Mathematics 20-2 Project

One of the requirements in Math 20-2 is to complete a research project related to mathematics. The project is fairly open-ended and the direction it takes is largely determined by you. Innovation and creativity are valued in projects like this, so you are free to experiment and try something new. Group projects are acceptable, but group members must be identified and approved by your teacher before you begin.

Begin by reading all of the project instructions. Contact your teacher if you are unsure how to proceed after you have read the instructions.

Project Topic

Choose a topic that you are interested in. The project needs to be appropriate for school. Finding information for some topics may be easier than for others. Start by thinking of a general idea you want to work with and then narrow the idea to a specific topic. The following table outlines some possibilities to get you thinking. **You are free to choose something that is not on the list.**

Category	Possible Topic
Weather	Precipitation in Lethbridge
Sports	Goal Scoring by the Edmonton Oilers
Ecology	Ground Squirrel Populations
Populations	World Population Growth
Gaming	Typical Number of Hours of Play Per Week
Technology	Cell Phone Use
Social Media	The Number of 'Friends' People Have
Finance	The Cost of Borrowing Money
Historical	Pythagoras

Project Purpose

Your project needs to have a purpose. **What do you hope to learn that you can then present to others?** It may be useful to think of a question that you will try to answer through your project. Questions related to the previous list of topics are shown. The question may change as you research your topic.

Topic	Possible Question
Precipitation in Lethbridge	Is the amount of precipitation in Lethbridge typical for Alberta?
Goal Scoring by the Edmonton Oilers	How has goal scoring by the Edmonton Oilers changed over the past decade?
Ground Squirrel Populations	How are ground squirrel populations modelled?
World Population Growth	Will the world population ever peak?
Typical Number of Hours of Play Per Week	Which type of video game is played the most?
Cell Phone Use	Which phone plan is the most cost effective?
The Number of 'Friends' People Have	Do I have more 'friends' than most people?
The Cost of Borrowing Money	Is it more expensive to borrow money from a payday loan company than a bank?
Pythagoras	Did Pythagoras discover the theorem named after him?

Research

Once you have decided on a topic and purpose, you will need to conduct some research. There are two types of research and your project can include either or both.

Primary Research

Primary research involves **you collecting data** from the world around you. You might use surveys, experiments, or observations. If you use primary research, make sure to describe how your data was collected as part of your presentation.

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Examples:

- In order to determine a typical height range for someone in grade 11, Emma measured the height of each of her classmates.
- Gamil was interested in where different birds live. He recorded the type and number of all the birds he saw over a set time period at several different locations.

- Brittney was interested in how much people read for leisure. She had people complete a survey to help answer this question.

Secondary Research

Secondary research means **using someone else's data**. Secondary sources of information include books, the internet, videos, or newspapers. If you use secondary research, make sure to reference your sources properly. See the references section.

Examples:

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- To determine the best season the Seattle Seahawks ever had, Brennan used statistics he found at *nfl.com*.
- In order to provide background information for her project, Perle needed to find out how an electric guitar works. From the library, she checked out one book on electric guitar history and another one on building electric guitars.
- Jacob watched a fascinating documentary on electric cars. He decided to use some of the information from the documentary for his project on comparing the fuel efficiencies of different vehicles.

It is more important to stay organized when conducting any type of research. Using lists and tables may help you to organize and keep track of the data as it comes in. Remember to write down all sources of information when using secondary research so you don't have to try to find the sources again later.

Analysis

Once you have researched your topic, you will need to interpret the data. Your task is to **analyze the information to answer your original question**. This will look different for every project and **may** include the following:

- Calculating statistics such as the mean and standard deviation of a set of data
- Graphing a set of data
- Comparing data values
- Looking for patterns or trends
- Determining whether data from different sources are consistent

Part of your analysis should be an analysis of the data source(s). Ask yourself the following:

- Do the data appear to be biased? Is the source promoting a particular point of view?
- Does the source appear to be reputable?
- Is there enough data to draw conclusions?

Biased information promotes one point of view while ignoring others. Most forms of advertising present biased information by indicating good qualities of a product while ignoring the negative.

Even if your data was obtained through primary research, you must still consider whether YOUR data and the manner in which YOU collected the data were at all biased and whether YOU obtained sufficient data to draw conclusions.

If there appears to be a problem with your primary or secondary data, either don't use the data or explain the problem so your audience can also interpret the data correctly.

Conclusions

Once you have analyzed your data, you should be able to draw conclusions related to your project's original question (purpose). Here you want to **state the key findings of your analysis** and describe the implications of these findings.

