Incoming Statistics Summer Work

Welcome! The Math Department is so excited that you are taking on the challenge of a course in Statistics! Statistics is a beautiful, new, and majestic way of approaching mathematics and using mathematics to explain the world around us. In order to jump into new material as soon as possible, you will need to review topics in the following packet.

A few guidelines:

- This packet feels long. That is because **there is AMPLE space to complete your work IN/ON this packet**. Please do not be intimidated by the size. It is created so that you can work directly on the packet.
- On this assignment, **you will need a calculator, TI-83 or TI-84.**
- If at any time, you need assistance with the topics included here, you may use online resources, such as Khan Academy. Any sources that you use should be cited.
- **This assignment will be due the first full day of school**. There will be a **graded assessment** on these topics within the first two weeks of school.
- Below, you will find a suggested breakdown of the assignment into manageable pieces.
    - Week 1: June 19 – June 23
    - Week 2: June 26 – June 30
    - Week 3: July 3 – July 7
    - Week 4: July 10 – July 14
    - Week 5: July 17 – July 21
    - Week 6: July 24 – July 28
    - Week 7: July 31 – August 4

If you have any questions, please also feel free to email Mrs. Hain at mhain@stpaulsmd.org. Please know it may take 48 hours to receive a response over the summer, and I will not be available to answer email from August 1 – August 7.

Thank you! Go Gators!

Week 1: Algebra Review

1. Perform the indicated operations.
   a. $\left(\frac{4}{9}\right)^3$

   b. $4^3 \cdot 5^2$

   c. $2 + 7^2$

   d. $\frac{9+3}{2^3-2^2}$

   e. $\frac{8}{15} - \frac{4}{15} \cdot \frac{1}{3}$

   f. $2 + \frac{2}{7}$

   g. $\frac{3}{7} \div 13$

   h. $\frac{x}{w} \div \frac{y}{z}$, when $w = 10, x = 3, y = 11, z = 30$

2. Complete the chart below.

Fraction	Decimal	Percent
		59%
	0.05	
	0.068	
		2.7%
		0.3%
	0.0027	
$\frac{1}{12}$		
$\frac{2}{11}$		

3. Find the percentages of the whole.
   a. 80% of 86

   b. 79% of 5

   c. 5.9% of 55

   d. 40% of 4

   e. 3% of 2000

4. Find the slope of the line that goes through the following points, and graph on the plot provided. Note, please indicate any scale that you use.
   a. $(2, 10); (6,3)$

   b. $(-9, -9); (-5, -8)$

   c. $(-3.6, 5.4); (-3.2, 2.1)$

Week 2: Types of Variables, Bar Graphs and Pie Graphs

There are two types of data: quantitative and qualitative (also called categorical).

Quantitative data (think *quantity*) takes on numerical values that actually represent a measurement, such as size, weight, how many, how long, score on a test, etc. For these data, it makes sense to find things like "average" or "range". For instance, it does not make sense to find the average eye color, because eye color is not an example of a quantitative variable. There are two types of quantitative variable: discrete and continuous.

Discrete variables are those such as shoe size, (6, 6.5, 7, 7.5, 8, 8.5, etc), the number of cans collected during a food drive, or class size. These variables have a finite, or countable, number of values.

Continuous variables are those such as height (60 in, 62.45 in, 63.342 in...), or how much water it takes to fill a water balloon before it bursts. These variables can assume an infinite number of values and can assume decimal quantity within a small range of values, even though we may choose to round the answer (like our heights). These are typically values that result from some type of measurement, like height, surface area of an orange, distance traveled to school, etc.

Qualitative (categorical) data are those that *categorize* individuals or place them into groups. Examples are eye color, year in school, sport played, etc. Within the qualitative group, we find **binary variables**. A binary variable is a qualitative variable that only have two outcomes (think of a yes/no question or a coin flip).

Draw a sketch below that summarizes the reading above.

