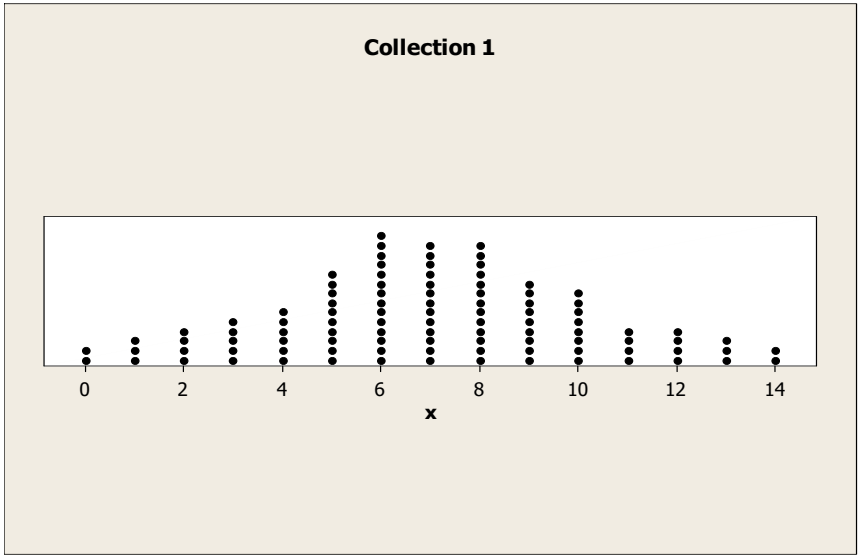
Honours Algebra II/Advanced Algebra
Unit 7: Inferences and Conclusions from Data
Empirical Rule Learning Task (Task 3)

STANDARDS ADDRESSED IN THIS TASK:
MGSE9-12.S.ID. 4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve.

For each of the dotplots below, use the Empirical Rule to estimate the mean and the standard deviation of each of the following distributions. Then, use your calculator to determine the mean and standard deviation of each of the distributions. Did the empirical rule give you a good estimate of the standard deviation?
For your convenience, there are 100 data points for each dotplot.



Estimated mean:_____Estimated standard deviation:_____

Actual mean:_____ Actual standard deviation:_____

Did the empirical rule help give you a good estimate of the standard deviation?

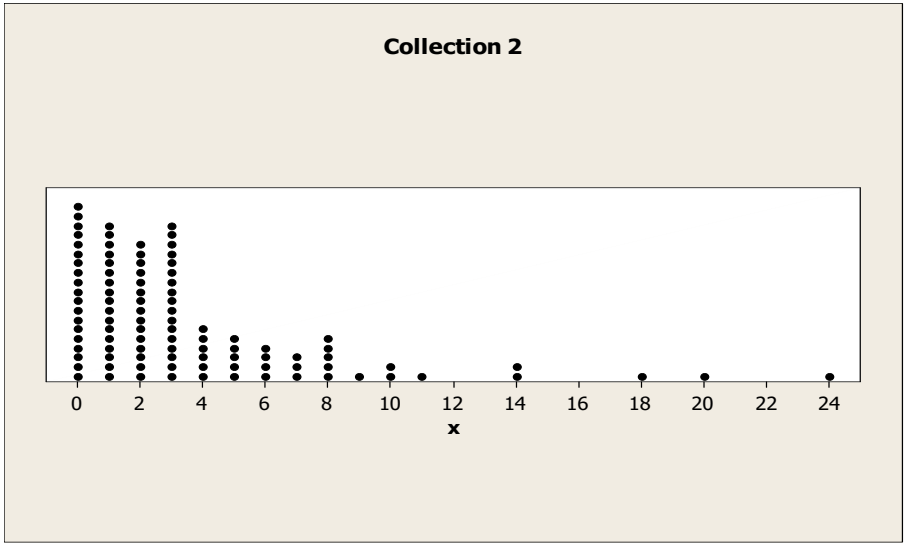
Now that you know what the actual mean and standard deviation, calculate one standard deviation below the mean and one standard deviation above the mean.