Example: Carlos' original question was "What will be the land speed record in 2030?". His key findings included the pattern of land speed records to date, factors that might limit a land speed record, and his prediction of the record for 2030. He then explained that his prediction was really a goal for the future and that technology would need to improve for his prediction to be correct.

Presentation

Your project's presentation is **how you will display/present your project** so others will understand it. The presentation format is your choice, but you need to be able to send it to your marker. Some suggested formats are a

- Written report
- Video
- Multimedia presentation (such as a PowerPoint or Prezi)
- Poster

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For many project presentations, it is a good idea to begin by giving background information on the topic and describing the question you are trying to answer. You can conclude your presentation by describing key findings and explaining why they are important or how they might be used.

References

It is important to **give credit to other people's work** used in your project. This credit should be given in two places.

In-Text Referencing

When you use a quote, picture, table or anything else that is not yours, make a note of it right beside the borrowed information. The exact format is not important for this project, but do try to be consistent throughout.

Reference List

This is a detailed list of the sources you used in your project. The reference list usually comes at the very end of a report or presentation. Microsoft Word has a References tool that may help you to format your references list.

Example

Billy Beane and Paul DePodesta took a radical approach to baseball management that allowed their financially-strapped team to be competitive with more well-funded teams (Lewis, 2004).
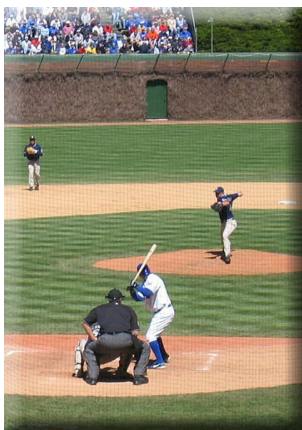
Papushin, 2005 *wikimedia.org*

RK	Player	Team	AVG	OBP	SLG	OPS
1	Giambi, J	OAK	0.342	0.477	0.66	1.137
2	Dye, J	OAK	0.297	0.366	0.547	0.913
3	Chavez, E	OAK	0.288	0.338	0.54	0.878
4	Giambi, J	OAK	0.283	0.391	0.45	0.841
5	Byrnes, E	OAK	0.237	0.326	0.5	0.826
6	McMillon, B	OAK	0.293	0.354	0.448	0.802

(MLBAM, 2013)

References

Lewis, M. (2004). *Moneyball: The Art of Winning an Unfair Game*. New York: W. W. Norton & Company.

MLBAM. (2013, 04 12). *MLB.com*. Retrieved 04 16, 2013, from Statistics: http://mlb.mlb.com/stats/sortable.jsp?c_id=mlb&tcid=mm_mlb_ stats#elem=[object+Object]&tab_level=child&click_text=Sortable+Player+hitting&game_ type=%27R%27&season=2001&season_type=ANY&league_code=%27MLB%27&sectionTy pe=sp&statType=hitting&page=1&ts=13661407

Papushin, K. (2005). Wrigley Field April 2005.

Notice in the example that even though there isn't a direct quote and the table has been modified from the original version, credit was still given to the original sources. If you are unsure, give credit.

Planning Guide

Use this guide to help you plan your project. Some sample guides are shown after this template.

Topic	
Purpose of project	
Anticipated research	
Anticipated analysis	
Presentation	

Once you have completed this guide, before proceeding with your plan, contact your teacher to discuss your project plan.

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Sample Planning Guides

Sample 1

Topic	Dolphin populations
Purpose of project	Are spotted dolphin populations high enough to sustain hunting?
Anticipated research	• Where do spotted dolphins live? • How large are the populations? • How have populations changed over time? • What areas are hunted? • What does a typical hunt encompass? • How have hunting practices changed over time?
Anticipated analysis	I plan to graph the spotted dolphin population data and the hunting data. I will look for patterns between the graphs that show how the two are related. If an increase in hunting seems to correlate with a lower dolphin population, I may conclude that an observed population change is due to hunting. I will also extrapolate the data to see what could be expected to happen to the spotted dolphin population in the future with and without hunting.
Presentation	PowerPoint presentation

A **correlation** shows a relationship between two things. For example, warm weather and sunshine are correlated.

An **extrapolation** uses existing data to make a prediction outside the range of the data.

An **interpolation** uses existing data to make a prediction within the range of the data.

Sample 2

Topic	Early ocean navigation
Purpose of project	I've heard that clocks used to be important to navigation. I want to find out how timekeeping was used by sailors to determine their location on the ocean.
Anticipated research	I plan to research historical ocean navigation. I may also need to look at a timeline of clocks to see what kinds were available to early sailors.
Anticipated analysis	I plan to give an overview of what I learn in my research. I will then give an explanation and some examples of how sailors navigated and hopefully I will be able to describe how clocks were used to help him.
Presentation	I plan to write a report that includes pictures and diagrams to support the explanations.

