Show work to support your solutions, whenever possible.

1.   Make the following into a magic square, with equivalent sums for all rows, columns and main diagonals.

-6		-2
	0	-4
	-8	6

2.   Write an expression in terms of the given variable that represents the given quantity.

   (a) The cost C of having an electrician spend h hours at your house if the electrician charges $35 for coming to the house and $60 per hour for labor.

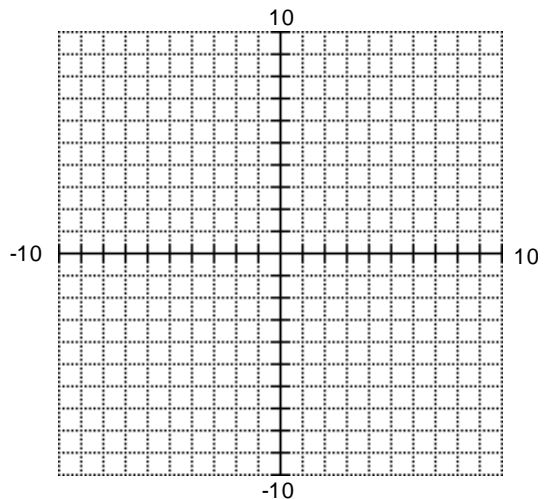   (b) The temperature, T, after t hours if the initial temperature is 54°F and each hour it falls 2°F

3.   Suppose $f(x) = 3x - 2$, and the domain is {0, 1, 2, 3, 4, 5}. Describe the function with the following representations:

   (a) a set of ordered pairs

   (b) a table

x						
y						

   (c) a graph

4.	According to wildlife experts, the rate at which snowy tree crickets chirp is a function of the temperature; specifically, $C = T - 40$, where C is the number of chirps every 15 seconds and T is the temperature in degrees Fahrenheit.

What is the temperature if the number of cricket chirps is 120 per minute?

5.	Find all whole number replacements to make the statements true. In other words, solve for W over the set of whole numbers.

$2 \times W + 10 < 25$

6.	The formula for converting degrees Celsius (C) to degrees Fahrenheit (F) is $F = \dfrac{9}{5}C + 32$. Celicia reads that the temperature is 68°F in Miami, Florida. What is the Celsius temperature?

7&8.	Think of a number. Add 17. Double the result. Subtract 4. Double the result. Add 20. Divide by 4. Subtract 20. Your answer is _____ .

Explain how this trick works.

Choose a number. Double it. Add 9 to the result. Add the original number. Divide by 3. Add 4. Subtract the original number. The result is _____ .

9&10. Solve for x:

$4x - 2 = 3(x + 4)$ $\qquad\qquad\qquad$ $3x + 1 = -11$

11. Factor completely:

(a) $2x^2 - 12x$ $\qquad\qquad$ (b) $x^4 + 18x^2$ $\qquad\qquad$ (c) $x^2 + 6x + 8$

12. Simplify the following expressions. Write your answers in exponential form, a^b.

(a) $3^8 \cdot 3^8$ $\qquad\qquad$ (b) $\left(3^2\right)^5$ $\qquad\qquad$ (c) $\dfrac{3^8}{3^2}$

13. The temperature dropped 25 °F from the high temperature for a day to reach a low of -5 °F. What was the high temperature?

14. Demonstrate and evaluate the problem using the charged field or chip model: $\quad -8 + 6$

15. In four downs, the football team lost 5 yards, gained 2 yards, gained 6 yards, and lost 8 yards. What is the total (net) gain or loss?

