

## PART 1 – CONCEPTS AND APPLICATIONS

### *Linear Equations*

1) Solve for  $m$ :  $8 - \frac{2m}{3} = 4$

$m = 6$

2) Which of the following equations is not equivalent to the equation:  $5(x - 1) + 3x = 21 - 5x$

- a)  $x = 2$
- b)  $13x - 5 = 21$
- c)  $13x = 26$
- d)  $13x = 21$

D

3) Mike and Jake work for an apple picking company. They get paid \$9 per bushel picked. After a Saturday of working, Jake was bragging that he made \$27 more than Mike made. If the total amount of money made between both men was \$153, how many bushels did Mike pick?

MIKE 7

JAKE 10

### *Proportions*

4) Solve the following equation for  $x$ :  $\frac{x + \frac{1}{3}}{7} = \frac{2x}{-5}$

$x = -\frac{5}{57}$

5) Create a true proportion using the numbers and the box: 12, 4, 7, . Fill the box with the correct number.

mult.  
Answers

6) Your dad recently started working for an architecture company. His first project is to design a new skyscraper for the city of Chicago. The following picture represents his building. If the scale is 1 inch = 160 ft., how tall is your father's building going to be? Measure the front (ground to highest point) (Yes, you do have to measure with a ruler, round to nearest quarter inch)



MEASURE  
IT!

### Rigid Transformations

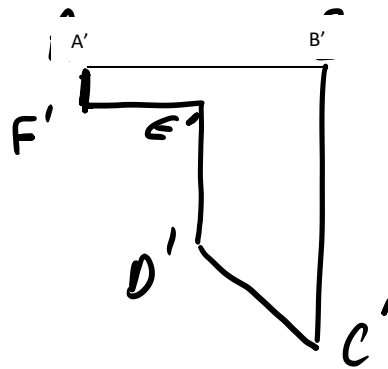
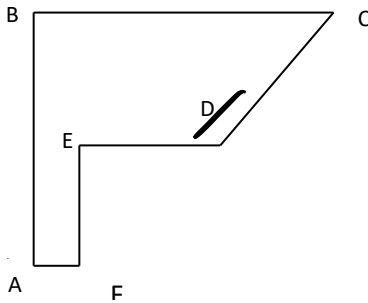
7) Answer True or False for each of the following:

- a) If the letter "M" is completely above the x-axis, and it is reflected across the x-axis, the result is a different uppercase letter? T
- b) If you had a picture of a dog, and you rotated it  $90^\circ$  clockwise and then shifted it 6 units to the right, your new image would be the exact same as if you first shifted 6 units to the right, then rotated it  $90^\circ$  T

### Congruency

8) True or False: Since all squares have four  $90^\circ$  angles, and all sides in a square are the same length, all squares are congruent to each other F

9) Given the following complete figure on the left, using a ruler and the given segment on the right, create a congruent picture.



### Informal Proofs

10) You are given two rectangles that have the same perimeter. The first rectangle has a length of  $x$  and a width of  $y$ . The second rectangle has a length that is greater than  $x$ . Write an explanation of what the width of the second rectangle has to be (note: you do not need an exact answer)

Must be  
less than  
 $y$

### Basic Geometric Shapes

11) The table below lists some different shapes, and properties. In each box place an "X" indicating of the shape has the property.

