

DATA EXPLORATION

Gold Level Project



In order to be eligible for Gold Level Status using the Data Exploration project, your club must (1) complete at least **two** of the three investigation options below, (2) provide the necessary project evidence for each option completed and (3) submit a completed Gold Level Application.

Option 1: Qualitative Investigation

- 1. Categorical Survey:** Select or write a survey question with descriptive (non-numeric) answer.
- 2. Hypothesis:** Make predictions about survey results.
- 3. Sampling Strategy:** Decide who you will survey and how.
- 4. Data Collection:** Organize your collected survey responses.
- 5. Graph of Results:** Choose the type of graph that best represents your findings.
- 6. Conclusions and Summary:** Summarize your investigation and evaluate how accurate your hypothesis was.

Option 2: Quantitative Investigation

- 1. Numerical Survey:** Select or write a survey question with a numeric answer.
- 2. Hypothesis:** Make predictions about survey results.
- 3. Sampling Strategy:** Decide who you will survey and how.
- 4. Data Collection:** Organize your collected survey responses.
- 5. Graph of Results:** Choose the type of graph that best represents your findings.
- 6. Calculations:** Determine the mean, median, mode and range of the data.
- 7. Conclusions and Summary:** Summarize your investigation and evaluate how accurate your hypothesis was.

Option 3: Comparative Investigation

- 1. Comparative Survey:** Select a question (numeric or non-numeric) to compare two or more groups' answers.
- 2. Hypothesis:** Make predictions about survey results.
- 3. Sampling Strategy:** Decide who you will survey and how.
- 4. Data Collection:** Organize your collected survey responses.
- 5. Graph of Results:** Choose the type(s) of graph(s) that best represent(s) your findings.
- 6. Calculations:** Determine the mean, median, mode and range of the data for each group (numeric survey only).
- 7. Conclusions and Summary:** Summarize your investigation and evaluate how accurate your hypothesis was.

Qualitative Investigation

Directions

1. CATEGORICAL SURVEY: *What would you like to know about your peers, family or friends? Choose a survey question with a **categorical** (non-numeric) response. For example, you could ask about people's favorite sport, food, color, etc. The question cannot be a yes or no question, and there must be a minimum of **3** possible responses.*

2. HYPOTHESIS: *Discuss what responses are possible, and what you believe the results will be. Then make predictions about what will be the most popular and least popular responses.*

3. SAMPLING STRATEGY: *Decide whom you are going to survey—other students, adults, teachers, a combination, etc. Understand exactly what data you need to collect and make decisions about your plan for getting survey responses. Your club must collect a minimum of **30** total survey responses, but you may want to obtain more, if possible, to get a better sampling of the population you are surveying. You can work as a group to collect the responses or divide the work up and have each student collect some portion of the total responses.*

4. DATA COLLECTION: *Leave at least 1-2 days for your group to collect survey data. Once your group has collected all of the necessary survey responses, organize the data using a table or list. This will make it easier to analyze and create your graph.*

5. GRAPH OF RESULTS: *Any graphical representation is acceptable, but focus on choosing one that best expresses your data and findings. Some examples of types of graphs that could be used include, but are not limited to: bar graphs, pie charts and pictographs.*

6. CONCLUSIONS AND SUMMARY: *Analyze the findings of the survey. What was the most common response? Least common? Did the data support your hypothesis? Would you change anything about your process? Reflect on these questions in your summary and make any other observations you notice about the results.*

Example

Survey Question: What is your favorite sport to play?

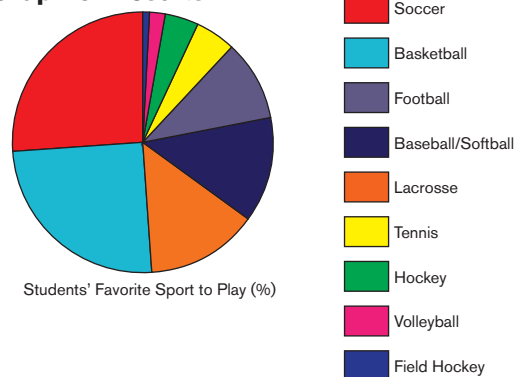
Hypothesis: We believe that the majority of responders will prefer playing basketball to any other sport. We think that the least popular sport will be tennis.

