2.6: Percentiles, Quartiles, and Deciles

Percentiles

This partitions the data into 100 groups with about 1% of the values in each group.

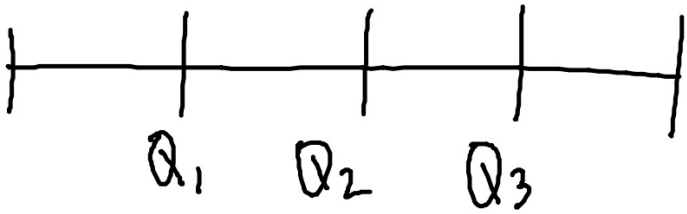
There are 99 percentiles, denoted as P_1, P_2, ...P_{99}

Quartiles: partitions the data into four parts with about 25% of the values in each group.

Q_1 same as the 25th percentile

Q_2 same as the 50th percentile (median)

Q_3 same as the 75th percentile



Deciles: Partitions the data into 10 groups with about 10% of the values in each group.

$D_1, D_2, \ldots D_9$

D_5 is the same as Q_2 and P_{50}

What do percentiles mean?

If you score at the 80th percentile, it means your score is at or better than 80% of the students who took the test.

If your score is at the 99th percentile, you scored at or better than 99% of the students who took the test.

Why is the 99th percentile the highest?

Formula to find the percentile given the value

$$\text{Percentile of value } x = \frac{\text{number of values less than } x}{\text{total number of values}} \cdot 100$$

Find the percentile corresponding to 25 medals.

Total # medals won

15 16 18 18 19 24 25 27 28 31

40 41 46 47 72

$$\frac{6}{15} \cdot 100 = P_{40}$$

The circled values are less than 25

Find the percentile corresponding to 30 medals.

Total # medals won

15 16 18 18 19 24 25 27 28 31

40 41 46 47 72

$\frac{9}{15} \cdot 100 = P_{60}$

The circled values are less than 30

Find the percentile corresponding to 60 medals.

Total # medals won

15 16 18 18 19 24 25 27 28 31

40 41 46 47 72

The circled values are less than 60

$$\frac{14}{15} \cdot 100 = P_{93}$$

Find the percentile corresponding to 46 medals.

Total # medals won

15 16 18 18 19 24 25 27 28 31

40 41 46 47 72

$\frac{12}{15} \cdot 100 = P_{80}$

Find the percentile corresponding to 18 medals.

Total # medals won

15 16 18 18 19 24 25 27 28 31
40 41 46 47 72

$\frac{2}{15} \cdot 100 = P_{13}$

To find the value of a percentile...(numbers must be in order)

1) Multiply the percentile (in decimal form) by the number of values in the data set.

Call this product X.

2) If X is a whole number, count to the Xth number. Average the Xth number with the next number in the set.

3) If X is not a whole number, round X up and count to the Xth number.

Total # medals won

15 16 18 18 19 24 25 27 28

31 40 41 46 47 72

Find the value at the 10th percentile.

$.10(15) = 1.5 = 2$ (round up)

go to the 2nd number : 16

Total # medals won

15 16 18 18 19 24 25 27 28
31 40 41 46 47 72

Find the value at the 40th percentile.

$(.40) \cdot 15 = 6$

6th number: 24
7th number: 25
> Average

24.5

Total # medals won

15 16 18 18 19 24 25 27 28

31 40 41 46 47 72

Find the value at the 65th percentile.

$.65(15) = 9.75 \rightarrow 10$

10th number: 31

Total # medals won

15 16 18 18 19 24 25 27

28 31 40 41 46 47 72

Find the value of Q_3.

$Q_3 = P_{75}$

$.75(15) = 11.25 \rightarrow 12$ (up)

12th value $\boxed{41}$

Total # medals won

15 16 18 18 19 24 25 27

28 31 40 41 46 47 72

Find the value of P_{60}.

$.6(15) = 9$

9th : 28

10th : 31 > Average 29.5

Total # medals won

15 16 18 18 19 24 25 27

28 31 40 41 46 47 72

Find the value of P_{84}.

$.84(15) = 12.6 \rightarrow 13$

13^{th} value $\boxed{46}$

Total # medals won

15 16 18 18 19 24 25 27

28 31 40 41 46 47 72

Find the value of D_4.

$D_4 = P_{40}$

$(.4)15) = 6$

6th : 24

7th : 25 → Average → 24.5