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

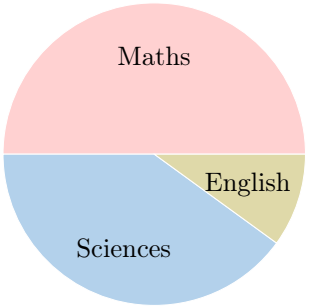
MCQ 2: "Do students prefer science over math?"
Which step does this sentence refer to?

- ☐ 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

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

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

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

B STATING THE PROBLEM

B.1 FINDING POPULATIONS

MCQ 6: You're studying how long kids play outside each day. Your question is: **"How many hours do kids spend playing outside each day?"**
Which population is best to study?
Check the correct answer:

- ☐ "All adults in a city."
- ☐ "All kids in a school."
- ☐ "All dogs in a neighborhood."
- ☐ "All teachers in a country."

MCQ 7: You're studying pets in homes. Your question is: **"How many families own a pet in our town?"**
Which population is best to study?
Check the correct answer:

- ☐ "All kids in a playground."
- ☐ "All birds in a forest."
- ☐ "All workers in a factory."
- ☐ "All families in our town."

MCQ 8: You're studying reading habits. Your question is: **"How many books do students borrow from the school library each month?"**
Which population is best to study?
Check the correct answer:

- ☐ "All librarians in a state."
- ☐ "All students in a school."
- ☐ "All books in a bookstore."
- ☐ "All parents in a neighborhood."

MCQ 9: You're studying nature. Your question is: **"How tall are the oak trees in a national park?"**
Which population is best to study?
Check the correct answer:

- ☐ "All oak trees in a national park."
- ☐ "All rivers in a country."
- ☐ "All clouds in the sky."
- ☐ "All rocks on a mountain."

B.2 SORTING DATA TYPES

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

☐ Quantitative variable

☐ Qualitative variable

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

☐ Quantitative variable

☐ Qualitative variable

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

☐ Quantitative variable

☐ Qualitative variable

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

☐ Quantitative variable

☐ Qualitative variable

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

☐ Quantitative variable

☐ Qualitative variable

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

☐ Quantitative variable

☐ Qualitative variable

C COLLECTING DATA

C.1 WRITING A SURVEY QUESTION

Ex 16: Write a survey question about music that would enable you to collect numerical data.

Ex 17: Write a survey question about music that would enable you to collect categorical data.

Ex 18: Write a survey question about food that would enable you to collect categorical data.

Ex 19: Write a survey question about food that would enable you to collect numerical data.

C.2 CHOOSING CENSUS OR SURVEY

MCQ 20: You need to elect the Grade 7 class representative. What method should you use?

☐ Survey

☐ Census

MCQ 21: You want to find out how much soda Grade 7 students drink in the entire country. What method should you use?

☐ Survey

☐ Census

MCQ 22: Your teacher wants to know exactly how many students in your class have a pet. What method should be used?

☐ Survey

☐ Census

MCQ 23: Researchers want to estimate the average number of hours Grade 7 students sleep per night in a large city. What method should they use?

☐ Survey

☐ Census

MCQ 24: You want to find out the most popular after-school snack among Grade 7 students in your entire country. What method should you use?

☐ Survey

☐ Census

C.3 COMPLETING FREQUENCY TABLES

Ex 25: The class took the temperature at lunchtime for 20 days:

$19°C, 18°C, 19°C, 20°C, 19°C, 20°C, 20°C, 20°C,$
$19°C, 18°C, 20°C, 19°C, 20°C, 19°C, 18°C, 20°C,$
$18°C, 17°C, 19°C, 20°C$

Complete the table to show how many times each temperature happened:

Temperature (°C)	Frequency
17	
18	
19	
20	

Ex 26: The class recorded the number of siblings for 20 students:

$1, 2, 1, 0, 1, 2, 2, 3, 1, 0,$
$2, 1, 3, 1, 0, 2, 1, 0, 2, 1$

Complete the table to show how many times each number of siblings happened:

Number of Siblings	Frequency
0	
1	
2	
3	

Ex 27: Count the vowels (a, e, i, o, u) in this sentence: "I love Mathematics. It is so fun to solve problems and discover cool patterns."

