MATH 027: ASSIGNMENT 1
A QUICK REVIEW OF
FRACTIONS, DECIMALS AND PERCENTS

1. A $\frac{1}{2}$ lb hamburger weighs $\frac{7}{16}$ lb after it is cooked. How much weight is lost after the hamburger is cooked?

2. Raju owned a $3\frac{7}{8}$- acre piece of land. If he sold $\frac{1}{3}$ of this, how many acres does he have left?

3. A stock starts at $24\frac{3}{8}$ on Monday, and ends up on Friday $22\frac{1}{2}$. How many points did the stock drop?

4. A metal sheet is $82\frac{3}{8}$ inches long. How many $7\frac{1}{2}$ inch long pieces can be cut from this sheet?

5. Paper can take up as much as $\frac{1}{2}$ of our landfills. Plastics take up as much as $\frac{1}{10}$ of our landfills. Miscellaneous items such as tires and disposable diapers take up $\frac{1}{5}$ of our landfills. All these items could be recycled or diverted away from our landfills. What fraction of our landfill space is taken by these items?

6. If paper takes up $\frac{1}{2}$ the landfill space and organic waste takes up $\frac{1}{8}$ of the space, how much of the landfill is used for other materials?

7. The scale on a map uses $1\frac{1}{4}$ inches to represent 100 miles. If two cities are $4\frac{1}{8}$ inches apart on the map, what is the actual distance between the two cities?

8. Most of the water on earth is salty and unavailable for direct use by humans. Only 0.03 of the earth's water is freshwater, and 0.87 of this freshwater is locked up in the glaciers and polar ice caps. What portion of fresh water on earth is in the form of ice?

9. A standard toilet uses 4.2 gallons of water each time it is flushed. A new model toilet promises to use only .62 of the water used by standard models. How much water will the new models save for each flush?

10. Merle earned $328.50 by working 38.25 hours. How much is his hourly rate?

11. If 14.4 gal of gas cost $21.60, what is the price per gallon of the gas?

12. Harry bought a new home and took out a mortgage for $80,000 at 8.75%. His payments (principal and interest) are $629.36 a month for 30 years. Not including the principal, how much does Harry end up paying for his $80,000 loan?

13. Anne takes out a five year car loan for $15,000 at 9%. If her monthly payments are $311.37, altogether how much does it cost her for the loan?

14. If a car travels for 224 miles on 10.4 gallons of gas, what is the average gas mileage for that period?

15. A dozen pens cost $2.95, at this rate, how much do 32 pens cost?

16. At Woodstock, in 1969, there were 492,000 people who left 1.8 million lb of trash: at Woodstock II, in 1994, there were 348,000 people who left 1.7 million lb of trash. Which event had the higher ratio of trash per person?

17. One brand has a package of a dozen pens costing $2.95: another brand has a package of 8 pens for $2.10. Which is the better buy?

18. In 1988, the average house cost $138,000: in 1998 the average house cost $195,000. Express the ratio of the increase in price of the average house to the cost of a house in 1988.

19. Last year, the average retail price of gasoline was $1.12 per gallon: this year the average price increased to $1.42 per gallon. Express the ratio of the increase in price of the gas to the cost of gas last year.

20. If sales tax on an item is 6.5%, find the tax on a car that sells for $24,500.

21. In 1999, the average price of a home fell 6% from the 1998 average home price. If the average price of a home was $82,000 in 1998, what was the price in 1999?

22. In 1999, the average price of a car rose 8% from the average price of a car in 1998. If the average price of a car was $16,000 in 1998, what was the price in 1999?

23. If $1000 is left in a bank that pays 6% simple interest per year, chart how much is in the bank at the end of each year for the first ten years.

24. If $2,000 is left in a CMA account that pays 5% simple (annual) interest per year, chart how much is in the bank at the end of each year for the first 5 years.

25. If $1,000 is left is a checking account paying 2.5% simple interest per year, chart how much is in the account at the end of each year for the first 4 years.

26. If $1,000 is left in a bank that pays 5% simple interest per year, chart how much is in the bank at the end of each year for the first 10 years.

27. You get a new job offering you a starting salary of $25,000 per year and a $600 raise for the first five years. What is your salary for each of the five years?

28. You borrow $1,000 for one year. The banker said that you must repay the loan at the end of the year at the annual rate of 2% above the average prime rate. The average prime rate is 8.5%. Not including the principal, what is the cost of the loan?

