STATISTICS

A STATISTICAL INVESTIGATION

A.1 IDENTIFYING THE STEPS

MCQ 1: The girls' average score in math is 87 (B+), while the boys' average is 75 (C). since $87 > 75$, on average, girls perform better than boys in math.
Which step does this sentence refer to?

- ☐ Step 1: State the Problem
- ☐ Step 2: Collect Data
- ☐ Step 3: Calculate Descriptive Statistics
- ☐ Step 4: Organize and Display Data
- ☒ Step 5: Interpret the Statistics

Answer: Step 5: Interpret the Statistics. This sentence draws a conclusion about what the data means, comparing girls' and boys' preferences based on calculated averages.

MCQ 2: "Do students prefer science over math?"
Which step does this sentence refer to?

- ☒ Step 1: State the Problem
- ☐ Step 2: Collect Data
- ☐ Step 3: Calculate Descriptive Statistics
- ☐ Step 4: Organize and Display Data
- ☐ Step 5: Interpret the Statistics

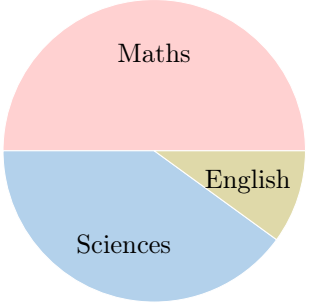
Answer: Step 1: State the Problem. This sentence asks a question to figure out what we want to learn, setting up the investigation.

MCQ 3: "We asked every student in the school to fill out a survey about their favorite subjects."
Which step does this sentence refer to?

- ☐ Step 1: State the Problem
- ☒ Step 2: Collect Data
- ☐ Step 3: Calculate Descriptive Statistics
- ☐ Step 4: Organize and Display Data
- ☐ Step 5: Interpret the Statistics

Answer: Step 2: Collect Data. This sentence describes gathering the information needed for the investigation.

MCQ 4: "We made a pie chart showing how many students chose each subject."



Which step does this sentence refer to?

- ☐ Step 1: State the Problem
- ☐ Step 2: Collect Data
- ☐ Step 3: Calculate Descriptive Statistics
- ☒ Step 4: Organize and Display Data
- ☐ Step 5: Interpret the Statistics

Answer: Step 4: Organize and Display Data. This sentence describes creating a visual representation of the data.

MCQ 5: "The relative frequency of students choosing 'Math' as their favorite subject is 50%."
Which step does this sentence refer to?

- ☐ Step 1: State the Problem
- ☐ Step 2: Collect Data
- ☒ Step 3: Calculate Descriptive Statistics
- ☐ Step 4: Organize and Display Data
- ☐ Step 5: Interpret the Statistics

Answer: Step 3: Calculate Descriptive Statistics. This sentence uses relative frequency to summarize the data collected, showing what portion of students picked 'Math' as their favorite.

B STATING THE PROBLEM

B.1 FINDING POPULATION

MCQ 6: Imagine you're a statistician studying how much time people spend outdoors. Here's your statistical question:**"How many hours do kids spend playing outside each day?"**
Which group is the best population to study for this question?
Check the correct answer:

- ☐ "All the adults in a city."
- ☒ "All the kids in a school."
- ☐ "Every dog in a neighborhood."
- ☐ "All the teachers in a country."

Answer:

- "All the adults in a city." **False** – The question is about kids, not adults.
- "All the kids in a school." **True** – This matches the question, which asks about kids playing outside, and a school is a clear group of kids to study.
- "Every dog in a neighborhood." **False** – Dogs aren't kids and don't play outside in the same way.
- "All the teachers in a country." **False** – Teachers are adults, not kids, so they don't fit the question.

MCQ 7: Imagine you're a statistician studying pets in homes. Here's your statistical question:**"How many families own a pet in our town?"**
Which group is the best population to study for this question?
Check the correct answer:

☐ "All the kids in a playground."

☐ "Every bird in a forest."

☐ "All the workers in a factory."

☒ "All the families in our town."

Answer:

- "All the kids in a playground." **False** – The question is about families, not just kids.
- "Every bird in a forest." **False** – Birds in a forest aren't families or pets, so they don't fit.
- "All the workers in a factory." **False** – Workers are individuals, not families, and the question isn't about them.
- "All the families in our town." **True** – This matches the question, which asks about families owning pets, and the town's families are the right group to study.

MCQ 8: Imagine you're a statistician studying reading habits. Here's your statistical question:**"How many books do students borrow from the school library each month?"**
Which group is the best population to study for this question?
Check the correct answer:

☐ "All the librarians in a state."

☒ "All the students in a school."

☐ "Every book in a bookstore."

☐ "All the parents in a neighborhood."

Answer:

- "All the librarians in a state." **False** – The question is about students, not librarians.
- "All the students in a school." **True** – This matches the question, which asks about students borrowing books, and a school's students are the perfect group to study.
- "Every book in a bookstore." **False** – Books aren't people and don't borrow; the question is about students.
- "All the parents in a neighborhood." **False** – Parents aren't students and don't borrow from the school library in this context."

MCQ 9: Imagine you're a statistician studying nature. Here's your statistical question:**"How tall are the oak trees in a national park?"**
Which group is the best population to study for this question?
Check the correct answer:

☒ "All the oak trees in a national park."

☐ "All the rivers in a country."

☐ "Every cloud in the sky."

☐ "All the rocks on a mountain."

Answer:

- "All the oak trees in a national park." **True** – This matches the question, which asks about the height of oak trees, and the oak trees in a national park are the right group to study.
- "All the rivers in a country." **False** – The question is about oak trees, not rivers.
- "Every cloud in the sky." **False** – Clouds don't have height like trees and aren't related to the question.
- "All the rocks on a mountain." **False** – Rocks aren't trees, so they don't fit the question.

B.2 SORTING DATA TYPES

MCQ 10: What type of data is this variable: favorite subject (e.g., Maths, Science, English)?

☐ Quantitative variable

☒ Qualitative variable

Answer: Qualitative variable. "Favorite subject" puts subjects into groups like Maths, Science, or English—it's not a number you measure.

MCQ 11: What type of data is this variable: number of siblings?

☒ Quantitative variable

☐ Qualitative variable

Answer: Quantitative variable. "Number of siblings" is a number you can count, like 1, 2, or 3.

MCQ 12: What type of data is this variable: type of vehicle (e.g., car, bicycle, bus)?

☐ Quantitative variable

☒ Qualitative variable

Answer: Qualitative variable. "Type of vehicle" sorts vehicles into groups like car, bicycle, or bus—it's not something you measure with numbers.

MCQ 13: What type of data is this variable: height of students (in cm)?

☒ Quantitative variable

☐ Qualitative variable

Answer: Quantitative variable. "Height of students" is a number you measure, like 150 cm or 165 cm.