Complete the table:

Vowel	a	e	i	o	u
Frequency					

D DESCRIPTIVE STATISTICS

D.1 SPOTTING STATISTICS

MCQ 28: "Su averages 14.6 points per game."
Is this an example of statistics?

☐ Yes

☐ No

MCQ 29: "John's height is 180 cm."
Is this an example of statistics?

☐ Yes

☐ No

MCQ 30: "The average temperature in July is 25°C."
Is this an example of statistics?

☐ Yes

☐ No

MCQ 31: "Emily's favorite color is blue."
Is this an example of statistics?

☐ Yes

☐ No

MCQ 32: "On average, students in the class scored 85% on the exam."
Is this an example of statistics?

☐ Yes

☐ No

MCQ 33: "The median income in the city is $ 50,000."
Is this an example of statistics?

☐ Yes

☐ No

E DESCRIPTIVE STATISTICS: RELATIVE FREQUENCY

E.1 CALCULATING RELATIVE FREQUENCIES WITH 2 CATEGORIES

Ex 34: A class of 25 students was surveyed about their gender. Compute the percentages (rounded to one decimal place):

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

Ex 35: 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	%
Fail	10	%
Total	25	100%

Ex 36: A basketball player attempted 50 shots during practice. Compute the shooting percentages (rounded to one decimal place):

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

Ex 37: 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	%
Miss	21	%
Total	70	100%

E.2 CALCULATING RELATIVE FREQUENCIES

Ex 38: 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	%
Dogs	14	%
Hamsters	5	%
Fish	3	%
Total	40	100%

Ex 39: 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	%
Bananas	15	%
Cherries	10	%
Grapes	5	%
Total	50	100%

Ex 40: 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	%
Bicycle	25	%
Walking	15	%
Car	5	%
Total	80	100%

Ex 41: 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	%
Rock	30	%
Classical	20	%
Jazz	10	%
Total	100	100%

F DESCRIPTIVE STATISTICS: CENTRAL TENDENCY

F.1 FINDING THE MODE

Ex 42: Look at this frequency table showing marks:

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

What's the mode?

- ☐ A
- ☐ B
- ☐ C mark
- ☐ D
- ☐ E

Ex 43: 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?

- ☐ Bus
- ☐ Bicycle
- ☐ Car
- ☐ Walking
- ☐ Train

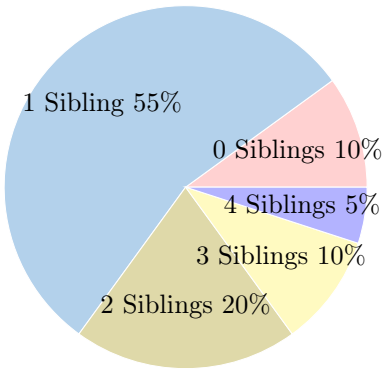
Ex 44: Look at this frequency table showing favorite fruits:

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

What's the mode?

- ☐ Apple
- ☐ Banana
- ☐ Orange fruit
- ☐ Grapes
- ☐ Mango

Ex 45: 30 students were asked how many siblings they have, and the results are shown in this pie chart:



What's the mode?

- ☐ 0 Siblings
- ☐ 1 Sibling
- ☐ 2 Siblings
- ☐ 3 Siblings
- ☐ 4 Siblings

F.2 CALCULATING A MEAN

Ex 46: Over the last 5 basketball games, I scored these points: 15, 20, 10, 2, and 5.
Find the mean score:

points

Ex 47: Over the last 5 days, I earned these tips as a waiter: 12, 18, 15, 22, and 28.
Find the mean tip:

dollars

Ex 48: 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:

pages

Ex 49: Over the last 6 days, I spent these amounts on lunch: 8, 12, 10, 15, 9, and 11.
Find the mean cost:

dollars

F.3 CALCULATING A MEDIAN

Ex 50: A café tracked hourly customers:

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

Calculate the median number of customers.

