

AP Statistics - Mean, Median, Standard Deviation and Outliers - Answer Key

Common Core AP STAT 1.6, AP STAT 1.7, HSS-ID.A.2, HSS-ID.A.3 · maths-pdf.fr/en/

Each solution shows the sorted data, every deviation or fence, and the final value in context. Use the answers to check intermediate steps, not only the last line.

AP Statistics · Common Core State Standards: **AP STAT 1.6, AP STAT 1.7, HSS-ID.A.2, HSS-ID.A.3**

Exercise 1 - Compute a mean

$$\bar{x} = \frac{12+15+9+14+20}{5} = \frac{70}{5} = 14.0.$$

14.0 points.

Exercise 2 - Median of an odd list

Order: 17, 19, 22, 23, 26, 28, 31.

The 4th value of 7 is the median.

23 minutes.

Exercise 3 - Median of an even list

Order: 5, 6, 8, 9, 12, 14.

The middle values are 8 and 9, so $\frac{8+9}{2} = 8.5$.

8.5.

Exercise 4 - Find the missing value

Total needed: $5 \times 84 = 420$. Known total: $90 + 78 + 85 + 81 = 334$.

Fifth score: $420 - 334 = 86$.

86.

Exercise 5 - Range and IQR

Median is 10. Lower half: 4, 6, 7, 9 so $Q_1 = 6.5$. Upper half: 12, 13, 15, 18 so $Q_3 = 14$.

Range: $18 - 4 = 14$. IQR: $14 - 6.5 = 7.5$.

Range 14, Q1 6.5, Q3 14, IQR 7.5.

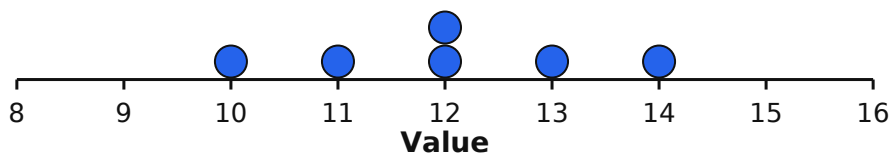
Exercise 6 - Standard deviation by hand

Mean: 7. Deviations: -4, -2, 0, 2, 4. Squares: 16, 4, 0, 4, 16, sum 40.

$$s = \sqrt{\frac{40}{4}} = \sqrt{10} \approx 3.16.$$

3.16.

Exercise 7 - Effect of an outlier



Before the error, mean and median agree.

Before: mean $\frac{72}{6} = 12.00$, median 12. After: mean $\frac{198}{6} = 33.00$, median 12.

The mean jumps from 12.00 to 33.00 but the median stays at 12, so the median is resistant.

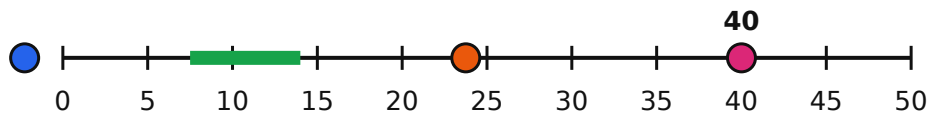
Exercise 8 - Mean versus median

The tail points right, so the mean is greater than the median.

$$\bar{x} = \frac{54}{12} = 4.5.$$

Greater: the mean is 4.5.

Exercise 9 - 1.5 IQR rule



Fences for the data set.

$$Q_1 = 7.5, Q_3 = 14, IQR = 6.5.$$

$$\text{Fences: } 7.5 - 1.5(6.5) = -2.25 \text{ and } 14 + 1.5(6.5) = 23.75.$$

Only 40 lies beyond a fence, so 40 is the lone outlier.

Exercise 10 - Resistant statistics

A resistant statistic changes little when extreme values are added or changed.

Resistant: median and IQR. Not resistant: mean, range, and standard deviation.

Exercise 11 - Add a constant

Adding 5 shifts the center and quartiles by 5 and leaves the spread unchanged.

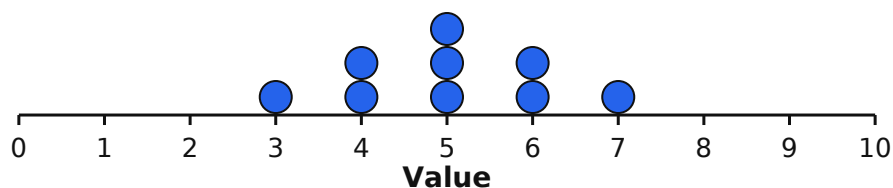
Mean 77, median 79, standard deviation 8, IQR 11.

Exercise 12 - Multiply by a constant

Mean: $1.8(20) + 32 = 68$. The addition of 32 does not change the spread, so $s = 1.8 \times 3 = 5.4$.

Mean 68°F; standard deviation 5.4°F.

Exercise 13 - Compare spreads



Data set A.

A: squares of deviations $4+1+1+0+0+0+1+1+4=12$, $s=\sqrt{12/8}\approx 1.22$.

B: sum of squares $16+9+4+1+0+1+4+9+16=60$, $s=\sqrt{60/8}\approx 2.74$.

B has the larger standard deviation (2.74 compared with 1.22) because its values are more spread out.

Exercise 14 - Mean from a frequency table

Pets	0	1	2	3
Students	5	8	6	6

Pets owned by 25 students.

Total students: $5+8+6+6=25$. Total pets: $0(5)+1(8)+2(6)+3(6)=38$.

Mean: $\frac{38}{25}=1.52$. The 13th value of 25 is in the 1-pet group ($5+8=13$), so the median is 1.

Mean 1.52 pets; median 1 pet.

Exercise 15 - Which measure to report?

Sum: 534; mean $\frac{534}{7}\approx 76.3$. Median: the 4th value, 48.

Mean about \$76,300; median \$48,000. The median is better because the 250 outlier inflates the mean.

Exercise 16 - Combine two means

Total points: $20(80)+30(90)=1600+2700=4300$.

$$\frac{4300}{50}=86.$$

86.

Exercise 17 - Required score

Total needed: $5\times 80=400$. Current total: $72+78+85+77=312$.

$$400 - 312 = 88.$$

At least 88.

Exercise 18 - Full summary

Median $\frac{17+18}{2} = 17.5$. $Q_1 = 15$, $Q_3 = 21$, $IQR = 6$.

Fences: $15 - 9 = 6$ and $21 + 9 = 30$.

Summary 14, 15, 17.5, 21, 41; the value 41 is an outlier.

Exercise 19 - Describe with statistics

Mean: $\frac{579}{9} = 64.3$, greater than the median 61.

The mean is pulled above the median by the 95-pound dog, so the data are skewed right and the median is the better summary.

Exercise 20 - Adding a value

New mean: $\frac{120+50}{6} = \frac{170}{6} \approx 28.3$. New median: ordered 20, 22, 25, 25, 28, 50, so $\frac{25+25}{2} = 25$.

The mean rises from 24 to about 28.3; the median stays 25. The mean changed more.