9th Grade Assignment – Week #22

Individual Work (More Individual Work is found below.)

- *Rolling Two Dice.* **Important: This should be done before Wednesday's lecture.**
  Roll two dice 100 times, and keep track of the results. Record the number of times you rolled (a sum of) a 2, 3, 4, all the way up to 12.

Group Assignment:

For Tuesday

- Comparing the Prize Problem with the Committee Problem. Follow these steps:

  1) How many possibilities are there for choosing a president, vice-president, and secretary out of a 5-person group? (This is essentially the *Prize Problem*.)

  2) In a very systematic manner, write down all the possibilities for the above answer (which should be 60).

  3) Now imagine that instead of having the above three offices, it is decided to instead have only a 3-person committee that will do all the work – and everyone on the committee is equal. Using the list you created from #2, circle all the cases where people A,B,C were selected in any order. How many cases did you just circle? (It should be 6.) This represents the number of ways that these particular three people could have been announced to be on the committee. For example, ACB shows that A was announced first to be on the committee, then C, and lastly B. CAB represents the same committee, but simply announced in a different order. Reread the previous statements to be sure you understand it!

  4) Now use a different colored pencil to circle a different committee choice – perhaps CDE. Once again, you should circle 6 variations of that committee choice. And then use another colored pencil to circle the 6 variations of another committee, and keep going until everything on the list (which was originally created in #2, above) has been circled.

  5) How many different pencils did you use? What does this number represent?

  6) Considering everything you did above, answer these questions:

     a) What are the number of ways that 3 people can be chosen (out of a 5-person group) where the <u>order matters</u>? (This is the *Prize Problem*.)

     b) What are the number of ways that 3 people can be chosen (out of a 5-person group) where the <u>order doesn't matter</u>? (This is the *Committee Problem*.)

     c) What are the number of ways that a particular choice of a 3-person committee can be announced?

  7) Let **n** be the size of the whole group, and **r** be the number of people to be selected. Therefore:

     - **nPr** is the number of ways to choose r people out of n, where <u>order matters</u>.
     - **nCr** is the number of ways to choose r people out of n, where <u>order doesn't matter</u>.
     - **r!** is the number of ways that a particular choice for an r-person committee can be announced.

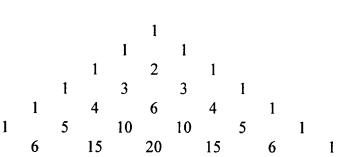   Put together a formula for nCr using nPr and r!

For Thursday

- *Using a Spreadsheet.* Using the blank spreadsheet I sent you with this assignment (9th Grade - Week #22 - Dice Experiment Spreadsheet.xls), do as I explained in the lecture, and follow these instructions:
  1) Enter your data in Row #5.
  2) Enter formulas in Row #6, Row #7, and Cells #C9, C10, C11.
  3) Note that Cell #M7 is for error checking. Does it make sense?
  4) Change the value of one of the cells in Row #5 to something random, and see which of the cells with formulas automatically change. Then undo that value.
- Calculate the theoretic probabilities for each of the rolls.
- <u>Most important</u>: After everything (data and formulas) has been correctly entered into your spreadsheet, compare your results by discussing the following:
  1) In what ways are the results for the individuals in your group similar and different?
  2) How do your experimental percentages compare to the theoretic probabilities?
  3) What surprises are there? What have you learned from all of this?

<u>Individual Work</u>
- *Pascal's Triangle.*
  - Shown here is the first six rows of something called Pascal's Triangle. Study it for a moment. Can you see how it is created; do you see the pattern? Actually, there are many patterns to see, some of which we will see later. But for now, all you need to know is the most basic pattern: every number (except for the outside 1's) is determined by adding the two numbers directly above. Can you see it now?

    ```
                          1
                       1     1
                    1     2     1
                 1     3     3     1
              1     4     6     4     1
           1     5    10    10     5     1
        1     6    15    20    15     6     1
    ```
  - Copy Pascal's Triangle neatly onto a main lesson book page, and then continue adding new rows until you have a total of (at least) 15 rows (which is 1, 15, 105, etc.). Be careful to leave plenty of space between the numbers in the first few rows, because the later rows will get more crowded. Also, it is best to leave half of the page empty because you will add more to it next week. **It is very important that you complete this before your group meeting next Tuesday.**
- *Midyear Review.* From the *Midyear Review* unit of the workbook, look over the problems in **Problem Set #3** and **Problem Set #4**, and do the ones that you feel you need the most practice with.
- *Main Lesson Book pages.* Below are suggestions for main lesson book pages. Do what you can. Following the format outlined in the Week #21 assignment, write a page for:
  - *Word Scrambling*
  - *Committee Problem*
  - *Rolling Two Dice.* Note that you will add a "conclusions" section next week.