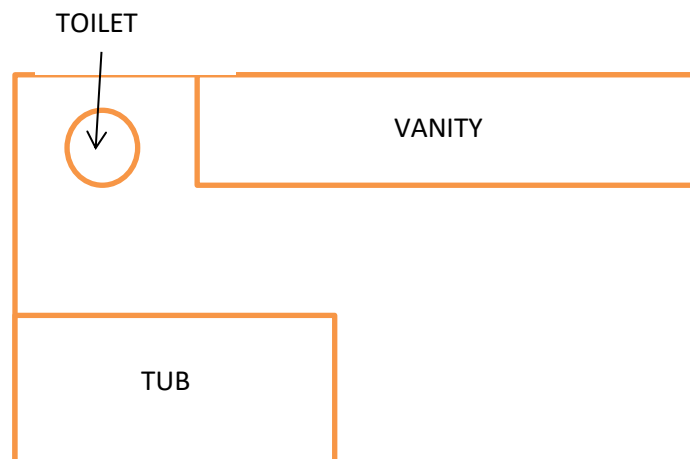
	<u>Square</u>	<u>Rectangle</u>	<u>Kite</u>	<u>Trapezoid</u>	<u>Isosceles Trapezoid</u>	<u>Rhombus</u>	<u>Parallelogram</u>
All angles are right angles	X	X					
All sides are congruent	X					X	
Diagonals bisect each other	X	X				X	X
Diagonals are perpendicular	X		X			X	

12) Complete each of the following by indicating if it is Always, Sometimes, or Never true.

- a) A square is a rectangle **A**
- b) A rectangle is a square **S**
- c) A quadrilateral has four sides **A**
- d) A pentagon has a greater perimeter than a triangle. **S**
- e) The angles in an octagon have a greater sum than the angles in a hexagon **A**

13) Zac and Jenny are remodeling their bathroom. Given the blue-print below, determine how many boxes of tiles they need to buy, if each box has 12 tiles, each measure one-square-foot (12" x 12"). (Note: Tile will be used in all unoccupied floor sections).

Room: 8ft. x 12 ft.  
 Toilet: radius = 12 inches  
 Vanity: 9ft. x 2 ft.  
 Tub: 5ft. x 3 yd.



**3 boxes**

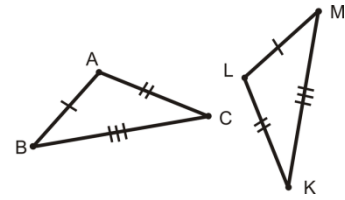
## Labeling and Understanding Geometric Diagrams

14) For the following triangles name all pairs of congruent segments.

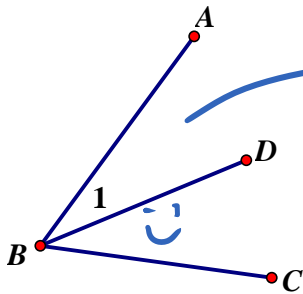
$$\overline{AB} \cong \overline{LM}$$

$$\overline{AC} \cong \overline{LK}$$

$$\overline{BC} \cong \overline{MK}$$



15) Given the following diagram, name  $\angle 1$  in two different ways



$\angle ABD$   
or  
 $\angle DBA$

Follow up question: Put a smiley face in  $\angle DBC$  above

## Expressions

16) Write an expression to model the woman's weekly salary in the following situation: "A woman making \$25 an hour gets a 10% raise." Identify any variables that you use

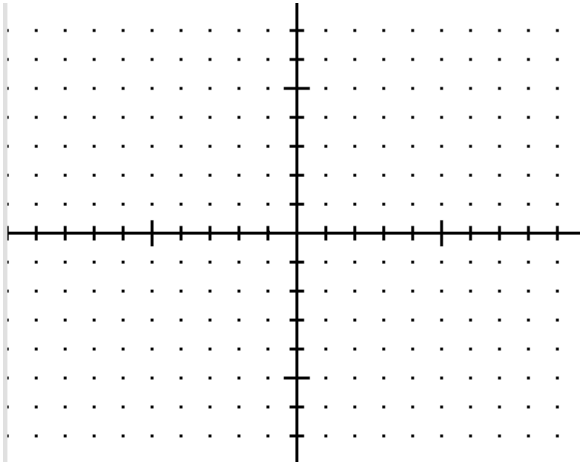
$$25x + .10(25x) \quad \text{or} \quad 27.5x$$

17) Given a rectangle with a perimeter of  $80\text{cm}$  and a length of  $x$ . What is the width in terms of  $x$ ?

$$40 - x$$

## Area

18) On the graph below, plot the points  $(-3, 1)$ ,  $(6, 1)$ , and  $(2, -4)$ . Then find the area of the triangle formed when the points are connected with straight line segments.



$$22.5 \text{ u}^2$$

## Functions

19) If  $f(x) = 3^x + 5$ ,

a. find  $f(2)$

$$3^2 + 5$$

$$\boxed{14}$$

b. find a value for “ $x$ ” which will result in a function value less than five

FIGURE IT OUT!

