

Part 1: Comparing Data

How many hours of sleep did you get last night (round to the nearest half hour)?

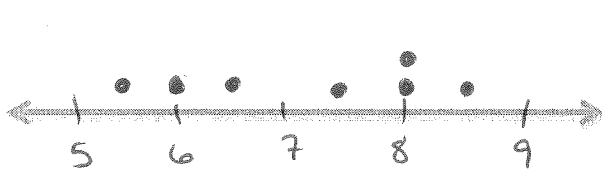
GIRLS			
8	8.5	8	6
7.5	6.5	5.5	

BOYS			
7	9	8	7
8	7	7	8

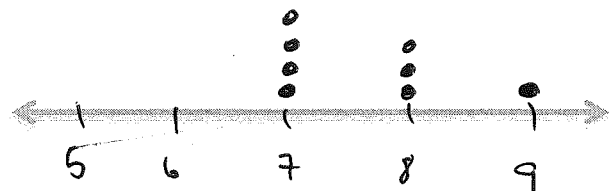
In what ways could we compare these groups of data? How?

- Compare averages & medians: WHERE IS THE MIDDLE?
- Compare the variety of values: HOW IS THE DATA SPREAD OUT FROM EACH OTHER?

Let's first look at the data in a dot plot, which is a diagram that uses a number line and x's to show frequency.



GIRLS



By looking at the data in these diagrams, are there any generalizations you can make?

- MOST OF GIRLS SLEPT 7-8 hrs
- NO ONE GOT 7
- DATA IS MORE SPREAD OUT

Are there any specific conclusions you can draw?

- MORE CONSISTENT
- MAJORITY SLEPT 7 hrs
- NO ONE SLEPT LESS THAN 7.

4 SLEPT 7 hours

What could we do with each group of data in order to truly compare it?

Calculate average and standard deviation.
 Summarize what the data says.

Part 2: Measures of Center

Data can be described and summarized using different

MEASURES OF CENTER

Commonly used measures of center:

Average

- **The mean** THE SUM OF THE DATA VALUES DIVIDED BY THE NUMBER OF VALUES IN THE DATA SET.
- **The median** THE MIDDLE VALUE OF THE DATA WHEN LISTED IN NUMERICAL ORDER.

DATA Boys	Steps	DATA GIRLS
<p>7 9 8 7 8 7 7 8</p> $\frac{61}{8} \approx 7.6$ <p>hours</p>	<p>Mean:</p> <ol style="list-style-type: none"> 1. FIND SUM. 2. DIVIDE THE SUM BY THE NUMBER OF VALUES 3. THE AVERAGE IS THE TYPICAL VALUE OF THE DATA SET. 	<p>8 + 8.5 + 8 + 6 + 7.5 + 6.5 + 5.5 = 50</p> $\frac{50}{7} \approx 7.1$ <p>hrs</p> <p>on average, the girls got 7.1 hours of sleep</p>
<p>7 7 7 7 8 8 8 9</p> <p>MEDIAN</p> $\frac{8+7}{2} = 7.5$	<p>Median: SET.</p> <ol style="list-style-type: none"> 1. REORDER DATA FROM LEAST TO GREATEST. 2. THE NUMBER THAT IS PHYSICALLY IN THE MIDDLE IS YOUR MEDIAN. 3. IF THERE IS NO NUMBER IN THE MIDDLE, ADD 2 MIDDLE NUMBERS & DIVIDE BY 2. 	<p>5.5 6 6.5 7.5 8 8 8.5</p> <p>← MEDIAN: 7.5</p>

Compare the measures of center between the amount of hours of sleep for girls and boys.

Part 3: Measures of Spread

Data can also be described and summarized using different MEASURES OF SPREAD,
WHICH SHOWS THE DIFFERENCE BETWEEN DATA VALUES. (how is it spread out?)

Standard Deviation: DESCRIBES ON AVERAGE HOW FAR EACH DATA IS FROM MEAN.

- Small standard deviation means data is closer together - its less spread from mean.
- a bigger standard deviation means data is more spread out from mean.