Problem Set #3

Section A

Simplify.

1) $12x^3 + 3x^3$
2) $7x^2 + x^2$
3) $7x^2y^4 - x^2y^4$
4) $7x^2y^4 + 3x^3y^4$
5) $(5x^3)(4x^2)$
6) $(5x^3)^2$
7) $\sqrt{900x^6}$

Multiply.

8) $9x^2(x^5 + 3x)$
9) $(x + 2)(x - 1)$
10) $(x - 12)(x - 4)$
11) $(x + 10)(x - 10)$
12) $(y - 6)^2$
13) $(x^4 - 5y^3)(x^4 + 5y^3)$
14) $(x^4 - 5y^3)^2$

Factor.

15) $x^2 + 4x - 21$
16) $x^2 + 13x + 30$
17) $x^2 + 13x - 30$
18) $x^2 - 13x - 30$
19) $x^2 - 13x + 30$
20) $x^2 - 1$
21) $x^{10} - 49$
22) $x^4 + 49$
23) $18x^3y + 24x^2y^5$
24) $x^8 - 10000$
25) $8x^8y^4w^5 - 32x^2y^4w^5$

Solve.

26) $4x - 1 = 10x + 23$
27) $13x = 41 - (-2x - 3)$
28) $0 = x^2 + 5x - 14$
29) $x^2 + x = 56$
30) $5x^2 + 3x - 11 = 6x^2 + 15x + 9$

Percent Review

31) What is 38% of 247?
32) What is 0.4% of 3000?
33) What is 708 increased by 13.8%?
34) 5.3 is what percent of 660?
35) What do you end up at when 8000 is increased by 25% and then that result is decreased by 25%?
36) What is 200 decreased by 30%?
37) A bike normally listed for $450 is on sale for a 20% discount. What is the new discounted price?

PDA Review

38) Unit Conversions

  a) 5.8 m = _____cm

  b) 81 mℓ = _____ℓ

  c) 5 qt = _____gal

  d) 3 mi = _____ft

  e) 8 ft ≈ _____ cm

  f) 5½ lb ≈ _____ kg

  g) 0.39 ℓ ≈ ____ fl oz

Section B

Simplify.

39) $(y^2 - 3)^3$

Factor.

40) $x^2 + 34x + 240$

41) $x^2 + 34x - 240$

42) $x^2 - 34x + 240$

43) $x^2 - 34x - 240$

Solve for x in terms of y.

44) $y = -2x + \frac{3}{4}$

45) $\frac{1}{2}x - \frac{2}{3}y = 7$

Solve.

46) $(x - 5)^2 = x(x - 10)$

47) $4x^2 - 6(x-1) = 7x^2 - 39$

Percent Review

48) 24¾ is 45% of what?

49) 527 is 15% less than what?

50) Hank is 60% as tall as Betty.
   a) How tall is Hank if Betty is 120cm tall?
   b) How tall is Betty if Hank is 120cm tall?

51) Betty is 60% taller than Hank.
   a) How tall is Hank if Betty is 120cm tall?
   b) How tall is Betty if Hank is 120cm tall?

PDA Review

52) Unit Conversions

   a) $0.7 \text{ oz} \approx$ _____ mg

   b) $200 \text{ km}^2 \approx$ ____ mi^2

   c) $200 \text{ mi}^2 \approx$ ____ km^2

   d) $6.3 \frac{\text{mi}}{\text{min}} \approx$ _____ $\frac{\text{m}}{\text{s}}$

   e) $9000 \text{ mm} \approx$ _____ ft

   f) $344 \frac{\text{lb}}{\text{ft}^3} \approx$ _____ $\frac{\text{kg}}{\text{m}^3}$

53) Which is faster,
   28 mph or 38 ft/s?

54) How much does a cube of aluminum weigh that has 8-inch long edges?

55) What is the volume of 300 grams of mercury? Give your answer both in milliliters and in fluid ounces.

