

Name _____

All work must be shown to receive credit for each problem.

1. Express $\frac{4}{5}$ as the sum of unique unit fractions. $\frac{4}{5} = \frac{1}{2} + \frac{1}{5} + \frac{1}{10} = \frac{1}{2} + \frac{1}{4} + \frac{1}{20} \dots$

2. Express $0.\overline{38}$ as a common fraction $\frac{38}{99}$

3. Why is 8 considered a natural number? **because 7 is a natural number**

4. The high school lunch menu repeats every 28 days. The middle school menu repeats every 15 days and the elementary school menu repeats every 24 days. All schools are serving sloppy joes today. In how many days will all the schools serve sloppy joes again?
LCM (28,15,24) = 840 days

5. Jill wants to put 45 sunflower plants, 81 corn plants, and 63 tomato plants in her garden. If she puts the same number of plants in each row and if each row has only one type of plant, what is the greatest number of plants Jill can put in one row?
GCF (45, 81, 63) = 9 plants

6. Which three **consecutive** addends give you a sum of 63? **20, 21, 22**

7. A pair of prime numbers are called *sexy prime numbers* if they differ by 6. For example, 11 and 17 are sexy primes. Find the first sexy primes greater than 100.
< 101, 107 >, < 103, 109 >, < 107, 113 >, < 131, 137 >, ...

8. a) Use Horner's Method to convert 4503_6 to its decimal equivalent.

$$4 \times 6 + 5 \times 6 + 0 \times 6 + 3 = 1,047$$

b) Use Horner's Method to check your answer to a), that is, change your decimal answer to its base 6 equivalent.

$$\begin{array}{r} 1047 \\ 6 \end{array} = 174 \text{ R } 3$$

$$\begin{array}{r} 174 \\ 6 \end{array} = 29 \text{ R } 0$$

$$\begin{array}{r} 29 \\ 6 \end{array} = 4 \text{ R } 5$$

$$\begin{array}{r} 4 \\ 6 \end{array} = 0 \text{ R } 4$$

9. What is the value of 2^{34} ? **2,417,851,639,229,258,349,412,352**
MS Excel performs incorrectly

10. Subtract 9,876 from 12,034 problem using the *equal addition* algorithm.

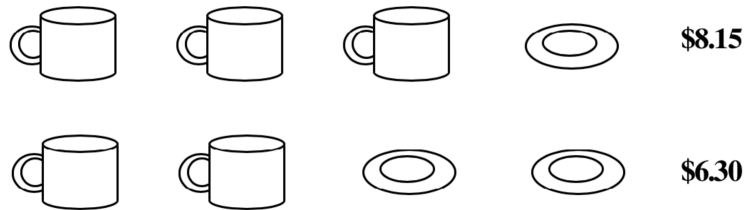
$$2 \times 0 \neq 7$$

11. Use *casting nines* to check $732,386 \times 93,348 = 683,467,828$.

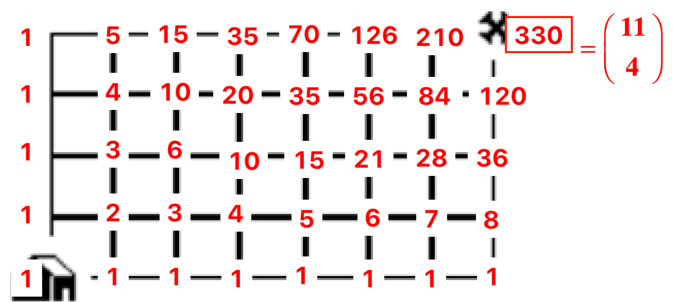
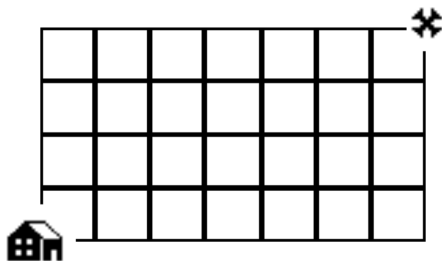
$$\begin{array}{r} 1210314 \\ - 9876 \\ \hline 2158 \end{array}$$

12. At Joe's Cafe 3 cups of coffee and one doughnut cost \$8.15 and 2 doughnuts and 2 cups of coffee cost \$6.30. What is the cost of 1 cup of coffee? 1 doughnut ?

Comparison indicates that coffee costs \$1.85 more than a doughnut, therefore if 4 cups of coffee were purchased order # 1 would cost \$10. 4 cups of coffee at \$10 implies each cup of coffee costs \$2.50 and a doughnut costs \$0.65.



13. How many paths (without reversing direction) would there be in traveling the grid below from home to "X"?



14. What is the value of $\binom{15}{5}$? **3,003**

15. a) What are logarithms and why were they developed? **Logarithms are exponents and they were developed to make calculations easier.**

- b) What is the meaning of the word logarithm and why is it so named? **"proportion number" because to create tables of logarithms proportions were solved via interpolation.**

16. List five (5) different problem solving strategies.



17. What is the value of the truncated continuous fraction $1 + \frac{1}{1 + \frac{1}{2 + \frac{1}{1 + \frac{1}{2 + 1}}}} = \frac{26}{15}$.

18. The half-life of Cobalt Thorium G (CoTh_g) is said to be 93 years. Express the half-life formula for CoTh_g using base e . Note that $\ln 2 \approx 0.6931472$.

$$\begin{aligned} A(t) &= A_0 \left(\frac{1}{2} \right)^{\frac{t}{93}} \\ &= A_0 (2)^{\frac{-t}{93}} = A_0 (e^{\ln 2})^{\frac{-t}{93}} = A_0 e^{\frac{-t \ln 2}{93}} \\ &= A_0 e^{-0.0074531 t} \end{aligned}$$

19. The chart below lists the half-life of some mid-term radioactive isotopes. Identify which of the isotopes listed is being used if the half life decay formula is $A(t) = A_0 e^{0.00043267614 t}$.

0.7 divided by 0.00043267614

Isotope	Half-life (yr)
C-14	5,730
Cm-245	8,500
Pu-240	6,561
Ra-226	1,602

20. You tell George that a negative number multiplied by another negative number gives a positive result. George is skeptical. Use $-3 \cdot -4 = +12$ as an example to provide a convincing explanation to persuade George that your statement is indeed true.

$$\begin{aligned} 0 &= -3 \times 0 \\ &= -3 \times (+4 + -4) \\ &= -3 \times +4 + -3 \times -4 \\ &= -12 + ? \end{aligned}$$