1. Classify each variable below as either categorical or quantitative. If quantitative, decide if it is discrete or continuous.

Variable	Type
Grade level (9th, 12th, etc)	
Number of siblings	
Birth month	
Number of pets	
Age category (young, middle-aged, etc.)	
Favorite sport	
How long you can hold your breath	
Favorite season	
Height	
Distance traveled to school each day	
Age	
How much a salad costs at different restaurants	
Weight of puppies at 8 weeks old	
Running time of Disney movies	

I. Measuring Central Tendency

a. Find the mean, median, and mode of the following collection.
15, 11, 19, 15, 14, 13, 17, 11, 12, 17, 15, 14, 15

To begin, order the fourteen numbers
11, 11, 12, 13, 14, 14, 14, 15, 15, 15, 17, 17, 19

To find the **mean**, divide the sum of the numbers by 14.

$$mean = \frac{11+11+12+13+14+14+14+15+15+15+15+17+17+19}{14} \approx 14.4$$

The **median** is the average of the two middle numbers for even data list.

$$median = \frac{14+15}{2} = 14.5$$

For odd data list, the median is the middle number.

The **mode** is 15 because that is the number that occurs the most frequently.

1. Determine the given statistics from the data below on the number of homeruns Mark McGuire hit in each season from 1982-2001.

70	52	22	49	3	32	58	39
39	65	42	29	9	32	9	33

Mean	
Minimum	
Maximum	
Median	
Mode	

2. Here are the travel times in minutes for 15 workers in North Carolina, chosen at random by the Census Bureau. Find the requested values below.

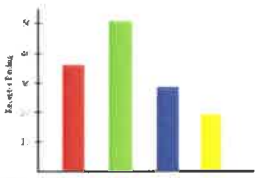
30 20 10 40 25 20 10 60 15 40 5 30 12 10 10

Mean	
Minimum	
Maximum	
Median	
Mode	

Week 4: Bar Graphs and Pie Charts

A **bar graph** uses rectangular bars to organize and display data. It is made up of these individual parts:

- A title
- A horizontal axis with labels
- A vertical axis with labels
- An interval
- Data

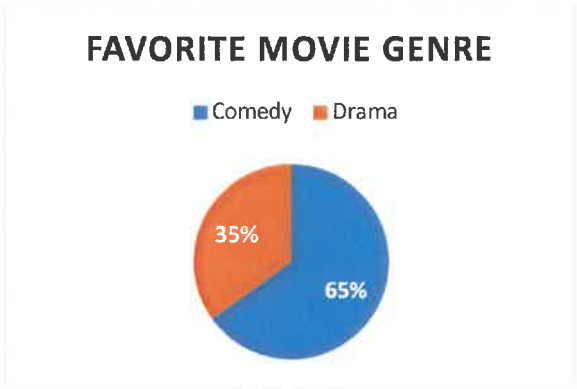


A **circle graph** uses parts of a circle to organize and display data.

The part of this graph labeled 65% makes up
234° of the graph because
65% of 360 = 0.65 X 360 = 234

The part of this graph labeled 35% makes up
126° of the graph because
35% of 360 = 0.35 X 360 = 126

