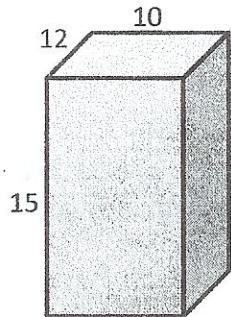


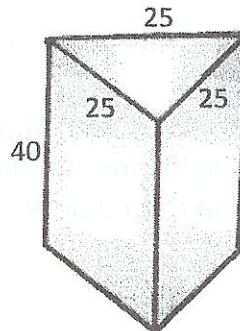
THE USPS BOX

Have you ever received a large box in the mail? The United States Postal Service (USPS) has certain restrictions on the dimensions of the packages it will ship. Specifically, no package may measure more than 108 inches in height and girth combined. The *height* is the measurement of the longest dimension of the box and the *girth* is the distance around the base.

1. Find the Height, Girth and combined Height plus Girth for each of the packages shown below. All measurements are inches. Will the USPS ship these boxes?

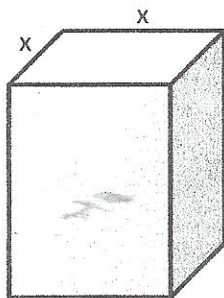


Height _____
 Girth _____
 Height plus Girth _____
 Will USPS ship it? _____



Height _____
 Girth _____
 Height plus Girth _____
 Will USPS ship it? _____

2. Your task today is to find the largest box (by volume) that the USPS will ship. You will only consider boxes that have a square base. For the box shown below, pick a possible value for x , the side length of the square. What is the Girth of your box? Explain how you know.



Pick a value for x _____
 Girth _____
 Explain: _____

3. Calculate the Height of your box so that the combined Height plus Girth is 108. Explain in words how you did your calculation. (Note: if you calculated a negative height, then you have picked an unallowable value for x . You need to redo #2).

Height _____
 Explain: _____

4. Calculate the volume of your box. Explain in words how you did your calculation.

Volume _____
 Explain: _____

5. Complete the chart below with the dimensions of your box and those of five other classmates. Each box must have different dimensions.

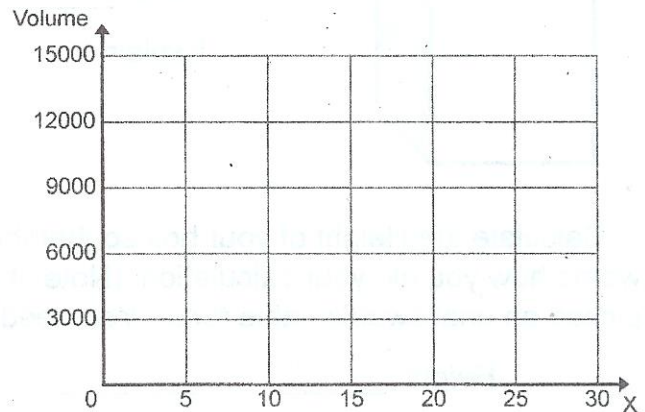
| Box | x | Girth | Height | Volume |
|--------|---|-------|--------|--------|
| Yours | | | | |
| Others | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

6. Use your calculator to make a scatterplot of the base length, x, and the Volume. Use STAT Edit and put the base lengths into L1 and the Volumes into L2. Adjust the WINDOW so that you can see all six of the data points. What did you use for the WINDOW settings?

7. Write formulas for the Girth, Height and Volume of the box in terms of x. Hint: You may want to look again at your explanations in #2, 3 & 4.

Girth = _____ Height = _____
 Volume = _____

8. Enter your Volume equation in Y= in your calculator. Does it go through all of your data points? If not check your equation. Draw a sketch of your graph using the window settings shown.



9. Change your window settings to Xmin = -10, Xmax = 40, Ymin = -5000, Ymax = 15000. Is your graph a parabola? Explain how you know in two different ways.

10. Use your calculator to determine the maximum Volume of the package. Label the coordinates of this point on your graph. What are the side lengths and height of the package?