Ex 51: A fitness group recorded their daily exercise minutes (Monday–Friday):

25, 40, 30, 45, 35

Find the median exercise time.

Ex 52: Family savings (in $) over 6 months:

120, 80, 150, 90, 200, 110

Determine the median savings.

Ex 53: 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.

G DESCRIPTIVE STATISTICS: DISPERSION

G.1 CALCULATING A RANGE

Ex 54: 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.

Ex 55: 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.

Ex 56: 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.

Ex 57: 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.

G.2 CALCULATING AN INTERQUARTILE RANGE

Ex 58: 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.

Ex 59: 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.

Ex 60: 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.

Ex 61: The following data shows the marks (out of 20) obtained by 9 students in a math exam:

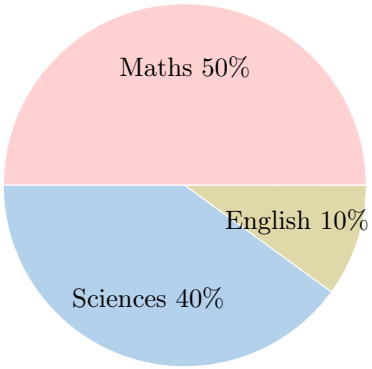
1, 19, 10, 2, 18, 11, 5, 15, 10

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

H ORGANIZING AND DISPLAYING DATA

H.1 UNDERSTANDING PIE CHARTS AND BAR CHARTS

Ex 62: 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?

   ☐ Bar chart
   ☐ Pie chart

2. Which was the most favoured subject?

   ☐ Sciences
   ☐ Maths
   ☐ English

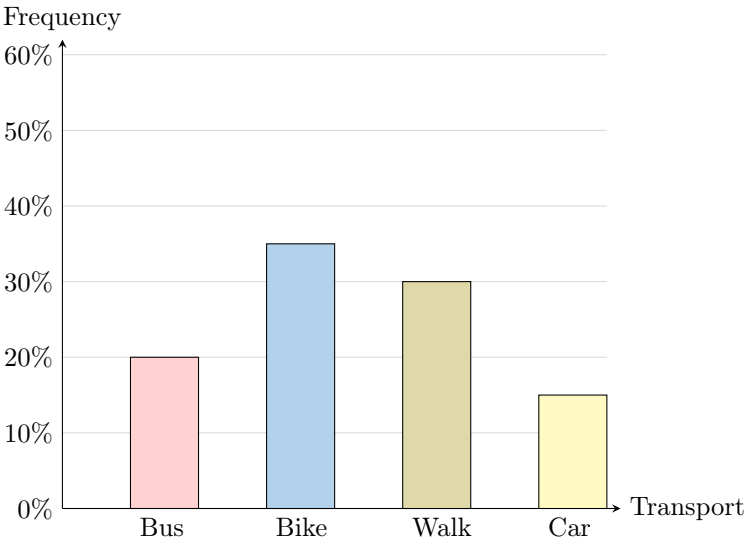
3. What percentage of the students named Sciences as their favorite subject?

   ☐ %

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

   ☐ %

Ex 63: 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
   ☐ Pie chart

2. Which was the most common mode of transportation?

   ☐ Bus
   ☐ Bike
   ☐ Walk
   ☐ Car

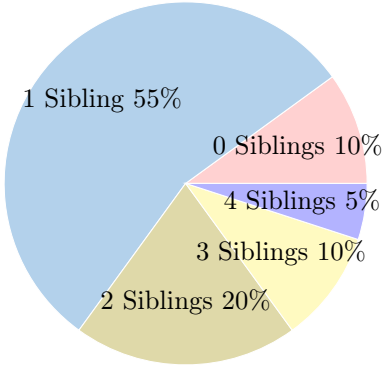
3. What percentage of the students travel to school by bike?