MCQ 14: What type of data is this variable: level of education (e.g., high school, bachelor's, master's)?

☐ Quantitative variable

☒ Qualitative variable

Answer: Qualitative variable. "Level of education" puts people into groups like high school or bachelor's—it's not a number you count or measure.

MCQ 15: What type of data is this variable: annual income (in dollars)?

☒ Quantitative variable

☐ Qualitative variable

Answer: Quantitative variable. "Annual income" is a number you measure, like $30,000 or $50,000.

C COLLECTING DATA

C.1 CHOOSING CENSUS OR SURVEY

MCQ 16: You want to find the proportion of girls in a class. Do you use:

☐ Survey

☒ Census

Answer: Census. A class is small, so you can ask every student and get the exact proportion of girls.

MCQ 17: You want to know how students feel about the new cafeteria menu. Do you use:

☒ Survey

☐ Census

Answer: Survey. There are too many students to ask everyone, so you check with just some of them to get an idea.

MCQ 18: You need to elect the Grade 7 class representative. Do you use:

☐ Survey

☒ Census

Answer: Census. For a fair election, you ask every student in the class to vote, not just a few.

MCQ 19: You want to find out if students across the country have faced physical violence this year. Do you use:

☒ Survey

☐ Census

Answer: Survey. There are way too many students nationwide to ask everyone, so you ask a smaller group to get a sense of it.

D DESCRIPTIVE STATISTICS

D.1 SPOTTING STATISTICS

MCQ 20: "Su averages 14.6 points per game."
Is this an example of statistics?

☒ Yes

☐ No

Answer: Yes, "Su averages 14.6 points per game" is an example of statistics. It's a number that sums up how Su has performed across multiple games, not just one.

MCQ 21: "John's height is 180 cm."
Is this an example of statistics?

☐ Yes

☒ No

Answer: No, "John's height is 180 cm" is not statistics. It's just one measurement about one person, not a summary of many measurements.

MCQ 22: "The average temperature in July is 25°C."
Is this an example of statistics?

☒ Yes

☐ No

Answer: Yes, "The average temperature in July is 25°C" is statistics. It combines temperature data from many days into one number.

MCQ 23: "Emily's favorite color is blue."
Is this an example of statistics?

☐ Yes

☒ No

Answer: No, "Emily's favorite color is blue" is not statistics. It's just one person's preference, not a summary of data from a group.

MCQ 24: "On average, students in the class scored 85% on the exam."
Is this an example of statistics?

☒ Yes

☐ No

Answer: Yes, "On average, students in the class scored 85% on the exam" is statistics. It sums up how the whole class did on the exam in one number.

MCQ 25: "The median income in the city is $50,000."
Is this an example of statistics?

☒ Yes

☐ No

Answer: Yes, "The median income in the city is $50,000" is statistics. It's a number that summarizes the incomes of many people in the city.

E DESCRIPTIVE STATISTICS: RELATIVE FREQUENCY

E.1 CALCULATING RELATIVE FREQUENCIES WITH 2 CATEGORIES

Ex 26: A class of 25 students was surveyed about their gender. Compute the percentages (rounded to one decimal place):

Gender	Frequency	Relative Frequency (%)
Girls	13	52 %
Boys	12	48 %
Total	25	100%

Answer: Here's how to calculate each percentage:

Gender	Frequency	Relative Frequency (%)
Girls	13	$\frac{13}{25} \times 100\% = 52\%$
Boys	12	$\frac{12}{25} \times 100\% = 48\%$
Total	25	100%

The percentage of girls is 52% and the percentage of boys is 48%.

Ex 27: A class of 25 students took a quiz, and their results were recorded. Compute the percentages (rounded to one decimal place):

Result	Frequency	Relative Frequency (%)
Pass	15	60 %
Fail	10	40 %
Total	25	100%

Answer: Here's how to calculate each percentage:

Result	Frequency	Relative Frequency (%)
Pass	15	$\frac{15}{25} \times 100\% = 60\%$
Fail	10	$\frac{10}{25} \times 100\% = 40\%$
Total	25	100%

The percentage of students who passed is 60%, and the percentage who failed is 40%.

Ex 28: A basketball player attempted 50 shots during practice. Compute the shooting percentages (rounded to one decimal place):

Outcome	Frequency	Relative Frequency (%)
Success	32	64 %
Miss	18	36 %
Total	50	100%

Answer:

Outcome	Frequency	Relative Frequency (%)
Success	32	$\frac{32}{50} \times 100\% = 64\%$
Miss	18	$\frac{18}{50} \times 100\% = 36\%$
Total	50	100%

The success rate is 64%.

Ex 29: A company tested 70 new light bulbs to see if they would last over 1,000 hours. Compute the success percentages (rounded to one decimal place):

Outcome	Frequency	Relative Frequency (%)
Success	49	70 %
Miss	21	30 %
Total	70	100%

Answer:

Outcome	Frequency	Relative Frequency (%)
Success	49	$\frac{49}{70} \times 100\% = 70\%$
Miss	21	$\frac{21}{70} \times 100\% = 30\%$
Total	70	100%

The success rate is 70%.

E.2 CALCULATING RELATIVE FREQUENCIES

Ex 30: In a middle school, students were asked what their favorite animal was. Fill in the relative frequencies (round to 1 decimal place):

Pet	Frequency	Relative Frequency (%)
Cats	18	45 %
Dogs	14	35 %
Hamsters	5	12.5 %
Fish	3	7.5 %
Total	40	100%

Answer: Here's how to calculate each relative frequency:

Pet	Frequency	Relative Frequency (%)
Cats	18	$\frac{18}{40} \times 100\% = 45\%$
Dogs	14	$\frac{14}{40} \times 100\% = 35\%$
Hamsters	5	$\frac{5}{40} \times 100\% = 12.5\%$
Fish	3	$\frac{3}{40} \times 100\% = 7.5\%$
Total	40	100%

Ex 31: A group of 50 students chose their favorite fruit. Fill in the relative frequencies (round to 1 decimal place):

Fruit	Frequency	Relative Frequency (%)
Apples	20	40 %
Bananas	15	30 %
Cherries	10	20 %
Grapes	5	10 %
Total	50	100%

Answer: Here's how to calculate each relative frequency:

Fruit	Frequency	Relative Frequency (%)
Apples	20	$\frac{20}{50} \times 100\% = 40\%$
Bananas	15	$\frac{15}{50} \times 100\% = 30\%$
Cherries	10	$\frac{10}{50} \times 100\% = 20\%$
Grapes	5	$\frac{5}{50} \times 100\% = 10\%$
Total	50	100%

Ex 32: In a middle school, students were asked what their favorite means of transportation was. Fill in the relative frequencies (round to 1 decimal place):