20) Compare the following two functions to determine which has a greater rate of change.

I)  $y = 2x + 4$     II)  $(-1, -6), (2, 3)$

a) The rate of change is equal

b) I has a greater rate of change

☒ c) II has a greater rate of change

C

21) Joanie and Chachi attempted to solve an equation. It read: if  $f(x) = 5x - 12$ , find  $x$  if  $f(x) = 22$ . Chachi said the correct answer is 98. Joanie said the answer 6.8. Who is correct Joanie or Chachi? Why?



Joanie  
is  
correct

22) Given the following table:

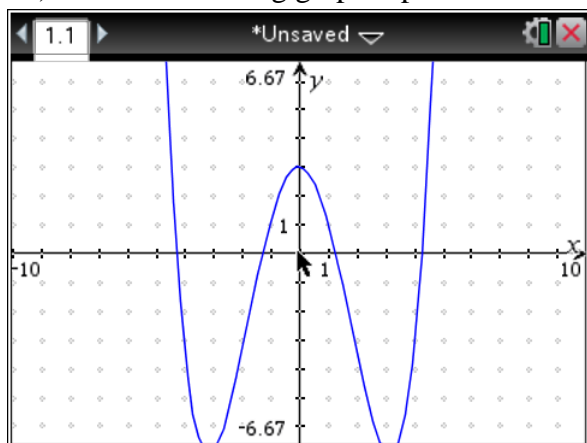
$x$	0	2	4	7	9
$y$	-4	-5	-6	-7	-10

Find the Domain and Range.

$$D: \{0, 2, 4, 7, 9\}$$

$$R: \{-10, -7, -6, -5, -4\}$$

23) Let the following graph represent a function  $f(x)$



a) Find  $f(0)$   $= 3$

b) Find  $f(-2)$   $= -3$

c) If you found  $f(-4) - f(5)$ , would the answer be positive, or negative?

Negative

24) The dosage in milligrams  $D$  of Ivermectin, a heartworm preventative, for a dog who weighs  $x$  pounds is

given by  $D(x) = \frac{136}{25}x$

a) Find the proper dosage for a dog that weighs 30 pounds.



$$163.2 \text{ mg}$$

b) If a doctor gave 152 milligrams of Ivermectin to a dog named Skippy, how many pounds does Skippy weigh? This is not a “ruff” problem!

$$27.94 \text{ pounds}$$

25) A salesperson earns \$600 per week plus a commission of 20% of their sales. Find the minimum amount of sales needed to receive a total income of at least \$1500 per week.

$$600 + .20(s) = 1500$$

$$.20s = 900$$

$$s = 4500$$

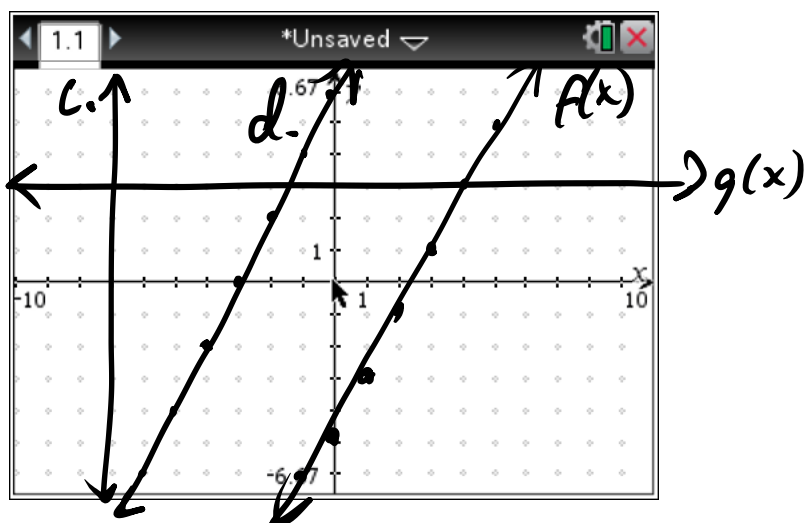
26) On the graph below, sketch the graphs of

a)  $f(x) = 2x - 5$

b)  $g(x) = 3$

c) a line using only quadrants II and III.

