How To Calculate Percentile Rank (With Example)

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Updated May 18, 2022 | Published February 23, 2021

Percentile rank is a common statistical measurement that you can use for everything from comparing standardized test scores to analyzing weight distribution in a sample. Statisticians often use percentile rank to get an idea of how a particular assessment score or result compares with others in a set. Additionally, understanding percentile rank can give you an insight into how well you're performing on any given assessment. In this article, we explore how to calculate percentile rank and range, and we offer examples to guide you.

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What is percentile rank?

Percentile rank is a common metric statisticians calculate when scoring standardized tests and examinations. This measurement shows the percentage of scores within a norm group that is lower than the score you're measuring. For instance, if you take a standardized test and your score is greater than or equal to 90% of all other scores, your percentile rank is the 90th percentile.

It's also important to note that the percentile rank may not denote an actual test score or other assessment score. It only represents an item's rank against a larger group's places between 0 and 100.

Percentile rank formula

You can calculate the percentile rank using this formula:

Percentile rank = p / 100 x (n + 1)

In the equation, p represents the percentile and n represents the total number of items in the data set.

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Calculating percentile
Before you can calculate percentile rank, you need to know the percentile of the item you're ranking. You can find the percentile of a specific score using this formula:

\[
\text{Percentile} = \frac{\text{number of values below score}}{\text{total number of scores}} \times 100
\]

For example, if a student scores 1,280 points out of 1,600 on the SATs, they can use this basic percentile formula to find out how their score compares with others in the set they're comparing.

To get the percentile rank, calculate the percentile of a specific assessment score. The steps below outline how to calculate the percentile using example test scores:

1. **Put your data in ascending order**

   When calculating the percentile of a set of data, such as test scores, arrange the values in ascending order, starting with the lowest value and ending with the highest. As an example, use the data set of standardized test scores (77, 76, 88, 85, 87, 78, 80, 95, 90, 83, 89, 93, 75, 70, 67) for a student who wants to find their percentile with a score of 88. The values in this data set in ascending order are (67, 70, 75, 76, 77, 78, 80, 83, 85, 87, 88, 89, 90, 93, 95).

2. **Divide the number of values below by the total number of values**

   Once your values are in ascending order, count the number of values that occur below the score you're measuring percentile for. Using the example scores from above (67, 70, 75, 76, 77, 78, 80, 83, 85, 87, 88, 89, 90, 93, 95) and the student's score of 88, the number of values that appear below 88 is 10. Then, count all the values in the entire data set. In this example, the number of all values in the data set is 15. Plug these values into the formula:

\[
\text{Percentile} = \frac{\text{number of values below score}}{\text{total number of scores}} \times 100 = \frac{10}{15} \times 100 = 66\%
\]

4. **Multiply the result**

   Using the formula, calculate the quotient between the number of values below your score and the number of all the values in your data set. Multiply the result by 100 to get a percentage. With the previous test score example, calculate percentile:

\[
\text{Percentile} = \frac{\text{number of values below score}}{\text{total number of scores}} \times 100 = \frac{10}{15} \times 100 = 0.66 \times 100 = 66\%
\]

This result shows that the student's score of 88 is in the 66th percentile.


**How to calculate percentile rank**
When you know the percentile of a specific value, you can easily calculate the percentile rank using the percentile rank formula:

\[ \text{Percentile rank} = \frac{p}{100 \times (n + 1)} \]

Use the steps below to apply the formula for calculating percentile rank:

1. **Find the percentile of your data set**

   Calculate the percentile of the data set you're measuring so you can calculate the percentile rank. As an example, assume you're calculating the percentile rank of a test score in the 80th percentile. The value 80 represents the percentile in this case, which you can use in the formula to find percentile rank. Substitute 80 for the p-value in the formula:

   \[ \text{Percentile rank} = \frac{80}{100 \times (n + 1)} \]

2. **Find the number of items in the data set**

   To find the n variable or the total number of values in your data set, simply count up the number of items you're working with. For instance, assume the above percentile is one of 25 test scores. The value 25 represents the n variable in the formula:

   \[ \text{Percentile rank} = \frac{80}{100 \times (25 + 1)} \]

   Add one to the total number of values in the data set to get this:

   \[ \text{Percentile rank} = \frac{80}{100 \times 26} \]

3. **Multiply the sum of the number of items and one by 100**

   Once you add one to your n value, multiply this sum by 100. Using the previous example, find this value in the formula:

   \[ \text{Percentile rank} = \frac{80}{100 \times 26} = \frac{80}{2,600} \]

   The sum of the value of all items in the data set and one gives a result of 260, and when you multiply this value by 100, the result is 26,000.

4. **Divide the percentile by the product of 100 and n+1**

   Divide the resulting product of 100 and n+1 by the percentile value you found in the first step. Using the example percentile of 80, this calculates as:

   \[ \text{Percentile rank} = \frac{80}{2,600} = 0.03 = 3\text{rd percentile rank} \]

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How to calculate percentile range

The percentile range represents the difference between two specific percentiles. For instance, a census employee measuring survey data may calculate the percentile range between two types of demographics to compare various information. Typically, statisticians calculate the percentile range between the 10th and 90th percentiles, though you can calculate the range between any two percentiles. You can calculate the percentile range between the 10th and 90th ranking items in a data set using this operation:

\[(90\text{th percentile}) - (10\text{th percentile})\]

Here are the steps to follow:

1. Find the percentile ranks of your values

If you know the percentile rank of two values, you can calculate the percentile range. For example, assume you measure the weight of 10 dogs and find one dog's weight of 15 pounds as the 10th percentile and another's weight of 125 pounds as the 90th percentile. Using these two example values, you can find the difference through subtraction.

2. Subtract the 10th from the 90th percentile

Once you know the percentile rank of each statistic you're measuring, find the percentile range by subtracting the value in the 10th percentile rank from the value in the 90th percentile rank. Using the previous example of dogs' weights, calculate the difference if 125 pounds is in the 90th percentile and 15 pounds is in the 10th percentile:

\[\text{Percentile range} = (90\text{th percentile}) - (10\text{th percentile}) = (125) - (15) = 110\]

3. Interpret your results

The percentile range simply compares two different percentile ranking items so you can get an idea of what the characteristics of your data are like. In the example of measuring the weight of different dogs, the percentile range of 110 means that 110 other possible weights can be above or below the average.

Related: How To Calculate Statistical Range
Percentile rank example

As an example of calculating percentile rank, assume a pediatrician wants to calculate the percentile rank for the weight distribution of 6-month-old infants:

Assume a pediatrician's office wants to know where a certain weight percentile ranks within their statistical information on healthy infant weight ranges at 6 months old. The pediatrician first finds the percentile of an infant's weight of 13.5 pounds by using the percentile formula when the number of values below 13.5 pounds is seven and the total number of measured 6-month-old weights is 42:

Percentile = (number of values below score) ÷ (total number of scores) x 100 = (7) ÷ (42) x 100
= 0.17 x 100 = 17

The 6-month-old infant's weight of 13.5 pounds is in the 17th percentile. Using this information, the pediatrician can then calculate the percentile rank out of all 42 weights they measured:

Percentile rank = p / [100 x (n + 1)] = (17) / 100 x (42 + 1) = (17) / 100 x (43) = 17 ÷ 4,300 = 3.95

The result of 3.95 indicates the infant's weight of 13.5 pounds is in the 3.95th percentile rank. This means that 3.95% of all weights out of the 42 the pediatrician measures are at or below the infant's weight of 13.5 pounds.

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