Mode of Transportation	Frequency	Relative Frequency (%)
Bus	35	43.8 %
Bicycle	25	31.3 %
Walking	15	18.8 %
Car	5	6.3 %
Total	80	100%

Answer: Here's how to calculate each relative frequency:

Mode of Transportation	Frequency	Relative Frequency (%)
Bus	35	$\frac{35}{80} \times 100\% \approx 43.8\%$
Bicycle	25	$\frac{25}{80} \times 100\% \approx 31.3\%$
Walking	15	$\frac{15}{80} \times 100\% \approx 18.8\%$
Car	5	$\frac{5}{80} \times 100\% \approx 6.3\%$
Total	80	100%

Ex 33: In a middle school, students were asked what their favorite music genre was. Fill in the relative frequencies (round to 1 decimal place):

Type of Music	Frequency	Relative Frequency (%)
Pop	40	40 %
Rock	30	30 %
Classical	20	20 %
Jazz	10	10 %
Total	100	100%

Answer: Here's how to calculate each relative frequency:

Type of Music	Frequency	Relative Frequency (%)
Pop	40	$\frac{40}{100} \times 100\% = 40\%$
Rock	30	$\frac{30}{100} \times 100\% = 30\%$
Classical	20	$\frac{20}{100} \times 100\% = 20\%$
Jazz	10	$\frac{10}{100} \times 100\% = 10\%$
Total	100	100%

F DESCRIPTIVE STATISTICS: CENTRAL TENDENCY

F.1 FINDING THE MODE

Ex 34: Look at this frequency table showing marks:

Marks	Frequency
A	10
B	22
C	19
D	15
E	6

What's the mode?

B mark

Answer: The mode is B because it has the highest frequency (22).

Ex 35: Check this frequency table for modes of transport:

Mode of Transport	Frequency
Bus	18
Bicycle	12
Car	8
Walking	14
Train	6

What's the mode?

Answer: The mode is Bus because it has the highest frequency (18).

Ex 36: Look at this frequency table showing favorite fruits:

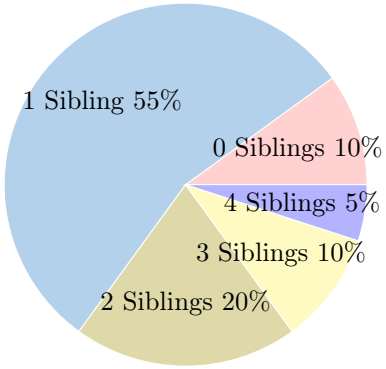
Fruit	Frequency
Apple	14
Banana	20
Orange	12
Grapes	10
Mango	16

What's the mode?

Banana fruit

Answer: The mode is Banana because it has the highest frequency (20).

Ex 37: 30 students were asked how many siblings they have, and the results are shown in this pie chart:



What's the mode?

1 Sibling

Answer: The mode is 1 Sibling because it's the most common, with 55% .

F.2 CALCULATING A MEAN

Ex 38: Over the last 5 basketball games, I scored these points: 15, 20, 10, 2, and 5.
Find the mean score:

10.4 points

Answer: Here's how to find the mean:

$$\begin{aligned}\text{mean} &= \frac{\text{sum of all points}}{\text{number of games}} \\ &= \frac{15+20+10+2+5}{5} \\ &= 10.4\end{aligned}$$

Ex 39: Over the last 5 days, I earned these tips as a waiter: 12, 18, 15, 22, and 28.
Find the mean tip:

19 dollars

Answer: Here's how to find the mean:

$$\begin{aligned}\text{mean} &= \frac{\text{sum of all tips}}{\text{number of days}} \\ &= \frac{12+18+15+22+28}{5} \\ &= 19\end{aligned}$$

Ex 40: Over the last 7 days, I read these numbers of pages: 30, 25, 35, 40, 20, 15, and 45.
Find the mean number of pages:

$\boxed{30}$ pages

Answer: Here's how to find the mean:

$$\begin{aligned}\text{mean} &= \frac{\text{sum of all pages}}{\text{number of days}} \\ &= \frac{30+25+35+40+20+15+45}{7} \\ &= 30\end{aligned}$$

Ex 41: Over the last 6 days, I spent these amounts on lunch: 8, 12, 10, 15, 9, and 11.
Find the mean cost:

$\boxed{10.8}$ dollars

Answer: Here's how to find the mean:

$$\begin{aligned}\text{mean} &= \frac{\text{sum of all costs}}{\text{number of days}} \\ &= \frac{8+12+10+15+9+11}{6} \\ &= 10.8\end{aligned}$$

F.3 CALCULATING A MEDIAN

Ex 42: A café tracked hourly customers:

$$12, 8, 15, 10, 14, 11, 9$$

Calculate the median number of customers.

$\boxed{11}$

Answer: Ordered data:

$$8, 9, 10, 11, 12, 14, 15$$

With 7 values (odd), the median is the 4th term: 11 customers.

Ex 43: A fitness group recorded their daily exercise minutes (Monday-Friday):

$$25, 40, 30, 45, 35$$

Find the median exercise time.

$\boxed{35}$

Answer: First, order the data:

$$25, 30, 35, 40, 45$$

For 5 values (odd), the median is the 3rd term: 35 minutes.

Ex 44: Family savings (in \$) over 6 months:

$$120, 80, 150, 90, 200, 110$$

Determine the median savings.

$\boxed{115}$

Answer: Ordered data:

$$80, 90, 110, 120, 150, 200$$

For 6 values (even), median = average of 3rd and 4th terms:

$$\frac{110+120}{2} = 115$$

Ex 45: A group of students reported the number of books they read in a month as follows:

$$1, 3, 4, 2, 5, 3, 6, 4, 3, 2$$

Determine the median of this dataset.

$\boxed{3}$

Answer: First, arrange the data in ascending order:

$$1, 2, 2, 3, 3, 3, 4, 4, 5, 6$$

With 10 values (an even number), the median is the average of the two middle values, which are the 5th and 6th terms:

$$\frac{3+3}{2} = 3$$

Thus, the median is 3.

G DESCRIPTIVE STATISTICS: DISPERSION

G.1 CALCULATING A RANGE

Ex 46: The following data shows the math marks (out of 20) obtained by a group of students:

$$4, 12, 9, 7, 11, 15, 8, 6, 14$$

Find the range of the marks.

$\boxed{11}$

Answer:

- The minimum mark is 4.
- The maximum mark is 15.
- The range is: $15 - 4 = 11$.

Ex 47: The following data shows the average monthly temperatures (in °C) in Montréal over a year:

$$-10, -7, 0, 7, 14, 19, 22, 21, 16, 9, 2, -5$$

Find the **range** of temperatures.

$\boxed{32}$

Answer:

- The minimum temperature is -10°C.
- The maximum temperature is 22°C.
- The range is: $22 - (-10) = 32$°C.