d) parallel to  $f(x)$  with an x-intercept of -3



27) Find the y – intercept of the function  $f(x) = \frac{1}{2}x + \frac{3}{7}$

$$\frac{3}{7}$$

28) How many x – intercepts does the graph  $f(x) = -45$  have?

None

29) Find the equation of the vertical line that goes through the point  $(3, -\frac{3}{4})$ .

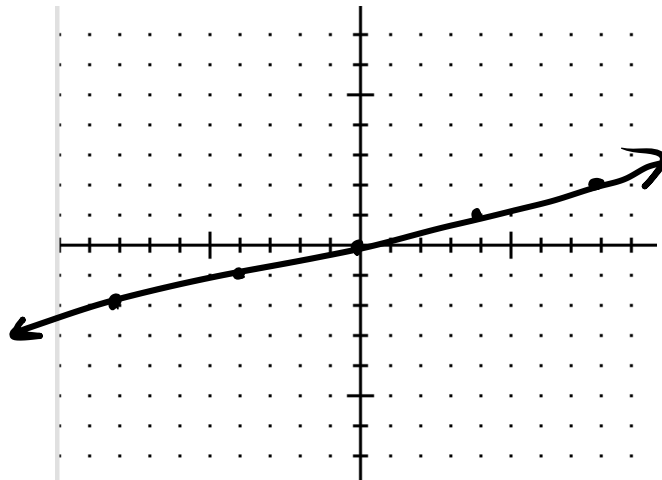
$$x = 3$$

30) a) Graph a line with a slope of  $\frac{1}{4}$  that passes through the origin

b) Write the equation of the line that is perpendicular to the graph and has the same y-intercept

$$b=0, m=-4$$

$$y = -4x$$



31) If you knew the slope of a line is -4, in what directions would you move from the y – intercept to create an accurate graph?

down and right

32) Find the equation of the line that goes through the points (3, 4) and (-1, -5).

$$y = \frac{9}{4}x - \frac{11}{4}$$

33) Stibnite is a silvery white mineral with a metallic luster. It is one of the few minerals that melts easily in match flame or at temperatures of approximately  $977^{\circ}F$  or greater. Using the conversion formula

$C = \frac{5}{9}(F - 32)$ , find the lowest temperature, in degrees  $C$ , at which stibnite will melt.



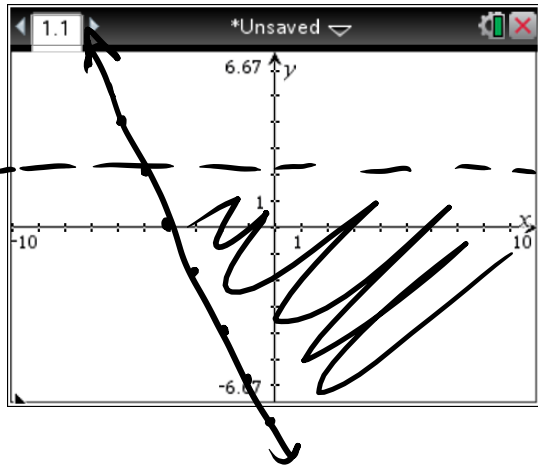
$525^{\circ}C$



34) The yearly cost of tuition (in state) and required fees for attending a public two-year college full time can be estimated by the linear function  $f(x) = 53.6x + 1029.34$ , where  $x$  is the number of years after 2009 and  $f(x)$  is the total cost. Find the total cost for you to receive an associate's degree if you start in 2018.

