

Percentiles and Box-and-Whisker Plot

Example 1: page 107/8. *Sociology: High-school Dropouts*

What percentage of general U.S. population are high-school dropouts? The *Statistical Abstract of the United States*, 120th Edition, gives the percentage of high-school dropouts by state. For convenience, the data are sorted in increasing order.

10 6 7 14 7 7 8 8 15 8
8 9 14 9 9 9 9 9 10 10
10 10 5 10 10 10 11 11 11 11
11 13 11 11 12 12 12 12 13 13
13 13 11 13 9 14 14 7 14 8

(a) Make a box-and-whisker plot and find the interquartile range

(b) Wyoming has a dropout rate about 7%. Into what quartile does this rate fall?

1. Order the data values from smallest to largest:

5 6 7 7 7 7 8 8 8 8
8 9 9 9 9 9 9 9 10 10
10 10 10 10 10 10 11 11 11 11
11 11 11 11 12 12 12 12 13 13
13 13 13 13 14 14 14 14 14 15

Percentiles and Box-and-Whisker Plot

2. Find the median (Q_2):

5	6	7	7	7	7	8	8	8	8
8	9	9	9	9	9	9	9	10	10
10	10	10	10	10	10	11	11	11	11
11	11	11	11	12	12	12	12	13	13
13	13	13	13	14	14	14	14	14	15

Percentiles and Box-and-Whisker Plot

2. Find the median (Q_2):

5	6	7	7	7	7	8	8	8	8
8	9	9	9	9	9	9	9	10	10
10	10	10	10	10	10	11	11	11	11
11	11	11	11	12	12	12	12	13	13
13	13	13	13	14	14	14	14	14	15

$$Q_2 = \text{median} = (10 + 10) / 2 = 10$$

another approach (without crossing out numbers):

there are 50 data values (even number).

$50 / 2 = 25$, then take the sum of 25th and 26th and divide by two: $(10 + 10) / 2 = 10$

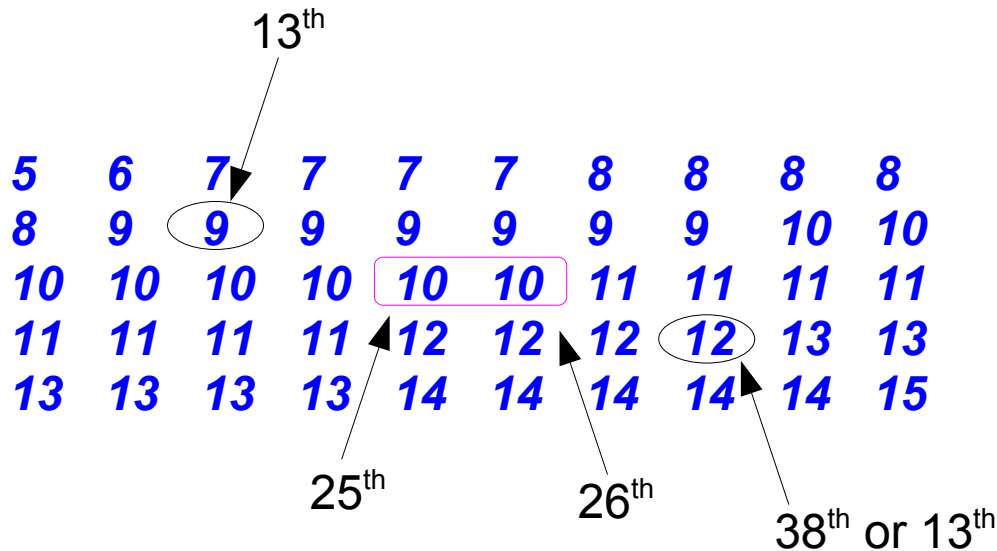
5	6	7	7	7	7	8	8	8	8
8	9	9	9	9	9	9	9	10	10
10	10	10	10	10	10	11	11	11	11
11	11	11	11	12	12	12	12	13	13
13	13	13	13	14	14	14	14	14	15

$$Q_2 = \text{median} = (10 + 10) / 2 = 10$$

25th

26th

Percentiles and Box-and-Whisker Plot



3. Find Q_1 :

25 numbers in the first half (odd number) - find their median:
 $25/2=12.5$, thus take the 13th number

$$Q_1 = 9$$

4. Find Q_3 :

25 numbers in the second half (odd number) - find their median:
 25 (lower middle) + $13 = 38$, thus take the 38th number (or 13th from the end)

$$Q_3 = 12$$

Interquartile range: $IQR = Q_3 - Q_1 = 12 - 9 = 3$

Let's draw Box-and-Whisker Plot:

Five-number summary:

lowest data value = 5

highest data value = 15

$Q_1 = 9$

$Q_2 = 10$

$Q_3 = 12$

Box-and-Whisker Plot