Ex 48: The following data shows the speeds (in km/h) recorded by a radar on a highway during 12 different times of the day:

88.4, 91.0, 95.7, 102.3, 89.6, 100.0, 97.5, 92.1, 94.3, 90.8, 93.2, 96.6

Find the **range** of the speeds.

$\boxed{13.9}$

Answer:

- The minimum speed is 88.4 km/h.
- The maximum speed is 102.3 km/h.
- The range is: $102.3 - 88.4 = 13.9$ km/h.

Ex 49: The following data shows the weights (in kg) of 10 packages stored in a warehouse:

4.2, 3.8, 5.5, 6.1, 4.9, 3.6, 4.4, 5.2, 6.7, 3.9

Find the **range** of the weights.

$\boxed{3.1}$

Answer:

- The minimum weight is 3.6 kg.
- The maximum weight is 6.7 kg.
- The range is: $6.7 - 3.6 = 3.1$ kg.

G.2 CALCULATING A INTERQUARTILE RANGE

Ex 50: The following data shows the marks (out of 20) obtained by 9 students in a math exam:

1, 19, 10, 2, 18, 11, 5, 15, 10

Find the **interquartile range** of the marks.

$\boxed{13}$

Answer:

- First, order the data:

$$1, 2, 5, 10, 10, 11, 15, 18, 19$$

- The median (Q2) is the middle value: 10
- Split the data into two halves:
  - Lower half (before the median): 1, 2, 5, 10
  - Upper half (after the median): 11, 15, 18, 19
- Find the quartiles:
  - $Q_1 = \frac{2+5}{2} = 3.5$
  - $Q_3 = \frac{15+18}{2} = 16.5$
- So, the interquartile range is:

$$Q_3 - Q_1 = 16.5 - 3.5 = 13$$

Ex 51: The following data shows the average monthly temperatures (in °C) in Montréal over a year:

$$-10, -7, 0, 7, 14, 19, 22, 21, 16, 9, 2, -5$$

Find the **interquartile range** of the temperatures.

$\boxed{25}$

Answer:

- First, order the data:

$$-10, -7, -5, 0, 2, 7, 9, 14, 16, 19, 21, 22$$

- The median (Q2) is the average of the two middle values: $\frac{7+9}{2} = 8$
- Split the data into two halves (excluding the median values):
  - Lower half: $-10, -7, -5, 0, 2$
  - Upper half: $14, 16, 19, 21, 22$
- Find the quartiles:
  - Q_1 = middle of $-10, -7, -5, 0, 2 = -5$
  - Q_3 = middle of $14, 16, 19, 21, 22 = 19$
- So, the interquartile range is:

$$Q_3 - Q_1 = 19 - (-5) = \mathbf{24}$$

Ex 52: The following data shows the speeds (in km/h) recorded by a radar for 11 cars:

88, 95, 102, 91, 87, 98, 105, 93, 89, 100, 92

Find the **interquartile range** of the speeds.

$\boxed{10}$

Answer:

- First, order the data:

$$87, 88, 89, 91, 92, 93, 95, 98, 100, 102, 105$$

- The median (Q2) is the 6th value: 93
- Split the data into two halves:
  - Lower half: $87, 88, 89, 91, 92 \rightarrow Q_1 = 89$
  - Upper half: $95, 98, 100, 102, 105 \rightarrow Q_3 = 99$
- So, the interquartile range is:

$$Q_3 - Q_1 = 99 - 89 = \mathbf{10}$$

Ex 53: The following data shows the weights (in kg) of 10 packages stored in a warehouse:

4.2, 3.5, 6.1, 5.0, 4.8, 3.9, 6.7, 5.5, 4.4, 5.2

Find the **interquartile range** of the weights.

1.4

Answer:

- First, order the data:

$$3.5,\ 3.9,\ 4.2,\ 4.4,\ 4.8,\ 5.0,\ 5.2,\ 5.5,\ 6.1,\ 6.7$$

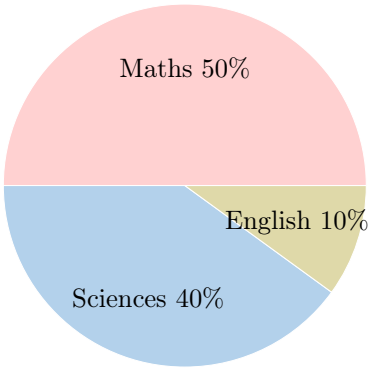
- The median (Q2) is the average of the 5th and 6th values: $\frac{4.8+5.0}{2} = 4.9$
- Split the data into two halves (excluding the two median values):
  - Lower half: $3.5,\ 3.9,\ 4.2,\ 4.4 \rightarrow Q_1 = \frac{3.9+4.2}{2} = 4.05$
  - Upper half: $5.2,\ 5.5,\ 6.1,\ 6.7 \rightarrow Q_3 = \frac{5.5+6.1}{2} = 5.8$
- So, the interquartile range is:

$$Q_3 - Q_1 = 5.8 - 4.05 = \mathbf{1.75}$$

H ORGANIZING AND DISPLAYING DATA

H.1 UNDERSTANDING PIE CHARTS AND BAR CHARTS

Ex 54: 30 randomly selected students were asked to name their favorite subject at school. The results of the survey are displayed in the graph.



1. What sort of graph is being used?

Pie chart

2. Which was the most favoured subject?

Maths

3. What percentage of the students named Sciences as their favorite subject?

40 %

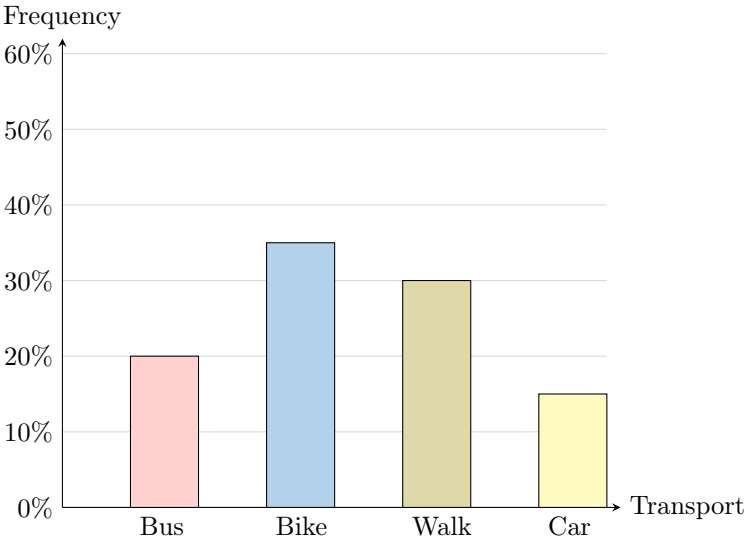
4. What percentage of the students chose either Maths or Sciences as their favorite subject?