$\mu - \sigma =$ ___ $\mu + \sigma =$ ___

Name: _____Date: _____Period: _____

Locate these numbers on the dotplot above. How many dots are between these numbers?_____

Is this close to 68%?_____ Do you think that the empirical rule should apply to this distribution? _____



Estimated mean:_____Estimated standard deviation:_____

Actual mean:_____ Actual standard deviation:_____

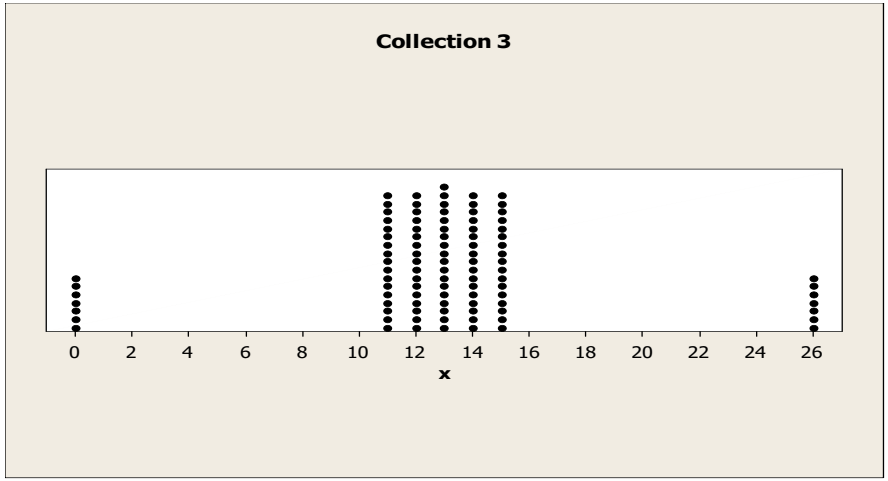
Did the empirical rule help give you a good estimate of the standard deviation?

Now that you know what the actual mean and standard deviation, calculate one standard deviation below the mean and one standard deviation above the mean.

$\mu - \sigma =$ ___ $\mu + \sigma =$ ___

Locate these numbers on the dotplot above. How many dots are between these numbers?_____

Is this close to 68%?_____ Do you think that the empirical rule should apply to this distribution?_____



Estimated mean:_____ Estimated standard deviation:_____

Actual mean:_____ Actual standard deviation:_____

Did the empirical rule help give you a good estimate of the standard deviation?
Now that you know what the actual mean and standard deviation, calculate one standard deviation below the mean and one standard deviation above the mean.

$\mu - \sigma =$ ___ $\mu + \sigma =$ ___

Locate these numbers on the dotplot above. How many dots are between these numbers?_____

Is this close to 68%?_____ Do you think that the empirical rule should apply to this distribution?_____

Estimated mean:_____ Estimated standard deviation:_____

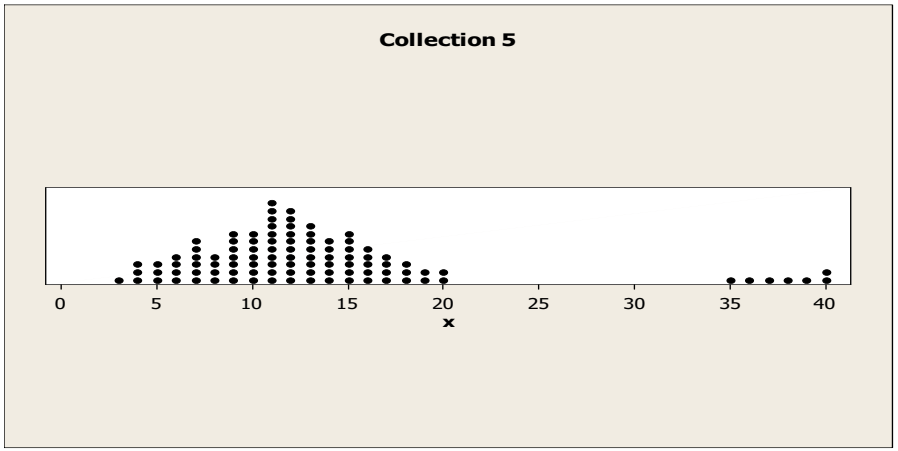
Actual mean:_____ Actual standard deviation:_____

Did the empirical rule help give you a good estimate of the standard deviation?

