

Reflect and Turn in!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: <u>4/09</u> Topic: <u>10A: Types of data</u>	0 1 2	
Tuesday Date: <u>4/10</u> Topic: <u>Pre- assessment</u>	0 1 2	
Wednesday Date: <u>4/11</u> Topic: <u>10B: Discrete data, stem plots</u>	0 1 2	
Thursday Date: <u>4/12</u> Topic: <u>10C: Continuous Data, Hisograms</u>	0 1 2	
Friday Date: <u>4/13</u> Topic: <u>10D: Measures of Center</u>	0 1 2	

Warm-up: Two groups of students were asked how many cousins they have.

State the similarities and differences of the two data sets.



^{front} 1, 4, 5, 5, 6, 7, 8, 9, 9 and ^{back} 4, 4, 5, 6, 6, 7, 7, 8

Mean = 6
Min = 1
Median = 6
Max = 9
Mode = 5, 9

$$\Sigma = 54$$

Mean = 6
Min = 4
Median = 6
Max = 8
Mode = 7

$$\Sigma = 54$$

Warm-up: Two groups of students were asked how many cousins they have.

State the similarities and differences of the two data sets.

1, 4, 5, 5, 6, 7, 8, 9, 9 and 4, 4, 5, 6, 6, 7, 7, 7, 8

$$\bar{x} = \frac{(1+4+5+5+6+7+8+9+9)}{9} = \frac{54}{9} = 6 \quad \bar{x} = \frac{54}{9} = 6$$

Median = 6

Median = 6

Mode = 5, 9

Mode = 7



The mean and median the same.
The mode \neq

Class Plan

1. Warm-up ✓

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MEASURING THE SPREAD OF A DATA SET

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BOX-AND-WHISKER PLOTS

② Youth Frontiers - Thursday!

3. Practice

F**MEASURING THE SPREAD OF A DATA SET**

1) The Range - Difference between the maximum (largest data value) and minimum (smallest data value).

$$\text{range} = \text{maximum} - \text{minimum}$$

$$\text{Range} = \text{Hi} - \text{Low}$$

Textbook...

THE RANGE

The **range** is the difference between the **maximum** or largest data value, and the **minimum** or smallest data value.

$$\text{range} = \text{maximum data value} - \text{minimum data value}$$

F**MEASURING THE SPREAD OF A DATA SET**

2) The Interquartile Range - The range of the middle half (50%) of the data.

$$\text{IQR} = Q_3 - Q_1$$

Minimum

Lower Quartile (Q_1) - middle value of the lower half. 25% of data is less than or equal to Q_1 .

Median = middle

Upper Quartile (Q_3) - middle value of the upper half. 25% of data is greater than or equal to Q_3 .

Maximum

Textbook...

THE INTERQUARTILE RANGE

We have already seen how the median divides an ordered data set into two halves. These halves are divided in half again by the **quartiles**.

The middle value of the *lower* half is called the **lower quartile** or Q_1 . One quarter or 25% of the data have values less than or equal to the lower quartile. 75% of the data have values greater than or equal to the lower quartile.

The middle value of the *upper* half is called the **upper quartile** or Q_3 . One quarter or 25% of the data have values greater than or equal to the upper quartile. 75% of the data have values less than or equal to the upper quartile.

The data set is thus divided into quarters by the lower quartile Q_1 , the median Q_2 , and the upper quartile Q_3 .








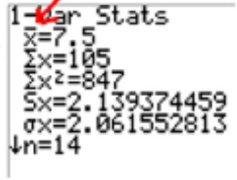
The **interquartile range** is the range of the middle half of the data.

$$\text{interquartile range} = \text{upper quartile} - \text{lower quartile}$$

$$\text{or } \text{IQR} = Q_3 - Q_1$$

Technology: TI - 83/84

Finding mean, 5 # Summary

1. 
2. 
3. 
4. #, enter
(repeat)
5. 
6. 
7. 
8. 
9. 