$$\$3077.08$$

35) Graph the union of the inequalities  $x + \frac{1}{2}y \geq -4$ , and  $y < 2$  below.



$$\frac{1}{2}y \geq -x - 4$$

$$y \geq -2x - 8$$

### Reading and Writing Inequalities

36) Write the inequality: four times the difference of a number less 5 is greater than three times the sum of the number and two

$$4(x - 5) > 3(x + 2)$$

37) Six Flags requires that you are 48 inches tall to ride a roller coaster. Write an inequality that best represents the requirement in feet?

$$h \geq 4$$

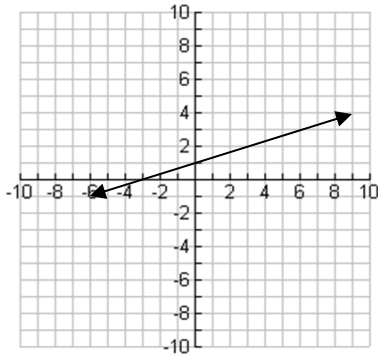


38) Solve each inequality for  $x$ :  $-5x + 3 \leq -1$  and  $2(x + 7) - 2 < 20 - 8x$ . Find a value of " $x$ " that will satisfy both inequalities.

FIGURE IT  
OUT!

### Slope

39) What is the slope of the graphed line? Write your answer as a fraction.



$$m = \frac{1}{3}$$

40) In 1990, the enrollment of Lemont High School was 900 and by 2010, the enrollment had grown to 1450.

Find the rate of change  $\left( \frac{\text{students}}{\text{year}} \right)$  from 1990 to 2010.

✓

$$27.5 \text{ students/year}$$

### Evaluating Expressions

41) Evaluate the following expressions for the given variables.

$$4x^2 - \frac{3}{7}y \quad (x = -3; y = 5)$$

$$\frac{237}{7}$$

$$(a + b)^0 - c \quad \left( a = -\frac{13}{22}; b = \frac{27}{39}; c = 1 \right)$$

$$0$$

42) Explain why the following expression cannot result in a negative number.

$$(a - b)^2 + |c \cdot d| \quad \text{Both terms } 0 \text{ or pos.}$$

43) The perimeter for a rectangle can be found using the formula  $P = 2w + 2l$ . The Adam's family wants to put in a rectangular fence for their dog. The length of their yard is 22 yards and the width is 360 inches. How much fencing will they need in feet?

$$192 \text{ ft.}$$

### Constructing Table Values

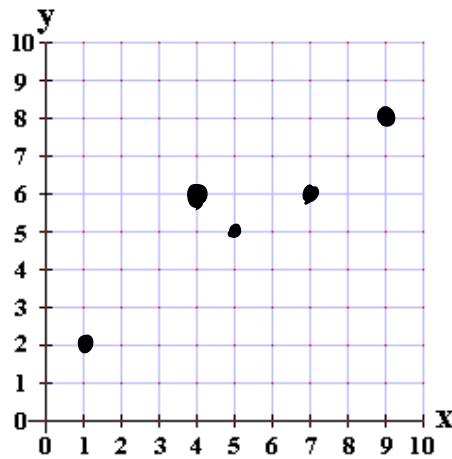
44) Given the equation  $y = 5 - \frac{2}{3}x$ , fill in the table of values.

$x$	$y$
-3	7
-1	$\frac{17}{3}$
5	$5\frac{1}{3}$
6	1
9	-1

### Scatter Plots and Correlation

45) Create the scatter plot given the following table.

