Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

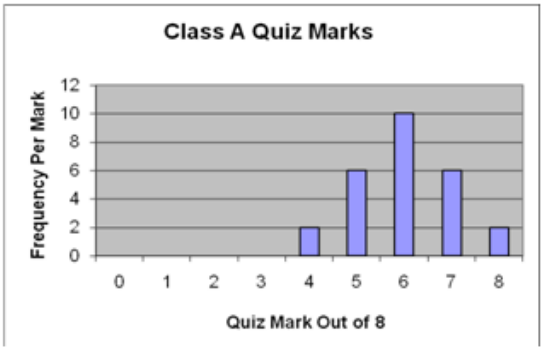
By the end of the class, I will be able to:

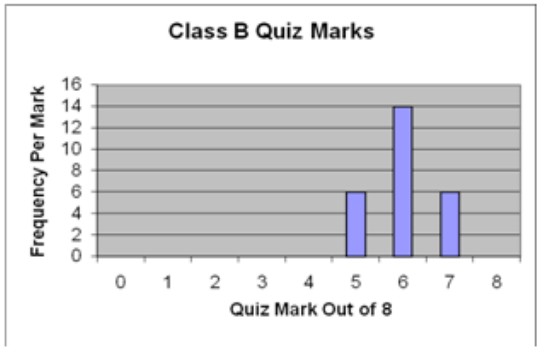
a) calculate the variance and the standard deviation for a set of data.

MBF 3CI Date: Oct. 19/16

3.5 Measures of Spread (Part1): Standard Deviation and Variance

How would you describe the similarities and differences between these two data sets:
Quiz marks for Class A versus Class B?





Similarities: class size = 26
mean = 6 median = 6 mode = 6

Differences: No marks of 4 or 8 in class B
Class A is more "*spread out*" than Class B,
because Class A has higher and lower marks.

Ranges are different

A measure of central tendency (or "average") indicates the central value of a set of data.
Often, you will also want to know how closely the data is clustered around the average.
In other words… **"How spread out is the data around the average?"**

or

"How much variation (or variety) is there in the data set?"

There are many ways to measures spread. They are discussed today and in the next class.

The **standard deviation** is the "typical distance" that a value in a data set is from the mean.
Follow these steps to calculate the standard deviation:

1. Calculate the mean
2. Find the difference between each value and the mean
3. Square each difference from Step 2
4. Add all of the squares from Step 3
5. Divide the sum from Step 4 by how many pieces of data there are; **(This is the data set's *variance*)**
6. Calculate the square root of the value from Step 5; **(This is the data set's standard deviation)**

EX. 1
Felix and Melanie laid patio stones for a landscaping company last summer.
During one day's work, the following data was collected by their manager:

Hour#	1	2	3	4	5	6
Felix	34	41	40	38	38	45
Melanie	51	28	36	44	41	46

a) Which worker is more productive? Justify.
b) Which worker is more consistent? Justify.

Follow these 6 steps to calculate the standard deviation:
1. Calculate the mean.
2. Find the difference between each value and the mean.
3. Square each difference from Step 2.
4. Add all of the squares from Step 3.
5. Divide the sum from Step 4 by how many pieces of data there are. (This gives you the *variance*.)
6. Calculate the square root of the value from Step 5. (This gives you the **standard deviation**.)

a) Melanie was more productive.
She laid 10 more patio stones that day.

Felix

1. Mean = $\frac{236}{6}$ $\doteq 39.3$

Data	2. (Data-Mean)	3. (Difference)^2
34	34-39.3 = -5.3	28.09
41	41-39.3 = 1.7	2.89
40	40-39.3 = 0.7	0.49
38	38-39.3 = -1.3	1.69
38	38-39.3 = -1.3	1.69
45	45-39.3 = 5.7	32.49
	4. Total:	67.34

5. Variance = $\frac{67.34}{6}$ $\doteq 11.22$

6. Standard Deviation $\doteq \sqrt{11.22}$ $\doteq 3.35$

Melanie

Mean = $\frac{246}{6}$ $= 41$

Data	2. (Data-Mean)	3. (Difference)^2
51	51-41 = 10	100
28	28-41 = -13	169
36	36-41 = -5	25
44	44-41 = 3	9
41	41-41 = 0	0
46	46-41 = 5	25
	4. Total:	328

5. Variance = $\frac{328}{6}$ $\doteq 54.66$

6. Standard Deviation $\doteq \sqrt{54.6}$ $\doteq 7.39$

Conclusion(s)
Felix is the more consistent worker.
His standard deviation is lower than Melanie's.

See extra examples on next slide.

Another way to measure spread is by calculating the data set's **variance.**
Once you calculate the standard deviation, square it; this is the variance!
Yet another way to calculate the spread in a data set is by the **range**.
(We did this last class. Do you remember?)

Today's entertainment: pp. 145-147 #2ab, 5ab, 6ab, 7d*(see below), 8
*7d. The answer in the back may be wrong. It should read variance = 9.8 pizzas and standard deviation = 3.1 pizzas

there is an In-class Assignment on this lesson.

Ex. If the variance is 49, calculate the standard deviation.

$$\text{std. dev.} = \sqrt{\text{variance}}$$
$$= \sqrt{49}$$
$$= 7$$

Ex. If the standard deviation is 6, calculate the variance.

$$\text{variance} = (\text{std. dev.})^2$$
$$= 6^2$$
$$= 36$$