

Novaree 2017 Nova: Mathematics Homework

Sorry everyone! There is a lot of homework for this class since most of the requirements require at least 3 hours of work for each task and we only have 3 hour's total together. A list of the requirements are [here](#).

Make sure to be safe on the internet and don't click on any strange links!

1. Watch another 2.5ish hours of videos about math, cryptography, models and modeling, physics, sports equipment design, or bridge building (Requirement 1A)
 - a. Milan recommends these TED talks (Some of them may be hard to understand but most are really cool)
 - i. https://www.ted.com/talks/arthur_benjamin_does_mathemagic
 - ii. https://www.ted.com/talks/eduardo_saenz_de_cabazon_math_is_forever?language=en
 - iii. https://www.ted.com/talks/marcus_du_sautoy_symmetry_reality_s_riddle/transcript?language=en#t-1000000
 - iv. https://www.ted.com/talks/clayton_cameron_a_rhythm_etica_the_math_behind_the_beats?language=en
 - v. https://www.ted.com/talks/ron_eglash_on_african_fractals?language=en
 - vi. https://www.ted.com/talks/benoit_mandelbrot_fractals_the_art_of_roughness?language=en
 - vii. https://www.ted.com/talks/jean_baptiste_michel_the_mathematics_of_history?language=en
 - viii. https://www.ted.com/talks/randall_munroe_comics_that_ask_what_if?language=en#t-242727
 - b. PBS is another good source for videos
2. Research cryptography or people who made major breakthroughs in the field of cryptography for about 3 hours (Requirement 1B)
 - a. Make sure to list the sites you visited and their major topic
 - b. Be ready to discuss how cryptography is used in the military and everyday life
 - c. Figure out how a cryptographer uses math
3. Read at least 3 articles about physics, math, modeling, or cryptography. You may wish to read about how technology and engineering are changing sports equipment, how and why triangles are used in construction, bridge building, engineering, climate and/or weather models, how banks keep information secure, or about the stock market. (Requirement 1C)
 - a. Make a list of at least two questions or ideas from each article.
 - b. Be ready to discuss 2 of these questions.
4. Do a combination of reading, writing, or researching (for another three hours ☺)
 - a. Make a list of two questions for each source

- b. Be ready to discuss of the questions
5. Do one of the following (Requirement 3, we already did one of two!)
- a. Attend at least two track, cross-country, or swim meets.
 - i. For each meet, time at least three racers. (Time the same racers at each meet.)
 - 1. Calculate the average speed of the racers you timed. (Make sure you write down your data and calculations.)
 - 2. Compare the average speeds of your racers to each other, to the official time, and to their times at the two meets you attended.
 - ii. Be ready to share and discuss your conclusions about the racers' strengths and weaknesses.
 - b. Attend a soccer, baseball, softball, or basketball game. Choose two players and keep track of their efforts during the game. (Make sure you write down your data and calculations.) Calculate their statistics using the following as examples:
 - i. Soccer—Goals, assists, corner kicks, keeper saves, fouls, offsides
 - ii. Baseball or softball—Batting average, runs batted in, fielding statistics, pitching statistics
 - iii. Basketball—Points, baskets attempted, rebounds, steals, turnovers, and blocked shots
 - iv. Be ready to share and discuss your conclusions about the players' strengths and weaknesses.
 - c. Attend a football game or watch one on TV. (This is a fun activity to do with a parent or friend!) Keep track of the efforts of your favorite team during the game. (Make sure you write down your data and calculations.) Calculate your team's statistics using the following as examples:
 - i. Kicks/punts
 - 1. Kickoff—Kick return yards
 - 2. Punt—Number, yards
 - 3. Field goals—Attempted, percent completed, yards
 - 4. Extra point—Attempted, percent completed
 - ii. Offense
 - 1. Number of first downs
 - 2. Forward passes—Attempted, percent completed, total length of passes, longest pass, number and length of passes caught by each receiver, yardage gained by each receiver after catching a pass
 - 3. Running plays—Number, yards gained or lost for each run, longest run from scrimmage line, total yards gained or lost, and number of touchdowns
 - iii. Defense—Number of quarterback sacks, interceptions turnovers, and safeties
 - iv. Be ready to share and discuss your conclusions about your team's strengths and weaknesses.

- d. How starry are your nights? Participate in a star count to find out. This may be done alone but is more fun with a group. Afterward, be ready to share.
 - i. Visit the website of the Astronomical Society of the Pacific at <http://www.astrosociety.org/education/hands-on-astronomy-activities/> for instructions on performing a star count.
 - ii. Do a star count on five clear nights at the same time each night.
6. Make sure to bring you calculator to next week!