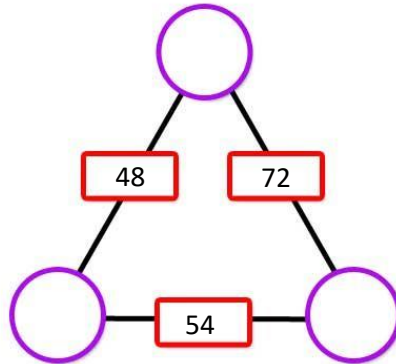**Instructions**: Show all work. Partial credit can only be given where work is shown. Be sure to answer all parts of each question. You may not use a calculator on this quiz.

1. Solve the arithmagon. What factors must go in the vertices of the triangle so that the two numbers at the end of each side multiplies to the number shown on the side? (8 points)
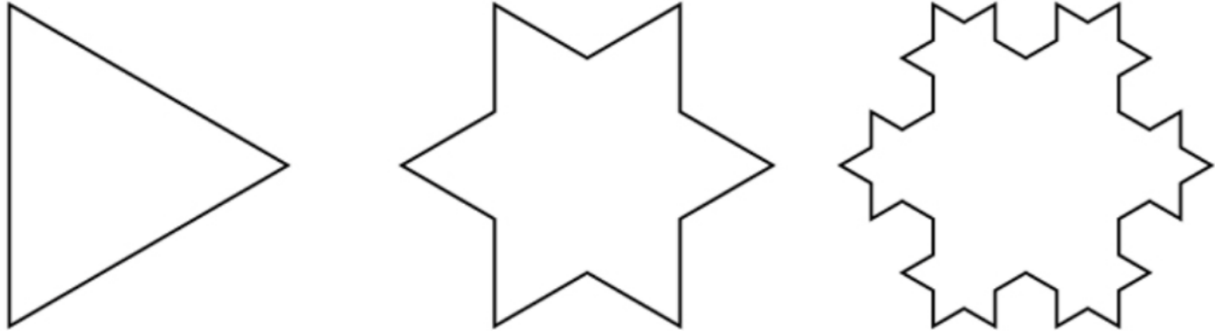

2. Write the number 2953 in Mayan. (8 points)

3. Translate each number from the historical writing system back into the Hindu-Arabic system. (8 points each)
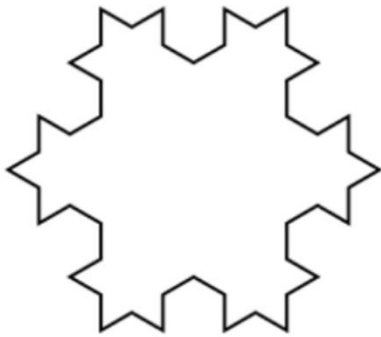
    a.

    b.

4. A Koch snowflake is built by starting with a triangle, and then modifying it as shown in the sequence below. Draw the next step of the process. (8 points)

Draw the next step as a modification of the last step on the shape below.

5. A casino promises a payoff on its slot machines of 93 cents on the dollar. If you insert 188 quarters one at a time, how much would you expect to "win"? (6 points)

6. Barry says he can't find the product of 12,750,000,000,000 and 3,987,000,000 on a standard calculator with a 10-digit display. How should you respond? Explain. (8 points)

7. Ms. Price has three times as many girls as boys in her class. Ms. Lippy has twice as many girls as boys. Ms. Price has 60 students in her class and Ms. Lippy has 135 students. If the classes were combined into one, what would be the ratio of girls to boys? (15 points)

