

Which Whole Does It Mean?

Read actual tables and graphs without changing the denominator.

HIGH SCHOOL • MA.912.DP.3.3

MA.912.DP.3.3 "Given a two-way relative frequency table or segmented bar graph summarizing categorical bivariate data, interpret joint, marginal and conditional relative frequencies in terms of a real-world context."

NAME _____

DATE _____

Name the denominator

Joint percentages describe two categories together; marginal percentages total one category across the other variable. In a whole-sample table, both use all respondents as the denominator. For a conditional percentage, divide the joint percentage by the named group's marginal percentage.

Worked example

Use the picnic table to find the share of fruit-bringers who packed lunch.

Practice picnic choices (% of all respondents)

Lunch	Fruit	No fruit	Total
Packed	20%	20%	40%
Bought	15%	45%	60%
Total	35%	65%	100%

1. Fruit-bringers are $20\% + 15\% = 35\%$ of the whole sample.

2. Packed lunch and fruit is 20% of the sample; divide 20 by 35.

$20/35 = 4/7$ of fruit-bringers packed lunch, approximately 57.1%. This differs from 20% of all respondents.

All data are simulated. Table percentages are exact and refer to all respondents unless the graph says each bar is its own group. Tasks 1-4 and 7 use the sport/travel table. State a denominator in every interpretation; round only when requested.

1. Read joint and marginal frequencies

Use the printed table. State the joint percentage for Sport and Transit and interpret it. Then find and interpret the marginal percentage using transit.

Sport and travel (% of all respondents)

Sport status	Transit	Other travel	Total
Sport	30%	20%	50%
No sport	10%	40%	50%
Total	40%	60%	100%

2. Calculate in both directions

Find the percent of transit users who play a sport and the percent of sport participants who use transit. Show both quotients and explain why the answers differ.

3. Repair a misleading claim

A student writes, '30% of transit users play a sport.' Explain the error and rewrite the sentence correctly in two different ways, preserving 30% in one version.

4. Interpret a comparison

Compare transit-use percentages among sport and non-sport respondents. Report the difference in percentage points and describe what it suggests about these data.

5. Use a different table

In this separate reading survey, find the weekly-reading percentage within each device group. Interpret the result, then compare Tablet-and-Weekly with all Weekly readers.

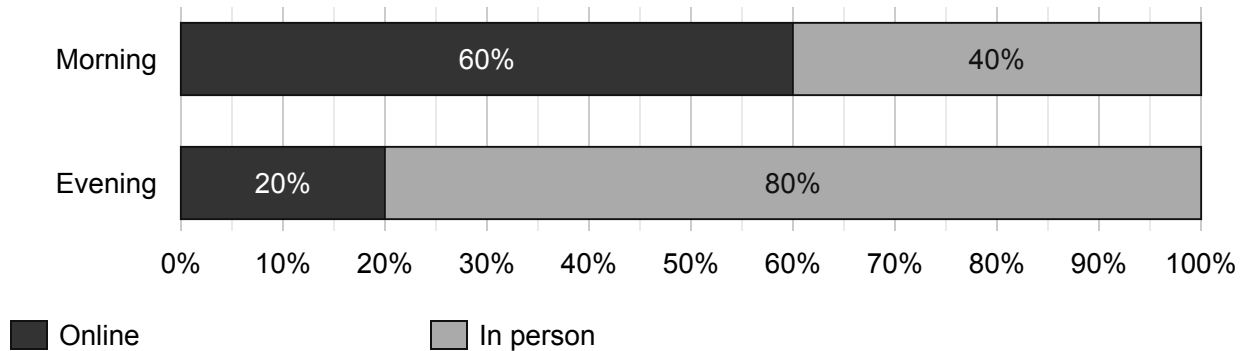
Reading survey (% of all respondents)

Device	Weekly reader	Not weekly	Total
Tablet	12%	28%	40%
Other device	18%	42%	60%
Total	30%	70%	100%

6. What equal-length bars cannot tell you

Read the actual segmented graph. A student averages 60% and 20% and claims 40% of ALL workshop participants attended online. Is that conclusion determined by this graph alone? Explain the missing information and give two possible overall percentages.

Online attendance within each workshop group



7. Test an exact-percentage report

Could the exact sport/travel percentages describe a survey of 125 people? Explain. Give a whole-number sample size between 100 and 125 that could produce the table, and state its four joint counts.

TEACHER NOTES

All scenarios are simulated classroom data. Accept equivalent exact fractions and percentages, but require the named denominator and an interpretation in context. Whole-sample relative-frequency tables have grand total 100%; row-conditional tables and each segmented bar instead represent 100% of their own group. Equal-length bars do not imply equal group sizes. Association does not establish causation. Keep solutions off student workspaces.

TASK 1

30% of all respondents both play a sport and use transit. $30\% + 10\% = 40\%$ of all respondents use transit, regardless of sport status.

TASK 2

Among transit users: $30/40 = 75\%$ play a sport. Among sport participants: $30/50 = 60\%$ use transit. The joint cell is the same, but the conditioning groups have different totals.

TASK 3

The 30% cell uses everyone, not only transit users. Correct: 30% of all respondents play a sport and use transit. Also correct: 75% of transit users play a sport.

TASK 4

Sport: $30/50 = 60\%$; no sport: $10/50 = 20\%$. The gap is 40 percentage points, suggesting an association in the supplied data. It does not establish a cause.

TASK 5

Tablet: $12/40 = 30\%$; other device: $18/60 = 30\%$, so the weekly-reading rates are equal. Tablet-and-Weekly is 12% of everyone (joint); all Weekly readers are 30% of everyone (marginal). Use the stated reference group and check all totals against that denominator.

TASK 6

No. The group sizes are missing. If both sessions have 100 participants, overall online attendance is 40%; if Morning has 100 and Evening 300, it is $(60+60)/400 = 30\%$. Equal 100% bar lengths do not show how many people each group contains. Use the stated reference group and check all totals against that denominator.

TASK 7

No: 10% of 125 is 12.5 people, not a whole count. A sample of 120 works: 36 Sport/Transit, 24 Sport/Other travel, 12 No sport/Transit, 48 No sport/Other travel. These counts sum to 120 and yield the exact percentages.