10. Scroll down for 5# summary

et 7, 3, 4, 2, 5, 6, 7, 5, 5, 9, 3, 8, 3, 5, 6, find the:
 $n = 15$ pieces of data
b lower and upper quartiles c inter

$\textcircled{2}, \textcircled{3}, \textcircled{3}, \textcircled{4}, \textcircled{5}, \textcircled{5}, \textcircled{5}, \textcircled{6}, \textcircled{6}, \textcircled{7}, \textcircled{7}, \textcircled{8}, \textcircled{9}$
min = 2 $Q_1 = 3$ med = 5 $Q_3 = 7$ Max = 9

5# Summare

Example 12**Self Tutor**

For the data set 7, 3, 4, 2, 5, 6, 7, 5, 5, 9, 3, 8, 3, 5, 6, find the:

- a** median **b** lower and upper quartiles **c** interquartile range.

The ordered data set is: ~~2 3 3 3 4 5 5 5~~ 5 ~~5 6 6 7 7 8 9~~ {15 data values}

- a** Since $n = 15$, $\frac{n+1}{2} = 8$ \therefore the median is the 8th score, which is 5.
b As the median is a data value, we now ignore it and split the remaining data into two halves:

lower	upper	
2 3 3 3 4 5 5 5	5 6 6 7 7 8 9	$Q_1 = \text{median of lower half} = 3$
Q_1	Q_3	$Q_3 = \text{median of upper half} = 7$

- c** $IQR = Q_3 - Q_1 = 7 - 3 = 4$

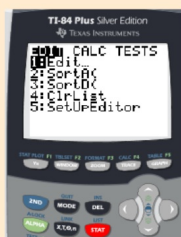
TI-84 Calculator

Example 12

Self Tutor

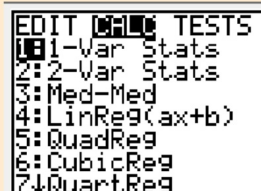
For the data set 7, 3, 4, 2, 5, 6, 7, 5, 5, 9, 3, 8, 3, 5, 6, find the:

- a median b lower and upper quartiles c interquartile range.



L1	L2	L3	1
7			
3			
4			
2			
5			
6			
7			
5			
5			
9			
3			
8			
3			
5			
6			

L1(15) = 6			



1-Var Stats L1

note: L₁ may need to be changed if your data is in a different list.

```
1-Var Stats
x̄=5.2
Σx=78
Σx²=462
Sx=2.007130147
σx=1.939071943
n=15
```

```
1-Var Stats
n=15
minX=2
Q1=3
Med=5
Q3=7
maxX=9
```

Example 13**Self Tutor**

For the data set 6, 10, 7, 8, 13, 7, 10, 8, 1, 7, 5, 4, 9, 4, 2, 5, 9, 6, 3, 2, find the:

- a** median **b** lower and upper quartiles **c** interquartile range.

Example 13**Self Tutor**

For the data set 6, 10, 7, 8, 13, 7, 10, 8, 1, 7, 5, 4, 9, 4, 2, 5, 9, 6, 3, 2, find the:

- a** median **b** lower and upper quartiles **c** interquartile range.

The ordered data set is:

1 2 2 3 4 4 5 5 6 6 7 7 7 8 8 9 9 10 10 13 {20 data values}

a Since $n = 20$, $\frac{n+1}{2} = \frac{21}{2} = 10.5$

\therefore the median = $\frac{10\text{th value} + 11\text{th value}}{2} = \frac{6+7}{2} = 6.5$

- b** As the median is not a data value, we split the data into two halves:

lower	upper
$\underbrace{1\ 2\ 2\ 3\ \mathbf{4\ 4}\ 5\ 5\ 6\ 6}$ $Q_1=4$	$\underbrace{7\ 7\ 7\ 8\ \mathbf{8\ 9}\ 9\ 10\ 10\ 13}$ $Q_3=8.5$

$Q_1 =$ median of lower half = 4

$Q_3 =$ median of upper half = 8.5

c $IQR = Q_3 - Q_1$
 $= 8.5 - 4$
 $= 4.5$

Some computer packages (for example, MS Excel) calculate quartiles in a different way from this example.



