2.6 Quartiles and Box Plots

Quartiles and Boxplots

Last class, we investigated the mean, median, and mode of raw and grouped data. Today, we will explore more ways of looking at the "middle" of data.

Here is some data listed out in order:

61 84 86 88 92 | 99 99 99 113 114 121 | 122 124 124 127 129 | 138 144 147 148 151

Q_1 Q_2 Q_3

Divide this data into two equal parts.

Now divide each half into two equal parts.

You have divided the data into four equal parts.

The boundary of each quarter of the data is called a __quartile__.

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Q_1 is the boundary of the 1st quartile. It is also called the 25th percentile.

Q_2 is another name for the 2nd quartile (median). It is also called the 50th percentile.

Q_3 is the boundary of the 3rd quartile. It is also called the 75th percentile.

The five-number summary of a set of data includes the minimum, Q1, Q2, Q3, and the maximum.   61, 95.5, 121, 133.5, 151

A box-and-whisker plot is used to show the five-number summary:

60 70 80 90 100 110 120 130 140 150 160
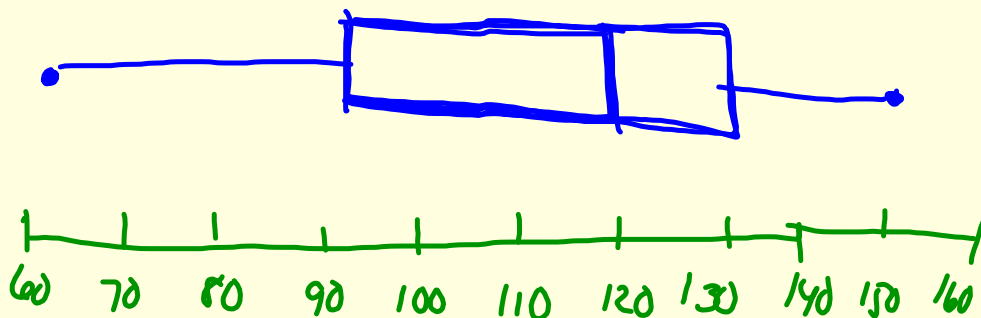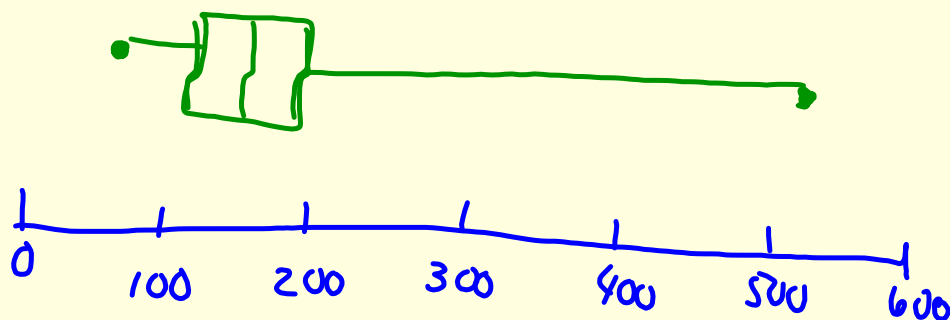
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Find the five-number summary of the data below.
Draw a box-and-whisker plot.

88   88   88   110   110 | 110   110   110   110 147 /
150 165 165 165 200 | 200 330 390 440 536

$Q_1 : 110$ $Q_2 : 148.5$ $Q_3 : 200$

Quartiles and Boxplots

The range of a set of data is the difference between the maximum and minimum values. Range = Maximum - Minimum

The interquartile range of a set of data is the difference between the upper and lower quartiles. IQR = Q3 - Q1

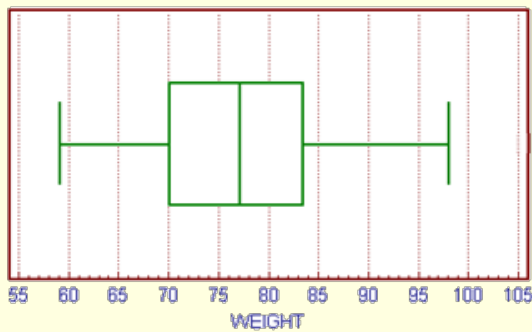Find the range and interquartile range of the data below.

88   88   88   110   110   110   110   110   110   147
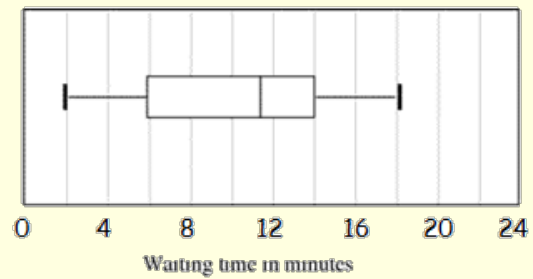150   165   165   165   200   200   330   390   440   536

Range: 536-88 = 448

IQR: 200-110 = 90

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Use the box-and-whisker plots to find the requested information.