Now that you know what the actual mean and standard deviation, calculate one standard deviation below the mean and one standard deviation above the mean.

$\mu - \sigma =$ ___ $\mu + \sigma =$ ___

Locate these numbers on the dotplot above. How many dots are between these numbers?_____
Is this close to 68%?_____ Do you think that the empirical rule should apply to this distribution?_____



Estimated mean:_____ Estimated standard deviation:_____

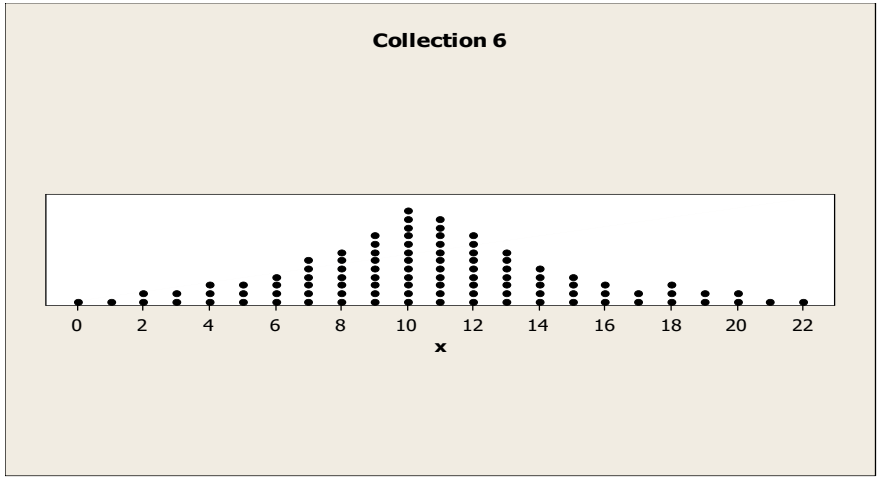
Actual mean:_____ Actual standard deviation:_____

Did the empirical rule help give you a good estimate of the standard deviation?

Now that you know what the actual mean and standard deviation, calculate one standard deviation below the mean and one standard deviation above the mean.

$\mu - \sigma =$ ___ $\mu + \sigma =$ ___

Locate these numbers on the dotplot above. How many dots are between these numbers?_____
Is this close to 68%?_____ Do you think that the empirical rule should apply to this distribution?_____



Estimated mean:_____ Estimated standard deviation:_____

Actual mean:_____ Actual standard deviation:_____

Did the empirical rule help give you a good estimate of the standard deviation?

Now that you know what the actual mean and standard deviation, calculate one standard deviation below the mean and one standard deviation above the mean.

$\mu - \sigma =$ ___ $\mu + \sigma =$ ___

Locate these numbers on the dotplot above. How many dots are between these numbers?_____

Is this close to 68%?_____ Do you think that the empirical rule should apply to this distribution?_____

Describe the distributions that gave you a good estimate of the standard deviation based on the empirical rule?

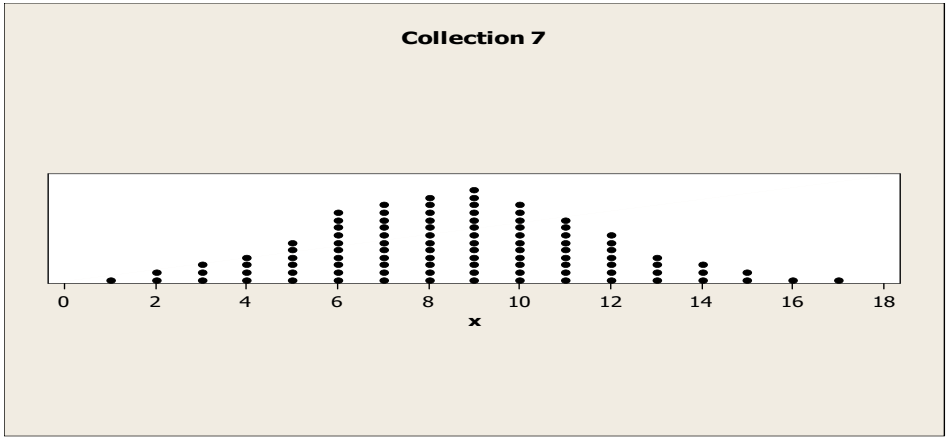
Describe the distributions that did not give you a good estimate of the standard deviation based on the empirical rule?