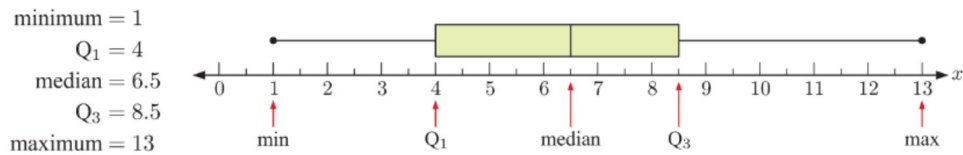
G

BOX-AND-WHISKER PLOTS

A **box-and-whisker plot** is a visual display of some of the descriptive statistics of a data set. It shows:

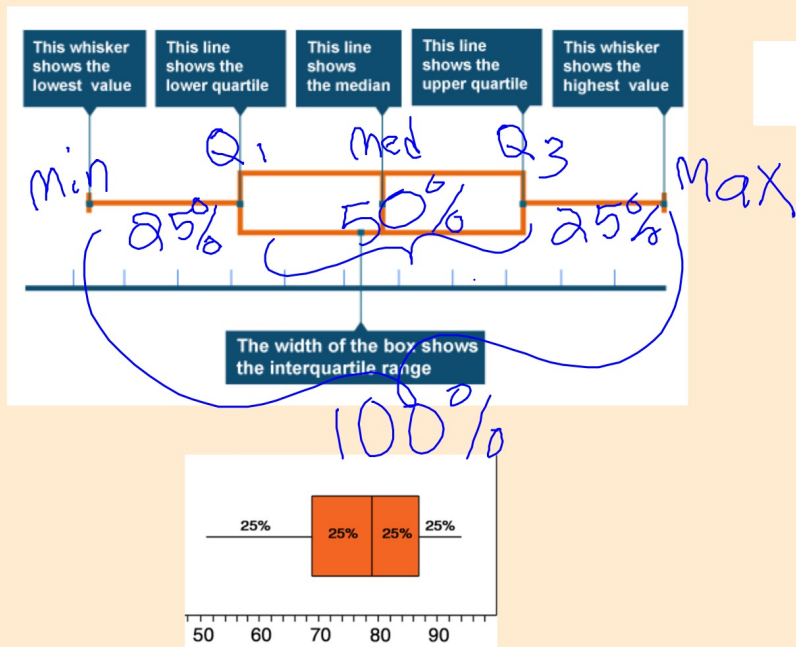
- the minimum value (min)
 - the lower quartile (Q_1)
 - the median (Q_2)
 - the upper quartile (Q_3)
 - the maximum value (max)
- These five numbers form the **five-number summary** of a data set.

For **Example 13**, the five-number summary and corresponding box-and-whisker plot are:



- Notice that:
- the rectangular box represents the 'middle' half of the data set
 - the lower whisker represents the 25% of the data with smallest values
 - the upper whisker represents the 25% of the data with greatest values.

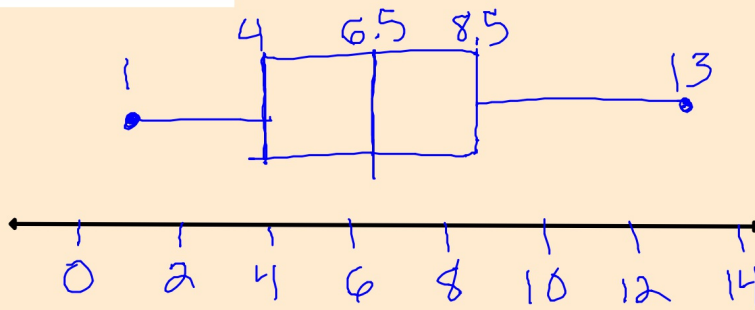
How does the box & whisker plot divide the data?



Example 13: Box and Whisker Plot

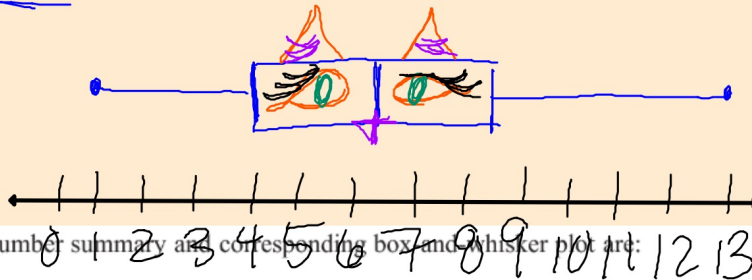
minimum = 1
 $Q_1 = 4$
median = 6.5
 $Q_3 = 8.5$
maximum = 13

