Applications of Parabolas

Alg1Week22_AppsParabolas.tns

Name ______________________

Class ______________________

Problem 1 – Number patterns can be revealed in a scatter plot.

On page 1.2, you see the ordered pairs that will be plotted on the next page. Focus on the *y*-values.

- Can you figure out a mathematical pattern for these values? Write an explanation if you can.

On page 1.3, the spreadsheet is shown again. Enter the next three *y*-values that follow the same pattern. You will need to scroll down to the empty cells in the **yval** column. The scatter plot will reveal your new ordered pairs immediately.

- Do you see a visual pattern or shape? What is it?

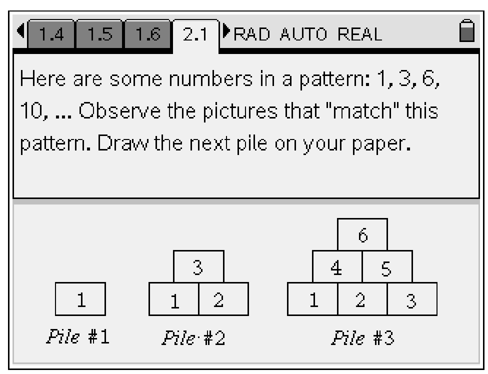
- On page 1.5, a function is graphed over the scatter plot. Do you agree that it matches the data? Why or why not?

- Now, use the matching function to predict a future term of the pattern. What is $f(7)$?

Problem 2 – A pattern that has a visual model with it

On page 2.1, you will see stacks of bricks. Observe the pattern.

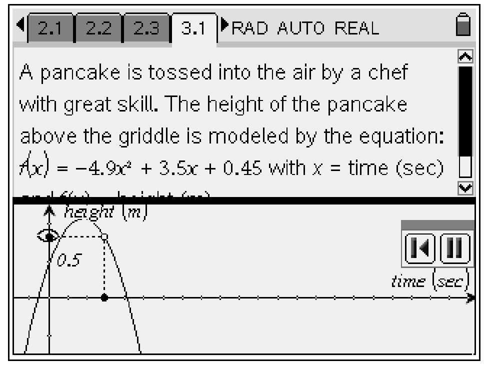
- Predict what the next pile will look like and sketch it below.



On page 2.2, enter the number you think will continue the pattern, representing how many bricks will be in the next larger "pile." You can check your answer by pressing (menu), and selecting **Check Answer** before you enter that number into the spreadsheet column labeled **bricks**.

- What shape does the data form?

Problem 3 – A pancake in the air? An application of a parabola at breakfast time!



Look at how the pancake rises slightly before it falls back to land on the griddle. Have you ever flipped a pancake? Have you ever seen a chef toss a pizza crust?

On page 3.2, use **Graph Trace** to find how high the pancake is above the griddle after several different lengths of time. Select **MENU > Trace, Graph Trace**, and then use the right/left arrows on the NavPad to trace along the graph. Ordered pairs will appear that represent a time in seconds, and the height of the pancake above the griddle at that time.

- Record several ordered pairs here: (you should round to the nearest tenth)

Time (sec)	Height (cm)

- On page 3.3, you will use **Graph Trace** to find the maximum height of the pancake, and when it occurs. Using **Graph Trace** will give you both the ordered pair, and an indication that this point is a maximum.

  Time (sec):_______ Maximum height (cm):_______

- At what time does the pancake land on the hot griddle? As you trace left and right, watch for the ordered pair to appear with an accompanying message that says “zero.” This is your solution.

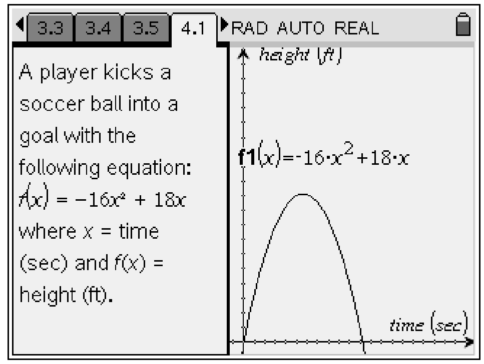
  Time (sec):_____ Height (cm): 0 (sizzle…Yum!)

- The pancake graph is a parabola because “what goes up must come down.” True or false?

Homework Problem – Soccer Ball

A new scenario is presented as an application of parabolas. This time, the height of the object is measured in feet and time is still measured in seconds.

On page 4.2, you will repeat the procedure using **Graph Trace**. Answer the following questions.



- Time (sec): 0.2 sec Height (ft): _______
- Time: _______ Maximum height (ft): ______
- Time: _______ Height: 0 ft. (ball lands on the ground, perhaps inside the goal net!)
- The soccer ball flies toward a goal that is 6 feet high. Could the ball go over the top bar of the goal?

Extensions

- Two different equations were introduced that actually have the effect of "gravity" built into them. In the pancake problem, the equation contains $-4.9x^2$, and in the soccer problem, the equation contains $-16x^2$. Investigate why there are two different numbers used in these equations. You may need to search for information about "acceleration due to gravity" on the internet in order to answer.
- Explain the entire formula for projectile motion: $h(\text{t}) = -0.5gt^2 + v_0t + h_0$. Your previous answer will help to explain the variable "*g*" in the formula.
- Write your own projectile motion problem using $g = 32$, initial velocity of 28 ft/sec and an initial height of 3 ft. Choose an object to be launched, and graph the equation. Make sure the window shows the parabola in the first quadrant so that you can see both the maximum (vertex) and where the parabola intersects the *x*-axis. Explain the meaning of the vertex and the *x*-intercept. Find several heights at different times.