9th Grade Assignment – Week #29

Group Assignment:

For Tuesday

1) *Puzzle! Five Hats*
   Five boys (A, B, C, D, E), each with a hat on that is either yellow or red, stand in a circle looking at one another. Each boy cannot see the color of his own hat, but can see the color of all the other hats.
   Boy A says: "I see three yellow hats and one red hat." Boy B says: "I see four red hats." Boy C says: "I see three red hats and one yellow hat." Boy E says: "I see four yellow hats."
   Determine the color of each boy's hat given that every boy with a red hat always tells the truth, and every boy with a yellow hat only tells lies.
2) *Puzzle! Two Pitchers*
   There are two pitchers – one with a quart of apple juice, and the other with a quart of milk. Mary takes one cup of apple juice from the apple juice pitcher, adds it to the pitcher of milk, and mixes it. Then she pours a cup of the liquid from the mixed pitcher into the pitcher of apple juice. In the end, is there more milk in the apple juice, or more apple juice in the milk?

For Thursday

- Together, work through **Logarithms** – **Problem Set #1** (p85). Note that the *Base Tables*, found on the proceeding page, will be very helpful.

Individual Work

- If you wish, work some more on the word problems found in last week's assignment.
- Take the test on the *Quadratic Formula* unit, which is found at the end of this document.
  Before you take the test, be sure that you can do the following:
  - Give the quadratic formula.
  - What is the quadratic formula?
  - How is al-Khwarizmi's version of the quadratic formula different than the modern version?
  - Starting with the *General Quadratic Equation*, give the proof of the quadratic formula by using the method of completing the square.
  - You need to be able to solve quadratic equations by using three methods:
    factoring, completing the square, and using the quadratic formula.

Problem Set #1 (*Logarithms* unit)

Simplify.

1) $(x^3)^2$
2) $x^3 \cdot x^2$
3) $(x^6)^4$
4) $x^6 \cdot x^4$
5) $x^3 + x^2$
6) $x^4 + x^4$
7) $(4x^3)^5$
8) $3x^4 \cdot 7x^5$
9) $(3x^5)^4$
10) $2x^3 \cdot 3x^9$
11) $4x^3 + 2x^5$
12) $2x^3 + 5x^3$
13) $3x^3 - x^3$

Give a simplified answer that has no negative exponents.

14) $x^{-4}x^7$
15) $\frac{x^{-4}}{x^3}$
16) $5x^{-4}$
17) $3x^2y^{-5}$
18) $3y^{-5}x^2$
19) $3y^{-5} + 4x^2$
20) $(\frac{2}{3})^4$
21) $(\frac{2}{3})^{-4}$
22) $(\frac{2}{3})^{-1}$
23) $(\frac{2}{3})^0$
24) $(x^{-4})^5$
25) $(3x^{-3})^2$
26) $(9x^{-4}y^3)^4$
27) $(6x^{-3}y^7)^3$
28) $(6x^{-6}y^2)^3$
29) $(4x^{-6}y^2)^{-4}$
30) $(8x^6y^{-5})^{-3}$
31) $\left(\frac{x^{-3}}{y^2}\right)^3$
32) $\frac{15x^{-4}y^{-3}}{6x^{-7}y^0}$
33) $\frac{8x^{-4}y^7}{6x^3y^3}$
34) $\left(\frac{8x^{-4}y^7}{6x^3y^3}\right)^{-1}$
35) $\left(\frac{8x^{-4}y^7}{6x^3y^3}\right)^2$
36) $\left(\frac{8x^{-4}y^7}{6x^3y^3}\right)^0$

Calculate each. Use the *Power and Base Tables* (on the next page), if needed. Leave square roots in simplified form.

37) 8^2
38) 8^{-2}
39) 6^0
40) 6^{-1}
41) 6475^{-1}
42) 7384^0
43) 7^{-3}
44) $\log_3 9$
45) $\log_2 16$
46) $\log_5 25$
47) $\log_5 625$
48) $\log_4 64$
49) $\log_2 64$
50) $\log_8 64$
51) $\log_2 1024$
52) $\log_9 531441$
53) $\log_7 16807$
54) $\log_2 2$
55) $\log_2 1$
56) $\log_{57} 57$
57) $\log_{29} 1$
58) Explain why each one is true:
    a) $2^{10} = 4^5$
    b) $3^{10} = 9^5$
    c) $2^9 = 8^3$
    d) $4^6 = 8^4$
59) A rectangle's length is 4 more than three times its width. Find its length if the perimeter is 52.

Power and Base Tables

2nd Power

N	N^2
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

3rd Power

N	N^3
1	1
2	8
3	27
4	64
5	125
6	216
7	343
8	512
9	729
10	1000

4th Power

N	N^4
1	1
2	16
3	81
4	256
5	625
6	1296
7	2401
8	4096
9	6561
10	10000

5th Power

N	N^5
1	1
2	32
3	243
4	1024
5	3125
6	7776
7	16807
8	32768
9	59049
10	100000

Base 2

N	2^N
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024

Base 3

N	3^N
1	3
2	9
3	27
4	81
5	243
6	729
7	2187
8	6561
9	19683
10	59049

Base 4

N	4^N
1	4
2	16
3	64
4	256
5	1024
6	4096
7	16384
8	65536

Base 5

N	5^N
1	5
2	25
3	125
4	625
5	3125
6	15625
7	78125

Base 6

N	6^N
1	6
2	36
3	216
4	1296
5	7776
6	46656

Base 7

N	7^N
1	7
2	49
3	343
4	2401
5	16807
6	117649

Base 8

N	8^N
1	8
2	64
3	512
4	4096
5	32768
6	262144

Base 9

N	9^N
1	9
2	81
3	729
4	6561
5	59049
6	531441

Quadratic Formula Test

You may not use any notes, nor use the workbook. Use your calculator as little as possible.

1) Give the quadratic formula.

2) Prove the quadratic formula by using the method of completing the square, .
(Hint: you should start with the *General Quadratic Equation*, which is $ax^2 + bx + c = 0$.)

3) How is al-Khwarizmi's version of the quadratic formula different than the modern version?

4) Solve $5x^2 - 10x + 4 = 0$ by using the quadratic formula.
Use a calculator to give your answers as decimal approximations.

5) Solve $x^2 + 12x + 27 = 0$ by using three methods:

- factoring
- completing the square
- using the quadratic formula

You must show your work!

Factoring

$x^2 + 12x + 27 = 0$

Completing the Square

$x^2 + 12x + 27 = 0$

Quadratic Formula

$x^2 + 12x + 27 = 0$