56) What is the density (in g/cm^3) of a cube that weighs 7.3 kg and has edges that are 6 cm long?

Problem Set #4

Section A

Simplify.

1) $8z^4 - 5z^4$

2) $8z^4 + 5z^8$

3) $(8z^4)(5z^8)$

4) $3x^2y^6 - 13x^2y^6$

5) $(3x^2y^6)(-13x^2y^6)$

6) $(3x^4y^3)^2$

7) $\dfrac{5x^{-3}y^{-4}}{3x^{-5}y^2}$

8) $(¾)^{-3}$

9) $\sqrt{2500x^6y^4}$

Multiply.

10) $(x + 8)(x + 4)$

11) $(x - 10)(4x - 3)$

12) $(x^5 + 2)(x^5 - 2)$

13) $(x + 5y)(x - 7y)$

14) $(x^4 + 3)^2$

15) $6y^3(3y^2 - 7y)$

Factor.

16) $x^2 - 2x - 35$

17) $x^2 + 17x + 60$

18) $x^2 + 17x - 60$

19) $x^2 - 17x + 60$

20) $x^2 - 17x - 60$

21) $x^2 - 4$

22) $x^4 - 81$

23) $3x^5 + 6x^4 - 24x^3$

24) $7x^3 - 28x$

25) $8x^9y^4 - 18x^3y^4$

Solve.

26) $7x - 3 = x + 27$

27) $0 = x^2 - x - 42$

28) $x^2 + 24x = 2x - 40$

29) $4 - 3(x + 6) = -17x + 12x$

30) $4 - 3(x + 6) = x^2 + 12x$

31) $(x+8)(x-3) = x^2 - 24$

32) $\frac{4}{5}x - \frac{1}{2} = \frac{2}{5}x + \frac{3}{5}$

Percent Review

33) 170 is what % of 6000?

34) What is 120% of 45?

35) What is 45 increased by 20%?

36) What percentage increase is it going from 1700 up to 2100?

37) What percentage decrease is it going from 400 down to 100?

38) What is 4600 decreased by 90%?

39) What is 10% of 4600?

40) In a local election for mayor, with approximately 38,000 people voting, 62% of the votes were cast in favor of Joe. Approximately how many people didn't vote for Joe?

PDA Review

41) Unit Conversions

a) 24 fl oz = _____ cups

b) 3.9 m ≈ _____ ft

c) 7.4 ℓ = _____ mℓ

d) 1400 mm = _____ km

e) 570 m = _____ km

f) 3¼ cups ≈ _____ mℓ

Section B

Factor.

42) $4y^5 - 40y^4x^2 + 36y^3x^4$

43) $8x^2 - 83x + 30$

44) $8x^2 + 56x - 30$

45) $8x^2 - x - 30$

Solve.

46) $2x^2(2x-5)^2 + 72 = 20x^2(5-2x)$

Percent Review

47) 2600 is 30% more than what?

48) 2600 is 130% of what?

49) Keith has 80% more money than Greta. How much money does Keith have if Greta has $990?

50) Keith has 80% more money than Greta. How much money does Greta have if Keith has $990?

51) Jeff left a $8.03 tip, which was 22% of the meal's price. What was the price of the meal?

52) A jacket is marked at a discounted price of $33. If this was a 45% discount, what was the original price?

PDA Review

53) Unit Conversions

a) 17.3 ℓ ≈ _____ pt

b) 4 ft^3 = _____ in^3

c) 4 ft^3 = _____ yd^3

d) 70 $\frac{kg}{m^3}$ = _____ $\frac{g}{cm^3}$

e) 13 $\frac{ft}{sec}$ ≈ _____ mph

54) A car has a fuel efficiency of 25 km/ℓ. What is this in mpg?

55) A concrete block measures 30cm by 25cm by 20cm. What does the block weigh (in kg) if the density of concrete is 2.1 g/cm^3?

56) What is the volume (in both in^3 and ft^3) of 100 pounds of gold?

57) A 300g block of cheese in England costs £1.74. In Germany a 250g block of cheese costs 1.45 euros. In the U.S. a 9-ounce block of cheese costs $1.79. The exchange rates are as follows: $1 = £0.578 = 0.855euro

a) Cheese is what percent more expensive in England than the U.S.?

b) Cheese is what percent cheaper in Germany than the U.S.?

58) If the ratio of boys to girls is 3:2, then how many of each are there if there are 150 children?