

Algebra 1
Range, Quartiles, and IQR

Range, Quartiles, and IQR | A1-U10-P02

96 problems · Four activity formats

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Topic focus

Across 96 tasks this topic asks for before/after ordered data, range, quartiles, IQR, and change classification, observed minimum, observed maximum, range, and unit, admissible ordered dataset with range and quartile verification, or impossibility proof, ordered data, halves, Q1, Q3, IQR, unit, and stated convention, cumulative intervals, observed endpoints, range, Q1, Q3, IQR, and unit and error diagnosis, corrected rank or endpoint calculation, and corrected spread statement.

8 PDFs and a README; 69 buyer pages.

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Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

The display order is not numerical order. The exact value-frequency table records points. Identify the smallest and largest observed values and calculate the range with its unit. Use maximum minus minimum, not last minus first. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention.

Value	Frequency
8	1
3	1
11	1

Bank label: _____

The support crosses zero. The exact value-frequency table records degrees. Identify the smallest and largest observed values and calculate the range with its unit. Subtracting a negative endpoint increases the difference. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention.

Value	Frequency
-4	1
2	1
7	1

Bank label: _____

The minimum occurs more than once. The exact value-frequency table records hours. Identify the smallest and largest observed values and calculate the range with its unit. Multiplicity does not change the endpoint distance. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention.

Value	Frequency
2	3
5	1
9	1

Bank label: _____

The maximum has the greatest frequency. The exact value-frequency table records tokens. Identify the smallest and largest observed values and calculate the range with its unit. Range depends on its value, not how often it occurs. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention.

Value	Frequency
1	1
6	2
10	4

Bank label: _____

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Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Both endpoints repeat with different multiplicities. Order these exact observations measured in ratings: 1, 1, 3, 5, 7, 9, 9, 9. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. Use half positions rather than endpoint counts alone. 	A single extreme appears at each end. Order these exact observations measured in units: -100, 2, 3, 4, 5, 6, 7, 100. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. The quartiles come from interior half positions.
Every observed value occurs as a pair. Order these exact observations measured in scores: 1, 1, 3, 3, 5, 5, 7, 7, 9, 9. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. The half boundary cuts between the two copies of 5. 	Each half has its own plateau. Order these exact observations measured in minutes: 2, 2, 2, 4, 6, 8, 8, 8. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. The central split lies between 4 and 6.
Two distant extremes bookend a tight center. Order these exact observations measured in units: -1000, 1, 2, 3, 4, 5, 6, 7, 1000. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. Trace half positions rather than averaging endpoints. 	Several frequency blocks meet quartile boundaries. Order these exact observations measured in ratings: 1, 1, 1, 2, 2, 4, 4, 4, 4, 9, 9, 12. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. Count ordered positions inside each repeated block.

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Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: maximum: $\frac{5}{2}$; minimum: $\frac{1}{2}$; range: 2; unit: meters The five values are deliberately unsorted. Order these exact observations measured in points: 9, 1, 5, 3, 7. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. Remove the third value before finding the two half-medians. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention. Your response: _____	Incoming: convention: exclude overall median for odd sample size; iqr: 11; q1: -4; q3: 7; unit: change units Every observation is below zero. Order these exact observations measured in degrees: -12, -10, -8, -6, -4, -2. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. $Q3$ can be negative while IQR remains nonnegative. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention. Your response: _____
Incoming: convention: exclude overall median for odd sample size; iqr: 6; q1: 4; q3: 10; unit: minutes Seven observations leave three values in each half after exclusion. Order these exact observations measured in pages: 14, 2, 8, 4, 12, 6, 10. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. The overall median belongs to neither half. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention. Your response: _____	Incoming: convention: exclude overall median for odd sample size; iqr: 4; q1: $\frac{5}{2}$; q3: $\frac{13}{2}$; unit: ratings After removing the fifth ordered value, each half has four values. Order these exact observations measured in seconds: 18, 2, 14, 6, 10, 4, 16, 8, 12. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. Average the two middle values within each half. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention. Your response: _____
Incoming: convention: exclude overall median for odd sample size; iqr: 7; q1: $\frac{5}{2}$; q3: $\frac{19}{2}$; unit: minutes Eleven values leave five in each half. Order these exact observations measured in pages: 0, 1, 2, 3, 4, 5, 7, 9, 12, 16, 21. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. $Q1$ and $Q3$ are the third positions of their halves. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention. Your response: _____	Incoming: convention: exclude overall median for odd sample size; iqr: 11; q1: 1; q3: 12; unit: hours Three copies of the median value occupy central positions. Order these exact observations measured in points: 1, 2, 4, 6, 6, 6, 8, 10, 12. Using the median-of-halves convention that excludes the overall median when n is odd, find $Q1$, $Q3$, and IQR. Exclude the fifth position only; the other copies stay in their halves. Match the complete originally requested extrema/quartile/spread response with units and any transformation order statement. Keep the declared median-of-halves convention. Your response: _____

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Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Nine observations are compressed into five rows. Use the exact frequency table of points and the convention that excludes the overall median when n is odd. Locate quartile ranks by cumulative frequency, then report the range, $Q1$, $Q3$, and IQR. Exclude ordered position 5 before splitting. Choose between expanding the frequency table into ordered observations and locating the needed ranks with cumulative frequencies. Justify the efficient choice for these counts, then show the original required rank evidence and apply the stated quartile convention.

Value	Frequency
1	2
3	2
5	1
7	2
9	2

Ten observations occupy three frequency blocks. Use the exact frequency table of minutes and the convention that excludes the overall median when n is odd. Locate quartile ranks by cumulative frequency, then report the range, $Q1$, $Q3$, and IQR. Split positions 1 – 5 and 6 – 10. Choose between expanding the frequency table into ordered observations and locating the needed ranks with cumulative frequencies. Justify the efficient choice for these counts, then show the original required rank evidence and apply the stated quartile convention.

Value	Frequency
2	3
6	4
10	3

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Full Worked Solutions - excerpt

Worked example

Problem. Check the required subtraction direction. Given observations 2, 5, 9, a student states: The range is $2 - 9 = -7$. Under the declared quartile convention, identify the precise error and replace the spread calculation with a correct one.

Answer. correction: the range is 7, a nonnegative distance.; diagnosis: minimum was subtracted in the wrong direction

Explanation and check.

The minimum is 2 and maximum is 9, so $\text{range} = 9 - 2 = 7$. Diagnosis: minimum was subtracted in the wrong direction. Therefore the range is 7, a nonnegative distance.

Worked example

Problem. Distinguish an upper quartile from the distance between quartiles. Given ordered data 0, 2, 4, 6, 8, 10, with $Q1 = 2$ and $Q3 = 8$, a student states: The IQR is 8 because $Q3$ is 8. Under the declared quartile convention, identify the precise error and replace the spread calculation with a correct one.

Answer. correction: $Q3$ is 8 but IQR is 6.; diagnosis: $Q3$ was named as the IQR without subtracting $Q1$

Explanation and check.

$\text{IQR} = Q3 - Q1 = 8 - 2 = 6$. Diagnosis: $Q3$ was named as the IQR without subtracting $Q1$. Therefore $Q3$ is 8 but IQR is 6.