Name_____ Period_____ TEAM #___

Math Modeling
Halloween 2012

What to see in the haunted trailer:

- TriWizard Tournament of Quidditch
- Writing and solving linear equations
- Linear Regression
- TAKS (oh no!!!)questions
- All numbers are to be ROUNDED TO THE NEAREST HUNDREDTH'S PLACE.

And worst of all: Page 1 is HOMEWORK!!!

What is not completed in class is

HOMEWORK DUE NEXT CLASS PERIOD!!!

THIS PAGE IS HOMEWORK

The Snow and Craft Witches visit Hogwart's TriWizard Tournament as often as possible to see the Quidditch games before the main event. This year there will be sixteen games played. There are two purchase plans for the games. We need to help the Witches decide which ticket plans to purchase to make all the Witches happy (an impossible task). Witch Snow decides she needs to know what the "break even point" is for each plan; that is when the costs are the same and how many games will that be.

Plan One: Entry fee of $48 and $5.00 for each game **Plan Two:** Entry fee $75 and $2.75 for each game. (Use y for total cost and x for games)

Write an equation for plan One:

_____

Write an equation for plan Two:

_____

We learned to solve equations with variables on both sides in preparation for this "SYSTEM OF EQUATION"
Set the two equations equal to each other and solve for x

_____=_____

x=_____ This is the number of rides they can ride and the cost will be the same for both plans. The cost will be_____. **SHOW YOUR WORK:**

Witch Craft will probably watch about 9 games. Which plan would be the best for her to ride? _____

Witch Snow will probably watch less than 18 games. Which would be the best plan for her to buy?
_____

Hogwart's offers a third plan. The cost is $97 and that includes the first three games with a price of $4 for each additional ride.
Which of the following equations fits this plan? (There may be more than one!!!!)

a) $y = 97 + 4x$
b) $y = 97 + 4x - 12$
c) $y = 97 + 4(x - 3)$
d) $y = 97 - 4x$
e) $y = 97 + 4(x + 3)$
f) $y = 85 + 4x$

Quidditch Anyone? Part II

In an effort to raise money for magical mischief on Halloween, a group of students have tried to come up with a sure fire betting method for the inter school Quidditch tournament to precede the TriWizard Contests at Hogwarts. Since the teams will be chosen on the day before the tournament by a draw, there is no possibility of betting on the team with the best record as the players will be mixed on five (5) different teams of six (6) players. As you know, in the tournament, 16 games will be played. .

The Weasley brothers have always been known for their mischief. They have been well schooled in the Measures of Central Tendency and they believe that applying these MCT to the number of games played in the Quidditch careers of each player should enable them to estimate the winners of the Quidditch tournaments. The Weasley brothers collected data provided by the Wizards Council on all the players who will play in the tournament.

- Ron is convinced that the team with the highest mean number of games will win.
- His brother Charlie is sure that using the highest median to estimate is the way to go.
- His brother Percy is the most popular boy at Hogwarts so he thinks the mode will estimate the winning team.

The data on the players by their shirt numbers is shown here.

Player	# games played	# games won
#1	30	30
#2	21	19
#3	4	3
#4	30	25
#5	4	3
#6	19	18
#7	29	28
#8	30	26
#9	25	22
#10	23	17
#11	30	26
#12	30	24
#13	26	24
#14	19	17
#15	30	28

Player	# games played	# games won
#16	20	19
#17	26	19
#18	26	26
#19	4	3
#20	26	23
#21	20	18
#22	5	3
#23	20	18
#24	27	22
#25	19	17
#26	7	5
#27	23	17
#28	24	21
#29	23	22
#30	26	21

Let's Do It Together

Before finding any MCT, you must put your data in order from low to high.

3, 3, 3, 3, 5, 17, 17, 17, 17, 18, 18, 18, 19, 19, 19, 21, 21, 22, 22, 22, 23, 24, 24, 25, 26, 26, 26, 28, 28, 30

1. There are 30 numbers. Let's find the median. The median is the _____.
Is there an even or odd number of data? _____ Circle the middle two numbers.
How do you find the median when there is an even number of pieces of data? _____
_____ What is the median value? _____

II. The mean is the average. How do you find the Mean?_____
Find the mean. Suggestion for long strings of numbers: add them in small groups, add these groups together, OR simply check the numbers before hitting enter on the calculator! What is the total? _____ Divide the total by _____. What is the mean? _____

III. What is a "Mode"_____ Is there a Mode? _____ Is there more than one mode? _____ What is/are the mode(s)?_____Do you think that the most popular number of games played is an estimate of outcome or is it a coincidence?_____.