Sample 3

Topic	Basketball shots
Purpose of project	Is a quadratic function actually a good model for a basketball shot?
Anticipated research	I'm going to make a video in which I will shoot a basketball from many different locations on a basketball court.
Anticipated analysis	I'm going to take several still frames from a single shot. Next, I will overlay a Cartesian coordinate plane on each still frame to give a set of coordinates to each ball location. I will then try to sketch and determine the equation of a quadratic function that passes through all of the points. I will repeat this process for a few different shots to see if my results are consistent.
Presentation	PowerPoint that includes my videos and pictures.

Sample 4

Topic	Social Media
Purpose of project	Do boys and girls use social media differently?

Anticipated research	A survey with questions like the following:
	 • Do you use social media?
	 • What types of social media do you use?
	     ◦ Facebook
	     ◦ Twitter
	     ◦ blogs
	     ◦ internet forums
	     ◦ gaming
	     ◦ other
	 • For how many hours per week do you use social media?
	 • For how long have you been using social media?
	 I plan to get at least 20 boys and 20 girls at my school to take the survey.

Anticipated analysis	I plan to calculate percentages for the first two questions' data and I will calculate the mean, median, range, and standard deviation for the third and fourth questions' data. I will compare all of the values of the two groups and look to see if boys and girls use social media differently.
Presentation	I'm going to make a video. In the video, I'm going to first describe social media and then I'm going to show the survey and some people completing it. After that, I'll give a summary of my data and calculations. Finally, I'll describe what I discovered from my analysis of the survey results.

Project Checklist

Use this checklist once you have completed your project. You should be able to answer **yes** to each statement when your project is complete.

Project Checklist	Yes	No
The topic is appropriate.		
My project uses math or is related to math.		
There is background information for someone that is not familiar with my topic.		
Diagrams and tables are clear and easy to read.		
The data or a summary of the data collected has been included.		
The data has been analyzed thoroughly.		
A convincing argument that answers the original question has been made.		
Where possible multiple points of view have been described.		
Information taken from another source has been properly referenced.		
Accuracy and reliability of the data has been checked and any concerns have been noted.		

"How long should my project be?"

There is no minimum or maximum length for your project, but asking yourself the following questions may help decide when you are finished.

- Have I considered all of the sections outlined in this guide?
- Have I described my topic thoroughly?
- Have I analyzed my data thoroughly?
- Does the project feel complete?
- Am I proud to present this to someone else?

Rubric

Complete your *Course Research Project* using your best work. Your project will be assessed according to the rubric and criteria provided.

Category	4	3	2	1
	The student…	*The student…*	*The student…*	*The student…*
Collect primary or secondary data related to the topic	Collected data that is **pertinent** and **conclusively** established the trend.	Collected data that is **relevant** and **substantially** established the trend.	Collected data that is **suitable** and **generally** established the trend.	Collected data that is **irrelevant** and **does little to** establish the trend.
Interpret the Data	Provided an **astute** interpretation of the data.	Provided a **credible** interpretation of the data.	Provided a **rudimentary** interpretation of the data.	Provided a **flawed** interpretation of the data.
Present multiple sides of the issue with supporting data	Presented multiple sides of issue with **precise** supporting data.	Presented multiple sides of issue with **relevant** supporting data.	Presented multiple sides of issue with **basic** supporting data.	**Unable** to present multiple sides, or presented multiple side of issue with **flawed** supporting data.
Organize and present the research project	Organized and presented the research in a **purposeful** and **compelling** manner.	Organized and presented the research in a **logical** and **effective** manner.	Organized and presented the research in a **reasonable** and **simplistic** manner.	Organized and presented the research in a **disorganized** and **ineffective** manner.

Total: _____ / 16

Criteria	Description of Criteria	Yes	Not Yet
Assess the accuracy, reliability, and relevance of the sources of the data collected	The student has critically analyzed the sources of data and discussed their accuracy and reliability.		

Teacher Comments:

Presenting multiple sides of an issue will mean different things for different projects. For the four sample projects, multiple sides may be presented in the following ways:

- Dolphin populations – Both a hunter's perspective as well as an environmentalist's perspective could be considered in the project.
- Oceanic navigation – The history of oceanic travel was not the same for all cultures, so the significance of clocks could be described for various cultures.
- Basketball shots – Reasons that a quadratic function is a good model as well as reasons that a quadratic function is a bad model could both be shown.
- Social media – Both similarities and differences in how boys and girls use social media could be discussed.