   ☐ %

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

   ☐ %

Ex 64: 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?

☐ Bar chart

☐ Pie chart

2. Which number of siblings is the most common?

☐ 0 Siblings

☐ 1 Sibling

☐ 2 Siblings

☐ 3 Siblings

☐ 4 Siblings

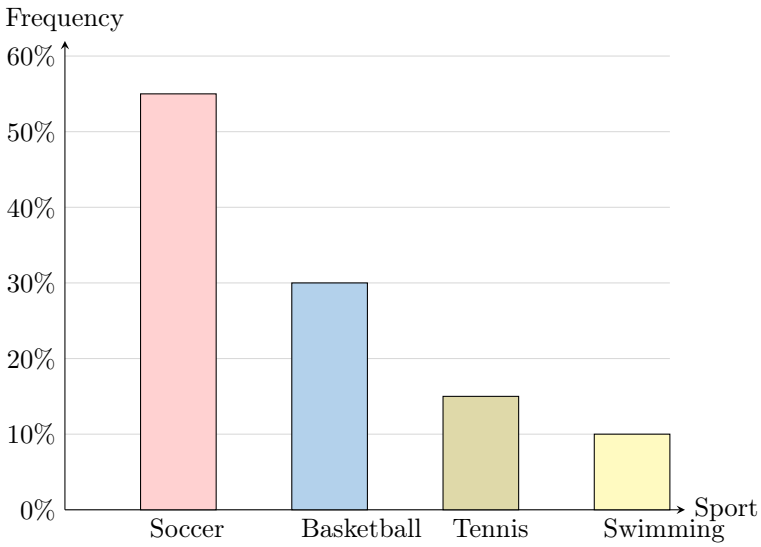
3. What percentage of the students have 2 siblings?

☐ %

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

☐ %

Ex 65: 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

☐ Pie chart

2. Which was the most favoured sport?

☐ Soccer

☐ Basketball

☐ Tennis

☐ Swimming

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

☐ %

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

☐ %

I INTERPRETING THE STATISTICS

I.1 INTERPRETING RELATIVE FREQUENCY

MCQ 66: 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.

MCQ 67: This table shows how students get to school, based on relative frequency:

Transportation	Relative Frequency
Bus	15%
Walking	40%
Bicycle	30%
Car	15%

Check the statements that are true:

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

☐ Car and Bus are equally popular.

☐ Bicycle is more popular than Bus.

☐ More students take the Bus than walk.

☐ Bicycle and Walking together make up more than half.

☐ Bus is the least popular way to get to school.

MCQ 68: Here's a table showing the relative frequency of students' favorite pet:

Pet Type	Relative Frequency
Dogs	27%
Cats	43%
Fish	20%
Birds	10%

Check the statements that are true:

☐ Cats are the most popular pets among students.

☐ Birds are the least popular pets among students.

☐ More students own Fish than Dogs.

☐ Cats and Fish together make up more than half of all pets.

☐ Dogs are more popular than Cats.

☐ Birds and Dogs together make up more than Fish.

MCQ 69: Here's a table showing the relative frequency of students' favorite subject:

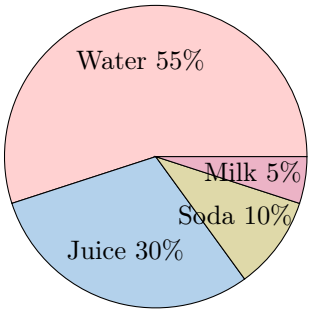
Subject	Relative Frequency (%)
Maths	46%
Science	44%
English	10%

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.

