

1-hour version

Name: _____ Pd: _____

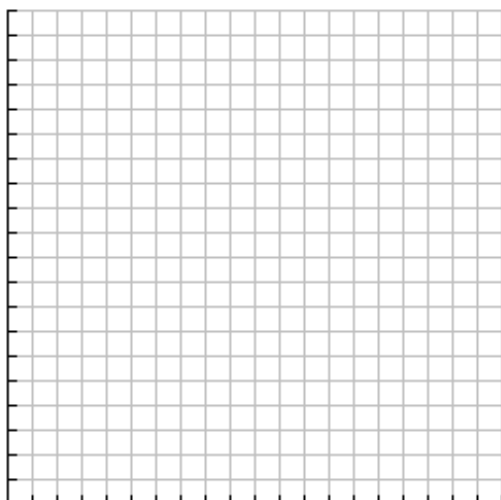
Note for the teacher: Prior to class, tape 6 tape measures to the wall (such that they are perpendicular to the ground) so that the height of the marshmallow can easily be seen. Also, have another tape measure on the ground to measure the distance from the catapult. Choose one student who thinks that they have a well-made catapult to shoot his/her marshmallow. Choose 6 more students (one per tape measure) to record the height of the marshmallow as it passes by them.

I. Finding the best fit model...teacher led...in order to understand the catapult, we will first look at the path that the marshmallow makes.

- a) As you watched the marshmallow fly in the air, what kind of path did the marshmallow make as you shot it from the catapult?
- b) Now, we will collect data to find the height of the marshmallow at certain distances from the catapult. Pick a distance from the catapult, and as the marshmallow passes you by estimate the height. Record this data in the table below.

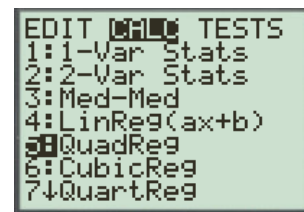
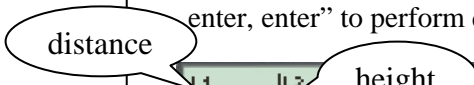
Horizontal distance each tape measure is from catapult										
Height of marshmallow										

- c) Make a scatterplot of your data on the grid:



- d) Enter the data into our TI-84 lists by choosing "Stat, edit." Put "distance from catapult" in L1 and "height of marshmallow" in L2.

On your calculator, choose "Stat, calc, QuadReg (#5), enter, enter" to perform quadratic regression on your



calculator to **come up with a model for your data:** _____

- e) Choose the "Y=" button at the top left of your calculator and type the quadratic regression equation.

Press "2nd, Y=" (which is the stat plot menu), hit enter to select Plot 1, then select the scatterplot option under "Type". Make sure that XList is L1 and YList is L2. See picture on the right.



Now press zoom #9 to see your scatterplot and quadratic model. Discuss whether you have a good fit or not.

II. Based on the model graphed on your calculator, answer the following questions. You can use either the trace feature of your calculator or the table to help you answer the following.

- a) What was the initial height of the marshmallow (at distance = 0)? _____
- b) On average, what was the maximum height of the marshmallow? _____
- c) On average, how high off the ground was the marshmallow when it was 12 inches away from the catapult? _____
- d) On average, at what distance(s) from the catapult was the marshmallow 1 foot off of the ground? _____

III. Testing the Catapult...teacher led with one student shooting his/her catapult:

Average Distance Travelled

- a) Put a marshmallow in your catapult cup. Shoot the marshmallow 3 times and record its distance from the catapult when it **first** hits the ground in the table below:

distance			
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- b) What is the average distance from the catapult that the marshmallow travelled? _____ Do you have a lot of variability? _____ Use your calculator to compute the standard deviation (Recall: type your data into L1 and choose stat/calc/1-var-stat). _____ Check your solution by hand for homework:

IV. Break into groups where each person in each group shoots the marshmallow three times (allow only 1 redo). The student with the lowest variability will represent their group when they try to hit the castle.

- c) Shoot the marshmallow 3 times. Record your distances below:

distance			
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- d) What is the average distance from the catapult that the marshmallow travelled? _____ Compute the standard deviation _____.
- e) Who in your group had the lowest variability (smallest standard deviation): _____

IV. Play the game...storm the castle! Place both the catapult and the castle on the ground or on the same table. The person who had the lowest variability represents their group.

- a) You have **3 chances** to hit the castle. Use part (d) to place the castle where it needs to be. Now, play the game. Did you hit the castle? _____ If not, why?