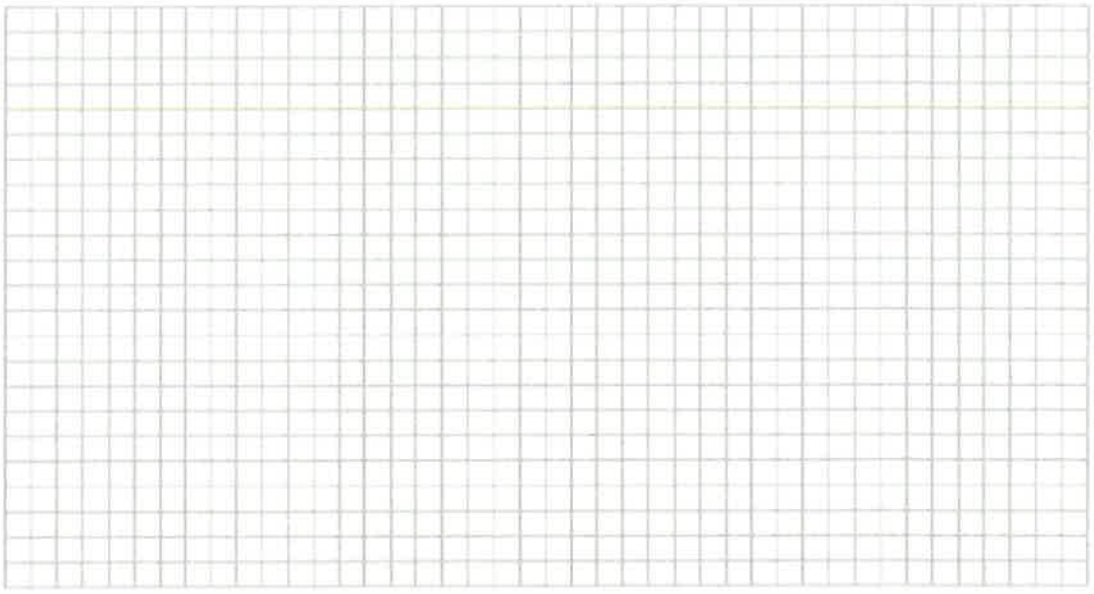
You can check your work by finding the sum of the parts:
234° + 126° = 360°



Suppose that you were interested in the actual percentage of each flavor skittle that was in a bag. To do this, you decide to purchase 5 bags of skittles and count how many of each flavor was in each bag (before enjoying them, of course!) You found that there are 176 green apple, 123 strawberry, 225 grape, 252 lemon, and 237 orange.

1. Find the percent of color of skittles from the total amount in your 5 bags, rounded to the nearest percent.

2. NEATLY created a well-labeled bar graph of the distribution of colors of skittles.



3. A pie chart is another graphical display used to show all the categories in a categorial variable relative to each other. Create a pie chart for colors of skittles.

Week 5: Stem and Leaf Plots

A **stem-and-leaf plot** shows quantitative data values in a way that sketches the distribution of the data. If you turn a stem-and-leaf plot on its side, it looks very similar to the shape of a histogram.

1	9
2	2 5 6 7 8 9
3	0 4 6 7
4	2 3 4 6 8 8 9
5	2 3 5 7 8
6	2

Data values:

19, 22, 25, 26, 27, 28, 29, 30, 34, 36, 37, 42,
43, 44, 46, 48, 48, 49, 52, 53, 55, 57, 58, 62

Given the stem-and-leaf plot below, answer the following questions:

5	5
6	
7	5 7 9
8	2 3 4 8 9
9	0 5

12) What are the date values? List in numerical order.

13) What is the mean?

14) What is the median?

15) What is the mode?

16) What is the minimum value?

17) What is the maximum value?

18) What is the range (Range = Max value – Min value)?

A marketing consultant observed 50 consecutive shoppers at a supermarket. One variable of interest was how much each shopper spent in the store. Here are the data (rounded to the nearest dollar), arranged in increasing order.

3	9	9	11	13	14	15	16	17	17
18	18	19	20	20	20	21	22	23	24
25	25	26	26	28	28	28	28	32	35
36	39	39	41	43	44	45	45	47	49
50	53	55	59	61	70	83	86	86	93

1. Make a stemplot using tens of dollars as the stem and dollars as the leaves. Make sure you include appropriate labels, title, and key.

Week 6: SAT Practice Problems
Week 7: Calculator Skills (Begins on the next page)

On Thursday, 240 adults and children attended a show. The ratio of adults to children was 5 to 1. How many children attended the show?

