

## Extension – Normal Distribution

## Stats for Algebra

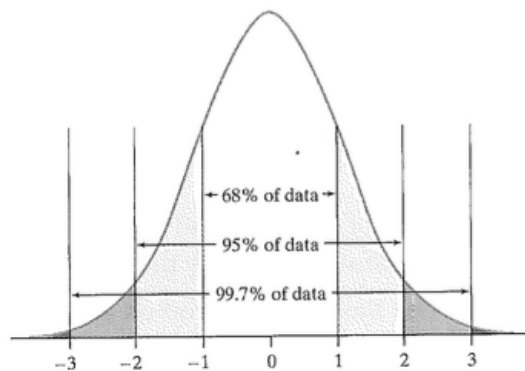
Goals: bell curve, center, and spread

Standards:

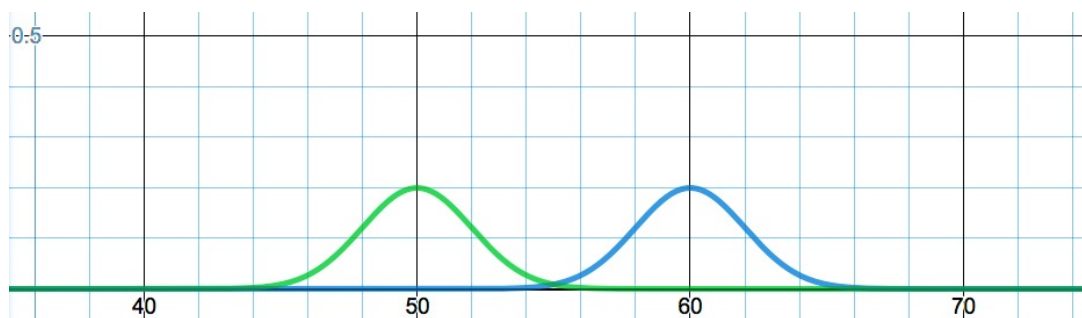
S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (IQR, standard deviation) of two or more different data sets.

S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Notes: The graph below is a bell curve. When data takes this form, it is said to be normally distributed. The peak of the graph is the mean. In the graph below, the mean is 0. The spread of the curve is described by the standard deviation (average distance the data values fall from the mean). The curve below has standard deviation of 1. The curvature changes at the first standard deviation.

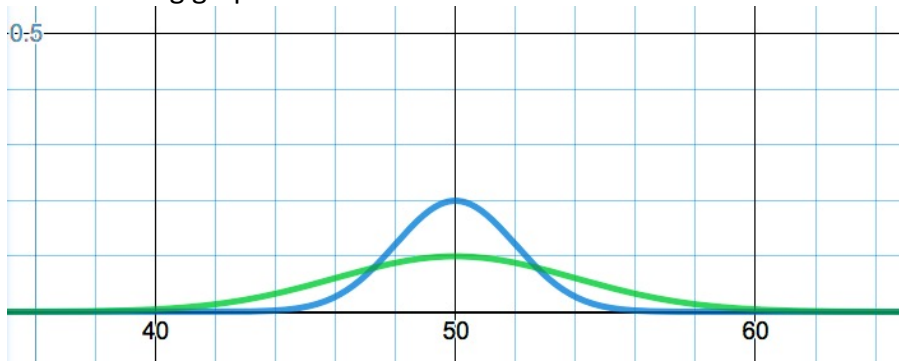


1 – The heights of elementary students is found to be normally distributed for each grade. The graphs of the 2<sup>nd</sup> grader students and 5<sup>th</sup> grade students is shown below. Unit: inches.



