Statistics –Day 5- NOTES
Frequency Tables, Histograms, and Percentiles

HISTOGRAMS: An effective way to learn how to organize data is by using a frequency table and a frequency histogram. We have used a frequency table in previous lessons but we have not constructed frequency histograms. A **frequency histogram** is a bar graph that helps you visualize the information presented in a frequency table.

1) The 2006 – 2007 Arlington High School Varsity Boys' basketball team had an excellent season, compiling a record of 15 – 5 (15 wins and 5 losses). The total points scored by the team for each of the 20 games are listed below in the order in which the games were played:

76, 55, 76, 64, 46, 91, 65, 46, 45, 53, 56, 53, 57, 67, 62, 64, 67, 52, 58, 62

(a) Complete the frequency table below.
(b) On the graph grid provided, create a histogram using the frequency table from (a).
(c) In what interval does the median of this data set lie?
(d) In what interval does the lower quartile of this data set lie?

Note: There should be no spaces between the bars on a frequency histogram because there are no gaps between intervals in the frequency table. LABEL the histogram.

| Points Scored	Tally	Frequency
40-49		
50-59		
60-69		
70-79		
80-89		
90-99		
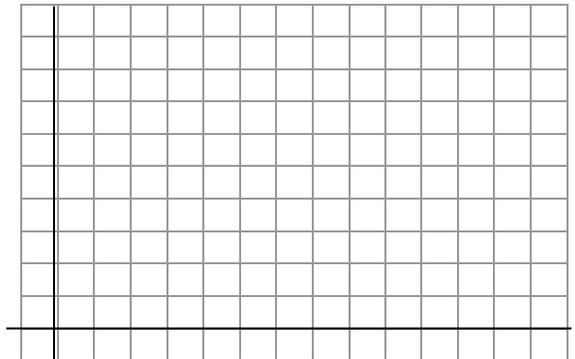
2) The following set of data represents the scores on a mathematics quiz:

58, 79, 81, 99, 68, 92, 76, 84, 53, 57, 81, 91, 77, 50, 65, 57, 51, 72, 84, 89

Quiz Score	Tally	Frequency
50-59		
60-69		
70-79		
80-89		
90-99		

(a) Complete the frequency table to the right.

(b) On the graph grid provided, create a histogram using the frequency table from part (a). Remember to label the histogram.

(c) In what interval does the median of this data set lie?

(d) In what interval does the lower quartile of this data set lie?
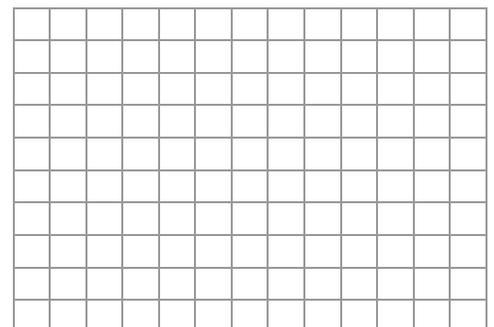
PERCENTLES

A **percentile** is a number that tells us the percent of values in a data set that **lies at or below** a given value. Percentiles are mostly used when working with large data sets (over 100 values) in order to give particular values a standardized ranking compared to others. (SAT, ACT, PSAT, STARS all provide percentile rankings).

Formula: Percentile Rank = $\dfrac{(B+0.5E)}{n} \cdot 100$ B = # of values below, E= # of values the same, n=total # of values

Always round up!

Example 1: The test scores were: 50, 65, 70, 72, 72, 78, 80, 82, 84, 84, 85, 86, 88, 88, 90, 94, 96, 98, 98, 99, 99. Find the percentile rank for a score of 84 on this test.

Percentile Rank = $\dfrac{(B+0.5E)}{n} \cdot 100$ B = 8, E = 2, n = 20 $\dfrac{(8+0.5(2))}{20} \cdot 100$ **84 is the 45th percentile.**

$0.45 \cdot 100 = 45$

The box-and-whisker plot graphically illustrates the 25th, 50th, and 75th percentiles of the data.

Find the percentile rank for each, using the formula above. Write a sentence explaining the meaning of the percentile.

The babies born in village in one year weighed:
5, 5, 6, 6, 7, 7, 7, 7, 8, 8, 8, 8, 9, 9, 9
Percentile Rank = $\dfrac{(B+0.5E)}{n} \cdot 100$
   B = # of values below,
   E= # of values the same,
   n = total # of values
	1. Find the percentile rank of a 6 pound baby.
	   B = ____
	
	   E = ____
	
	   n = ____
		2. Using the same data find the percentile rank for an 8 pound baby.

The math test scores were:
 	
50, 65, 70, 72, 72, 78, 80, 82, 84, 84, 85, 86, 88, 88, 90, 94, 96, 98, 98, 99
	3. Find the percentile rank for a score of 86.
	   B = ____
	
	   E = ____
	
	   n = ____
		4. Find the percentile rank for a score of 72.

Example 2: If Isabella said that her score on a test was in the 80th percentile, this means that her score was better than or equal to 80% of all the scores for that test. If there were 40 students who took this test, then how many students did Isabella do better than on the test?

Just find 80% of 40. $\dfrac{(\text{Percentile})(n)}{(0.80)(40)} = 32$ Isabella did the same or better than 32 other students.

