

Lesson 12: Transformations on data

Daily Data Collection

Measure your height on the floor and on a chair (inches and cm)

Class Data – Heights

Create a spreadsheet that finds the following statistics for everyone's height in inches.

CENTER: Mean: Median:
SPREAD: St. Dev: IQR: Range:
SHAPE: Histogram:

If everyone repeats this process by measuring heights while standing on a chair, then all heights will increase by 18 inches. Use the spreadsheet to model this change to the data values and find the the statistics again.

CENTER: Mean: Median:
SPREAD: St. Dev: IQR: Range:
SHAPE: Histogram:

How did adding the same number to all data values affect the following?

CENTER:

SPREAD:

SHAPE:

If everyone repeats this process by measuring heights in centimeters, then all heights will be multiplied by 2.54. Use the spreadsheet to model this change to the data values and find the the statistics again.

CENTER: Mean: Median:
SPREAD: St. Dev: IQR: Range:
SHAPE: Histogram:

How did multiplying the same number to all data values affect the following?

CENTER:
SPREAD:
SHAPE:

Use the spreadsheet to find the z-value for everyone and find the the statistics again.

CENTER: Mean: Median:
SPREAD: St. Dev: IQR: Range:
SHAPE: Histogram:

How did adding and multiplying the same numbers to all data values affect the following?

CENTER:
SPREAD:
SHAPE:

Operations on statistics:

	Addition of constant a	Subtraction of constant a	Multiplication of constant a	Division of constant a
Mean	Increase by a	Decrease by a	Multiply by a	Divides by a
Median	Increase by a	Decrease by a	Multiply by a	Divides by a
Standard Deviation	No change	No change	Multiply by $ a $	Divides by $ a $
Quartiles	Increase by a	Decrease by a	Multiply by a	Divides by a
IQR	No change	No change	Multiply by $ a $	Divides by $ a $
Min and Max	Increase by a	Decrease by a	Multiply by a	Divides by a
Range	No change	No change	Multiply by $ a $	Divides by $ a $
Percentiles	Increase by a	Decrease by a	Multiply by a	Divides by a

The following example shows what happens to a statistic when 2 is added, subtracted, multiplied, or divided by all data values.

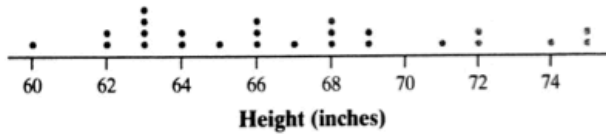
	Starting Value	Add 2	Subtract 2	Multiply by 2	Divide by 2
Mean	5	7	3	10	2.5
Median	4	6	2	8	2
Standard Dev.	2	2	2	4	1
Quartiles	3 and 6	5 and 8	5 and 8	6 and 12	1.5 and 3
IQR	3	3	3	6	1.5
Min and Max	1 and 11	3 and 13	-1 and 9	2 and 22	.5 and 5.5
Range	10	10	10	20	5
Percentiles	3.5 is 40%	5.5 is 40%	1.5 is 40%	7 is 40%	1.75 is 40%

Guided Practice:



CHECK YOUR UNDERSTANDING

The figure below shows a dotplot of the height distribution for Mrs. Navard's class, along with summary statistics from computer output.



Variable	n	\bar{x}	s_x	Min	Q_1	M	Q_3	Max
Height	25	67	4.29	60	63	66	69	75

1. Suppose that you convert the class's heights from inches to centimeters (1 inch = 2.54 cm). Describe the effect this will have on the shape, center, and spread of the distribution.

2. If Mrs. Navard had the entire class stand on a 6-inch-high platform and then had the students measure the distance from

the top of their heads to the ground, how would the shape, center, and spread of this distribution compare with the original height distribution?

3. Now suppose that you convert the class's heights to z-scores. What would be the shape, center, and spread of this distribution? Explain.