Mathematics 30-2
Mathematics Research Project
Statistics in Sport

Moneyball is a 2003 book by Michael Lewis, which was later turned into a movie starring Brad Pitt. The book and movie follow the 2002 Oakland Athletics, who successfully used statistics to find value in players who didn't cost much in salary.

http://images.cdn.fotopedia.com/flickr-3591369437-hd.jpg

Research statistics and salaries from a professional sport of your choice. Determine any correlation between one statistic and salary. For example, you might research the NHL and examine 40 players to compare their salary to the number of goals scored last season. You could research the CFL and compare the starting quarterbacks for each team in terms of salary compared to passing yards.

Your Task

Collect Data and Validate Sources
- Research statistics and salaries from a professional sport of your choice. For example, you might research the NHL and examine 40 players to compare their salary to the number of goals scored last season. You could research the NFL and compare the starting quarterbacks for each team in terms of salary compared to passing

Analyze and Present Data
- Determine any correlation between the statistics you chose to collect. Is there a trend? Are there any outliers?

Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. In the example above, you might consider questions like (but not limited to): Do the highest paid players always perform the best? What other factors influence how an individual player performs? Which player was the best bargain? Which player was the biggest bust? If you were putting together a team, which statistics would you look at, and why? Would this "Moneyball" approach work in the sport you have chosen?

Present Research Project
- Present your project in a format approved by your teacher.

Mathematics 30-2
Mathematics Research Project
World Population Growth

In 2012, the world population surpassed 7 billion people.

http://chesterfields.me.uk/wp-content/uploads/2010/12/New_York_City_Gridlock-240x300.jpg

Some people feel that the population is growing too fast, and that our resources aren't sufficient to sustain us on this planet, given our current growth rate. Others believe that the growth is leveling off.

Your Task

Collect Data and Validate Sources
- Research the historical growth of the population on earth.
- Justify the validity of your sources.
- Research what the experts are saying.

Analyze and Present Data
- You might want to graph this data. Are there any trends? Can you make any predictions about population growth?
- Does your prediction match the experts? What factors need to be considered in making these predictions? What factors will influence whether the predictions prove to be correct?

Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. You might look at questions like (but not limited to): Are our resources sufficient to support our population growth? What controversies surround population growth?

Present Research Project
- Present your project in a format approved by your teacher.

Mathematics 30-2
Mathematics Research Project
Minimum Wage vs. Unemployment

Conventional wisdom suggests that raising minimum wage will increase unemployment. A paper written in September of 2011 by Jeremy R. Magruder contends that the opposite is true. The paper is available here:
http://www.econ.yale.edu/conference/neudc11/papers/paper_272.pdf

http://capl.washjeff.edu/13/m/462.jpg

Your Task

Collect Data and Validate Sources
- Collect data from a province or country that increased its minimum wage. Compare the unemployment rate prior to that increase with the unemployment rate after the increase.
- Justify the validity of your sources.

Analyze and Present Data
- Analyze the data and determine what affect that increase had on the unemployment rate.

Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. You might look at questions like (but not limited to): Does the data support or refute the article written by Magruder? Could any trends be attributed to other factors?

Present Research Project
- Present your project in a format approved by your teacher.

Mathematics 30-2
Mathematics Research Project
Alberta License Plates

In 1984, the province of Alberta replaced its old yellow and black license plates with the colour scheme we still use today.

Pre-1984

http://upload.wikimedia.org/wikipedia/commons/thumb/4/46/AB_plate_EDC064.jpg/800px-AB_plate_EDC064.jpg

Post-1984

http://upload.wikimedia.org/wikipedia/commons/thumb/1/1d/AB_plate_GTC883.jpg/800px-AB_plate_GTC883.jpg

In 1984, it was anticipated that the new colour scheme and re-starting the number system would give us enough plates to last forever. In 1998, however, it became apparent that we would run out of plates soon. A small adjustment was made in 2003 to prolong the numbering system seen above, but that adjustment ran out in 2010, when an entirely new numbering scheme was devised.

Your Task

Collect Data and Validate Sources
- Research the post-1984 history of license plates in Alberta. Determine what restrictions were placed on the plates initially, and look at the adjustments that were made in subsequent years.

Analyze and Present Data
- Analyze the data you have collected. Explore questions like (but not limited to): How many plates were available initially? How many did the adjustments add? What effect did the restrictions have on the number of available plates?
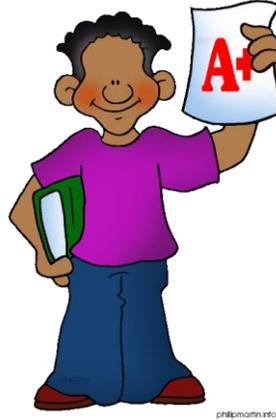
Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. You might present multiple sides by proposing an alternative to the solution the Alberta government arrived at in 2010. What else could they have done to come up with more license plates? You might present multiple sides by looking at what other provinces did when they ran out of license plates.