5. Kali recently ran in a marathon of 350 runners (including herself). She finished in the 12th percentile. How many runners beat her time?	6. When the heights of 250 ninth-grade boys were measured, Jaden found that his height placed him at the 82nd percentile. This means Jaden is the same height or taller than 82% of boys his age. How many boys out of the 250 are at or below Jaden's height?

Statistics Day 5 HOMEWORK
Frequency Tables, Histograms, and Percentiles

1. Jim Shorts is a star basketball player for the Arlington High School basketball team. The number of points scored by Jim in each of his last 20 games are as follows:

35, 28, 25, 34, 41, 26, 19, 23, 32, 20, 11, 8, 38, 48, 22, 25, 16, 19, 22, 40

(a) Complete the table to find the number in each interval.

Interval	Tally	Frequency
0-9		
10-19		
20-29		
30-39		
40-49		

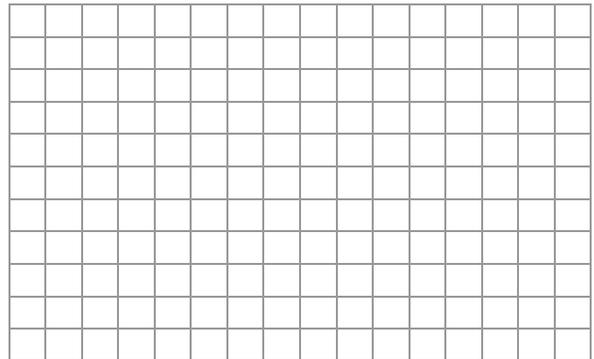(b) Which interval contains the greatest frequency?

(c) In what percent of these 20 games did Jim score 30 or more points?

(d) In what interval does the median of this data set lie?

(e) In what interval does the upper quartile of this data set lie?

(f) Construct a frequency histogram for points scored by Jim in these 20 games.

2. The height of the basketball players in inches were: 66, 67, 68, 68, 68, 70, 70, 70, 72, 74, 75, 81.

(a) Find the percentile rank for a height of 74 inches in this team.	(b) Find the percentile rank for a height of 68 inches for this team.

(c)
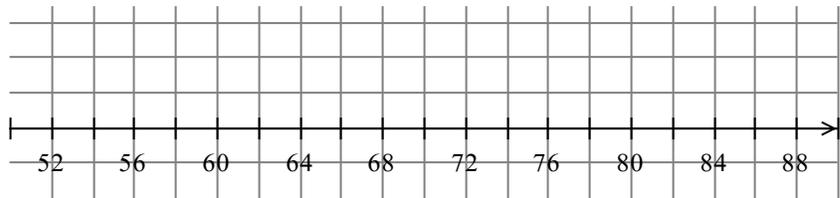**5-Number Summary:**

Min =

Q_1 =

Med =

Q_3 =

Max =

(d) What score represents the 75th percentile?

(e) What score represents the 25th percentile?

(f) Range: _____   IQR: ____

(g) The other team shows up to the game and says that it's totally unfair to play against someone who is 81 inches tall. They say that player must be an outlier for typical high school height. Using math, analyze that claim. Is that player indeed a mathematical outlier in terms of height for his team?

Fences: Q_1–1.5(IQR)
        Q_3+1.5(IQR)

3. A random survey of 100 cars found the following frequency distribution for the fuel efficiency of the car, as measured in miles per gallon.

Fuel Efficiency (miles per gallon)	Number of Cars
10 to 14	4
15 to 19	17
20 to 24	36
25 to 29	24
30 to 34	10
35 to 39	6
40 to 44	3

(a) Construct a frequency histogram for this data on the graph. Make sure all axes are properly labeled.

(b) In which interval would the first quartile value fall?

(c) In which interval would the median value fall?

(d) Why is it **not** possible to determine the mean value for this data set?
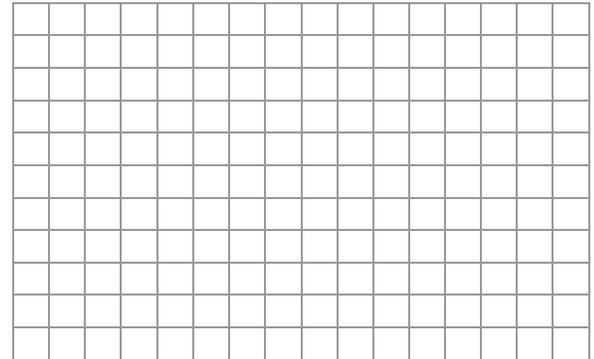
4. There are 30 students in the Algebra course. If Angela scored in the 60th percentile,

a. How many students scored as well or below Angela?

b. How many students scored as well or BETTER than Angela?

5. There were 19 horses in the 2013 Kentucky Derby and OverAnalyze (horses name) finished in 11th place. What was his percentile?

6. The math test scores were: 70, 72, 78, 84, 84, 85, 86, 88, 88, 90, 90, 90, 94, 96, 98, 99.

(a) Find the **percentile rank** for a score of 90 on this test.

(b) Find the **percentile rank** for a score of 94 on this test.

(c)

5-Number Summary:

Min =

Q_1 =

Med =

Q_3 =

Max =

(d) Range: _____   IQR: ____   Fences: _____ _____   Outlier: _____

64   68   72   76   80   84   88   92   96   10