A) 40

B) 48

C) 192

D) 200

Every month Jamal adds two new books to his library. Which of the following types of functions best models the number of books in Jamal's library as a function of time?

A) Increasing linear

B) Decreasing linear

C) Increasing exponential

D) Decreasing exponential

A store is deciding whether to install a new security system to prevent shoplifting. Based on store records, the security manager of the store estimates that 10,000 customers enter the store each week, 24 of whom will attempt to shoplift. Based on data provided from other users of the security system, the manager estimates the results of the new security system in detecting shoplifters would be as shown in the table below.

	Alarm sounds	Alarm does not sound	Total
Customer attempts to shoplift	21	3	24
Customer does not attempt to shoplift	35	9,941	9,976
Total	56	9,944	10,000

According to the manager's estimates, if the alarm sounds for a customer, what is the probability that the customer did *not* attempt to shoplift?

A) 0.0003

B) 0.0035

C) 0.0056

D) 0.625

A quality control researcher at an electronics company is testing the life of the company's batteries in a certain camera. The researcher selects 100 batteries at random from the daily output of the batteries and finds that the life of the batteries has a mean of 342 pictures with an associated margin of error of 18 pictures. Which of the following is the most appropriate conclusion based on these data?

A) All the batteries produced by the company that day have a life between 324 and 360 pictures.

B) All the batteries ever produced by the company have a life between 324 and 360 pictures.

C) It is plausible that the mean life of batteries produced by the company that day is between 324 and 360 pictures.

D) It is plausible that the mean life of all the batteries ever produced by the company is between 324 and 360 pictures.

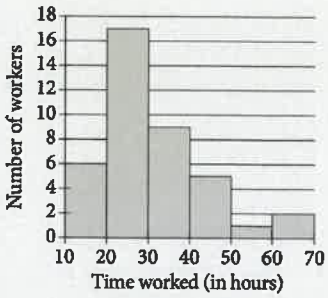
A community center offers a Spanish course. This year, all students in the course were offered additional audio lessons they could take at home. The students who took these additional audio lessons did better in the course than students who didn't take the additional audio lessons. Based on these results, which of the following is the most appropriate conclusion?

A) Taking additional audio lessons will cause an improvement for any student who takes any foreign language course.

B) Taking additional audio lessons will cause an improvement for any student who takes a Spanish course.

C) Taking additional audio lessons was the cause of the improvement for the students at the community center who took the Spanish course.

D) No conclusion about cause and effect can be made regarding students at the community center who took the additional audio lessons at home and their performance in the Spanish course.



The histogram shown summarizes the distribution of time worked last week, in hours, by the 40 employees of a landscaping company. In the histogram, the first bar represents all workers who worked at least 10 hours but less than 20 hours; the second represents all workers who worked at least 20 hours but less than 30 hours; and so on. Which of the following could be the median and mean amount of time worked, in hours, for the 40 employees?

A) Median = 22, Mean = 23

B) Median = 24, Mean = 22

C) Median = 26, Mean = 32

D) Median = 32, Mean = 30

(Note: On the SAT, all histograms have the same type of boundary condition. That is, the values represented by a bar include the left endpoint but do not include the right endpoint.)