Sampling Strategy: As a club, we will obtain at least 100 survey responses. Our school has 500 students and we believe we can get an accurate representation of the entire school, by obtaining responses from 100 students. We are going to work as a club to collect the responses by asking people before school, after school and during recess. We are going to survey both girls and boys in 6th, 7th and 8th grade to make sure the data is a representation of our entire school.

Data Collection:

Sport	Number of responses
Football	
Basketball	
Soccer	
Lacrosse	
Hockey	
Baseball/Softball	
Tennis	
Field Hockey	
Volleyball	

Graph of Results:



Conclusions and Summary: Soccer was the most preferred sport with 26% of respondents saying it was their favorite. Our hypothesis was not correct; however, basketball was the second most popular and only differed from soccer by 1% of the total responses. The least popular sport was field hockey. We believe this is because our school does not have an official field hockey team, while it does have official teams for all of the other sports in our survey.

Quantitative Investigation

Directions

1. NUMERICAL SURVEY: *What would you like to know about your peers, family or friends? Choose a survey question with a **numeric** response. For example, you could ask people how many texts they send per day or how many hours they sleep each night.*

2. HYPOTHESIS: *Think about what responses are possible. Discuss what you believe the results will be. Make predictions about what you think will be the average and the extremes.*

3. SAMPLING STRATEGY: *Decide whom you are going to survey, and understand what data you need to collect. Make decisions about your plan for getting survey responses. Your club must collect a minimum of **30** total survey responses, but you may want to obtain more, if possible, to get a better sampling of the population you are surveying. You can work as a group or individually to collect the responses.*

4. DATA COLLECTION: *Leave at least 1-2 days for your group to collect survey data. Once you have collected all of the survey responses, organize the data in a table or a list. This will make it easier to analyze and create your graph.*

5. CALCULATIONS: *Since you have numeric data, you must calculate mean, median, mode and range in order to help with drawing conclusions about the results.*

6. GRAPH OF RESULTS: *Any graphical representation is acceptable, but focus on choosing one that best expresses your data and findings. A box and whisker plot could work well here if your students are familiar with them, but any other graphical representation is acceptable.*

7. CONCLUSIONS AND SUMMARY: *Analyze the findings of the survey. What was the range of your data? Were there any outliers? Did the data support your hypothesis? Was the average larger or smaller than you expected? Reflect on these questions in your summary and make any other observations you notice about the results.*

Example

Survey Question:

How many hours do you spend on homework per week?

Hypothesis:

We think that on average, middle school students at our school spend 4 hours per week on homework.

Sampling Strategy:

As a club, we will obtain at least 50 survey responses. We are going to work as individuals to ask students in our homeroom classes. Each of our 10 club members will survey five other people. We are going to survey both girls and boys in 6th, 7th and 8th grade to make sure the data is representative of our entire school.

Data Collection:

List of 50 responses organized from least to greatest:

1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 7, 8, 8, 8, 9, 9, 10, 11

Calculations:

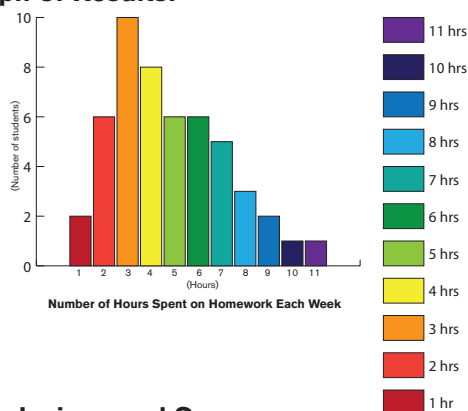
mean = 5.68 hours

median = 4 hours

mode = 3 hours

range = 10 hours

Graph of Results:



Conclusions and Summary:

We found that the average amount of time spent on homework is 5.68 hours per week. This is higher than what we hypothesized; however, the median was 4 hours which is what we had predicted would be the average. There was a large range in responses. The most and least amount of time spent on homework per week differed by 10 hours. The mode was 3 hours and the majority of students spend 5 hours or less per week. This tells us that the high average is due to a smaller group of students who spend a significantly larger amount of time on homework per week.

Comparative Investigation

Directions

1. COMPARATIVE SURVEY: Think of a comparative study question to compare **two or more groups** (for example, 6th graders and 7th graders or teachers and students). This question can be completely different from the questions you used for the qualitative and quantitative investigations, or can also be an extension of one of those survey questions. If your survey question is non-numeric, it must have at least **3** possible responses.

2. HYPOTHESIS: Make predictions about how you believe the groups will differ or be similar. Explain your reasoning for this prediction.

3. SAMPLING STRATEGY: Decide what groups you need to survey and how you will obtain their responses. For the comparative survey, it is important to make sure you get an equal representation of the groups. Come up with a detailed collection plan to keep everything organized. Your club must collect a minimum of **30** total survey responses.

4. DATA COLLECTION: Once you have collected all of the survey responses, organize the data in a table or a list. This will make it easier to analyze and create your graph.

5. CALCULATIONS: If you chose a numerical question, calculate mean, median, mode and range as well as any other relevant statistics you want to include. This is not required for a non-numeric question.

6. GRAPH OF RESULTS: Any graphical representation is acceptable. You can make separate graphs for each group or you can make one graph—such as a double bar graph—to compare them all.

7. CONCLUSIONS AND SUMMARY: Analyze the findings of the survey. Compare the two or more groups and make observations about how they differ or are similar. Did the findings support your hypothesis?

Example

Survey Question: How many hours do you spend on homework per week?

Hypothesis: We think 8th graders will spend the most amount of time per week on homework, whereas 6th graders will spend the least. We believe this is because as you move up in middle school you have to take more challenging courses.

Sampling Strategy: We wanted to make sure we obtained an equal number of responses from each grade. Since we have 6th, 7th and 8th graders in our club we divided into groups by grade to get responses. Our goal is to get 15 responses from each grade level.

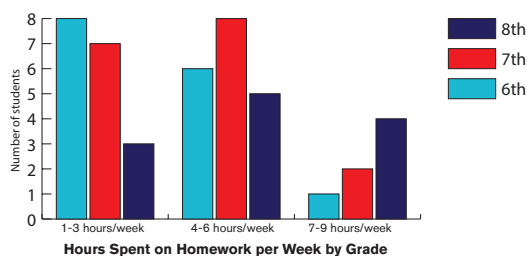
Survey Data: List of 45 responses organized by grade level and then from least to greatest:

Grade	Hours per week
6th	1, 2, 2, 2, 3, 3, 3, 3, 4, 4, 4, 5, 5, 6, 7
7th	1, 2, 2, 3, 3, 3, 3, 4, 4, 4, 5, 6, 6, 7, 8
8th	2, 3, 3, 4, 4, 5, 5, 5, 6, 6, 6, 7, 7, 8, 9

Calculations:

	6th	7th	8th
mean	3.6 hours	4.1 hours	5.3 hours
median	3 hours	4 hours	5 hours
mode	3 hours	3 hours	5.5 hours
range	6 hours	7 hours	7 hours

Graph of Results:



Conclusions and Summary: The findings supported our hypothesis. On average, students in 8th grade spend more time per week on homework than 7th or 6th grade students. Sixth grade students spend the least amount of time per week.

What should My Club Include with our Gold Level Application?