$\{1, 4, 6.5, 8.5, 13\}$



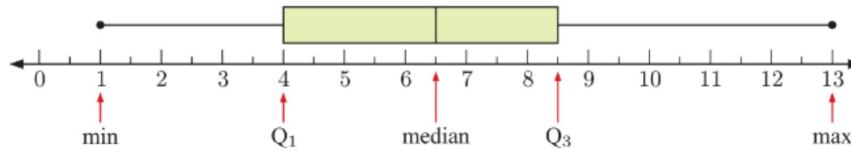
Example 13: Box and Whisker Plot

minimum = 1
 $Q_1 = 4$
 median = 6.5
 $Q_3 = 8.5$
 maximum = 13



For **Example 13**, the five-number summary and corresponding box and whisker plot are:

minimum = 1
 $Q_1 = 4$
 median = 6.5
 $Q_3 = 8.5$
 maximum = 13



Notice that:

- the rectangular box represents the 'middle' half of the data set
- the lower whisker represents the 25% of the data with smallest values
- the upper whisker represents the 25% of the data with greatest values.

Example 14

Consider the data set: 5 6 7 6 2 8 9 8 4 6 7 4 5 4 3 6 6

- a Construct the five-number summary for the data.
- b Draw a box-and-whisker plot to display the data.
- c Find the: **i** range **ii** interquartile range of the data.

a The ordered data set is:

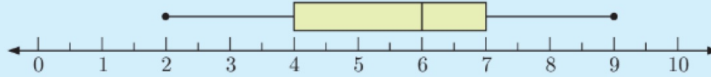
2 3 4 4 4 5 5 6 6 6 6 6 7 7 8 8 9 {17 data values}

\downarrow \downarrow \downarrow
 $Q_1 = 4$ median = 6 $Q_3 = 7$

So, the 5-number summary is:

min = 2	$Q_1 = 4$
median = 6	$Q_3 = 7$
max = 9	

b



- c **i** range = max - min = 9 - 2 = 7 **ii** IQR = $Q_3 - Q_1 = 7 - 4 = 3$

Exercises...

- 2 Kimmi runs a weekly painting class. The numbers of people attending the class over the last 10 weeks have been:

17 14 21 18 19 26 20 22 16 25

Find the range of the data.



- 4 The following amounts of money were withdrawn from an ATM on a particular day:

\$100 \$60 \$120 \$90 \$130 \$150 \$200 \$120 \$180
\$70 \$140 \$100 \$50 \$200 \$120 \$80 \$100 \$150

Find the:

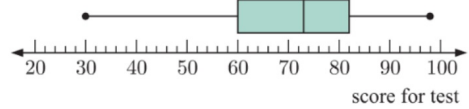
- a median
- b lower quartile
- c upper quartile
- d interquartile range of the data.

F

MEASURING THE SPREAD OF A DATA SET

Exercises...

2 A box-and-whisker plot has been drawn to show the distribution of marks for a class in a test out of 100.



- a Find the:
 - i highest mark
 - ii lowest mark.
- b What was the median test score for the class?
- c What was the range of marks scored for the test?
- d What percentage of students scored 60 or more for the test?
- e What was the interquartile range for the test?
- f If you scored 70 for the test, would you be in the top 50% of students in the class?

Exercises...

- 3** Consider the data set: 7 13 16 9 12 17 13 10 11
- a** Construct the five-number summary for the data.
 - b** Draw a box-and-whisker plot to display the data.
 - c** Find the: **i** range **ii** interquartile range of the data.

G

BOX-AND-WHISKER PLOTS

Solutions

F

MEASURING THE SPREAD OF A DATA SET

2 12 people

4 **a** \$120 **b** $Q_1 = \$90$ **c** $Q_3 = \$150$ **d** $IQR = \$60$

6 **a** 6 cm **b** 10.1 cm **c** 8.2 cm **d** 7.3 cm
e 8.95 cm **f** 4.1 cm **g** 1.65 cm

Solutions

G

BOX-AND-WHISKER PLOTS

- 2 a** **i** 98 marks **ii** 30 marks **b** 73 marks
c 68 marks **d** 75% **e** 22 marks **f** no

- 3 a** min = 7, $Q_1 = 9.5$, med = 12, $Q_3 = 14.5$, max = 17

b



- c** **i** 10 **ii** 5