29. A department store is having a 15% off sale. You also have a newspaper coupon for an additional 10% off. What will you pay for a $99.95 coat?

30. You read an ad for a portable stereo, " $120 down and $40 monthly". Upon inquiry you found there were 15 monthly payments under this installment plan. Find the total price using the installment plan. How much would you save using cash if the cash price is $599.95?

31. You wish to buy a condo selling for $80,000. The bank has required 20% down plus 2 Points (2% of the cost), plus closing costs of $800. Find the total due at closing.

MATH 027: ASSIGNMENT 2
A SALARY DECISION

You decide to accept employment from a company for a 30 day project. You are given the choice of two salary plans, Plan A or Plan B, as follows:

<u>Plan A</u>: You will be paid 1 cent at the end of your first day, and your salary will double each day thereafter, thereby receiving 2 cents at the end of the second day, 4 cents after 3 days, 8 cents after 4 days, etc, up to and including the 30th day.

<u>Plan B</u>: You will be paid $500 a day for each of the 30 days.

You have 5 seconds to decide which plan you would take: Plan A or Plan B.

Now take the time to analyze the problem. Write a paper comparing the two plans in the following way:

1. Numerically: Construct a table showing the amount you will be paid for each day and the total accumulated for the project at the end of each day: do this for each plan, for the first 10 days. Based on this data, hypothesize which plan is better for the 30 days.

2. Graphically: Use the table above to construct graphs to estimate how much you would make for each plan at the end of 30 days. Which plan is better?

3. Algebraically: Use the table above to construct a formula showing the total income I at the end of day n for each plan. Use this formula to determine how much is made at the end of 30 days for each plan.

MATH 027: ASSIGNMENT 3
SIGNED NUMBERS

1. Make up a "real-life" example from your own experience which makes use of signed numbers.

2. Discuss the similarities and differences between $7 - 4$ and $7(-4)$.

3. Discuss the similarities and differences between $8 - (2 - 5)$ and $8(-2 - 5)$.

4. Explain the error made by a student who did the following: $8 - 2(3 - 7) = 6(-4) = -24$.

5. When performing the four arithmetic operations with signed numbers is it accurate to say "two negatives make a positive?" Explain and illustrate with examples.

6. Design 5 exercises involving signed numbers that, if done correctly, would indicate that you know how to perform the four arithmetic operations with signed numbers. Explain what you are trying to test for in each exercise.

MATH 027: ASSIGNMENT 4
EXPONENTS AND ORDER OF OPERATIONS

1. Explain what 3^4 means. How would you compute 3^4?

2. Discuss the similarities and differences between $2 \cdot 5$ and 2^5.

3. How do exponents fit into the order of operations?

4. Compute the following: $3 - \{5 - [4 - 1]^2\}$

5. Explain the difference between $5 \cdot 4^3$ and $(5 \cdot 4)^3$.

6. Is the following computation correct $-2^4 = (-2)(-2)(-2)(-2) = 16$? Explain.

7. Compute the following: $6 - [4(3 - 5)^2 - 7]$

MATH 027: ASSIGNMENT 5

FORMULAS

1. Given $s_e = s_y \sqrt{1 - r_{xy}^2}$, if $s_y = 1.25$, and $r_{xy}^2 = .4$, find s_e rounded to two places.

2. Given $s_e = s_y \sqrt{1 - r_{xy}^2}$, if $s_y = 2.24$, and $r_{xy} = .73$, find s_e rounded to four places.

3. Given
$$Z = \frac{Z_{r_1} - Z_{r_2}}{\sqrt{\frac{1}{n_1 - 3} + \frac{1}{n_2 - 3}}}$$

compute Z to two places for $Z_{r_1} = .50$, $Z_{r_2} = .32$, $n_1 = 65$ and $n_2 = 83$.

4. Given
$$t = \frac{\overline{X} - a}{\frac{s_x}{\sqrt{n}}}$$

compute t to two places, for $\overline{X} = 90$, $a = 95$, $s_x = 5.2$, and $n = 15$.

5. Given
$$\sigma_r = \sqrt{\frac{1 - \rho^2}{n - 1}}$$

compute σ_r to three places, for $\rho = .5$ and $n = 100$.

