

Grade 8 - Two-Way Tables and Relative Frequency - Lesson

Common Core 8.SP.A.4 · maths-pdf.fr/en/

A two-way table organizes data about two categorical variables, with counts in each cell and totals on the edges. Dividing a count by a row or column total gives a relative frequency, usually written as a percent. If the relative frequencies differ clearly between rows, there is an association between the two variables.

Grade 8 · Common Core State Standards: **8.SP.A.4**

Key facts

- Joint frequencies are the counts inside the table; marginal frequencies are the totals.
- Relative frequency = $\text{count} \div \text{total}$, usually as a percent.
- Row percents compare groups defined by the rows.
- If row percents differ a lot, the variables are associated.
- Association does not prove that one variable causes the other.

What is a two-way table?

A two-way table shows data about two categorical variables at once. One variable labels the rows and the other labels the columns. Each cell holds a **frequency**, the number of individuals in that category pair. The table below comes from a survey of 90 eighth graders about owning a phone.

	Phone	No phone	Total
Boys	34	6	40
Girls	38	12	50
Total	72	18	90

Counts and totals.

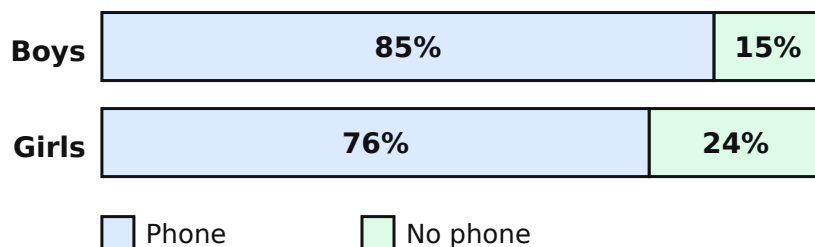
Key terms

A **joint frequency** is a count inside the table (34 boys with a phone). A **marginal frequency** is a total on the edge (72 students with a phone). A **relative frequency** is a

count divided by a total, usually written as a percent.

How do you find relative frequencies?

Choose the total that makes sense for your question. To compare boys and girls, divide each count by the row total. Among boys, $\frac{34}{40} = 85\%$ have a phone. Among girls, $\frac{38}{50} = 76\%$ have one. For all students, $\frac{38}{90} \approx 42.2\%$ are girls with a phone.



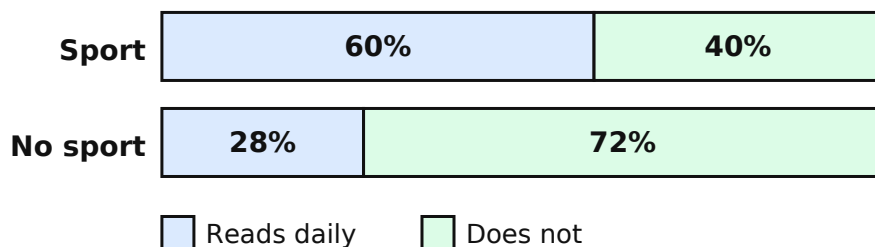
Row relative frequencies: 85% of boys and 76% of girls have a phone.

What is association in a two-way table?

Two variables are associated if the relative frequencies change from one row to the next. In the sports and reading survey, 60% of the 30 students who play a sport read daily, but only 28% of the 50 who do not play a sport do. The percents are very different, so there is an association.

	Reads daily	Does not	Total
Sport	18	12	30
No sport	14	36	50
Total	32	48	80

Sports and reading.



60% of athletes and 28% of non-athletes read daily.

The segmented bars make the comparison easy to see. Each bar is scaled to 100%, so groups

of different sizes can be compared fairly. When the colored sections look nearly the same in every bar, the variables are not associated. When the sections change a lot from bar to bar, as they do here, the variables are associated. You can also build a two-way table yourself from a list of survey answers by tallying each pair of responses.

1. Decide which variable defines the groups to compare (rows or columns).
2. Divide each cell by its group total.
3. Compare the percents: if they are close, there is little or no association; if far apart, there is a clear association.

An association does not prove cause and effect. It only describes how the two categories are connected in the data.

Questions about two-way tables and relative frequency

What is the difference between frequency and relative frequency?

Frequency is a count, such as 34 students. Relative frequency is that count divided by a total, such as $\frac{34}{40} = 85\%$.

Which total should I divide by?

Use the total of the group the question is about. To compare boys with girls, divide by each row total; to ask about phone owners, divide by the column total.

How can I tell if there is an association?

Compare the relative frequencies across groups. Large differences suggest an association; small differences suggest little or none.

What are marginal totals?

They are the row totals and column totals on the edges of the table. The grand total is the number of all individuals.

Does an association mean one variable causes the other?

No. It only shows that the categories are related in this data set. Other factors may explain the relationship.