

Data Management Review

Try each problem first. You don't need to finish everything.

Core path ~55 min · Full sheet ~1 h 45 min

Recommended: K1-K5, then one A and one T problem

K = Knowledge & Understanding · A = Application · T = Thinking · Boss = Challenge



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QUICK REFERENCE

Frequency table mean: multiply each value by its frequency, add, then divide by the **total frequency**, not by the number of rows.

Quartiles: Q_1 and Q_3 are the medians of the lower and upper halves; with an odd count, the median belongs to neither half.
 $IQR = Q_3 - Q_1$ is one number. An outlier lies below $Q_1 - 1.5 \times IQR$ or above $Q_3 + 1.5 \times IQR$.

Interpolation stays inside the range of the data; **extrapolation** goes outside it and is less reliable. A strong correlation does not prove that one variable causes the other.

Show your work on separate paper.

Core Skills (K)

Types of Data · Mean, Median, Mode · Quartiles · Lines of Best Fit · Predictions

K1 Circle Graph

A survey asked 40 Grade 9 students how they usually get to school.

Way to school	Walk	Bus	Car	Bike
Students	14	12	10	4

- State whether each variable is categorical, discrete or continuous: (i) way to school, (ii) number of people in a student's household, (iii) time to get to school.
- Determine the percent of students in each category.
- Determine the sector angle of each category in a circle graph.

K2 Summer Reading

The table shows how many books each of 25 students read over the summer.

Books read	0	1	2	3	4	5
Students	2	9	5	4	3	2

- Determine the mean number of books read.
- Determine the median.
- State the mode.

K3 Quartiles and Outliers

Eleven students recorded how many minutes they spent on homework last night:

21, 15, 45, 18, 12, 24, 17, 26, 15, 20, 23

- Determine the five-number summary.

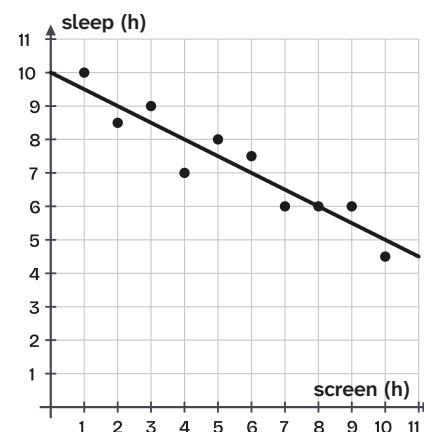
Median: put the data in order first. Odd count: the middle value. Even count: the mean of the two middle values.

Circle graph: sector angle = fraction of the total $\times 360^\circ$.

- Determine the interquartile range.
- Determine the values $Q_1 - 1.5 \times IQR$ and $Q_3 + 1.5 \times IQR$, then identify any outliers.

K4 Screen Time and Sleep

The scatter plot shows the daily screen time and the nightly sleep, in hours, of 10 students, with a line of best fit. Each grid square is 1 hour.



- State the direction and the strength of the correlation.
- Determine the equation of the line of best fit, with x the screen time and y the sleep.
- Use your equation to determine the screen time of a student who sleeps 6.5 hours.

K5 Growing Sunflower

The model $h = 2.5t + 4$ gives the height h , in centimetres, of a sunflower t days after planting. It was built from measurements taken on days 10, 20, 30, 40, 50 and 60.

- Determine h when $t = 35$. State whether this is interpolation or extrapolation.

- b) Determine h when $t = 90$. State whether this is interpolation or extrapolation.
- c) Determine t when the sunflower is 16.5 cm tall. State whether this is interpolation or extrapolation.

Real World (A)

Combined Means · Car Prices · Comparing Box Plots

A1 Two Classes, One Test

Two Grade 9 classes write the same test. Period 1 has 30 students and a mean mark of 70%. Period 2 has 20 students and a mean mark of 78%.

- a) Determine the mean mark of all 50 students.
- b) The teacher finds that one Period 2 mark of 100% was entered as 10%. Determine the corrected Period 2 mean.
- c) A Period 1 student who scored 60% rewrites the test, and the new mark replaces the old one. What mark would raise the Period 1 mean to 72%? Is that possible?

