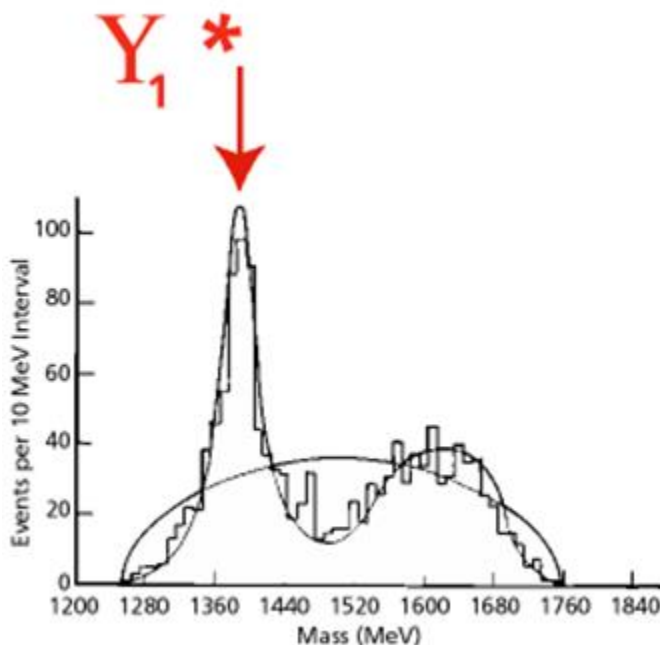


MASS OF U.S. PENNIES

Name(s) _____ Date _____

Particle physicists use graphs like the one shown to look at the results of their experiments. By putting mass readings on a histogram, they can see that the peaks show separate particles.



Since we don't have ready access to particles or machines to make them, we are going to look at something more readily available: U.S. pennies. There are lots of pennies in circulation. Are they all the same? They all represent \$0.01 and may be similar in color, but is that the only thing that they have in common?

Divide into groups of two or three students. Obtain a set of pennies from your teacher.

Begin by brainstorming characteristics of a U.S. penny. Identify the characteristics that can be measured or described with a number value. Measure and record as many properties of each penny as you can observe. Be sure the mass in grams is one of them!

Organize your data in a table. It should look something like this (but with more cells):

Penny	Mass (g)	Other Quantity	Other Quantity
1			
2			
3			

Now make a new "frequency" table with masses in 0.1 g bins and the number of pennies that fall in each bin, something like this:

Mass Bin (g)	Number of Pennies/0.1 g
0.0–0.1	
0.1–0.2	
0.2–0.3	

Draw a histogram of your group data; then make a class frequency table and a histogram of the class data. If you have other data that you made into frequency table form, discuss with your group and the class about whether to make histograms for these as well.

Answer the following questions on another sheet of paper. Show all calculations.

1. Describe the masses of the pennies in your set. Be as specific as you can.
2. Describe the masses of the pennies in the class set. Are there any differences between your set of data and the class set?

3. Can you suggest an explanation for the mass distribution that you see? What evidence can you provide to support your explanation?
4. Are there more pennies from more recent years or from prior years? Can you suggest an explanation for this? How would you test this idea?
5. Which year is represented by the most pennies? By the second most? By the third most?
6. What conclusion can you draw based on the evidence provided by your two histograms?
7. What additional measurements might you make to learn more? What tools might you need?

Extension

If other characteristics were recorded, you might construct histograms for these results. In some cases, you may get more insight by trying “scatter plots” or A- vs. B-type graphs. A graph of mass as a function of one of the other quantities you measured would be a scatter plot. What conclusion can you draw from your new plots? Did any of the new plots contribute to your conclusions? How?