90 %

Answer:

1. The type of graph being used is a pie chart.
2. The most favoured subject is Maths.
3. The percentage of students who named Sciences as their favorite subject is 40%.
4. The percentage of students who chose either Maths or Sciences as their favorite subject is $50\% + 40\% = 90\%$.

Ex 55: 200 randomly selected students were asked how they travel to school. The results of the survey are displayed in the graph.



1. What sort of graph is being used?

Bar chart

2. Which was the most common mode of transportation?

Bike

3. What percentage of the students travel to school by bike?

35 %

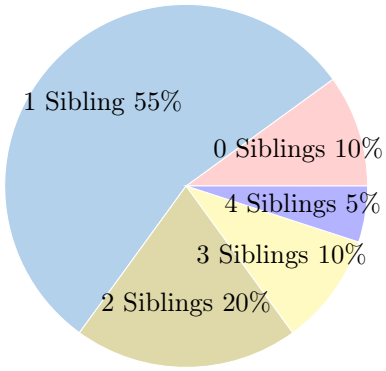
4. What percentage of the students travel to school either by bus or bike?

55 %

Answer:

1. The type of graph being used is a bar chart.
2. The most common mode of transportation is Bike.
3. The percentage of students who travel to school by bike is 35%.
4. The percentage of students who travel to school either by bus or bike is $20\% + 35\% = 55\%$.

Ex 56: 30 randomly selected students were asked to state the number of siblings they have. The results of the survey are displayed in the graph.



1. What sort of graph is being used?

Pie chart

2. Which number of siblings is the most common?

1 Sibling

3. What percentage of the students have 2 siblings?

20 %

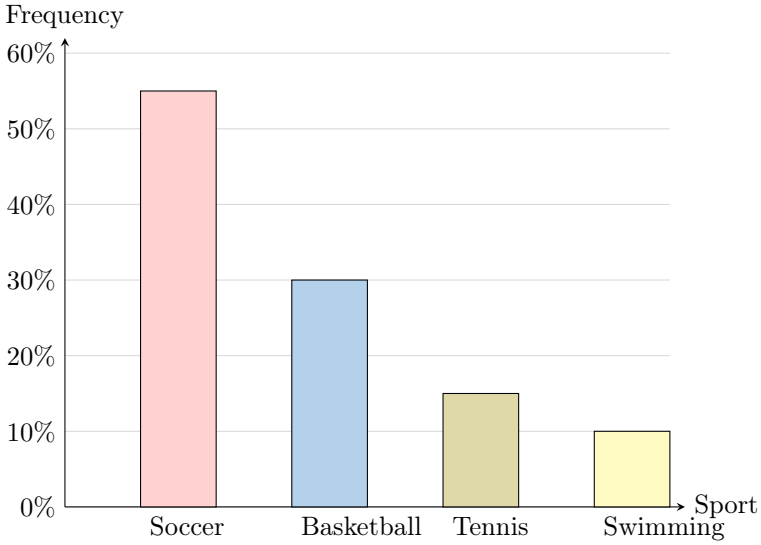
4. What percentage of the students have at least 1 sibling?

90 %

Answer:

1. The type of graph being used is a pie chart.
2. The most common number of siblings is 1.
3. The percentage of students who have 2 siblings is 20%.
4. The percentage of students who have at least 1 sibling is $55\% + 20\% + 10\% + 5\% = 90\%$.

Ex 57: 30 randomly selected students were asked to name their favorite sport. The results of the survey are displayed in the graph.



1. What sort of graph is being used?

Bar chart

2. Which was the most favoured sport?

Soccer

3. What percentage of the students named Basketball as their favorite sport?

30 %

4. What percentage of the students chose either Soccer or Basketball as their favorite sport?

85 %

Answer:

1. The type of graph being used is a bar chart.
2. The most favoured sport is Soccer.
3. The percentage of students who named Basketball as their favorite sport is 30%.
4. The percentage of students who chose either Soccer or Basketball as their favorite sport is $55\% + 30\% = 85\%$.

I INTERPRETING THE STATISTICS

I.1 INTERPRETING RELATIVE FREQUENCY

MCQ 58: Here's a table showing the relative frequency of students' favorite subject:

Subject	Relative Frequency (%)
Maths	46%
Science	44%
English	10%

Check the statements that are true:

☒ Maths is the most popular subject among students.

☒ English is the least popular subject among students.

☒ Maths and Science are almost equally popular among students.

☐ Students get good grades in Maths.

☐ English is the most popular subject among students.

Answer:

- Maths is the most popular subject among students. **True** – At 46%, Maths has the highest percentage.
- English is the least popular subject among students. **True** – English has the lowest percentage at 10%.
- Maths and Science are almost equally popular among students. **True** – Maths (46%) and Science (44%) are very close.
- Students get good grades in Maths. **False** – This table is about favorites, not grades.

- English is the most popular subject among students. **False** – English is the least popular, not the most.

MCQ 59: This table shows the relative frequency of beverage children drink:

Beverage	Relative Frequency (%)
Water	55%
Juice	30%
Soda	10%
Milk	5%

Check the statements that are true:

☒ Water is the most popular beverage among children.

☒ Milk is the least popular beverage among children.

☐ Soda is more popular than Juice.

☐ Milk is the most popular beverage.

☒ Water makes up more than half of all drinks.

☒ Juice and Soda together are less popular than Water alone.

Answer:

- Water is the most popular beverage among children. **True** – Water has the highest percentage at 55%.
- Milk is the least popular beverage among children. **True** – Milk is the lowest at 5%.
- Soda is more popular than Juice. **False** – Juice (30%) beats Soda (10%).
- Milk is the most popular beverage. **False** – Milk is the least popular at 5%.
- Water makes up more than half of all drinks. **True** – 55% is over half.
- Juice and Soda together are less popular than Water alone. **True** – Juice (30%) + Soda (10%) = 40%, less than Water's 55%.

MCQ 60: This table shows how students get to school, based on relative frequency:

Transportation	Relative Frequency (Bus
40%	Walking
30%	Bicycle
20%	Car
10%	

Check the statements that are true:

☒ The Bus is the most popular way to get to school.

☒ The Car is the least popular way to get to school.

☐ Walking and Bicycle are equally popular.

☐ More students walk than take the Bus.

☒ Bicycle and Car together are less popular than the Bus alone.

☐ Walking is the most popular way to get to school.