16. Use number patterns to show that $-3 \cdot -5 = 15$. Start with $3 \cdot 5 = 15$.

17. Evaluate:

(a) $(-12) - 4 + (-5)$ (b) $(-48) \div (-6)$ (c) $3(-4) - 10 \div (-2)$

18. If x is a negative integer, what is the sign (+ or –) of each of the following expressions?

(a) $x^{1,234,567}$ _____   (b) $\left| -x \right|$ _____

19. Evaluate:

(a) $-20 \div 4 \cdot (-5)$ (b) $\dfrac{5 - (-3)}{2 - 4}$

20. Find the next two terms in each number sequence.

(a) 5, -10, 20, _____ , _____

(b) 16, 8, 0, _____ , _____

21. Solve for x:

(a) $4x - 2 = 3x - 10$ (b) $7(x + 8) = 5x - 10$

22. List all the factors of

(a) 24 _____

(b) 100 _____

23. Tell whether the following numbers are prime (P), composite (C), or neither (N).

(a) 147   (b) 233

24. Fill in the blank with the <u>greatest digit</u> that makes the statement true.

(a) $2 \mid 138,67\_\_$ (b) $5 \mid 138,67\_\_$

25. Test whether the number 87,360 is divisible by:

2_____   3_____   4_____   6_____   9_____   10_____

26. Find the prime factorization of each composite number. Use exponents.

(a) 250   (b) 360   (c) 84

27. Factor completely: $3x^2 - 48$

28. Find the least common multiple _____ and the greatest common divisor _____ for the three numbers: 6, 12, and 20.

(a) LCM   (b) GCD

29.	In the movie *Father of the Bride*, Steve Martin goes into a grocery store and gathers packages of hot dog buns (8 per pack) and hot dogs (12 per pack). What is the least number of packages that he should buy to have the same number of hot dogs and buns?

_____ packages of hot dogs   _____ packages of buns

30.	If $a = 2 \cdot 3^2 \cdot 5^4 \cdot 7^3$ and $b = 2^2 \cdot 3^2 \cdot 5^3 \cdot 7^2 \cdot 11$, find the following. Leave your answer written with exponents.

(a)	GCD (a, b)				(b)	LCM (a, b)

31.	True or false. If false, explain or give a counterexample.

(a)	If a | b, then GCD (a, b) = a. _____

(b)	If a and b are even integers, then LCM (a, b) = 2. _____

(c)	3 | 654,980,321 _____

(d)	59 is prime _____

(e)	57 is composite _____

32.	If $a = 12x^2y^3z$ and $b = -18xy^3z^2$, find the following. Leave your answer written with exponents.

(a)	GCD (a, b)				(b)	LCM (a, b)

(c)	Factor the expression $12x^2y^3z - 18xy^3z^2$ completely.

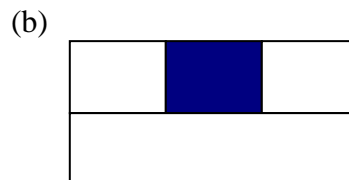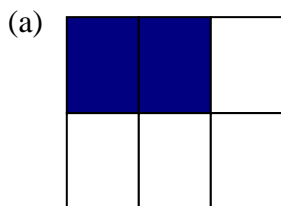32. (d)   Add the following expressions, and simplify.

$$\frac{7}{12x^2y^3z} + \frac{5}{-18xy^3z^2}$$

33. Draw a geometric diagram illustrating

(a) The fraction $\dfrac{4}{8}$ (b) The mixed number $2\dfrac{1}{4}$

34. For each of the following, write a fraction to represent the shaded portion.

(a)

(b)

35. Simplify completely.

(a) $\dfrac{48}{160}$ (b) $7\dfrac{36}{60}$ (c) $\dfrac{48}{72}$

(d) $\dfrac{84}{100}$ (e) $\dfrac{512}{1000}$ (f) $4\dfrac{24}{32}$

36. Compare, using $<$, $>$, or $=$ to make the statement true.

(a) $\left| -4\dfrac{1}{6} \right|$ _____ $|-5|$ (b) $2\dfrac{1}{5}$ _____ $2\dfrac{1}{3}$ (c) $-\dfrac{7}{4}$ _____ $-\dfrac{5}{3}$

37. Perform the given operations, and simplify.

(a) $\left(7\dfrac{1}{4} + 10\dfrac{1}{16}\right) - 8\dfrac{5}{8}$

(b) $\dfrac{1}{2}(7)\left(5\dfrac{3}{5} + 9\dfrac{1}{2}\right)$
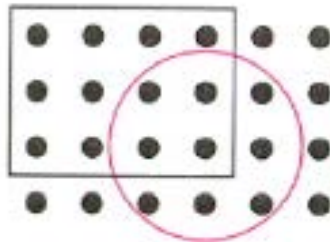
(c) $\dfrac{1}{6} + \dfrac{2}{3} + \dfrac{3}{8}$

(d) $\dfrac{2}{9} \div \left(\dfrac{1}{3} + \dfrac{3}{10}\right)$

(e) $4\dfrac{1}{10} \cdot 7$

38. Al gives $\dfrac{1}{2}$ of his marbles to Bev. Bev gives $\dfrac{1}{3}$ of these to Carl. Carl gives $\dfrac{1}{4}$ of these to Dani. If Dani has 5 marbles, how many did Al have originally?