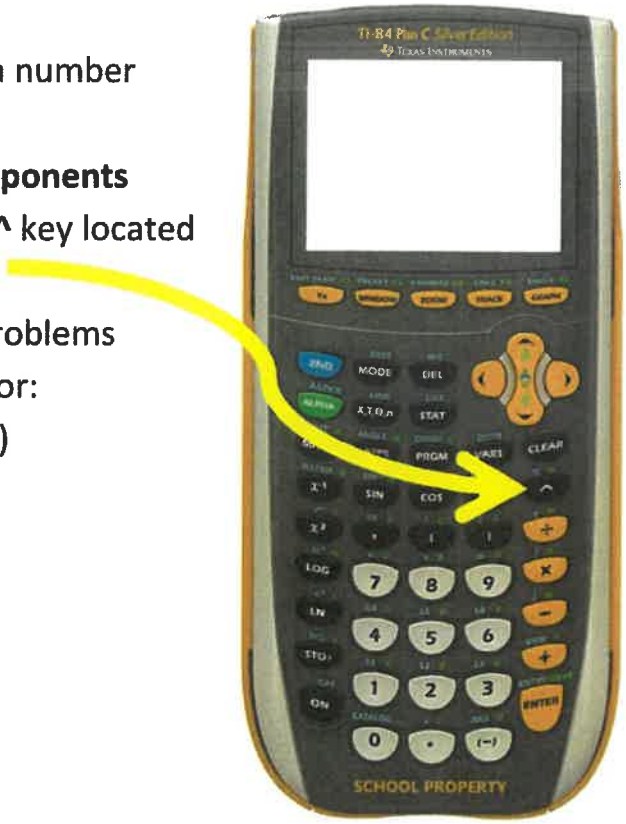
Name: _____ Graphing Calculator Basics

The calculators you use today are *not just any old calculator* – they are **graphing calculators**. They can do much more for you than just simple math. This lesson will teach you many of the great ways your graphing calculator can support you.

A. **EXPONENTS**

a. An **exponent** is a raised symbol beside a number such as 2^4 meaning$2 * 2 * 2 * 2$.

b. In order to solve a problem including **exponents** using your graphing calculator, use the **^** key located on the right side of the calculator.



c. *TRY IT YOURSELF!* Solve the following problems involving **exponents** using your calculator:
(As always, be careful with parenthesis!)

i. $4^2 =$ _____

ii. $(-18)^6 =$ _____

iii. $23^4 =$ _____

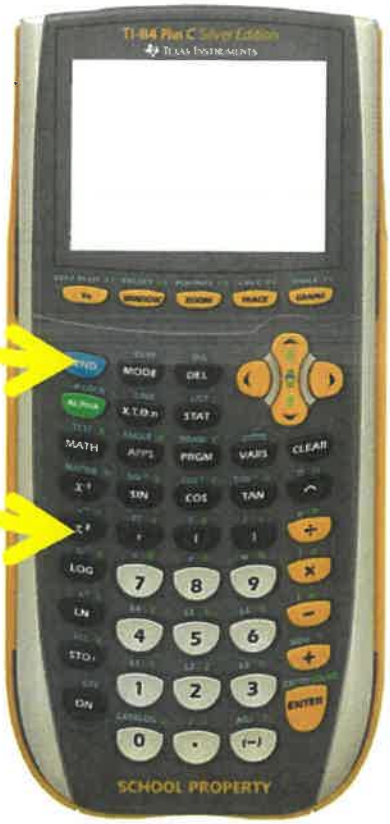
iv. $2^{14} * 3^3 =$ _____

v. $7^8 + 9^2 =$ _____

B. SQUARE ROOTS

a. The **square root** of a number is a number that produces a certain quantity when multiplied by itself.
Example: $\sqrt{16} = \pm 4$ because
$4 * 4 = 16\ and\ (-4) * (-4) = 16.$

b. In order to solve a problem including **square roots** using your graphing calculator, use the blue **2ND** key located on the left side of the calculator followed by the $\sqrt{\ }$ key shared with the x^2 key.
Any operations written in **BLUE** *behind the buttons on the calculator* can always be used by first using the blue **2ND** key.



c. *TRY IT YOURSELF!* Solve the following problems involving **square roots** using your calculator:
(As always, be careful with parenthesis!)

