of numbers. (You can leave your answers in factored form, if you'd like.)

(a) 210, 300

(b) 110, 198

9. Perform the following arithmetic operations. For each problem, use one method to show your work. (For example, you can use the chip abacus, base blocks, number line, etc.) (Note: Make sure you can do both partitive and measurement methods for division.)

(a) 6 - 4

(b) $\dfrac{3}{4}+\dfrac{1}{5}$

(c) $\dfrac{5}{8}\div\dfrac{1}{2}$

(d) $561\div 8$

(e) 5209 x 67

(f) -3 + 10

(g) $\dfrac{2}{3}\cdot\dfrac{1}{6}$

(h) -5 x -4

(i) 238 + 96

(j) 177 - 85

10. Solve these linear equations using (i) a diagram and (ii) algebra notation.
(a) -2x + 9 = 4x – 6 + (-x)

(b) 3(x – 2) + 5 = -2x + 4

11. Solve the systems of equations.

(a) $\begin{array}{l}2x+3y=1\\5x-y=11\end{array}$

(b) $\begin{array}{l}-3x+y=7\\2y=6x+14\end{array}$

(c) $\begin{array}{l}x-4y=18\\3x+2y=12\end{array}$

(d) $\begin{array}{l}2x+y=7\\-5x-3y=-21\end{array}$

(e) $\begin{array}{l}2x+8y=9\\2+x=-4y\end{array}$

12. Solve the quadratic equations.

   (a) $x^2-16=0$

   (b) $x^2+2x-15=0$

   (c) $2(x+3)^2-50=0$

   (d) $2x^2-35=-9x$

13.   If possible, find an odd number that can be expressed as the sum of four consecutive counting numbers. If impossible, explain why.

14. Think of a number. Multiply it by 5. Add 8. Multiply by 4. Add 9. Multiply by 5. Subtract 105. Divide by 100. Subtract 1. How does your result compare with your original number? Explain why.

15. Together a baseball and a football weigh 1.25 pounds, the baseball and a soccer ball weigh 1.35 pounds, and the football and the soccer ball weigh 1.6 pounds. How much does each of the balls weigh? Explain your reasoning.

16. In three years, mike will be three times my present age. I will then be half as old as he. How old am I now?

17. When Betty sorts her marbles, she noties that if she puts them into groups of 5, she has 1 left over. When she puts them in groups of 7, she also has 1 left over, but in groups of size 6, she has none left over. What is the smallest number of marbles she could have?

18. An auditorium contains 315 occupied seats and was $\dfrac{7}{9}$ filled. How many empty seats were there?

19. If $3\dfrac{1}{4}$ cups of sugar are used to make a batch of candy for 30 people, how many cups are required for 55 people?

20. The bill (including parts and labor) for the repair of a home appliance was $165. The cost for parts was $85. The labor rate is $16 per half hour. How many hours were spent in repairing the appliance?

21. A store is offering a 20% discount on all items in its inventory. Find the list price on a tractor that has a sale price of $6400.

22. A pet store owner mixes two types of dog food costing $1.50 per pound and $3.05 per pound to make 25 pounds of a mixture costing $2.12 per pound. How many pounds of each kind of dog food are in the mixture?

23. A fundraising dinner was held on two consecutive nights. ON the first night, 100 adult tickets and 175 children's tickets were sold, for a total of $937.50. On the second night, 200 adult tickets and 316 children's tickets were sold, for a total of $1790.00. Find the price of each type of ticket.

24. The perimeter of a rectangle is 68 feet and its width is $\frac{8}{9}$ times its length. Find the dimensions of the rectangle.

25. If $\frac{3}{5}$ of a pound of nuts costs $3.60, how much does $2\frac{1}{3}$ pounds of nuts cost?

26. In parenting a teenage daughter, I've discovered that patience is a necessary commodity. During the school year, $\frac{1}{3}$ of my patience was used up in the first term. The second term required $\frac{2}{5}$ of the patience that I had left. In the third term, I used up $\frac{3}{4}$ of my remaining patience. How much patience did I have left for the fourth term?