Present Research Project
- Present your project in a format approved by your teacher.

Mathematics 30-2
Mathematics Research Project
Grade Inflation

Articles like "A History of College Grade Inflation" by Catherine Rampell (Exonomix, July 14, 2011) claim that grades in college courses have been increasing since 1960, despite the fact that students aren't as studious as they were in the past.

Your Task

Collect Data and Validate Sources
- Research the issue of college and/or university grade inflation by collecting relevant data.
- Justify the validity of your sources.

Analyze and Present Data
- Analyze the data you have collected. Examine any trends. Speculate on the causes.

Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. Explore questions like (but not limited to): Is grade inflation a real phenomenon? If so, what might be the factors contributing to grade inflation. If not, what is wrong with the data in Catherine Rampell's article?

Present Research Project
- Present your project in a format approved by your teacher.

Mathematics 30-2
Mathematics Research Project
Post-Secondary Tuition

Tuition at post-secondary institutions tends to increase year after year. Recently, major protests took place in the province of Quebec by students who were opposing tuition increases.

http://capl.washjeff.edu/1/l/2950.jpg

Research the history of tuition costs in a Canada, or in a specific province. Use the data to make a prediction about the future of tuition costs.

Your Task

Collect Data and Validate Sources
- Research the historical cost of tuition in a region of Canada, or in all of Canada.
- Justify the validity of your sources.

Analyze and Present Data
- Analyze the data you have collected. Explore questions like (but not limited to): What will my tuition cost next year? How much will my children's tuition cost? How much did my grandfather's tuition cost?

Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. Answer questions like (but not limited to): How does tuition in Canada compare to other countries? Who should pay for post-secondary education?

Present Research Project
- Present your project in a format approved by your teacher.

Note: The idea for this project comes from this website: http://www.yummymath.com/2012/is-college-affordable/

Mathematics 30-2
Mathematics Research Project

Cost of Home Ownership

The cost of home ownership has varied greatly over the past century.

http://images.cdn.fotopedia.com/flickr-307914463-hd.jpg

Research the historical cost of owning a home in a neighborhood of your choice. Compare the cost today to the cost in an earlier generation. You might predict the cost of ownership in 20 years. When considering the cost of ownership, you could consider purchase price, mortgage rates, utility costs, property taxes and other measures.

Your Task

Collect Data and Validate Sources
- Gather data on cost of home ownership in a neighborhood of your choice. You will need current data and historical data.

Analyze and Present Data
- Analyze the data you have collected. Answer questions like (but not limited to): What did homes in this neighborhood cost to own in a previous generation? What might the cost of ownership be in future generations? How do interest rates affect the cost of ownership?

Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. Answer questions like (but not limited to): Has anything ever happened in the neighborhood that significantly affected ownership costs? Are people spending too much on homes to be able to make payments if interest rates rise?

Present Research Project
- Present your project in a format approved by your teacher.

Mathematics 30-2
Mathematics Research Project
Golf Clubs

Different golf clubs are used for different shots, and they give the ball different trajectories.

http://images.cdn.fotopedia.com/flickr-2539667369-hd.jpg

"Loft," or "loft angle," is a measurement, in degrees, of the angle at which the face of the golf club lies relative to a perfectly vertical face represented by the shaft. Technically, iron loft and wood loft are measured slightly differently, but the effective result is the same.
http://golf.about.com/cs/golfterms/g/bldef_loft.htm

Your Task

Collect Data and Validate Sources
- Gather data and research the effect of the loft of various clubs on the trajectory of the shot.

Analyze and Present Data
- Analyze the data you have collected. Answer questions like (but not limited to): How do you determine what club to use? Which club will send the ball the farthest? Which club will send the ball the highest?
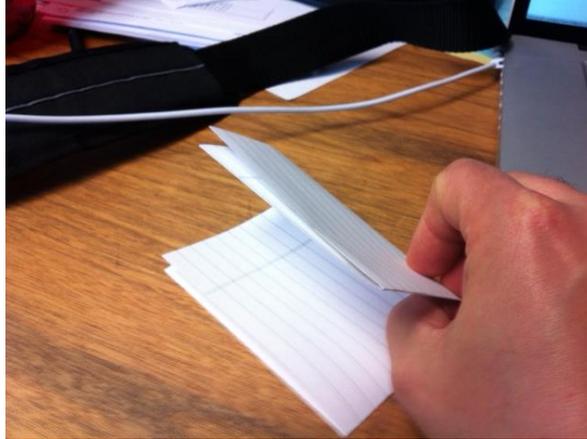
Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. What are the regulations on golf club production? Why might those regulations be needed?