8. The following pie chart shows a student's relative expenditures. If the student's resources are $12000.00, how much is spent on each item? Fill in the table below. (21 points)
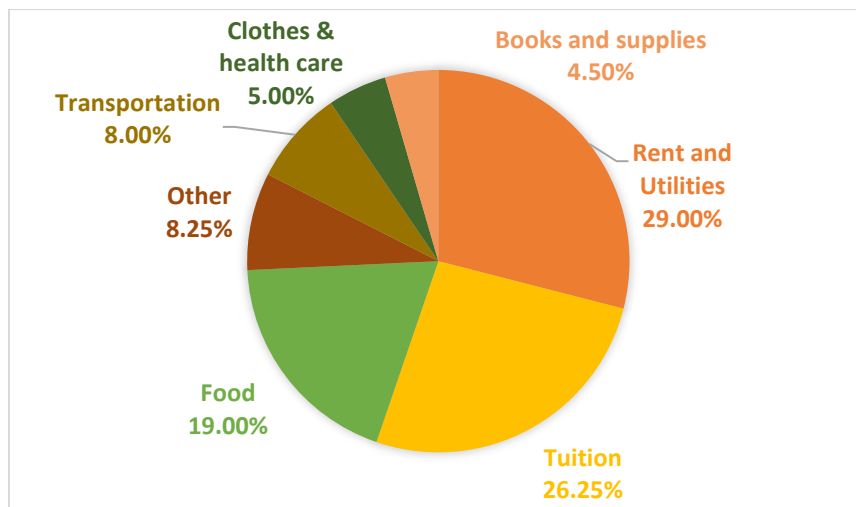
Expense category	Expense Amount
Rent and Utilities	
Tuition	
Food	
Other	
Transportation	
Clothes & health care	
Books and supplies	

9. A department store marked down all of its summer clothing 25%. The follow week the remaining items were marked down again another 35% off the sale price. When Jorge bought two tank tops on sale, he presented a coupon that gave him an additional 20% off. What percent of the original price did Jorge save? (10 points)

10. Write the decimal number 287 (in base-10) as a number in base-12. (10 points)

11. Is the statement $\{4,3\} \in \{1,3,4,6\}$ true or false? (4 points—no partial credit)

12. Consider the sets $A = \{a, c, e, l, p, s, u\}$, $B = \{a, g, i, m, n, o, t\}$. Find the following if the Universal set is the set of all (lower case) letters in the Alphabet. (5 points each)
    a. $A \cap B$

    b. $\bar{A}$

13. Use the lattice method to find the product of 4.6×7.9. (6 points)

14. Find a factor tree for 5880. Write the final result as prime factors. (8 points)

15. For the relation shown, write out the list of ordered pairs that represents the relation. Then determine if the relation is a function. (10 points)
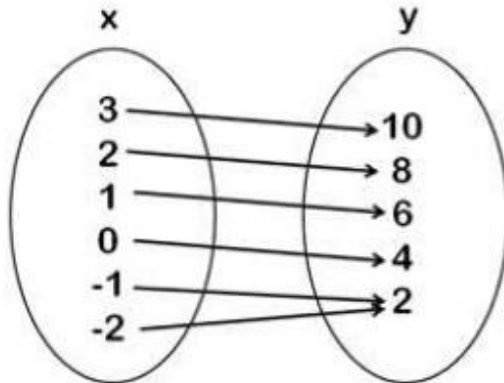
16. Check the number $430{,}848$ for divisibility by $2, 3, 4, 5, 6, 8, 9, 10, 11$. You don't need to factor the number but say which of these numbers divides each. Partial credit is possible only if you show work. (8 points)

17. Consider the numbers $(2^4 \cdot 5^3 \cdot 7 \cdot 17^2, 2^5 \cdot 3^3 \cdot 7^7 \cdot 13^3)$. (8 points)
    a. Find GCF

    b. Find LCM

18. Calculate the following expressions. (5 points each)
    a. $8 - (-14)$

    b. $-(-7)(-5)$

    c. $-3(-5 - 6)$

d. $\frac{8}{9} + \frac{1}{12} + \frac{3}{16}$

e. $\frac{24}{35} \div \frac{6}{7}$

19. For the numbers in the set $\left\{ \frac{58}{17}, 11, -4, \sqrt{49}, -6.75, 14000, \sqrt{3}, \pi^2, \frac{0}{5}, 0.\overline{73}, \frac{64}{8} \right\}$, determine which of the numbers belongs to each of the number types below. (5 points each)
   a. Natural (Counting) Numbers
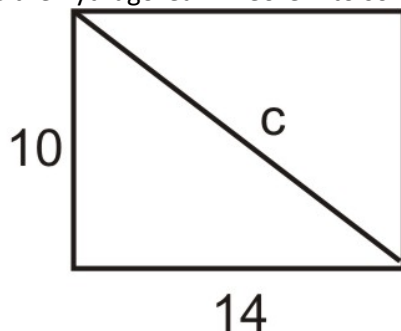
   b. Integers