STANDARD DEVIATION: Girls			Steps
Mean:	7.1		
<u>Data Value, x</u>	<u>Deviation from mean (x-mean)</u>	<u>Square the deviation</u>	
5.5	$(5.5-7.1) = -1.6$	$(-1.6)^2 = 2.56$	1. HAVE DATA IN TABLE.
6	$(6-7.1) = -1.1$	$(-1.1)^2 = 1.21$	2. HAVE MEAN READY.
6.5	$(6.5-7.1) = -0.6$	$(-0.6)^2 = 0.36$	3. SUBTRACT: VALUE - MEAN
7.5	$(7.5-7.1) = 0.4$	$(0.4)^2 = 0.16$	4. SQUARE THESE DIFFERENCES
8	$(8-7.1) = 0.9$	$(0.9)^2 = 0.81$	5. FIND THE SUM OF THESE DIFFERENCES.
8	$(8-7.1) = 0.9$	$(0.9)^2 = 0.81$	
8.5	$(8.5-7.1) = 1.4$	$(1.4)^2 = 1.96$	
			6. DIVIDE BY # OF VALUES
			7. TAKE THE SQUARE ROOT
			This is the standard deviation, meaning the average difference between each girls' sleep and the average of the group is 1.06 hrs.
		Sum: 7.87	
		Divide: $\frac{7.87}{7} = 1.124$	
		Square Root: $\sqrt{1.124} \approx 1.06$	

More measures of spread...

While standard deviation uses the mean to describe how spread out a group of data is from the mean, the spread of data can be described by comparing it to the median.

GIRLS Range: MAX - MIN
 : 8.5 - 5.5
 → : 3

Subtract

how different the max & min are

- RANGE: DIFFERENCE BETWEEN THE MAXIMUM & MINIMUM VALUES.

- INTERQUARTILE RANGE:

INTERQUARTILE RANGE: Girls	Steps
<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 10px;"> 5.5 </div> <div style="margin-bottom: 10px;"> 6 ← LOWER MEDIAN: QUARTILE 1: Q₁ </div> <div style="margin-bottom: 10px;"> 6.5 </div> <div style="margin-bottom: 10px;"> 7.5 ← MEDIAN </div> <div style="margin-bottom: 10px;"> 8 </div> <div style="margin-bottom: 10px;"> 8 ← UPPER MEDIAN: QUARTILE 3: Q₃ </div> <div style="margin-bottom: 10px;"> 8.5 </div> <div style="margin-top: 20px; text-align: center;"> <p style="font-size: 1.5em;">IQR = Q₃ - Q₁</p> <p style="font-size: 1.5em;">= 8 - 6</p> <p style="font-size: 1.5em;">IQR = 2</p> </div> </div>	<ol style="list-style-type: none"> 1. PUT DATA IN ORDER. 2. IDENTIFY MEDIAN. THE MEDIAN SPLITS THE DATA INTO A LOWER & UPPER GROUP 3. FIND THE LOWER MEDIAN: QUARTILE 1 (Q₁) 4. FIND THE UPPER MEDIAN: QUARTILE 3 (Q₃) 5. SUBTRACT THE QUARTILES: Q₃ - Q₁ = INTERQUARTILE RANGE = IQR

Lower group

Upper group

Why is the IQR less than the range?

Where is quartile 2 (Q2)?

Boys Example: On your own...

Mean: 7.6

Find the standard deviation:

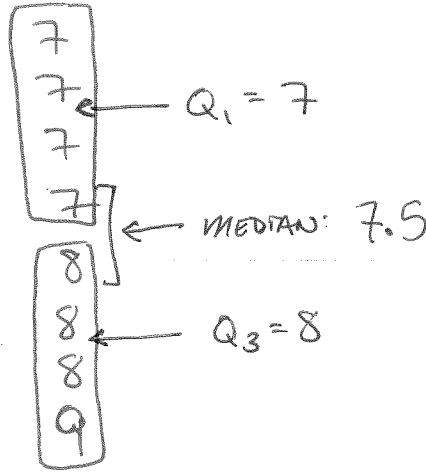
Data Value, x	Deviation from mean ($x - \text{mean}$)	Square the deviation
7	$(7 - 7.6) = -0.6$	$(-0.6)^2 = 0.36$
7	$(7 - 7.6) = -0.6$	$= 0.36$
7	$(7 - 7.6) = -0.6$	$= 0.36$
7	$(7 - 7.6) = -0.6$	$= 0.36$
8	$(8 - 7.6) = 0.4$	$(0.4)^2 = 0.16$
8	$(8 - 7.6) = 0.4$	$= 0.16$
8	$(8 - 7.6) = 0.4$	$= 0.16$
9	$(9 - 7.6) = 1.4$	$(1.4)^2 = 1.96$
		Sum: 3.88
		Divide: $\frac{3.88}{8} = 0.485$
		Square Root: $\sqrt{0.485} \approx 0.70$

Standard Deviation: 0.70

← AVERAGE DIFFERENCE EACH VALUE (BOYS' SLEEP) IS FROM MEAN.

Find the Range: $9 - 7 = 2$

Find the Inter-Quartile Range: $8 - 7 = 1$



	IQR	Range
Girls		
Boys		

Compare the measures of variation between the amount of hours of sleep that girls and boys get.