Present Research Project
- Present your project in a format approved by your teacher.

Mathematics 30-2
Mathematics Research Project
Paper Folding

It has long been rumored that it is impossible to fold a piece of paper more than 6 times.

Explore the mathematics behind this rumor.

Your Task

Collect Data and Validate Sources
- Collect data showing the number of layers compared to the number of folds. What pattern emerges?
- If you generated the data yourself, how can you be sure it is accurate?

Analyze and Present Data
- Explore the math behind the pattern, and make some predictions. Answer questions like (but not limited to): Is it possible to fold a piece of paper more than 6 times? How many layers thick would a 7 fold paper be? How many folds would be required to reach the height of a common object like a desk or a counter? If it could be folded over and over again, how many folds would be required to reach the height of a tall building?
- Compare the number of folds to the heights of several objects. Be sure to show any calculations you make.

Present Multiple Sides
- Identify any controversies and present multiple sides of the issue with supporting data. The Myth Busters team tackled this one. Watch the video of their attempt on YouTube, and discuss whether or not they have debunked this myth.
  http://www.youtube.com/watch?v=kRAEBbotuIE

Present Research Project
- Present your project in a format approved by your teacher.

Student Planning Guide

Name _____

Basic Expectations of a Research Project
- The topic is appropriate
- The sources are identified and evaluated
- The data is analyzed and interpreted

Planning Guide

This planning guide will help you organize and prepare your mathematics research project. It will help you meet all of the criteria required of this project.

Step 1 - Choosing an Appropriate Topic

Choose a topic that involves mathematics and that is of interest to you. In the space below, briefly describe your topic and the mathematics involved. Share your topic with your teacher before beginning your research. Your teacher and/or your classmates can help you come up with an appropriate topic if you can't think of anything.

My Topic:

Mathematics Involved:

Step 2 - Conducting Your Research

You will need to find data related to your topic to analyze and interpret. This data may be informational or statistical in nature. You need to access your data from more than one source so that you can compare and evaluate the validity of the sources.

Where will you go to find the information/data you need? Is it readily available? Explain.

Once you have found the information/data, explain how you know the data is valid.

Student Planning Guide

Step 3 - Interpreting the Data

Interpret your data. It is possible that a mathematical interpretation of your data will require mathematics you haven't studied yet. If that is the case, please see your teacher for help. Mathematical calculations are not the focus of this research project. Your interpretation is what will be assessed.

How will you present your interpretation of this data? Some data might be displayed in a graph. Other data might be presented in a chart or by showing your calculations. Provide a brief description of your interpretation of the data below.

Did you encounter any controversies or multiple points of view in your research? If so, explain below what those are.

Step 4 - Preparing Your Presentation

You now have your topic, data, and an idea about how to interpret that data. Your next step is to prepare your presentation. You may wish to use:
- Prezi
- PowerPoint
- Poster
- Written Summary

Please check with your teacher as to what types of presentation will be acceptable in your class.

Describe below how you will present your findings. Then get to work building your presentation.

Your presentation must include:
- Your topic
- Your data
- An analysis of the validity of your data sources
- A description of the multiple points of view and controversies, if applicable
- An interpretation of your data including any predictions and conclusions you can reach

Mathematics 30-2
Mathematics Research Project

Rubric

Student _____ **Date** _____

Level / Criteria	Excellent	Proficient	Adequate	Limited *	Insufficient/ Blank *
Collect primary or secondary data related to the topic (MRP 1) [CN, V]	Collects data that is **pertinent** and **conclusively** establishes the trend.	Collects data that is **relevant** and **substantially** establishes the trend.	Collects data that is **suitable** and **generally** establishes the trend.	Collects data that is **irrelevant** and **does little to** establish the trend.	No score is awarded because there is insufficient evidence of student performance based on the requirements of the assessment task.
Interpret the Data (MRP 1) [ME, PS, R, V, T]	Provides an **astute** interpretation of the data.	Provides a **credible** interpretation of the data.	Provides a **rudimentary** interpretation of the data.	Provides a **flawed** interpretation of the data.	
Present multiple sides of the issue with supporting data (MRP 1) [C, CN, R]	Presents multiple sides of issue with **precise** supporting data.	Presents multiple sides of issue with **relevant** supporting data.	Presents multiple sides of issue with **basic** supporting data.	Presents multiple sides of issue with **flawed** supporting data.	
Organize and present the research project (MRP 1) [C, CN]	Organizes and presents the research in a **purposeful** and **compelling** manner.	Organizes and presents the research in a **logical** and **effective** manner.	Organizes and presents the research in a **reasonable** and **simplistic** manner.	Organizes and presents the research in a **disorganized** and **ineffective** manner.	

* When work is judged to be limited or insufficient, the teacher makes decisions about appropriate intervention to help the student improve.