IV. If we consider all the players as a group, which has a better rate of games played? The Mean, Median or Mode? _____ Why is range left out of the choices?_____

V. What is an outlier?
_____
Look at the data. Are there any values or a value that could be considered OUTLIERS?_____
What are they? _____

VI. Recalculate the median leaving out the outliers: new total is <u>25.</u> The middle value is the _____ term and is _____.

VII. Recalculate the mean leaving out the outliers. (Hint), take your total on #2 and subtract the total of the outliers _____ and then divide by _____(less the number of outliers).
Mean=_____

VIII. Which was affected more by the deletion of the outliers, the mean or the median?
_____

Summary:
Median with outliers=_____ Mean with outliers=_____

Median without outliers=_____ Mean without outliers=_____

Let's Look At the Teams

The team draw was made using a statistical method: the players counted off by 5's and made into five teams.

Team I : 1,6,11,16,21,26
(Tables A & E)
Team II: 2,7,12,17,22,27
(Table B & F)
Team III: 3,8,13,18,23,28
(Table C)
Team IV: 4,9,14,19,24,29
(Table D)
Team V: 5,10,15,20,25,30
(Table E)

Make a table of Values for your Team

Player #	Games Played	Games Won
Total		

Note: We are not using games played yet but, fill it in anyway.

List the games won in order.
____, _____,_____,_____,_____,_____

What is the median for your team?_____

What is the mean for your team?_____

Does your team have an outlier?_____
What is the median without the outlier?____
What is the mean without the outlier?_____

Did you get a mode?_____
Is "popularity" significant in a problem like this?_____

For your team, which is the highest score estimate? Circle:

a) mean
b) median
c) mean without outlier
d) median without outlier

Let's compare information:

Team	Mean	Mean /o	Median	Median /o	%	%(16)	Regression
1							
2							
3							
4							
5							

Based on this information, which of the 4 categories would you use to bet on the winning team? _____
There is no right or wrong answer here

Warning, in reality, the median is the best estimate when there is an outlier, the median is changed less than the mean by a super big or super small number.

When there are no outliers, the mean is the best estimate.

Harry Potter's Take on the Matter

Harry is not buying the Weasley brothers' logic. He thinks it is more important to use a ratio or a percent based on the number of games played compared to the number of games won.

He thinks the team with the largest ratio, or percent of games won is the team to bet on…sounds good.

A ratio is a comparison by division.

Go back and make a ratio of your team's number of games played to number of games won:

$$\frac{Games\ Won}{Games\ Played} = \# = \_\_\_\_\_$$

This ratio may be written as a percent:

$$decimal \times 100 = - - \%$$

so we have:_____ $\times 100 =$ ____%

Take the above ratio and solve for games won.

_____

Also remember how to relate numbers and %:

A number is a percent of another number.

$$\#\quad =\quad \%\quad \times\quad \#$$

_____

(Fill in form with games won=…….)

How many games should your team win if there are 16 games played?_____

Do you think this is a better method than the Weasley's method and why?

_____

Hermione Granger takes over

Hermione thinks these methods are not mathematically appropriate at all. So she proposes graph team's information (games won and games played), make a line of best fit, and write an equation for each team and then decide which team should have the most wins based on 16 games (SOOOOO Hermione).

So, let's talk about how to make a line of best fit and how to use that information to write an equation and how to use your calculator to make a more accurate line of best fit.

I. Graphing.

First decide your x and y. Remembering that y depends on x. So, does the number of games played depend on how many were won, or does the number of games won depend on the number played?

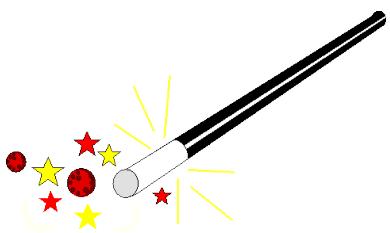
_____

So our y =_____

And x =_____

To graph we need to decide how to layout the graph. Look at the data. What is the lowest x value? _____ The highest?_____ So we can look at a spread of about 0 to 30 across the 15 tic marks. Points per tic are about 2. So label the x axis accordingly.

