

Lesson 12 – Percentiles

Percentiles are like quartiles, except that percentiles divide the set of data into 100 equal parts while quartiles divide the set of data into 4 equal parts. Percentiles measure position from the bottom.

Percentiles are most often used for determining the relative standing of an individual in a population or the rank position of the individual. Some of the most popular uses for percentiles are connected with test scores and graduation standings. Percentile ranks are an easy way to convey an individual's standing relative to others. The rank of the percentile indicates the percentage of values that are lower than or equal to the given value.

In order to calculate a percentile the data must be in order (smallest to largest). We then count how many are lower and how many are equal to the value we are looking at. Then plug these numbers into the following formula:

$$\text{Percentile of } x = \left(\frac{\text{number of data values less than } x + \frac{\text{number of data values equal to } x}{2}}{\text{total number of values}} \right) \times 100$$

Ex. Calculate the percentile of 65 in the following distribution:

43, 43, 44, 45, 45, 47, 48, 50, 53, 54, 55, 55, 57, 62, 64, 65, 65, 65, 65, 67, 69, 69, 70, 72, 75

Step 1: Count the number of data values less than and equal to the given value, as well as the total number of values.

The number of data values less than 65 = 15

The number of data values equal to 65 = 4

Total number of values = 25

Step 2: Plug values found into the formula.

$$\text{Percentile of } 65 = \left(\frac{15 + \frac{4}{2}}{25} \right) \times 100$$

$$\text{Percentile of } 65 = \left(\frac{15 + 2}{25} \right) \times 100$$

$$\text{Percentile of } 65 = \left(\frac{17}{25} \right) \times 100$$

$$\text{Percentile of } 65 = (0.68) \times 100 = 68\text{th percentile}$$

If a percentile is given we can identify the data value with this percentile by doing the following:

1. Determine the position of the value by using the formula:

$$\text{Position of data value in the distribution} = \left(\frac{\text{percentile}}{100} \right) \times \text{total number of values}$$

If you do not get an integer (ie if you get a number with a decimal) **round downwards to the nearest integer.**

2. With the distribution in order (smallest to largest), find the position calculated above and identify the data value with the given percentile.

Ex. Find the data value which corresponds to the 85th percentile of the following distribution:

43, 43, 44, 45, 45, 47, 48, 50, 53, 54, 55, 55, 57, 62, 64, 65, 65, 65, 65, 67, 69, 69, 70, 72, 75

Step 1: Determine the position:

$$\text{Position of data value in the distribution} = \left(\frac{85}{100} \right) \times 25$$

$$\text{Position of data value in the distribution} = 21.25 \text{ (round down to 21)}$$

$$\therefore \text{Position of data value in the distribution} = 21\text{th data value}$$

Step 2: Find the 21st data value

The data value which corresponds to the 85th percentile is 69.