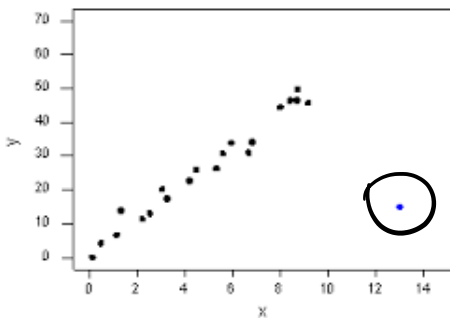
$x$	$y$
1	2
4	6
5	5
7	6
9	8



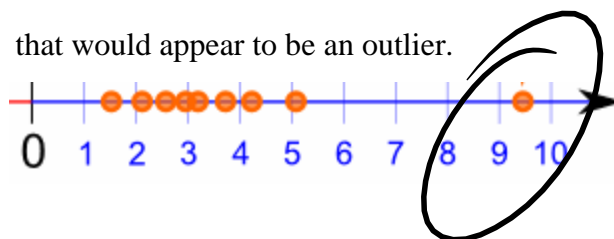
### Statistics

46) Circle the data point in the following data sets that would appear to be an outlier.

a.



b.



c. 10, 13, 11, 12, 100, 14, 8, 16, 17

47) In measuring the heights of the players of a 6<sup>th</sup> grade basketball team, explain why adding the height of LeBron James to this set of data would create an outlier?

Much Taller than rest

### Representing Functions Graphically/ with Tables

48) Match the following functions with the table of values. Place the correct function name above the right column.

$$f(x) = 2x + 5$$

$$g(x) = -3x + 1$$

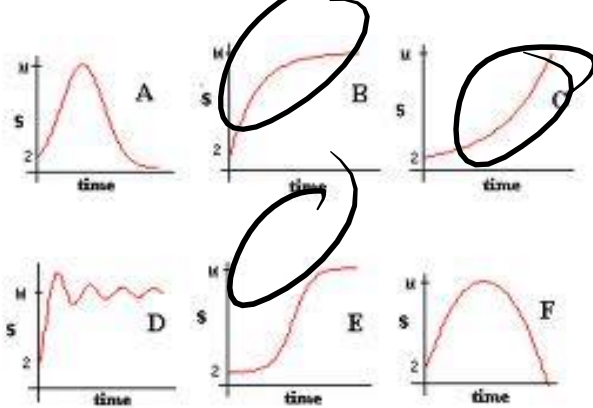
$$h(x) = 5$$

$x$	$h(x)$
1	5
2	5
3	5
4	5
5	5

$x$	$f(x)$
1	7
2	9
3	11
4	13
5	15

$x$	$g(x)$
1	-2
2	-5
3	-8
4	-11
5	-14

49) List all of the functions that are increasing as time increases.



### Sequences

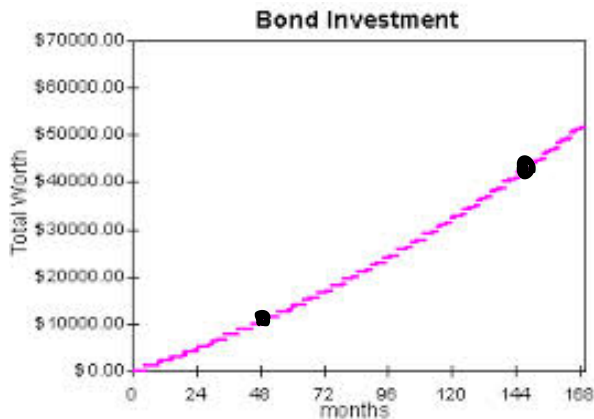
50) Write the next three terms of the sequence: 5, 8, 11, 14, ...

17, 20, 23

51) Alex makes \$15 a week in allowance after four weeks, he has \$105. If he continues to save at the same rate, how much money will he have at the end of 7 weeks?

