

AP Statistics - Variables and Categorical Data Displays - Answer Key

Common Core AP STAT 1.1, AP STAT 1.2, AP STAT 1.3, HSS-ID.A.1 · maths-pdf.fr/en/

Each solution shows the counting or division behind the answer. Check that relative frequencies add to 1 and that every conclusion is written in the context of the problem.

AP Statistics · Common Core State Standards: **AP STAT 1.1, AP STAT 1.2, AP STAT 1.3, HSS-ID.A.1**

Exercise 1 - Classify the variable

A variable is quantitative only if arithmetic on its values makes sense.

- Categorical (genre names are labels).
- Quantitative (a count of messages).
- Categorical: an area code names a region, and adding area codes is meaningless.
- Quantitative (a measurement).
- Categorical: sizes are labels for groups.

Answers: categorical, quantitative, categorical, quantitative, categorical.

Exercise 2 - Individuals and variables

The individuals are the swimmers: Maya, Jamal, and Sofia.

The variables are grade, best time, and stroke.

- Grade: quantitative (a number that can be compared and averaged).
- Best 50 m time: quantitative.
- Stroke: categorical.

3 individuals, 3 variables: 2 quantitative and 1 categorical.

Exercise 3 - Relative frequency table

Divide each count by the total $n = 200$.

- $\frac{84}{200} = 0.42$, or 42%

- b. $\frac{62}{200} = 0.31$, or 31%
- c. $\frac{34}{200} = 0.17$, or 17%
- d. $\frac{20}{200} = 0.10$, or 10%

Check: $0.42 + 0.31 + 0.17 + 0.10 = 1.00$.

Bus 42%, car 31%, walk 17%, bike 10%.

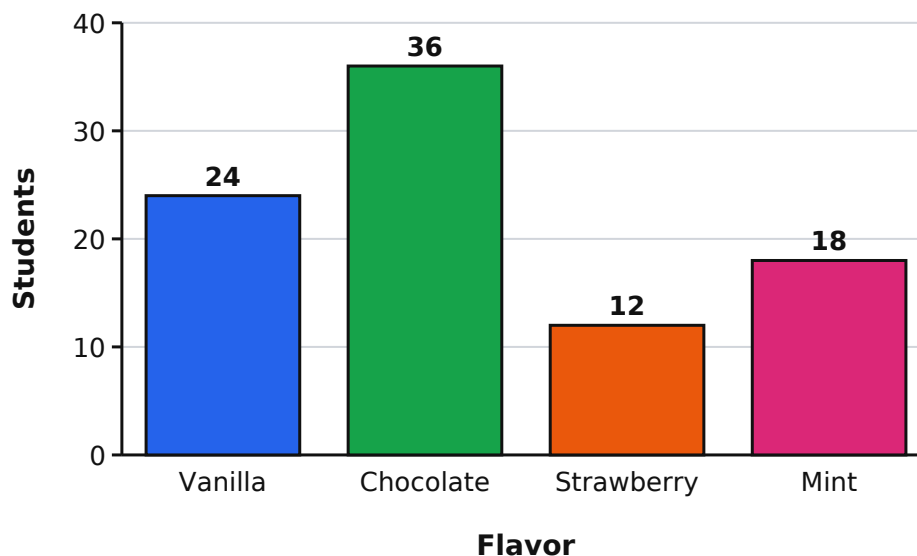
Exercise 4 - Find the missing count

The percents must total 100%, so other = $100\% - 46\% - 22\% - 18\% = 14\%$.

Count: $0.14 \times 250 = 35$.

14%, which is 35 teens.

Exercise 5 - Read a bar graph



Chocolate is the tallest bar: 36 of 90 students.

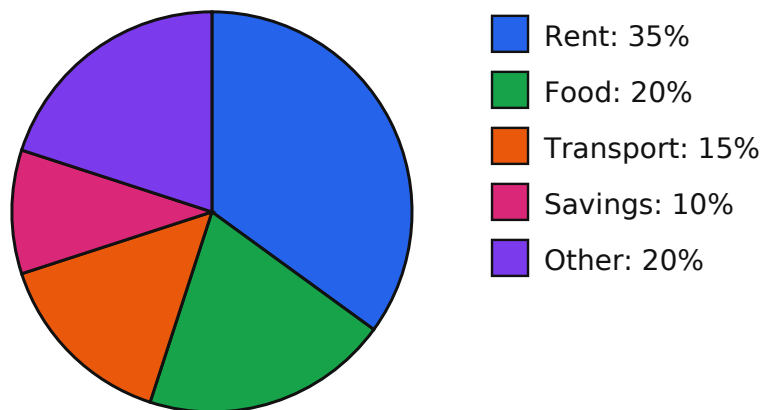
(a) $24 + 36 + 12 + 18 = 90$ students.