Which distributions had close to 68% of the data within one standard deviation of the mean? What do they have in common?

For which type of distributions do you think the Empirical rule applies?

As you discovered, the empirical rule does not work unless your data is bell-shaped. However, not all bell-shaped graphs are normal. The next two dotplots are bell-shaped graphs. You will apply the empirical rule to determine if the bell-shaped graph is normal or not.

Using the dotplot below, calculate the mean and the standard deviation of the distribution.



Mark the mean on your dotplot above.

Calculate one standard deviation above and below the mean.

$\mu_X - \sigma_X =$ ____ and $\mu_X + \sigma_X =$ _____. Mark these points on the x-axis of the dotplot. How many data points are between these values? _____

Calculate two standard deviations below and above the mean.

$\mu_X + 2\sigma_X =$_____ and $\mu_X - 2\sigma_X =$ _____. Mark these points on the x-axis of the dotplot. How many data points are between these values? _____

Calculate three standard deviations below and above the mean.

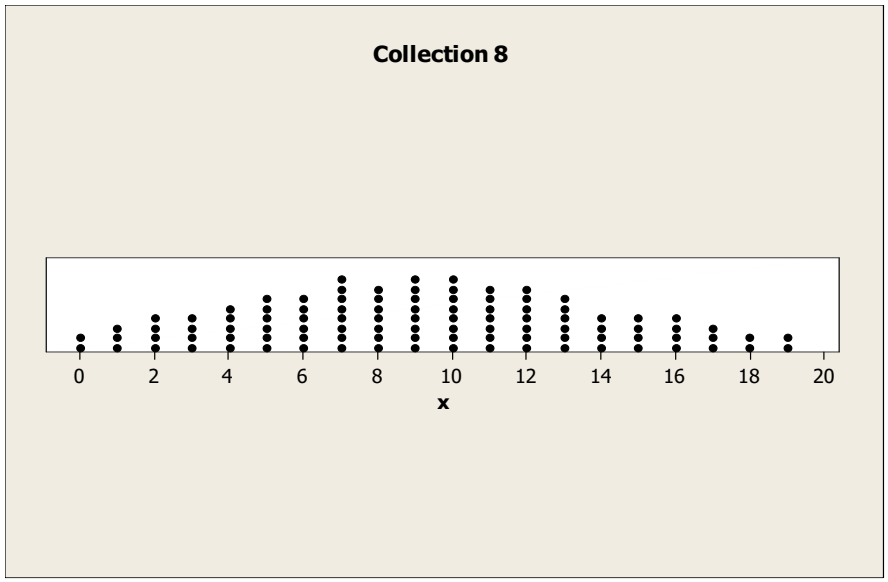
$\mu_X - 3\sigma_X =$ _____ and $\mu_X + 3\sigma_X =$ _____. Mark these points on the x-axis of the dotplot. How many data points are between these values? _____

Is it likely that this sample is from a normal population? Explain your thinking.

Outliers are values that are beyond two standard deviations from the mean in either direction.

Which values from the data would be considered to be outliers? _____

Using the dotplot below, calculate the mean and the standard deviation of the distribution.



Mark the mean on your dotplot above.
Calculate one standard deviation above and below the mean.

$\mu_X - \sigma_X$ = _____ and $\mu_X + \sigma_X$ = _____. Mark these points on the x-axis of the dotplot. How many data points are between these values? _____

Calculate two standard deviations below and above the mean.

$\mu_X + 2\sigma_X$ =_____ and $\mu_X - 2\sigma_X$ = _____. Mark these points on the x-axis of the dotplot. How many data points are between these values? _____

Calculate three standard deviations below and above the mean.

$\mu_X - 3\sigma_X$ = _____ and $\mu_X + 3\sigma_X$ = _____. Mark these points on the x-axis of the dotplot. How many data points are between these values? _____

Is it likely that this sample is from a normal population? Explain your thinking.

One definition of an outlier is a value that is beyond two standard deviations from the mean in either direction.

Which values from the data would be considered to be outliers?

_____

Based on your observations when is it appropriate to conclude that a data set is approximately normal?