6. The solutions to the equation $Ax^2 + Bx + C = 0$ are given by

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

Use a calculator to find the solution to the equation $3x^2 - 6x - 2 = 0$ rounded to 2 decimal places.

7. The *harmonic mean* of n positive numbers, $X_1, X_2, X_3, \ldots, X_n$ is defined as follows:

$$h = \frac{1}{\left[\frac{1}{X_1} + \frac{1}{X_2} + \frac{1}{X_3} + \cdots \frac{1}{X_n}\right]/n}$$

Find the harmonic mean of $5, 8, 7, 9, 7, 8,$ and 6 both exact and rounded to four places.

8. If P dollars are put in a bank account paying $r\%$ interest per year, the amount A in the bank at the end of year t is given by the formula:

$$A = P(1 + r)^t$$

where r is written as a decimal.

If $\$2,000$ is invested at 8% yearly interest, how much is in the bank at the end of 10 years?

9. If P dollars are put in a bank account paying $r\%$ yearly interest *compounded n times per year*, the amount A in the bank at the end of year t is given by the formula:

$$A = P(1 + \tfrac{r}{n})^{nt}$$

where r is written as a decimal and n is the number of times per year the interest is compounded.

(For example, $n = 12$ if interest is compounded monthly, $n = 52$ if interest is compounded weekly, etc.) If $\$2,000$ is invested at 8% yearly interest compounded monthly, how much is in the bank at the end of 10 years?

MATH 027: ASSIGNMENT 6
THE MEANING OF A VARIABLE:
PROPERTIES OF REAL NUMBERS

1. Given the following two statements:

$$x + 3 = 3 + x \qquad \text{and} \qquad x + 4 = 8$$

Explain how variables are being used in each statement.

2. Describe the commutative property symbolically, and explain in your own words what it means.

3. Describe the associative property symbolically, and explain in your own words what it means.

4. Describe the distributive property symbolically, and explain in your own words what it means.

OPERATIONS WITH LITERAL EXPRESSIONS

1. What does x^4 mean? What does x^5 mean? What does $x^4 \cdot x^5$ mean?

$x^4 \cdot x^5 = x^?$.

2. What does x^8 mean? What does x^9 mean? What does $x^8 \cdot x^9$ mean?

$x^8 \cdot x^9 = x^?$.

3. What does x^n mean? What does x^m mean? What does $x^n \cdot x^m$ mean?

Develop a rule for multiplying exponential expressions with the same base; that is, what is the simplest (and quickest) way to express the product $x^n \cdot x^m$?

4. What does x^4 mean? What does $(x^4)^5$ mean?

$(x^4)^5 = x^?$.

5. What does x^8 mean? What does $(x^8)^9$ mean?

$(x^8)^9 = x^?$.

6. What does x^n mean? What does $(x^n)^m$ mean?

Develop a rule for raising a simple exponential expression to a power; that is, what is the simplest (and quickest) way to express $(x^n)^m$?

7. In your own words, explain the first two rules of whole number exponents (the rules you developed in the previous two exercises.)

8. Show that $x^5 \cdot x^7 = x^{12}$.

9. Show that $(x^5)^7 = x^{35}$.

10. Give an example of an expression involving exponents where the exponents should be added, and give an example of an expression involving exponents where the exponents should be multiplied. Explain why one situation calls for adding the exponents while the other calls for multiplying them.

11. Is x positive? Is $-x$ negative? Explain.

12. Explain the difference in the operations indicated by the following expressions.

(a) $3 - (x - 4)$ **(b)** $3(-x - 4)$

13. What does the statement "Simplify as completely as possible" mean to you?

14. In your own words, describe the difference between a term and a factor.

15. What real number property allows you to "add like terms"? (Why does $3x + 5x = 8x$?)

MATH 027: ASSIGNMENT 8

TRANSLATING ALGEBRAIC EXPRESSIONS

The following are algebraic statements (symbolic expressions or equations). Write as many english phrases as you can which would translate into these algebraic statements.

1. $n + 2$

2. $2n$

3. $x + y$

4. $n/2$

5. $n - 2$

6. $2 - n$

7. $4(x + y)$

8. $4x + y$

9. $4 - (x + y)$

10. $2 > n$

11. $n < 2$

12. $x + y = 70$

13. $xy = 70$

14. $2x + y = 70$

15. $2(x + y) = 70$

16. $4n - 5 = 3$

17. $xy + 3 = x$