Answer:

- The Bus is the most popular way to get to school. **True** – Bus has the highest percentage at 40%.
- The Car is the least popular way to get to school. **True** – Car is the lowest at 10%.
- Walking and Bicycle are equally popular. **False** – Walking (30%) is more popular than Bicycle (20%).
- More students walk than take the Bus. **False** – Bus (40%) beats Walking (30%).
- Bicycle and Car together are less popular than the Bus alone. **True** – Bicycle (20%) + Car (10%) = 30%, less than Bus (40%).
- Walking is the most popular way to get to school. **False** – Bus is the most popular, not Walking.

MCQ 61: Here's a table showing the relative frequency of student's favorite pet:

Pet Type	Relative Frequency (Dogs
50%	Cats
30%	Fish
15%	Birds
5%	

Check the statements that are true:

☒ Dogs are the most popular pets among students.

☒ Birds are the least popular pets among students.

☒ More students own Cats than Fish.

☒ Dogs and Cats together make up more than 75% of all pets.

☐ Birds are more popular than Fish.

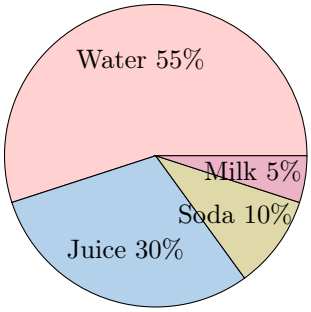
☐ Dogs cost more than Cats.

Answer:

- Dogs are the most popular pets among students. **True** – Dogs have the highest percentage at 50%.
- Birds are the least popular pets among students. **True** – Birds are the lowest at 5%.
- More students own Cats than Fish. **True** – Cats (30%) outnumber Fish (15%).
- Dogs and Cats together make up more than 75% of all pets. **True** – Dogs (50%) + Cats (30%) = 80%, which is over 75%.
- Birds are more popular than Fish. **False** – Fish (15%) beat Birds (5%).
- Dogs cost more than Cats. **False** – This table is about ownership, not cost.

I.2 INTERPRETING RELATIVE FREQUENCY

Ex 62: Here's a pie chart showing what kids drink most often:



Answer these questions based on the pie chart:

1. Which drink do kids choose the most?

   Water

2. Which drink do kids choose the least?

   Milk

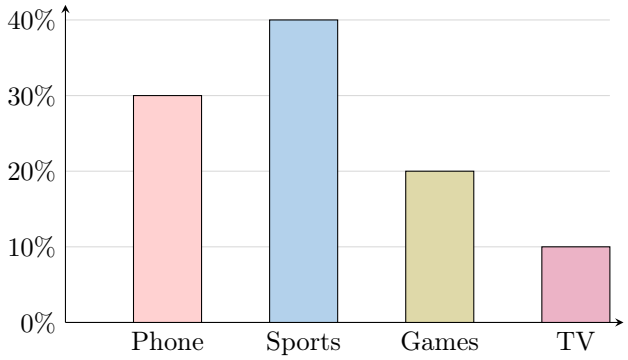
3. Do more kids drink soda than juice?

   No

Answer:

1. Water – It's the biggest slice at 55%.
2. Milk – It's the smallest slice at 5%.
3. No – Juice (30%) is more than Soda (10%).

Ex 63: This bar graph shows how students spend their free time:



Answer these questions based on the bar graph:

1. What's the most popular activity?

   Sports

2. What's the least popular activity?

   TV

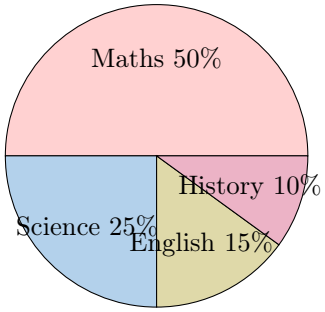
3. Do more students play games than use their phones?

   No

Answer:

1. Sports – It's the tallest bar at 40%.
2. TV – It's the shortest bar at 10%.
3. No – Phones (30%) are more popular than Games (20%).

Ex 64: This pie chart shows how much time students spend studying different subjects:



Answer these questions based on the pie chart:

1. Which subject gets the most study time?

   Maths

2. Which subject gets the least study time?

   History

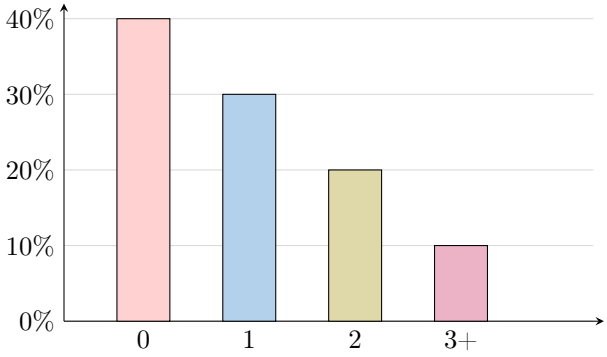
3. Do students spend more time on English than Science?

   No

Answer:

1. Maths – It's the biggest slice at 50%.
2. History – It's the smallest slice at 10%.
3. No – Science (25%) is more than English (15%).

Ex 65: This bar graph shows how many siblings students have:



Answer these questions based on the bar graph:

1. What's the most common number of siblings?

   0

2. What's the least common number of siblings?

   3+

3. Do more students have 1 sibling than none?

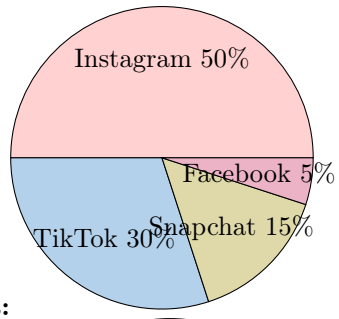
No

Answer:

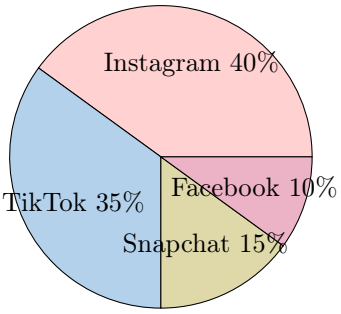
1. 0 – It's the tallest bar at 40%.
2. 3+ – It's the shortest bar at 10%.
3. No – 0 siblings (40%) is more than 1 sibling (30%).

I.3 COMPARING USING PIE CHARTS

MCQ 66: Here are pie charts showing the favorite social media apps for girls and boys:



Girls:



Boys:

Check the true statements about these favorite apps:

☒ "Instagram is the top app for both girls and boys."

☒ "Boys like Facebook more than girls do."

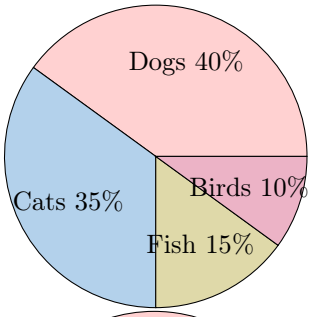
☐ "Girls like TikTok more than boys do."

