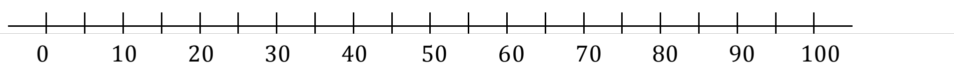
Learning Goal: For the distribution of a quantitative variable, describe the overall pattern (shape, center, and spread) and striking deviations from the pattern.

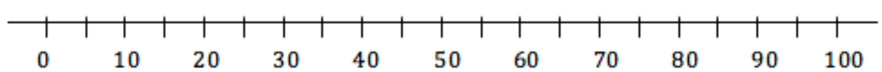
Specific Learning Objective: Discover why the mean is called a balancing point.

1) Betty Sue is struggling in her math class (she failed to apply herself at first, but her effort is steadily improving). To date, her quiz scores are 0, 43, 56, 66, 68, 74, 83, and 90 (each quiz is worth 100 points). What is her mean score? $\bar{x}$ = ___

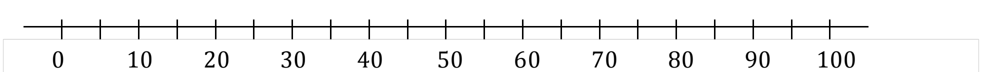
   a) Student A has the same mean score as Betty Sue, but his quiz scores are all the same score (unlike Betty Sue whose scores improved over time.) Make a dot plot of Student A's 8 quiz scores and mark the mean.



   b) Student B also has the same mean score as Betty Sue. She has 6 quizzes with a score of 60 and one quiz with a score of 70. What did she score on the 8th quiz? Make a dot plot of Student B's 8 quiz scores and mark the mean. (Jot down a few notes to remind yourself how you figured this out.)



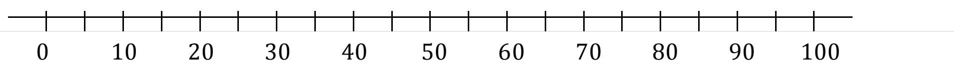
   c) Student C also has the same mean score as Betty Sue. She has 5 quizzes with a score of 60 and two quizzes with a score of 70. What did she score on the 8th quiz? Make a dot plot of Student C's 8 quiz scores and mark the mean. (Jot down a few notes to remind yourself how you figured this out.)

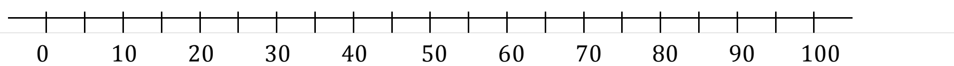


   d) Student D also has the same mean score as Betty Sue. Is it possible for Student D to have a 100 on a quiz? What is the maximum number of 100-point quiz scores possible? How do you know?

2) Draw two dotplots of 8 quiz scores such that:

- both have the same mean as Betty Sue's (indicate the mean with a triangle);
- one dot plot has very little spread;
- one dot plot has a lot of spread.





3) Write Betty Sue's mean quiz score below. For each of her quiz scores, record the signed distance from the mean by calculating *Score – Mean*. (Note: A score below the mean will have a negative distance. A score above the mean will have a positive distance.)

Betty Sue's Mean Quiz Score: $\bar{x} =$ ___________

Betty Sue's Quiz Score	0	43	56	66	68	74	83	90
Signed Distance from the Mean (quiz score minus the mean)								

Now add up the signed distances from the mean. What did you get? __________

4) For one of the distributions you created in (2), record the quiz scores in the table below. For each quiz score, record its signed distance from the mean by calculating *Score – Mean*. (As before, a score below the mean will have a negative distance. A score above the mean will have a positive distance.)

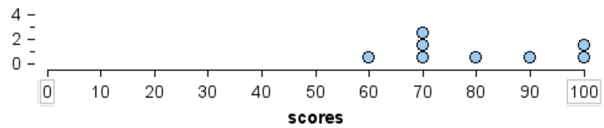
Mean Quiz Score: $\bar{x} =$ ___________ (Should be the same mean as Betty Sue's.)

Quiz Score								
Signed Distance from the Mean (quiz score minus the mean)								

Now add up the signed distances from the mean. What did you get? __________

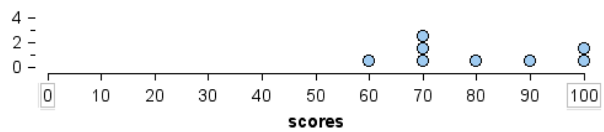
5) What do you notice when you add the signed distances from the mean? Why do you think this happens?

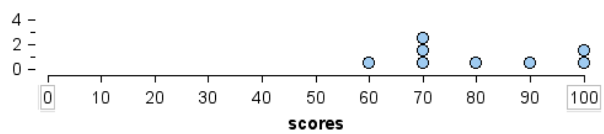
6) For the dotplot of quiz scores below, find the mean. If the student takes another quiz and it doesn't change his mean score, what did he score on this quiz? Explain why this makes sense using signed distances from the mean.

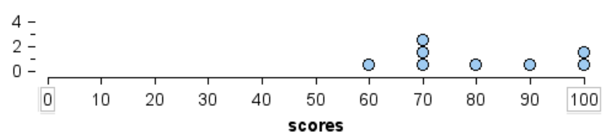


7) The student with the distribution of quiz scores below takes two more quizzes. One score is above his mean and the other is below his mean, but his mean does not change. What are some possible pairs of quiz scores for this student? Show three possibilities using the dotplots below.

How can signed distances from the mean be used to find possible pairs?







8) Why do you think that statisticians call the mean the "balancing point" of a distribution?