A2 Used Car Prices

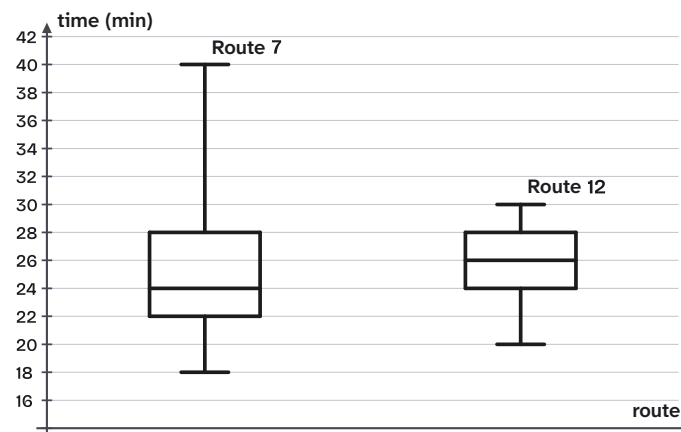
The table shows the age and price of eight used compact cars for sale in Ontario. A line of best fit for the data is $P = -1.8a + 24$, where a is the age in years and P is the price in thousands of dollars.

Age (years)	1	2	3	4	5	6
Price (\$1000s)	22.0	20.5	18.4	17.0	15.2	13.0

- a) Interpret the slope and the P -intercept in this context.
- b) Predict the price of a car that is 4.5 years old. Is this interpolation or extrapolation?
- c) What does the model predict for a 15-year-old car? What does this tell you about using the model?

A3 Which Bus?

Two bus routes take students from the same neighbourhood to school. The box plots show the travel time, in minutes, of each route on the same 20 school days. Each grid square is 2 minutes.



- a) Determine the median and the interquartile range of each route.
- b) A rider says most Route 7 trips take between 28 and 40 minutes, because that part of the plot is the longest. About how many of the 20 trips are in that part?
- c) A student must get to school in 30 minutes or less. On how many of the 20 days did each route do this?

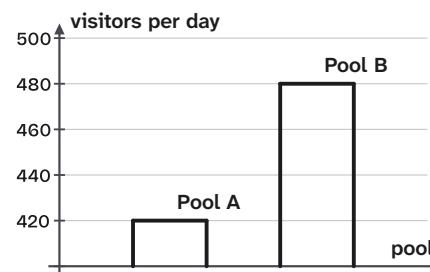
Think It Through (T)

Misleading Graphs · Counterexamples

T1 Spot the Flaw

A town newsletter shows the mean number of daily visitors at its two outdoor pools last summer. A student reads the graph and claims:

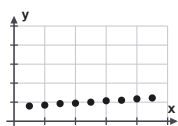
"Pool B gets four times as many visitors as Pool A."



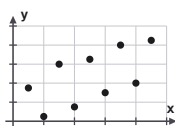
- a) Determine the daily visitors at each pool, and the percent by which Pool B's number is greater than Pool A's.
- b) Explain why the graph makes Pool B look four times as large.
- c) State how to redraw the graph fairly, and the ratio of the bar heights in the fair graph.

T2 Steep Is Not Strong

A student claims: "The steeper the line of best fit, the stronger the correlation."



Graph A



Graph B

- Write four data points that have a perfect positive correlation and a line of best fit with slope $\frac{1}{10}$.
- Graphs A and B use the same scales. Which graph shows the stronger correlation? Which would have the steeper line of best fit?
- Explain what the strength of a correlation describes, and why the student's claim is false.

Boss Level

Optional challenge

Moving the Mean

- The mean of six test scores is 75. After a seventh test, the mean of all seven scores is 78. Find the seventh score.
- Five different positive whole numbers have a median of 10 and a mean of 12. Find the largest possible value of the greatest number.
- For five numbers with the same conditions as in (b), find the smallest possible value of the greatest number.

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