☒ "Snapchat is just as popular with girls as with boys."

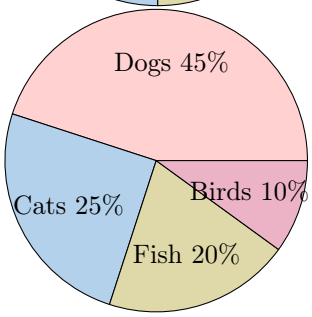
Answer:

- "Instagram is the top app for both girls and boys." **True** – It's the biggest slice for girls (50%) and boys (40%).
- "Boys like Facebook more than girls do." **True** – Boys have 10% for Facebook, while girls have 5%.
- "Girls like TikTok more than boys do." **False** – Girls have 30% for TikTok, but boys have 35%.
- "Snapchat is just as popular with girls as with boys." **True** – Both have 15% for Snapchat.

MCQ 67: Here are pie charts showing the favorite pets for girls and boys:



Girls:



Boys:

Check the true statements about these favorite pets:

☒ "Dogs are the favorite pet for both girls and boys."

☒ "Girls like cats more than boys do."

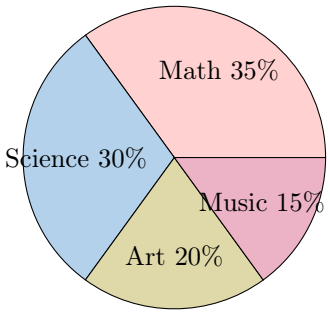
☐ "Boys like fish less than girls do."

☒ "Birds are equally popular with girls and boys."

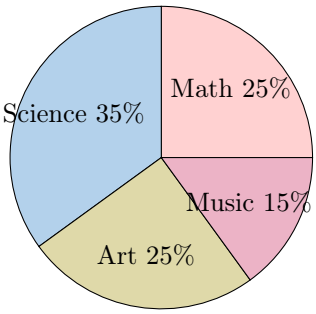
Answer:

- "Dogs are the favorite pet for both girls and boys." **True** – Dogs have the biggest slice for girls (40%) and boys (45%).
- "Girls like cats more than boys do." **True** – Girls have 35% for cats, while boys have 25%.
- "Boys like fish less than girls do." **False** – Boys have 20% for fish, while girls have 15%.
- "Birds are equally popular with girls and boys." **True** – Both have 10% for birds.

MCQ 68: Here are pie charts showing the favorite school subjects in Country A and Country B:



Country A:



Country B:

Check the true statements about these favorite subjects:

☒ "Country A loves math more than Country B does."

☐ "Science is the least favorite subject in Country B."

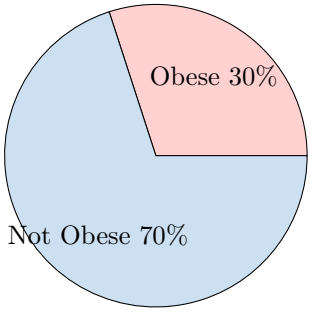
☒ "Art is more popular in Country B than in Country A."

☒ "Music has the same fans in both countries."

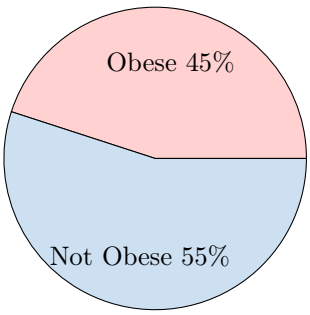
Answer:

- "Country A loves math more than Country B does." **True** – Country A has 35% for math, while Country B has 25%.
- "Science is the least favorite subject in Country B." **False** – Science is 35% in Country B, the highest, not the lowest (Music is 15%).
- "Art is more popular in Country B than in Country A." **True** – Country B has 25% for art, while Country A has 20%.
- "Music has the same fans in both countries." **True** – Both have 15% for music.

MCQ 69: Here are pie charts showing the percentage of adults who are obese in Country A and Country B:



Country A:



Country B:

Check the true statements about obesity in these countries:

☒ "Country B has a bigger obesity problem than Country A."

☐ "More than half of adults in Country A are obese."

☒ "Country A has more non-obese adults than Country B."

☒ "The obesity rate in Country B is higher than 40%."

Answer:

- "Country B has a bigger obesity problem than Country A." **True** – Country B has 45% obese, while Country A has 30%.
- "More than half of adults in Country A are obese." **False** – Country A has 30% obese, which is less than 50%.
- "Country A has more non-obese adults than Country B." **True** – Country A has 70% non-obese, while Country B has 55%.
- "The obesity rate in Country B is higher than 40%." **True** – Country B's obesity rate is 45%, which is above 40%.

I.4 COMPARING USING CENTRAL TENDENCIES

Ex 70: The girls' average score in math is 87 (B+), while the boys' average is 75 (C). Are girls better at math?

Yes, since $87 > 75$, on average, girls perform better than boys in math.

Answer: Yes, since $87 > 75$, on average, girls perform better than boys in math.

Ex 71: The average salary of employees in Company A is \$65,000, while in Company B, it is \$58,000. Does Company A pay higher salaries on average?

Yes, since \$65,000 > \$58,000, employees at Company A earn more on average.

Answer: Yes, since \$65,000 > \$58,000, employees at Company A earn more on average.

Ex 72: The mean summer temperature in City P is 26°C, while in City Q, it is 29°C. Which city is hotter on average?

City Q, since 29°C > 26°C, making it the hotter city on average.

Answer: City Q, since 29°C > 26°C, making it the hotter city on average.

Ex 73: The mean household income in Neighborhood A is \$82,000, while in Neighborhood B it is \$68,500. Which neighborhood has a higher central tendency in income?

Neighborhood A, since \$82,000 > \$68,500, indicating higher typical household income.

Answer: Neighborhood A, since \$82,000 > \$68,500, indicating higher typical household income.

I.5 INTERPRETING CENTRAL TENDENCY

MCQ 74: In a math exam, the median score for a class was 40 out of 100. To pass, students needed at least 50 out of 100.

Check the statements that are true for the teacher:

☐ "Oh no! Every student failed the exam."

☒ "Oh no! More than half the students failed the exam."

☐ "Why didn't we use the CommeUnJeu platform to help them pass?"

☒ "The class didn't do very well."

Answer:

- "Oh no! Every student failed the exam." **False** – The median is 40/100, so half scored below 40, but some could still have scored above 50 and passed.
- "Oh no! More than half the students failed the exam." **True** – Since the median (40) is below the passing score (50), at least half scored less than 50 and failed.
- "Why didn't we use the CommeUnJeu platform to help them pass?" **False** – This is about a teaching choice, not the exam results themselves.
- "The class didn't do very well." **True** – A median of 40, below the passing mark, shows the class struggled overall.