(b) Chocolate has the tallest bar.

(c) $\frac{36}{90} = 0.40$.

90 students; chocolate; 40%.

Exercise 6 - Pie chart angles



Slices with their percents.

A full circle is 360° , so each 1% is 3.6° .

- a. $35 \times 3.6 = 126^\circ$
- b. $20 \times 3.6 = 72^\circ$
- c. $15 \times 3.6 = 54^\circ$
- d. $10 \times 3.6 = 36^\circ$
- e. $20 \times 3.6 = 72^\circ$

Check: $126 + 72 + 54 + 36 + 72 = 360$.

126, 72, 54, 36, 72 degrees.

Exercise 7 - Is it a distribution?

Add them: $0.28 + 0.35 + 0.19 + 0.12 = 0.94$.

The total must be 1, so these cannot be the complete distribution. There is a missing category of $1 - 0.94 = 0.06$.

No; a category with relative frequency 0.06 is missing.

Exercise 8 - Count raw data

Tally each response.

Pet	Count	Relative frequency
dog	9	0.45
cat	6	0.30
fish	3	0.15
bird	2	0.10

Total 20, and the relative frequencies add to 1.

Dog 9, cat 6, fish 3, bird 2.

Exercise 9 - Misleading axis

On this axis, the visible heights are $92 - 90 = 2$ and $96 - 90 = 6$ units.

The Main Street bar looks $\frac{6}{2} = 3$ times as tall, but the real ratio is $\frac{96}{92} \approx 1.04$.

The bar looks 3 times as tall but the rate is only about 4% higher. A bar graph should start at 0.

Exercise 10 - Percent to count

Solve $0.19n = 57$.

$$n = \frac{57}{0.19} = 300.$$

Not soccer: $300 - 57 = 243$.

300 students polled; 243 chose something else.

Exercise 11 - Numbers that are labels

No. Jersey numbers identify players; they do not measure an amount. A jersey 20 is not twice as much of anything as jersey 10.

Jersey number is categorical, and its mean has no meaning.

Exercise 12 - Choose a display

a. Either works: each student is in exactly one grade, so the parts make a whole.

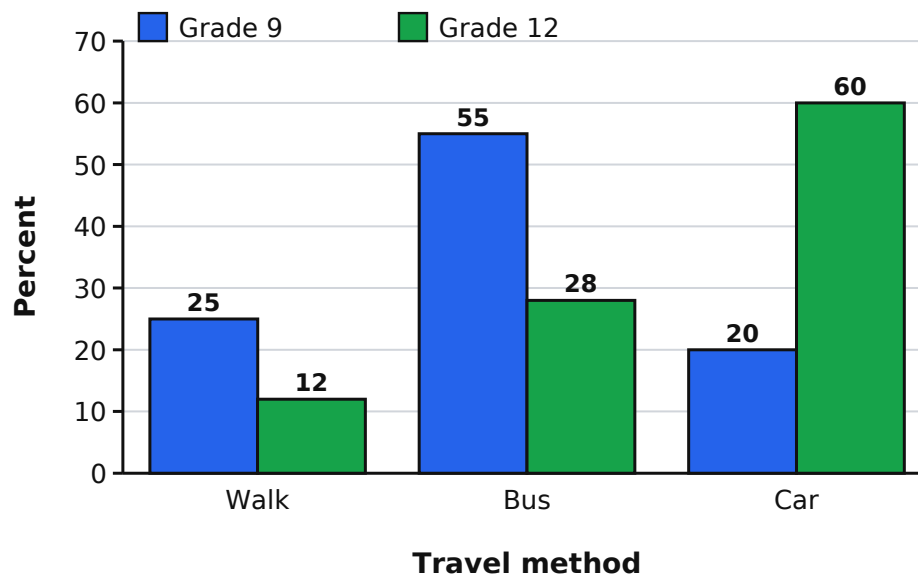
- b. Bar graph only. The percents add to more than 100%, so a pie chart would be wrong.
- c. Either works; the 5 percents add to 100%.

Pie chart is allowed in (a) and (c) only; a bar graph is safe in all three.

Exercise 13 - Compare two groups

Ninth graders: $\frac{20}{80} = 25\%$, $\frac{44}{80} = 55\%$, $\frac{16}{80} = 20\%$.