i. $\sqrt{100} =$ _____

ii. $\sqrt{85} =$ _____

iii. $\sqrt{256} * \sqrt{4} =$ _____

iv. $\sqrt{9025} * 6 =$ _____

v. $\sqrt{81} + 16 =$ _____

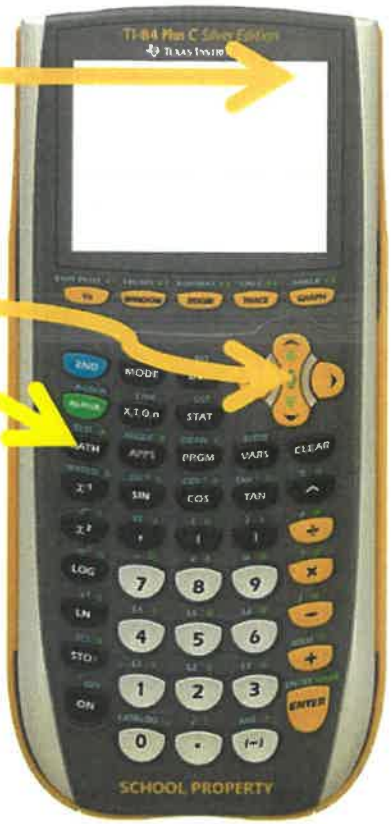
vi. $\sqrt{-9} =$ _____

C. FRACTIONS

a. A **fraction** is a number written in the form $\frac{a}{b}$ or a/b.

Examples: $\frac{6}{5} and\ 9/10.$

b. In order to solve a problem including **fractions** using your graphing calculator, use the **MATH** key located on the left side of the calculator. Then, in the **calculator window** scroll right → to the **FRAC** heading. Finally, scroll down ↓ to the selection n/d.



c. *TRY IT YOURSELF!* Solve the following problems involving **fractions** by simplifying using your calculator when possible:

i. $852/2 =$ _____

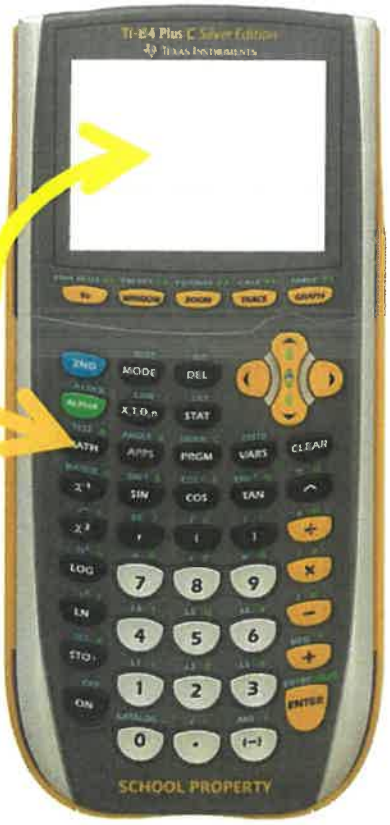
ii. $-\frac{4887}{250} =$ _____

iii. $\frac{-2323}{-3} =$ _____

iv. $\frac{550}{15} + 84 =$ _____

v. $\frac{777}{11} - \frac{54}{6} =$ _____

D. CONVERTING A NUMBER TO A FRACTION



a. Again, a number written using **fractions** looks like $\frac{6}{7}$ or $5/10$. Sometimes, you have a number and would like to know its **fraction** equivalent.

b. In order to convert a number to a **fraction** using your graphing calculator, use the **MATH** key located on the left side of the calculator. Then, in the **calculator window** select **⟩FRAC.**

c. *TRY IT YOURSELF!* Write the following numbers in their equivalent **fraction** form using your calculator: (As always, be careful with parenthesis!)