39. Refer to the figure. Represent each of the following as a simplified fraction:

(a) The dots outside the rectangle as a part of all the dots

(b) The dots inside the circle and outside the rectangle as a part of all the dots

40. For each of the following, choose the expression in parentheses that equals or describes the given fraction:

(a) $\dfrac{0}{0}$ (1 ,   undefined ,   0 ,   40)

40. (b) $\dfrac{2^{100} + 2^{98}}{2^{100} - 2^{98}}$ $(\ 2^{196}\ ,$ $\dfrac{5}{3}\ ,$ 2 and 0,   too large)

41. The formula for converting degrees Celsius (C) to degrees Fahrenheit (F) is
     $F = \dfrac{9}{5} \cdot C + 32$.

     (a) If Jack reads that the temperature is 30°C in Colorado Springs, what is the
         Fahrenheit temperature? Round to the nearest degree.

     (b) If Jill reads the temperature is -13°F in Beaver Falls, what is the temperature
         in degrees Celsius?

42. Sunflower seeds are packed in packages each weighing $2\dfrac{1}{4}$ ounces. [16 ounces = 1 lb]

     (a) If there is a supply of $17\dfrac{1}{2}$ pounds of sunflower seeds, how many packages can be
         completely filled?

     (b) How many ounces of sunflower seeds will be left over?

43. The normal brain weight for an African bull elephant is $9\dfrac{1}{4}$ lb. Approximately how
     much would be the combined weight of the brains of $2\dfrac{1}{2}$ dozen of these elephants?

44. Use partial products or "FOIL" to prove that $2\frac{1}{2} \cdot 3\frac{1}{3} \neq 6\frac{1}{6}$.

45. Simplify completely.

(a) $\dfrac{ax^2}{bx}$

(b) $\dfrac{a-b}{b-a}$

(c) $\dfrac{b^2+bx}{b+x}$

46. Without actually performing the operations, choose the best estimate in the parentheses for the following expressions:

(a) $\dfrac{30\frac{3}{8}}{4\frac{1}{9}} \cdot \dfrac{8\frac{1}{3}}{3\frac{8}{9}}$

(8 , 15 , 20)

(b) $6 \cdot \left(\dfrac{3}{800} + \dfrac{4}{5000} + \dfrac{15}{6} \right)$

(0 , 15 , 132)

(c) $\dfrac{1}{407} \div \dfrac{1}{1609}$

$\left(0, \dfrac{1}{4}, 4 \right)$

47. Find two rational numbers between $\dfrac{3}{4}$ and $\dfrac{4}{5}$.

48. Simplify, if possible.

(a) $\dfrac{0}{12}$

(b) $\dfrac{12}{0}$

(c) $\dfrac{12}{12}$

(d) $\dfrac{12}{1}$

49. Fred wants to fertilize 12 acres of soil for watermelons. If it takes $9\frac{1}{2}$ bags for each acre, how many bags does he need?

50. Solve for x.

(a) $5^x = 125$

(b) $2^{-3x} = \dfrac{1}{512}$

(c) $\dfrac{4^x}{4^3} = 8$

51. Solve for x.

(a) $2x - \dfrac{5}{3} = \dfrac{5}{6}$

(b) $x + 2\dfrac{1}{2} = 5\dfrac{1}{4}$

(c) $2x + 4 = 3x - \dfrac{1}{3}$

52. Find each sum or difference.

(a) $\dfrac{3a}{x^2} + \dfrac{b}{x^2 y^2}$

(b) $\dfrac{5}{xy^2} - \dfrac{2}{3x}$

Do your best! Rise to the challenge! Live and learn!