Twelfth graders: $\frac{15}{125} = 12\%$, $\frac{35}{125} = 28\%$, $\frac{75}{125} = 60\%$.



Percent of each group by travel method.

Twelfth graders: 60% drive compared with 20% of ninth graders.

Exercise 14 - Counts or percents?

The groups have different sizes: 80 and 125 students. The counts differ partly because the groups differ in size.

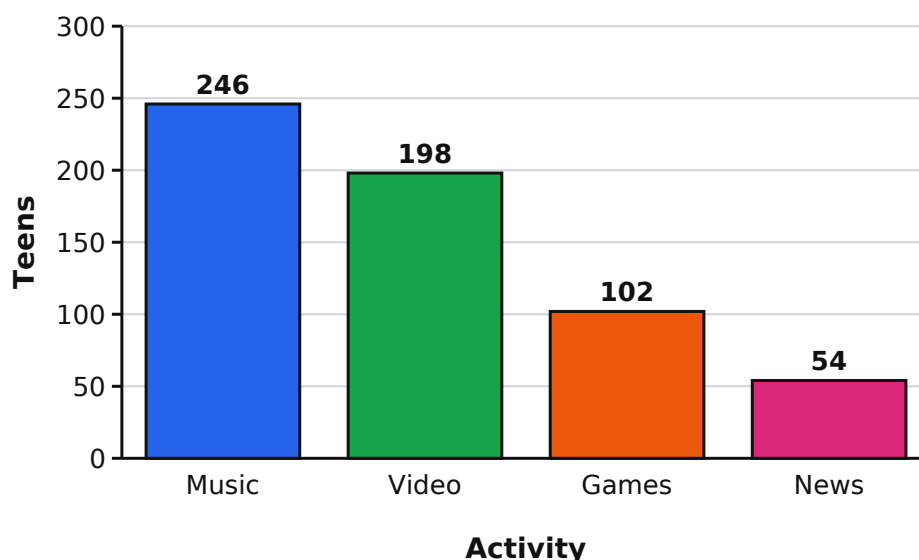
Percents of each group, 20% and 60%, remove the effect of group size.

Use relative frequencies when group sizes differ.

Exercise 15 - Pie chart to counts

Multiply each percent by 600.

- a. $41\% \times 600 = 246$
- b. $33\% \times 600 = 198$
- c. $17\% \times 600 = 102$
- d. $9\% \times 600 = 54$



Counts for 600 teens.

Music or video: $41\% + 33\% = 74\%$, or $246 + 198 = 444$ teens.

246, 198, 102, 54 teens; 74% chose music or video.

Exercise 16 - Survey summary

Calculators: $150 - 54 - 36 - 45 = 15$.

Relative frequencies: $\frac{54}{150} = 0.36$, $\frac{36}{150} = 0.24$, $\frac{45}{150} = 0.30$, $\frac{15}{150} = 0.10$.

Not snacks: $1 - 0.30 = 0.70$.

15 calculators; 70% of sales were not snacks.

Exercise 17 - Write a description

Percents: 35%, 22.5%, 15%, 27.5%.

Sample answer: Pizza was the most popular lunch, chosen by 35% of the 120 students, and salad was the least popular at 15%. Tacos (27.5%) and burgers (22.5%) were in the middle.

Exercise 18 - Combined categories

Other: $100\% - 38\% - 29\% - 21\% = 12\%$.

Brand A: $0.38 \times 480 = 182.4$, about 182. Brand C: $0.21 \times 480 = 100.8$, about 101.

Difference: $(0.38 - 0.21) \times 480 = 0.17 \times 480 = 81.6$, about 82 owners.

About 82 more owners use brand A; 12% use other brands.

Exercise 19 - Which survey is fairer?

Ms. Lee: $\frac{14}{28} = 0.50$. Mr. Cruz: $\frac{18}{40} = 0.45$.

The class sizes differ, so percents are the fair comparison.

Yes, 50% of Ms. Lee's class compared with 45% of Mr. Cruz's class prefer fall, but the difference is small.

Exercise 20 - Multi-step analysis

Adults: $2400 - 1080 - 720 = 600$.

New teens: $720 \times 1.20 = 864$.

New total: $1080 + 864 + 600 = 2544$.

- a. $\frac{1080}{2544} \approx 0.4245$
- b. $\frac{864}{2544} \approx 0.3396$
- c. $\frac{600}{2544} \approx 0.2358$

Children 42.5%, teens 34.0%, adults 23.6% (they add to 100.1% because of rounding).