   c. Rational Numbers

   d. Irrational Numbers

20. Order the following numbers from smallest to largest. (6 points)
   $\left\{ \frac{58}{17}, 11, -4, \sqrt{49}, -6.75, 14000, \sqrt{3}, \pi^2, \frac{0}{5}, 0.\overline{73}, \frac{64}{8} \right\}$

21. Use the Pythagorean Theorem to solve for the missing side. (6 points)

22. Calculate $(4 \otimes 3) \oplus (4 \boxdiv 5)$ in the 7-clock. (10 points)

23. Are the following numbers positive or negative, or not real? You don't need to fully evaluate the expression, just find the sign. (4 points each)
    a. $(-2)^{1/5}$

    b. $(-1)^{1/20}$

    c. $-(-8)^{-1/3}$

24. Is the fraction $\frac{13}{45}$ terminating or repeating? Explain why that is the case. (4 points)

25. Write the decimal $0.\overline{1827}$ as a fraction in lowest terms. (6 points)

26. Calculate $16.8 \div 5.6$ by hand using long division. (6 points)

27. Simplify $\dfrac{(4.56\times10^9)(7.0\times10^{21})}{(1.2\times10^{-6})(2.8\times10^{10})}$. (8 points)

28. Complete the table. (28 points)

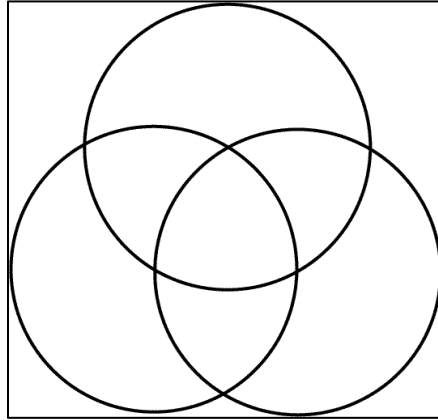|	Fraction	Decimal	Percent
a.			$66.\overline{6}\%$
b.		0.003	
c.	$\dfrac{1}{40}$		
d.		0.05	
e.	$\dfrac{1}{100}$		
f.		0.00001	
g.			0.0085%

29. 35 is what percent of 125? (5 points)

Bonus questions:

30. Write the binary number 100011010011 as a base four number. (10 points)

31. On the Venn diagram below, shade the region given by $(A \cup C) - (B \cap C)$. Label your sets clearly. (10 points)

32. Suppose that a number is divisible by (all) $2, 4, 6, 8, 10, 12, 14$. What other numbers must it also be divisible by? (10 points)

33. Jim wants to deposit money into a bank account to save for a $4000 stereo in two years. Suppose that he has a choice of 6.1% compounded annually, or 5.75% compounded quarterly. How much would he have to deposit in the account in each case? Which one is the better deal? (15 points)

34. An income tax table for single people is shown below. Use the table to find the tax on $53,000 of taxable income. (10 points)

Individual Taxpayers

If Taxable Income Is Between:	The Tax Due Is:
0 - $9,875	10% of taxable income
$9,876- $40,125	$987.50 + 12% of the amount over $9,875
$40,126 - $85,525	$4,617.50 + 22% of the amount over $40,125
$85,526 - $163,300	$14,605.50 + 24% of the amount over $85,525
$163,301 - $207,350	$33,271.50 + 32% of the amount over $163,300
$207,351 - $518,400	$47,367.50 + 35% of the amount over $207,350
$518,400	$156,235 + 37% of the amount over $518,400