I.2 INTERPRETING RELATIVE FREQUENCY

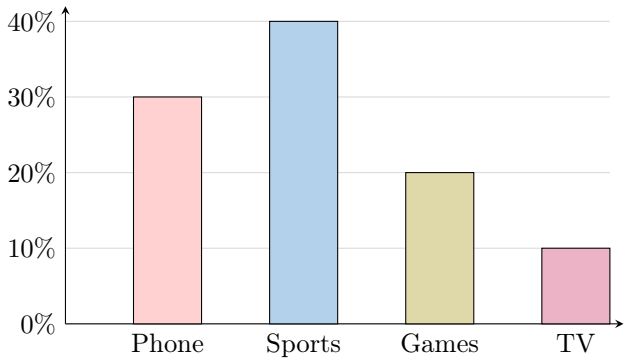
Ex 70: Here's a pie chart showing what kids drink most often:



Answer these questions based on the pie chart:

1. Which drink do kids choose the most?
   - ☐ Water
   - ☐ Juice
   - ☐ Soda
   - ☐ Milk
2. Which drink do kids choose the least?
   - ☐ Water
   - ☐ Juice
   - ☐ Soda
   - ☐ Milk
3. Do more kids drink soda than juice?
   - ☐ Yes
   - ☐ No

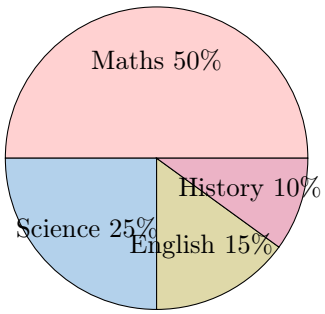
Ex 71: This bar graph shows how students spend their free time:



Answer these questions based on the bar graph:

1. What's the most popular activity?
   - ☐ Phone
   - ☐ Sports
   - ☐ Games
   - ☐ TV
2. What's the least popular activity?
   - ☐ Phone
   - ☐ Sports
   - ☐ Games
   - ☐ TV
3. Do more students play games than use their phones?
   - ☐ Yes
   - ☐ No

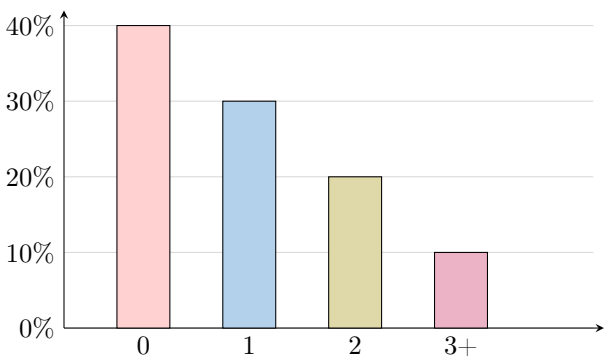
Ex 72: This pie chart shows how much time students spend studying different subjects:



Answer these questions based on the pie chart:

1. Which subject gets the most study time?
   - ☐ Maths
   - ☐ Science
   - ☐ English
   - ☐ History
2. Which subject gets the least study time?
   - ☐ Maths
   - ☐ Science
   - ☐ English
   - ☐ History
3. Do students spend more time on English than Science?
   - ☐ Yes
   - ☐ No

Ex 73: 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
☐ 1
☐ 2
☐ 3+

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

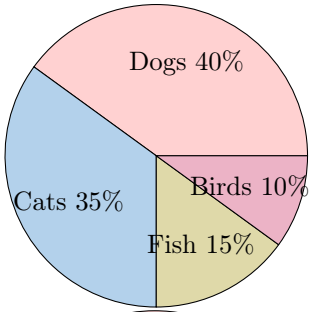
☐ 0
☐ 1
☐ 2
☐ 3+

3. Do more students have 1 sibling than none?

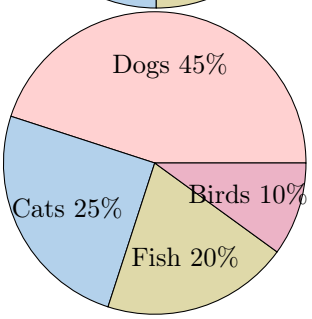
☐ Yes
☐ No

I.3 COMPARING USING PIE CHARTS

MCQ 74: Here are pie charts showing the favorite pets for girls and boys:



Girls:



Boys:

Check the true statements about these favorite pets:

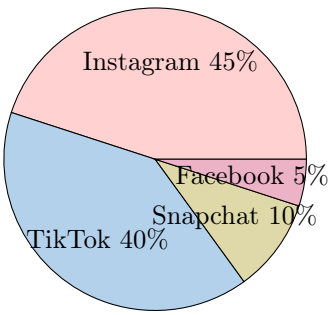
☐ "Dogs are the favorite pet for both girls and boys."