Below is a checklist of the Data Exploration project evidence your club should submit in addition to your Gold Level Application. You may submit this evidence electronically as an emailed PowerPoint, Word or PDF file or by mail.

Qualitative Investigation	Quantitative Investigation	Comparative Investigation
<input type="checkbox"/> Survey Question ✓ Not a yes or no question ✓ At least 3 possible responses ✓ Non-numeric response <input type="checkbox"/> Hypothesis ✓ At least one sentence <input type="checkbox"/> Sampling Strategy ✓ Whom are you surveying? ✓ How many people are you surveying? ✓ How do you plan to accomplish this? ✓ At least 2 sentences <input type="checkbox"/> Data Collection ✓ List/table of responses ✓ Minimum of 30 responses <input type="checkbox"/> Graph of Results ✓ Has a title ✓ Has necessary labels or key <input type="checkbox"/> Conclusions and Summary ✓ Compare to your hypothesis ✓ At least 2 sentences	<input type="checkbox"/> Survey question ✓ Numerical response <input type="checkbox"/> Hypothesis ✓ At least one sentence <input type="checkbox"/> Sampling Strategy ✓ Whom are you surveying? ✓ How many people are you surveying? ✓ How do you plan to accomplish this? ✓ At least 2 sentences <input type="checkbox"/> Data Collection ✓ List/table of responses ✓ Minimum of 30 responses <input type="checkbox"/> Calculations ✓ Mean ✓ Median ✓ Mode ✓ Range <input type="checkbox"/> Graph of Results ✓ Has a title ✓ Has necessary labels or key <input type="checkbox"/> Conclusions and Summary ✓ Compare to your hypothesis ✓ At least 2 sentences	<input type="checkbox"/> Survey question ✓ Compares 2 or more groups <input type="checkbox"/> Hypothesis ✓ At least one sentence <input type="checkbox"/> Sampling Strategy ✓ Whom are you surveying? ✓ How many people are you surveying? ✓ How do you plan to accomplish this? ✓ At least 2 sentences <input type="checkbox"/> Data Collection ✓ List/table of responses ✓ Minimum of 30 responses <input type="checkbox"/> Calculations (if applicable) ✓ Mean ✓ Median ✓ Mode ✓ Range <input type="checkbox"/> Graph of Results ✓ Has a title ✓ Has necessary labels or key <input type="checkbox"/> Conclusions and Summary ✓ Compare to your hypothesis ✓ At least 2 sentences



GOLD LEVEL APPLICATION

PLEASE PRINT CLEARLY.

SCHOOL/ORG/GROUP NAME: _____

CLUB LEADER NAME: _____ CLUB LEADER PHONE: _____

CLUB LEADER EMAIL: _____

AWARDS MAILING ADDRESS: _____

CITY, STATE, ZIP: _____

Select Type of Gold Level Project: Data Exploration Math Video Challenge Service Project

Evidence of Completed Gold Level Project Provided:

Electronic copy Photographs Physical copy Name of submitted Math Video Challenge video: _____

Signatures of Club Members Who Contributed to the Gold Level Project

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

AWARDS DEADLINE

***Received by Friday, April 1, 2022**

Eligible for all Gold Level awards and prizes, as well as entry into the Gold Level and Grand Prize drawings.

*Gold Level awards cannot be guaranteed for applications and projects received after **April 1, 2022**. No Gold Level applications or projects will be accepted after **June 1, 2022**.*

HERE'S HOW TO SUBMIT YOUR APPLICATION

Email as scanned PDF or JPG attachment to info@mathcounts.org
Email to MATHCOUNTS Foundation

The National Math Club - Gold Level
1420 King Street, Alexandria, VA 22314

Faxed applications and projects will not be accepted.

By signing, I, the club leader, attest that my club had a minimum of five meetings and the club members who signed this application contributed to the Gold Level Project.

Club Leader Signature: _____

Date: _____