What is the lowest y value? _____ The highest?_____ So we can look at a spread of about 0 to 30 across the 15 tic marks. Points per tic are about 2. So label the x axis accordingly.



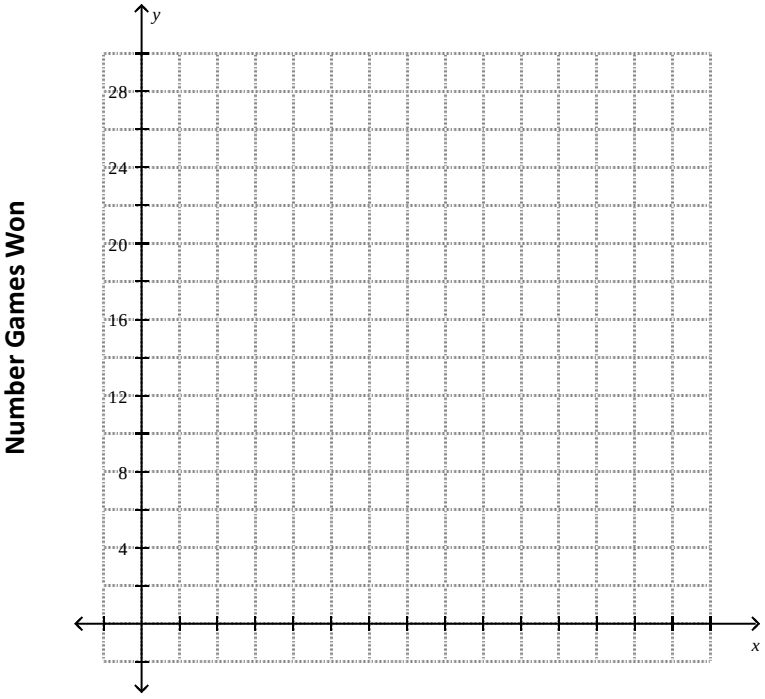
After the points are plotted, draw a "Line of Best fit". *What you think is the best fitting line that represents the data.*
A LINE OF BEST FIT MAY OR MAY NOT GO THROUGH THE POINT (0, 0). It needs to go all the way across the graph in a STRAIGHT LINE and touch the y axis!!!!!

Slope: Pick two points on THE LINE OF BEST FIT. Try to pick two that are close to perfect integer intersections on the graph. (,) and (,). Use the slope formula:

$$(x_2,\ y_2),\ and\ \ (x_1, y_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} =$$

What is the slope of your line? m=_____
What is your y-intercept? b=_____ Based on your hand drawn graph, what is your line of best fit? _____



Write your slope intercept form (from above) of the line:_____

Now based on this formula, how many games should your team win if games played is $x = 16$?
_____

Complete the next page then come back and answer this question.

Using the calculator to calculate a linear regression, how many games should your team win if games played =16? _____

Calculator Magic!! Linear Regression

Although all these methods are ways of making mathematical estimates, perhaps Hermione's way was the most mathematically accurate. But that was a lot of work!!!
Can we do this on the calculator? YEP! With Linear Regression. The Calculator will do all the work. We need to get the data into the Stat Plot and tell the calculator what we need it to do.

1. Given a set of data:
2. Enter the Data into the calculator

   STAT – ENTER
   type in independent variable data into **L1**, dependent data **Y-1** in **L2** and Y-2 in **L3**

3. Turn on STAT PLOT1

   2^{nd} – Y= – Enter – Enter –2^{nd} MODE
   OR Y= – ↑ Plot1 – Enter

4. Plot the data points

   ZOOM – 9

5. Find the line of best fit and send the equation over to the y-plot **4** is selected for a linear regression.

   STAT CALC – 4 – VARS Y-VARS – ENTER – ENTER – ENTER

   When **Y=** is opened you will see the equation has been placed for graphing, and a line will be drawn of best fit

   GRAPH

On your calculation screen you have: $y = ax + b$
a =_____ b=_____ Round to 100ths place

Now write your equation:

$$(y = ax + b)$$

This is your line of best fit using the Linear Regression Program on your Calculator.
Compare it to the one you wrote.
Were you close?_____

How does the graph of the Linear Regression Line compare to the line you drew by hand?
_____ Was your line's

slope steeper or flatter? What about your intercept? Was your intercept smaller or larger? (Careful with negative numbers!)