☐ "Girls like cats more than boys do."

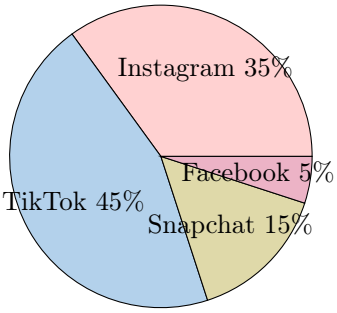
☐ "Boys like fish less than girls do."

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

MCQ 75: Here are pie charts showing the favorite social media apps for girls and boys:



Girls:



Boys:

Check the true statements about these favorite apps:

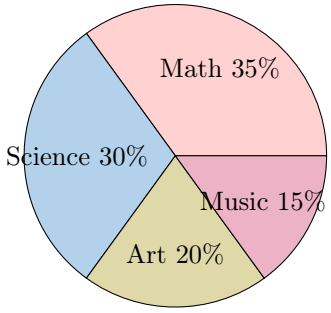
☐ Instagram is the favorite app for both girls and boys.

☐ Boys like TikTok more than girls do.

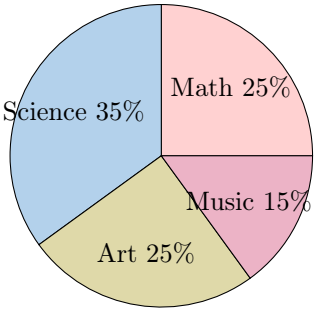
☐ Girls like Snapchat more than boys do.

☐ Facebook is the least popular app for both.

MCQ 76: 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:

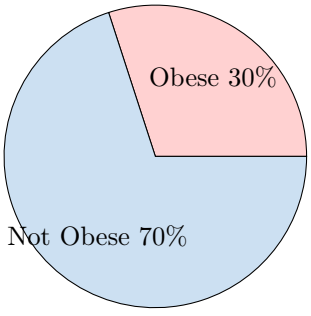
☐ "Country A loves math more than Country B does."

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

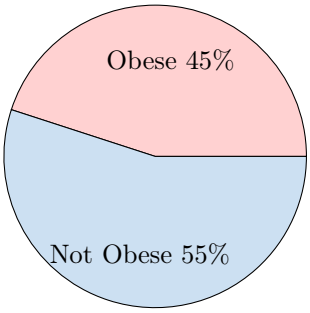
☐ "Art is more popular in Country B than in Country A."

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

MCQ 77: 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%."

I.4 COMPARING USING CENTRAL TENDENCIES

Ex 78: The girls' average score in math is 87 (B+), while the boys' average is 75 (C). Are girls better at math?

Ex 79: 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?

Ex 80: The mean summer temperature in City P is 26°C, while in City Q, it is 29°C. Which city is hotter on average?

Ex 81: 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?

I.5 COMPARING CENTRAL TENDENCY AND DISPERSION

MCQ 82: 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

MCQ 83: 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

MCQ 84: Store A and Store B both have an average daily sale of \$1,500. However, Store A's daily sales ranges from \$1,000 to \$2,000, while Store B's ranges from \$1,400 to \$1,600. Does this mean that the sales were more variable in Store A than in Store B?

☐ Yes

☐ No

☐ The data are insufficient to answer

MCQ 85: 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

MCQ 86: 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?

☐ Yes

☐ No

☐ The data are insufficient to answer

I.6 COMPARING CENTRAL TENDENCY AND DISPERSION

Ex 87: 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?

Ex 88: 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?

Ex 89: 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?

Ex 90: 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?

Ex 91: 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?