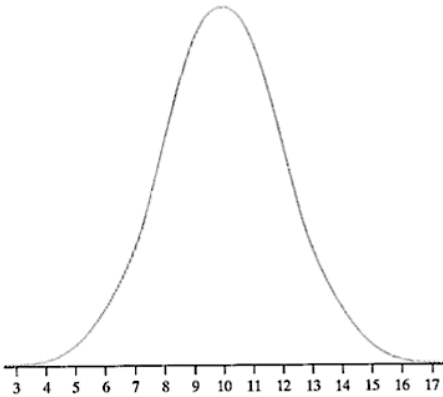
- Which graph represents each grade?
- What is the mean height for each grade?
- True or false: The median height for 5<sup>th</sup> graders is equal to the mean height of 5<sup>th</sup> graders.
- The claim is made that the distribution is more variable for 3<sup>rd</sup> graders than 5<sup>th</sup> graders. Based on the graph do you agree with this claim?
- True or false: half of the 3<sup>rd</sup> graders are shorter than 50 inches.
- True or false: all 5<sup>th</sup> graders are taller than all 3<sup>rd</sup> graders.

2 – Use the following graph to state if the claims below are true.

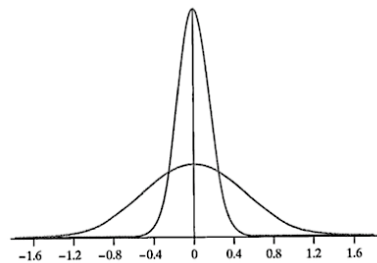


- Both graphs are symmetric
- The means of the graphs are the same
- The variation of the graphs are the same
- A value is selected from the data used to create the tall graph. This data point is equally likely to be greater than 50 as it is to be less than 50.

46. **A Normal curve** Estimate the mean and standard deviation of the Normal density curve in the figure below.



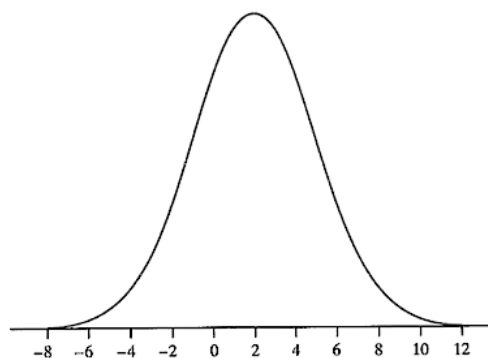
Estimate the mean and standard deviation for BOTH curves below:



69. Which of the following is *least* likely to have a nearly Normal distribution?

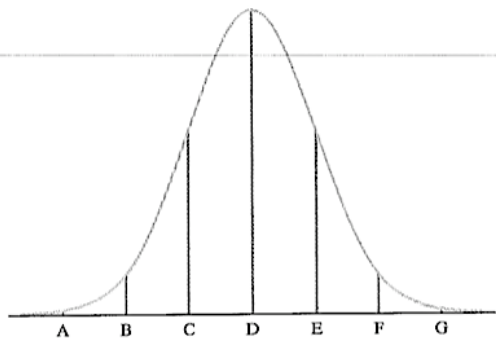
- (a) Heights of all female students taking STAT 001 at State Tech.
- (b) IQ scores of all students taking STAT 001 at State Tech.
- (c) SAT Math scores of all students taking STAT 001 at State Tech.
- (d) Family incomes of all students taking STAT 001 at State Tech.
- (e) All of (a)–(d) will be approximately Normal.

T2.2. For the Normal distribution shown, the standard deviation is closest to



- (a) 0
- (b) 1
- (c) 2
- (d) 3
- (e) 5

Exercises 70 to 72 refer to the following setting. The weights of laboratory cockroaches follow a Normal distribution with mean 80 grams and standard deviation 2 grams. The figure below is the Normal curve for this distribution of weights.



70. Point C on this Normal curve corresponds to

- (a) 84 grams.
- (b) 82 grams.
- (c) 78 grams.
- (d) 76 grams.
- (e) 74 grams.

71. About what percent of the cockroaches have weights between 76 and 84 grams?

- (a) 99.7%
- (b) 95%
- (c) 68%
- (d) 47.5%
- (e) 34%

72. About what percent of the cockroaches have weights less than 78 grams?

- (a) 34%
- (b) 32%
- (c) 16%
- (d) 2.5%
- (e) none of these