\$150

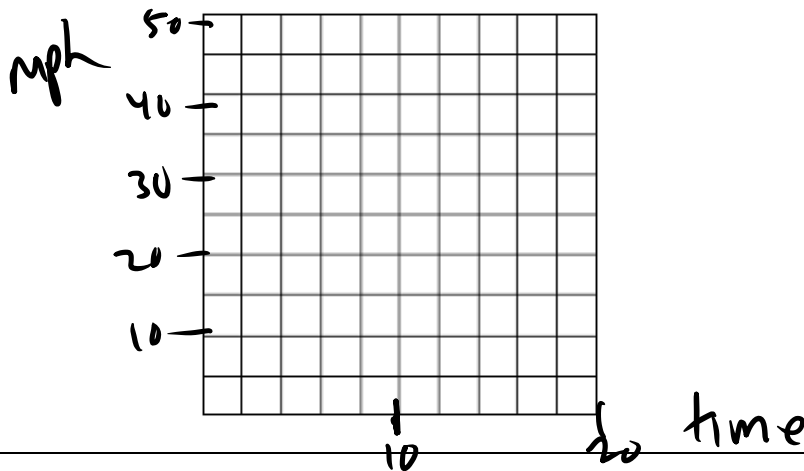
52) The following is the graph a function representing the worth of an investment over time. Approximately how much more is the investment worth at 12 years than 4 years?



*\$30,000*

*Using Scales and Labels on Graphs*

53) Label the axes of the following grid so that the horizontal axis represents time in seconds and goes from 0-20 and the vertical axis represents speed in miles per hour and goes from 0-50.



### PART 2 – PROBLEM SOLVING

54) If the definition of a square is “a four sided figure with four right angles and four sides of equal length”, and a standard chessboard is made up of eight rows and eight columns (of squares), how many squares are exist on the chessboard?

*204*

55) You have two measuring cups to hold liquids. One holds 4 cups and the other holds 9 cups. There are no markings on either container to indicate lesser quantities. You cannot estimate the amounts in the containers. You are standing next to a river, therefore you have a steady supply of water at your disposal. You need **exactly 6** cups of water to water the new vegetable garden.

a) How can you accomplish this by using these 2 containers?

b) How much water did you waste (or throw away) in order to achieve your goal of 6 cups?

Figure ~~It~~  
OUT!

56) Vicky went to the doctor to get a prescription of antibiotics. She followed the instructions exactly. She began at 4:00 in the afternoon on Monday taking 4 mg of the medicine. She was to take 4 mg every four hours (even in the middle of the night). From the time she took the dose of medicine until the time she needed to take another dose of medicine, 25% of the medicine would leave her body. So, when she took the second dose at 8:00 in the evening on Monday 25% of the medicine she had taken in the afternoon was gone, but she took 4 mg more in the second dose. This pattern continues that she loses 25% of the medicine in the body during the four hour period and then takes another dose of the medicine. At what time on which day will she have at least 14 mg of medicine in her body?

8pm on Tuesday

57) When the baseball scouts for the Los Angeles Dodgers were looking at bringing a player to the United States from Korea to pitch they were interested in the speed of his pitches. His fastball was clocked at 43 meters per second in Korea, but the United States measures the speed in miles per hour. What is the rate that the United States can understand?

$\approx 96$  mph

58) The Blikony People have a monthly ritual of making payments to the King. The King sits atop his castle, where there are 20 steps, and then the 21<sup>st</sup> step gets you to the top where the King awaits. When a peasant makes their payment, they must leave 1 quarter on the first stair, 2 on the second, 3 on the third, and so on for the 20 steps. When they arrive to the King, they must give the King half of the money in their pocket. On the way down, the peasant is allowed to pick up any money on stairs that have whole-dollar amounts (i.e. \$1, \$2, etc.). When the peasant gets to the bottom, he now has \$59 in his pocket. How much did he start with?

\$140.50

59) Jimbo has a lot of pets, including two dogs, Rocky and Toby. If you take the product of the number of fish, times the number of dogs, times the number of horses, times Jimbo's age (which is a higher number than the rest), the product is 1218. Knowing that he has more fish than horses, how many fish does he have?

7 fish

60) Consider the situation that there is a pond where some flowers have grown up, and there are bees hovering over the flowers. Now read the following statements carefully:

1. If each of the bees lands on a flower, then one bee does not get a flower
2. If two bees share each flower, then there is one flower left.

How many bees and flowers are there?

3 flowers  
4 bees