

Research Project Guidelines for Math 105M Online: Spring 2017

Each student will research and present a project that demonstrates a general mathematical understanding, history, or utility. You may write a paper of around 800-1000 words, or you may make a slide show (PowerPoint or Google Slides) of around 10 slides. **The project is due by Friday, June 16th.**

Your project does **NOT** have to relate to the topics we're studying in class; it could be on anything you want, as long as it's at least partly related to math.

Here are some topics that past students have chosen; you may choose something from this list or come up with your own idea. (The categories listed are not important; your topic could be totally different.)

- Health & Society: the effects of eating sugar, exercise for people over 40, the positive effects of youth athletics, marriage & divorce statistics in the U.S. (or in the U.S. military), USAF demographics, world (or U.S.) population growth, demographics of world religions, high school graduation rates, donating blood, using an insulin pump, medical calculations.
- Aviation & Technology: aircraft wing design, center of mass in a cargo plane, repairing turbine blades, installing rivets, seating a bearing compartment, ballistics and bullet design, installing solar panels, heating water with solar power, electrical circuits, encoding data, online banking, ham radio.
- Home & Work & Play: the history and design of the Slinky, converting a pickup truck to diesel, calculating mileage for a pickup truck with big tires, cost of biodiesel vs. normal diesel, cost of hybrid vs. conventional car, remodeling a kitchen, starting a small business, restaurant expenses.
- Art & Culture: Native American art, geometry in art, mandalas, tessellations & M.C. Escher, scale drawings, perspective, labyrinths.
- Math & Education: gender differences in learning mathematics, changes in U.S. math education such as common core, math anxiety, teaching fractions in elementary school.
- Math in History: women mathematicians, the abacus, Mayan math, Egyptian math, Babylonian math, the discoveries of Archimedes, the discoveries of Copernicus, the discoveries of Eratosthenes.
- Patterns & Theories in Math: binary numbers, magic squares, the Fibonacci sequence, Keynesian economics, conservation of momentum, numerology, the Library of Babel website.
- Sports: advanced statistics in hockey (Corsi, Fenwick, PDO...), advanced statistics in baseball (WAR, FIP, Pythagorean expectation...), advanced statistics in basketball (usage rate, PER, true shooting percentage...), advanced statistics in football (QBR, Pythagorean expectation...), the big business of fantasy football, taxpayer-funded arenas, defensive shifts in baseball, pulling the goalie in hockey, going for it on 4th down in football, focusing on "threes and frees" in basketball.

Choose your topic by the end of Week 6, Monday, May 15th. When you have decided on a topic, email me and let me know what you're considering. If your topic is too broad or too narrow or troublesome in some other way, I can help you reshape your idea into something manageable. Once we agree that your idea sounds good, I will post your topic in the Discussions forum on MyMathLab.

Submit a rough draft by the end of Week 10, Monday, June 12th. Students will be divided into groups of 4. You will share your rough draft with your group members and they will critique it and give you advice for improving your project before final submission.

I do not care how you format your citations; you may use any format as long as it clearly gives credit to your sources. Be sure to list your works cited; it should be easy for me to check your sources and verify that you did not plagiarize them. Also, I may use a plagiarism-checking service such as Turnitin.com to check for this. You may use Wikipedia for general information, but you **cannot** cite it as a source. For full points, you must include at least one source that is also available in print (a book or periodical) and not just online. (I don't want all of your sources to be short, crappy, online-only articles.) It's okay if you access that book/magazine/newspaper online, but it must be from a reputable publisher, not just some clown who got paid 50 bucks to write clickbait. You can find resources at your local library, and your library is probably part of a group that lends materials countywide. (If you are deployed overseas or have some other legitimate reason why you can't get hold of a book, let me know and we'll come up with a solution.) Mrs. Chase is a librarian who knows librarians all over the country, so I'll find out if you give me a B.S. excuse for not using a print source.

External Work: Did you follow the timeline? Did you critique your classmates' projects?

1 Point	2 Points	3 Points	4 Points
Did 0 of 3: Chose topic on time, submitted rough draft on time, critiqued classmates' projects	Did 1 of 3: Chose topic on time, submitted rough draft on time, critiqued classmates' projects	Did 2 of 3: Chose topic on time, submitted rough draft on time, critiqued classmates' projects	Did 3 of 3: Chose topic on time, submitted rough draft on time, critiqued classmates' projects

Focus: What are you trying to say? Is it interesting? What point are you trying to prove?

1 Point	2 Points	3 Points	4 Points
Thesis/purpose is unclear, unsupportable, vague, or confusing	Thesis/purpose is clear, but too broad or unfocused	Thesis/purpose is clear, some aspects of thesis are addressed	Thesis/purpose is clear, all aspects of thesis are addressed

Content: Did you explain your topic fully? Does the reader learn something?

1 Point	2 Points	3 Points	4 Points
Demonstrates minimal knowledge of topic, does not support main idea with examples	Demonstrates some knowledge of topic, supports some aspects of main idea with examples	Demonstrates strong knowledge of topic, supports main idea with appropriate examples	Demonstrates thorough knowledge of topic, supports main idea with vivid examples

Organization, Transitions, Grammar/Usage/Mechanics: Is it well written and easy to follow?

1 Point	2 Points	3 Points	4 Points
No apparent progression of ideas, awkward transitions, no conclusion, writing errors hurt communication	Uneven progression of ideas, awkward transitions, vague conclusion, writing errors distract the reader	Logical progression of ideas, smooth transitions, conclusion summarizing main points, any writing errors are minor	Logical progression of ideas, smooth transitions, strong conclusion drawing main points together

Support: Did you give full credit to your sources for information and images?

1 Point	2 Points	3 Points	4 Points
Support is limited to 1 general source OR no sources given; quotes not attributed to sources	Support comes mainly from 1 or 2 sources; uses direct quotes when paraphrasing would have been better	Support comes from at least 3 sources; direct quotes are used sparingly	Excellent support selected from a wide variety of trustworthy sources including one that is available offline