3.3 Percentiles and Box Whisker Plots with work

Oct 8-2:34 PM

3.3 Percentiles and Box-and-Whisker Plots

Essential Question:

What does it mean when standardized tests or doctors tell me I am in a certain percentile?

How do I read a box-&-whisker plot?

Focus Points:

- Interpret the meaning of percentile scores.
- Compute the median, quartiles, and five-number summary from raw data.
- Make a box-and-whisker plot. Interpret the results.
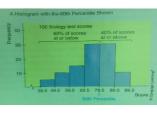- Describe how a box-and-whisker plot indicates spread of data about the median.

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Ms. Landon tells her classes the median of the test from yesterday was an 81. What does that tell us?

50% of the students were above and below. In fact, the 50th percentile.

For whole numbers P (where $1 \leq P \leq 99$), the Pth percentile of a distribution is a value such that P % of the data fall at or below it. and $(100 - P)$% of the data fall at or above it.

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What was the median score for this Biology test?

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Quartiles

Quartiles divide percentiles into fourths.

- Q_1 = 25th percentile or the *first quartile*
- Q_2 = 50th percentile or the *second quartile* *"median"*
- Q_3 = 75th percentile or the *third quartile*

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HOW TO COMPUTE QUARTILES

1. Order the data from smallest to largest.
2. Find the median. This is the 2nd quartile.
3. The first quartile is then the median of the lower half of the data BELOW not including.
4. The third quartile is the median of the upper half of the data. Not including the median.

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3.3 Percentiles and Box Whisker Plots with work

The **median** is used as the <mark>center</mark> for data on a box and whisker plot.

To measure <mark>spread</mark> on a box-and-whisker plots we use the *interquartile range (IQR)*.

$$IQR = Q_3 - Q_1$$

not standard deviation when using the $\bar{x}$ as the center

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Example 1: Ice Cream

In a hurry? On the run? Hungry as well? How about an ice cream bar as a snack? Ice cream bars are popular among all age groups. *Consumer Reports* did a study of ice cream bars. Twenty-seven bars with taste ratings of at least "fair" were listed, and cost per bar was included in the report. Just how much does an ice cream bar cost in American dollars?

1.29	1.37	1.30	0.80	0.67	1.33	1.37	1.37	1.27	0.93	0.63	0.80
0.27	1.38	0.77	1.14	1.53	0.55	0.80	0.70	0.36	0.65	0.47	0.68
0.50	0.48	0.46									

1. Find the quartiles.

$Q_1 = .55$
$Q_2 = .8$
$Q_3 = 1.3$

```
1-Var Stats
n=27
minX=.27
Q1=.55
Med=.8
Q3=1.3
maxX=1.53
```

2. Find the IQR.

$$IQR = Q_3 - Q_1 = 1.3 - .55 = \boxed{.75}$$

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Box-and-Whisker Plots

These plots are made up of the five-number summary:

1. lowest data value
2. Q_1
3. Q_2 Median
4. Q_3
5. highest data value

Title

min Q_1 Q_2 Q_3 max

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HOW TO MAKE A BOX-AND-WHISKER PLOT

1. Draw a vertical or horizontal scale to include the lowest and highest data values.
2. Your "box" covers your Q_1 to Q_3.
3. Include a solid line through the box at the Q_2/median value.
4. Draw vertical/horizontal lines called whiskers, from Q_1 to the lowest value and from Q_3 to the highest value.

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Example 2: Vanilla-Flavored Ice Cream

Many people consider the number of calories in an ice cream bar as important as the cost. The *Consumer Reports* article also included the calorie count of the rated ice cream bars. There were 22 vanilla flavored bars rated. Again, the bars varied in size.

| 342 | 377 | 319 | 353 | 295 | 234 | 294 | 286 | 377 | 182 | 310 | 439 |
| 111 | 201 | 182 | 197 | 209 | 147 | 190 | 151 | 131 | 151 | | |

Make a box-and-whisker plot.

```
1-Var Stats
n=22
minX=111
Q1=182
Med=221.5
Q3=319
maxX=439
```

Calorie Count for Vanilla Flavored Ice

min Q_1 Q_2 max

111   182   221.5   319   439

Calorie Count

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Modified box-and-whisker plot shows outliers/ influential observations.

```
Plot1 Plot2 Plot3
On Off
Type: 
Xlist:L1
Freq:1
Mark: □ + ·
```

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Using your calculator

5 # Summary:

STAT
EDIT
STAT
CALC
1
Scroll down to the bottom

ZOOM CALC TESTS
1:Edit
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor

EDIT CALC TESTS
1:1-Var Stats
2:2-Var Stats
3:Med-Med
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7↓QuartReg

1-Var Stats
n̄=7
minX=-3
Q₁=2
Med=0
Q₃=2
maxX=3

Box-&-Whisker Plot:

2nd y=

Plot1 Off
2:Plot2…Off
3:Plot3…Off
4↓PlotsOff

ZOOM MEMORY
3↑Zoom Out
4:ZDecimal
5:ZSquare
6:ZStandard
7:ZTrig
8:ZInteger
9↓ZoomStat

B-&-W

Plot1 Plot2 Plot3
On Off
Type:
Xlist:L₁
Freq:1

Modified

Plot1 Plot2 Plot3
On Off
Type:
Xlist:L₁
Freq:1
Mark: □ + ·

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Example 3: Vanilla-Flavored Ice Cream

Many people consider the number of calories in an ice cream bar as important as the cost. The *Consumer Reports* article also included the calorie count of the rated ice cream bars. There were 22 vanilla flavored bars rated. Again, the bars varied in size.

342	377	319	353	295	234	294	286	377	182	310	439
111	201	182	197	209	147	190	151	131	151		

Determine your five number summary and graph the box-and-whisker all on the calculator to verify the answer to example 2.

Vanilla Flavored Ice Cream
Calorie Count

111   221.5   319   439

Calorie Count

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HW: pg. 127: 1 - 11 (odd)

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Day Two 3.3

Glance over these notes quick and take the 10 question quiz at the bottom. Screen shot both final scores and e-mail it to me at noblem@lancastersd.k12.wi.us

THIS IS A GRADE!

Ctrl + Ctrl + Window Switcher

Ctrl + Shift + Ctrl + Shift + Window Switcher

https://www.mathsisfun.com/data/percentiles.html → https://tinyurl.com/h4hhjx9

https://www.mathsisfun.com/data/quartiles.html → https://tinyurl.com/onsgq36

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