MCQ 75: In a health survey, the median daily sugar intake in a community was 35 grams per person. The recommended maximum is 25 grams per person.

Check the statements that are true for health officials:

☒ "We need to act fast! Most people are eating too much sugar."

☒ "We should start campaigns to cut down on sugar."

☐ "The community's sugar intake is just fine."

Answer:

- "We need to act fast! Most people are eating too much sugar." **True** – The median is 35 grams, above the 25-gram limit, so more than half are over the recommended amount.
- "We should start campaigns to cut down on sugar." **True** – A median above the limit suggests a need to help people lower their sugar intake.
- "The community's sugar intake is just fine." **False** – Since the median exceeds the recommended amount, the community's sugar levels are too high.

MCQ 76: In a community cleanup, the median amount of trash collected by teams was 60 kilograms. The target was at least 50 kilograms per team.

Check the statements that are true for the organizers:

☐ "Awesome! Every team beat the target."

☒ "Awesome! Most teams reached the target."

☐ "Why didn't we give more resources to hit the target?"

☐ "The cleanup didn't meet our goals."

Answer:

- "Awesome! Every team beat the target." **False** – The median is 60 kilograms, so half collected less than 60, and some might have been below 50.
- "Awesome! Most teams reached the target." **True** – With a median of 60, above the 50-kilogram target, more than half likely met or exceeded it.
- "Why didn't we give more resources to hit the target?" **False** – This is about planning, not the results, and the median suggests success anyway.
- "The cleanup didn't meet our goals." **False** – A median above the target shows the cleanup went well overall.

MCQ 77: In an economic report, the median yearly salary in a country was \$20,000. The poverty line is set at \$25,000 per year.

Check the statements that are true for policymakers:

☒ "This is serious! Most people are below the poverty line."

☒ "We need economic changes to help people earn more."

☐ "The economy is doing great right now."

Answer:

- "This is serious! Most people are below the poverty line." **True** – The median is \$ 20,000, below the \$25,000 poverty line, so more than half earn less than that.
- "We need economic changes to help people earn more." **True** – A median below the poverty line suggests many need better income, pointing to a need for reform.
- "The economy is doing great right now." **False** – With most people below the poverty line, the economy isn't doing well for them.

I.6 COMPARING CENTRAL TENDENCY AND DISPERSION

MCQ 78: Company A reports an average salary of \$50,000, while Company B reports an average salary of \$55,000. Can we say that the average salary is higher in Company A?

☐ Yes

☒ No

☐ The data are insufficient to answer

Answer:

- The question is whether the average salary is higher in Company A.
- The data show an average of \$50,000 for Company A and \$55,000 for Company B.
- So, the average salary is **not** higher in Company A. It is higher in Company B.

MCQ 79: In 2023, the average temperature was 22°C. In 2024, it was 24°C.Can we conclude that temperatures were more variable in 2024?

☐ Yes

☐ No

☒ The data are insufficient to answer

Answer:

- The question asks about temperature variability.
- We are only given average values for each year, not any measure of dispersion.
- To compare variability, we need data such as the range, standard deviation, or interquartile range.
- So we **cannot determine** if temperatures were more variable in 2024.

MCQ 80: Store A and Store B both had an average daily sale of \$1500. However, Store A's daily sales ranged from \$1000 to \$2000,while Store B's ranged from \$1400 to \$1600.Were sales more variable in Store A?

☒ Yes

☐ No

☐ The data are insufficient to answer

Answer:

- The question is about sales variability.
- The range of Store A's sales is \$1000 (2000 − 1000), while Store B's is \$200 (1600 − 1400).
- A larger range suggests more variability.
- So, **sales were more variable in Store A**.

MCQ 81: In a study, the average height of girls was 160 cm, and the average height of boys was 162 cm.Are girls taller than boys on average?

☐ Yes

☒ No

☐ The data are insufficient to answer

Answer:

- The question asks whether girls are taller than boys on average.
- The data show that girls average 160 cm, while boys average 162 cm.
- So, **on average, girls are not taller than boys**.

MCQ 82: In Country X, the interquartile range (IQR) of salaries was \$20,000 in 2022and \$25,000 in 2023.Does this indicate greater salary inequality in 2023?

☐ Yes

☒ No

☐ The data are insufficient to answer

Answer:

- The question concerns salary inequality based on the IQR.
- A higher IQR means greater spread of salaries.
- Since the IQR increased from \$20,000 to \$25,000,this suggests **more salary inequality in 2023**.

I.7 COMPARING CENTRAL TENDENCY AND DISPERSION

Ex 83: In Country X, the interquartile range (IQR) of salaries was \$20,000 in 2022 and \$25,000 in 2023. Does this indicate greater salary inequality in 2023?

Since the IQR increased from \$20,000 to \$25,000, this suggests more salary inequality in 2023.

Answer:

- The question concerns salary inequality based on the IQR.
- A higher IQR means greater spread of salaries.
- Since the IQR increased from \$20,000 to \$25,000, this suggests **more salary inequality in 2023**.

Ex 84: In two schools, the average grade on the national math exam was 14 out of 20.However, in School A, the interquartile range (IQR) was 4, while in School B, it was 7.Which school had more variability in students' results?

Since the IQR is higher in School B (7 compared to 4), it shows greater variability in student results.

Answer:

- Both schools have the same average (14/20), but the IQR differs.
- A higher IQR indicates more dispersion among students' grades.
- Since the IQR is greater in School B, student results are more variable there.

Ex 85: In City X, the average income in 2023 was \$40,000 with an interquartile range (IQR) of \$10,000.In City Y, the average income was \$45,000, but the IQR was \$18,000.Which city shows more income disparity?

City Y has a higher IQR, which means more variability in income and therefore more disparity.

Answer:

- City Y has a larger IQR.
- A larger IQR means that income values are more spread out around the median.
- So, there is more income disparity in City Y.

Ex 86: Investment A had an average return of \$5,000 per year, with an interquartile range (IQR) of \$2,000.Investment B had an average return of \$6,000 per year, with an IQR of \$4,000.If we only care about average return, which investment is more attractive?

Investment B is more attractive because it has a higher average return.

Answer:

- The question focuses only on the average return.
- Investment A has an average return of \$5,000, and B has \$6,000.
- Therefore, Investment B is more attractive based on average return alone.

Ex 87: Investment A had an average return of \$5,000 per year, with an interquartile range (IQR) of \$2,000.Investment B had an average return of \$6,000 per year, with an IQR of \$4,000.If we prefer a safer investment with more predictable returns, which one should we choose?

Investment A is safer because it has a smaller IQR, which means less variability in returns.

Answer:

- The question focuses on choosing the safer investment, not necessarily the most profitable.

- A smaller IQR means more stable and predictable returns.
- Investment A has a lower IQR ($2,000), so it is the safer choice.