WEIGHT

Minimum: 59   Q1: 70   IQR: 13

Maximum: 98   Q2: 77

Range: 39   Q3: 83

Waiting time in minutes

Minimum: 2   Q1: 6   IQR: 8

Maximum: 18   Q2: 11.5

Range: 16   Q3: 14

Quartiles and Boxplots

See if you can find this information using grouped data.
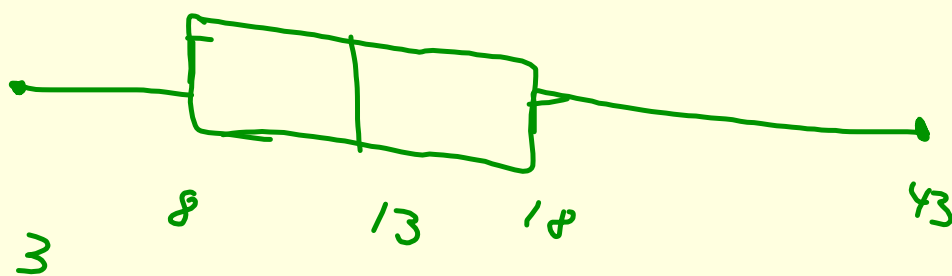
Minimum: 3

Q1: 8

Median: 13

Q3: 18

Maximum: 43

Range: 40

Interquartile Range: 10

L_1 L_2

Class interval (number of words)	Frequency f
3 1 – 5	16
8 6 – 10	28
13 11 – 15	26
18 16 – 20	14
23 21 – 25	10
28 26 – 30	3
33 31 – 35	1
38 36 – 40	0
43 41 – 45	2

8   13   18   43

3

Quartiles and Boxplots

IB Practice A

The heights (cm) of seedlings in a sample are shown below.

```
 6 | 3.  7
 7 | 2.  5.  8
 8 | 3.  6.  6.  8.  8
 9 | 2.  5.  7.  8
10 | 5.  6.  6
11 | 2.  2
```

key 6|3   represents 63 cm

(a) State how many seedlings are in the sample.   **19**

(b) Write down the values of

    (i)   the median.   **88**

    (ii) the first and third quartile.   **78 / 103**

(c) Calculate the range.   **112 - 63 = 49**

(d) Using the scale below, draw a box and whisker plot for this data.
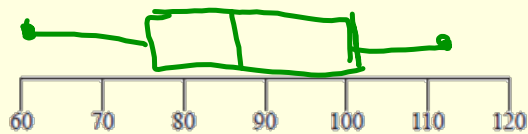
Quartiles and Boxplots

IB Practice B

The following stem and leaf diagram gives the weights in kg of 34 eight year-old children.

Stem	Leaf
26	1, 2
27	2, 4, 4
28	0, 1, 6, 0
29	2, 2, 4, 4, 5
30	0, 1, 2, t, 6, 8, 8, 9
31	3, 3, 5, 0, 6
32	1, 3, 5, 5, 8
33	0, 4

Key: 26|1 reads 26.1kg

(a) The median weight is 30.3 kg. Find the value of t.   30.4 → t = 4

(b) Write down the lower quartile weight.   28.6

(c) The value of the upper quartile is 31.6 kg and there are no outliers. Draw a box and whisker plot of the data using the axis below.

26   27   28   29   30   31   32   33   34   Weight (kg)
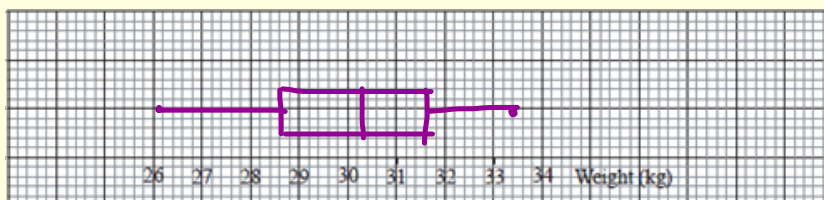
Descriptive Statistics
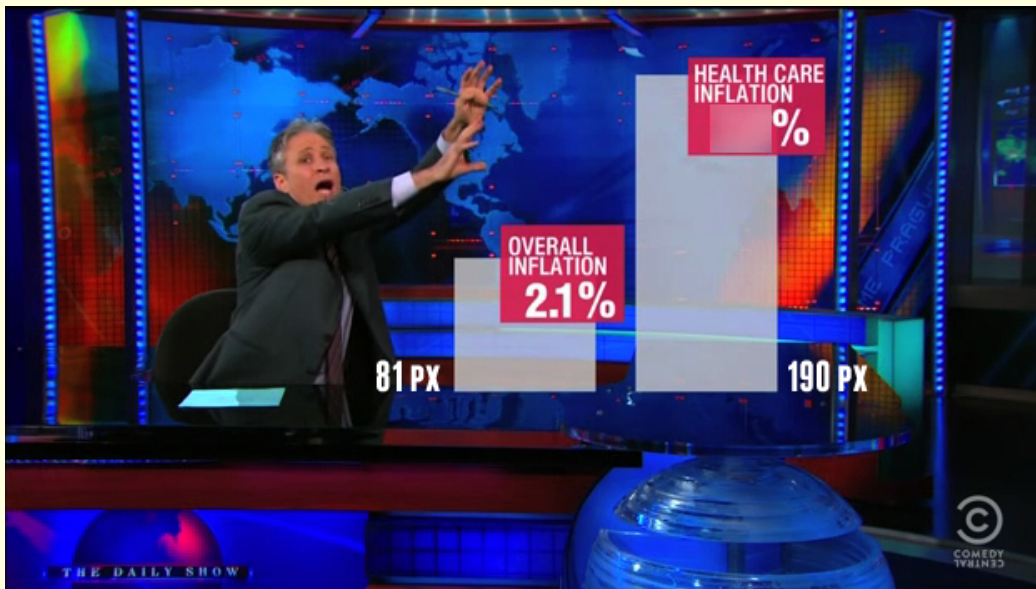
Homework:

page 70-71:1-5 all; 72:1-3 all