   i. $7.5 =$ _____

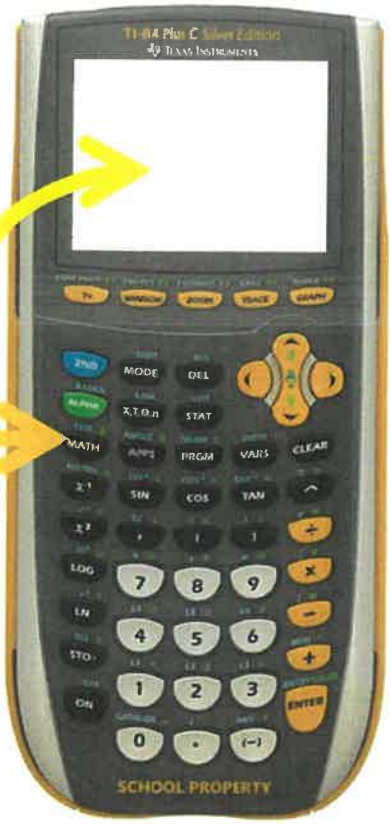
   ii. $-6.777 =$ _____

   iii. $-10.05 =$ _____

   iv. $99.34 + 78.6 =$ _____

   v. $6.01 * 9.45 =$ _____

E. CONVERTING NUMBERS TO DECIMALS



a. A number written using **decimals** looks like 5.422 or 6.0001. Sometimes, you have a number and would like to know its **decimal** equivalent.

b. In order to convert a number to a **decimal** using your graphing calculator, use the **MATH** key located on the left side of the calculator.
Then, in the **calculator window** select **)DEC.**

c. *TRY IT YOURSELF!* Write the following numbers in their equivalent **decimal** form using your calculator: (As always, be careful with parenthesis!)

i. $\frac{843}{6} =$ _____

ii. $-\frac{486963}{1000} =$ _____

iii. $\frac{-10}{-9} =$ _____

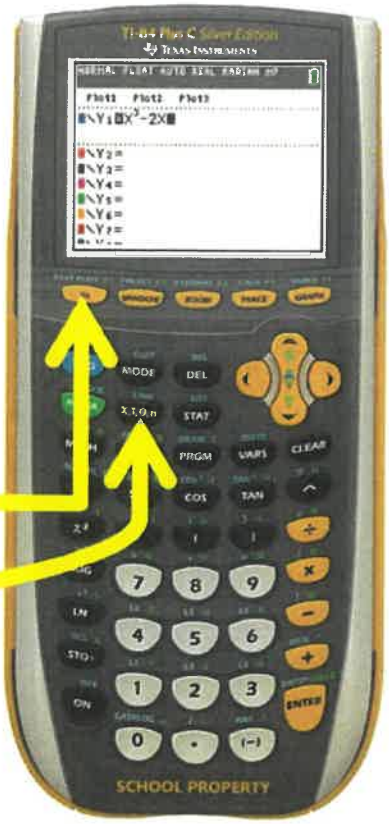
iv. $\frac{55}{15} + 764 =$ _____

v. $\frac{77}{19} - \frac{59}{6} =$ _____

F. INPUTTING EQUATIONS

a. In order to input an equation into your calculator, your equation must first be written in such a way that the variable **y** is isolated on one side of the equation.
Examples: $y = 15x + 5$ and $y = 65x^2$.
Counter-Example: The equation $2y + 5 = x - 7$ cannot be used and must be manipulated in such a way that the variable **y** is isolated on one side of the equation prior to being input into the calculator.

b. In order to input an equation into your calculator, use the **Y=** key located on the left side of the calculator. Then, type your equation in the window using the **X,T,Θ,n** key for the variable **x**.
NOTE: You will notice that there are several **y_1, y_2, etc.** in the window. This is because you are able to input multiple equations into your calculator at the same time. This is especially useful when studying **systems of equations.**



c. *TRY IT YOURSELF!* Practice typing the following equations into your calculator using the **Y=** window:

i. $y = 16x + 4$

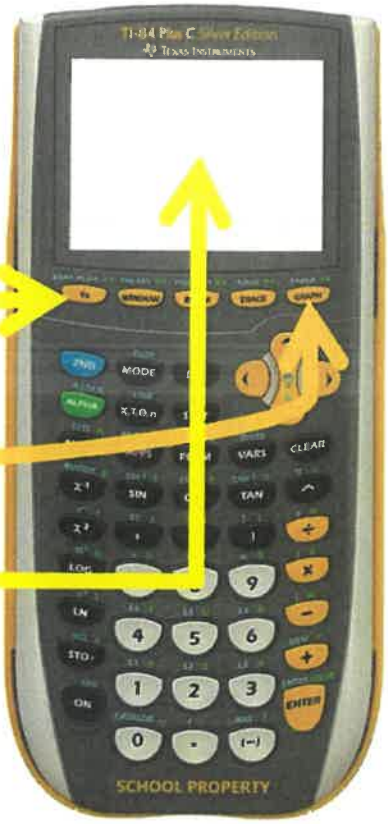
ii. $y = -5x - 5$

iii. $y = 19.5x + 65x - 5$

G. CREATING GRAPHS

a. A **graph** is another useful way to track how values for *x* and *y* change for a given equation.

b. In order to create a **graph** using your calculator, you must first input your equation(s) into the calculator using the **Y=** window.
Once your equation has been input into the calculator, use the **GRAPH** key located on the right side of the calculator.
You should now see a graph of your equation(s) in the window.



c. *TRY IT YOURSELF!* Graph the following equations on your calculator and make observations about the graphs:

i. $y = 16x + 4$

1. Is the graphed line *increasing* or *decreasing*? _____

2. Describe the *steepness* of the line: _____

3. Can you see the line's *y-intercept*? _____

a. If you can, what is its *y-intercept*? _____

ii. $y = -5x - 5$

1. Is the graphed line *increasing* or *decreasing*? _____

2. Describe the *steepness* of the line: _____

3. Can you see the line's *y-intercept*? _____

a. If you can, what is its *y-intercept*? _____

iii. $y = 19.5x + 65x - 5$

1. Is the graphed line *increasing* or *decreasing*? _____

2. Describe the *steepness* of the line: _____

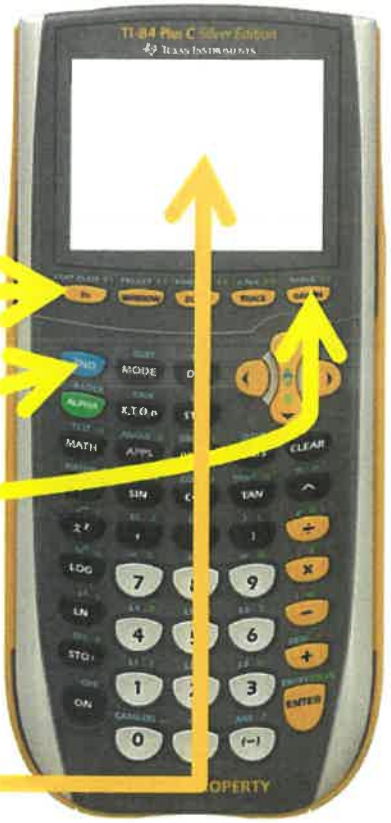
3. Can you see the line's *y-intercept*? _____

a. If you can, what is its *y-intercept*? _____

H. CREATING TABLES

a. A **table** is a useful way to track how values for *x* and *y* change for a given equation or set of equations.

b. In order to create a **table** using your calculator, you must first input your equation(s) into the calculator using the **Y=** window.
Once your equation has been input into the calculator, use the blue **2ND** key located on the left side of the calculator followed by the **TABLE** key shared with the **GRAPH** key.
Remember: Any operations written in **BLUE** *behind the buttons on the calculator* can always be used by first using the blue **2ND** key.
You should now see a table of your equation(s) in the window.



c. *TRY IT YOURSELF!* Create a table for the following equations on your calculator and record the tables in the empty tables below:

i. $y = 19x + 98$

x	y

iii. $y = 650x - 2$

x	y

ii. $y = -15x + 76$

x	y

iv. $y = -2x + 7$

x	y