

Category: Mathematics

Student Name: Joshua Broekhuijsen

Team Members (if any):

Project Title: Patterns in Prime Numbers

Abstract: I wanted to know whether there was a pattern to prime numbers, and if so, whether I could find it. To begin, I thought of an equation that I presented to my dad, to see if he had anything to say. He found a counterexample, so I modified my original equation and re-presented it. For the second time, he proved me wrong. This continued for a while until my dad couldn't find a counterexample. We decided this would be a good thing to pursue, so my dad wrote a computer program with which to test my equations with the first 500 numbers they generated, and check to see if they were prime. To determine whether or not a number was prime, we divided it by every prime number up to the square root of the number in question. To generate the prime numbers with which to divide the numbers in question, we wrote a program to run the Sieve of Eratosthenes. After each equation was tested, I would revise it, and we would test the revised equation. In the end, I was not able to find a pattern in prime numbers, or an equation to describe that pattern, although I did invent several equations that would find some prime numbers. I believe that with enough time and effort, I will be able to find an equation to find all, or at least only, prime numbers.

Category: Medicine & Health

Student Name: Logan Cole

Team Members (if any): Kristian Huff

Project Title: Dracula's Cabernet

Abstract: QUESTION/PURPOSE The purpose of this experiment is to determine the degree of hydration based on changes in the hematocrit. The hematocrit is the percentage of whole blood occupied by cellular elements. We hypothesized that hydration can be determined based on changes in the hematocrit. METHOD All equipment and supplies necessary to conduct the experiment were obtained. Then we fasted for 24 hours in order to obtain a preprandial hematocrit. We then consumed a high sodium meal and accompanied the meal with Powerade. These steps were repeated two additional times, with Coca-Cola and water as beverages. We then checked our postprandial hematocrit at specified time intervals. To measure our hematocrit, we obtained our own blood samples, centrifuged them, and then performed calculations. The data was recorded in lab notebooks and graphed. RESULTS We confirmed that hydration levels could be determined based on changes in the hematocrit. A decrease in the hematocrit indicated a more hydrated state, whereas an increase in the hematocrit indicated a less hydrated state. We also concluded that consuming Coca-Cola and Powerade produced larger changes in the hematocrit, relative to the changes in the hematocrit that occurred with water.

We also determined that water maintained homeostasis with regard to the hematocrit better than Coca-Cola or Powerade.

Category: Medicine & Health

Student Name: Emma Ewell

Team Members (if any): AnnaJane Mason

Project Title: Posture Matters

Abstract: Our question was Does Posture Matter to a ballet dancer? Our hypothesis was that by paying proper attention to balance, direction, and position that it would help us in our dancing. We each did a certain amount of turns called chaines. We used a backpack to relate this to the real world. We found we could do 22 turns without the back pack, 7 with the back pack on one shoulder, and 12 with the back pack on both shoulders. We also went and observed a few classes at the dance studio we go to, and when the teacher would correct them on something we would record if we thought that what they corrected helped or not and if they even fixed what had been corrected or not. Our answer is that through changing the way your balance, direction, and position are then it really does help you and you don't have back problems.

Category: Medicine & Health

Student Name: Connor Hines

Team Members (if any):

Project Title: The Cleaner We Are, The Greener We are: Sanitation and its affects on global economies

Abstract: My project is entitled The Cleaner We Are, The Greener We Are: The Effect of a Nation's Sanitation System on its Economy. Its purpose is to illustrate the effect that the condition of a nation's sanitation system has on its economy. I decided to use this topic for my Science Fair project after traveling to the African nations of Kenya and Tanzania, utilizing their sanitation systems (which aren't the worlds' finest) and then looking at the state of their economy. I then compared them to the Japanese sanitation system (which is one of the worlds' finest) and its' economic status. The method I will use to demonstrate this is RESEARCH and COMPARISON. I have gathered information on the subject by both reading the book entitled The Big Necessity: The Unmentionable World of Human Waste and Why it Matters by Rose George, and by using Google to research international sanitation on the Internet. I believe that this is an extremely important topic that is currently being ignored by all but a few nations in the developed world and one that we ignore to the peril of billions of people.

Category: Medicine & Health

Student Name: Kristian Huff

Team Members (if any): Logan Cole

Project Title: Dracula's Cabernet

Abstract: **QUESTION/PURPOSE** The purpose of this experiment is to determine the degree of hydration based on changes in the hematocrit. The hematocrit is the percentage of whole blood occupied by cellular elements. We hypothesized that hydration can be determined based on changes in the hematocrit. **METHOD** All equipment and supplies necessary to conduct the experiment were obtained. Then we fasted for 24 hours in order to obtain a preprandial hematocrit. We then consumed a high sodium meal and accompanied the meal with Powerade. These steps were repeated two additional times, with Coca-Cola and water as beverages. We then checked our postprandial hematocrit at specified time intervals. To measure our hematocrit, we obtained our own blood samples, centrifuged them, and then performed calculations. The data was recorded in lab notebooks and graphed. **RESULTS** We confirmed that hydration levels could be determined based on changes in the hematocrit. A decrease in the hematocrit indicated a more hydrated state, whereas an increase in the hematocrit indicated a less hydrated state. We also concluded that consuming Coca-Cola and Powerade produced larger changes in the hematocrit, relative to the changes in the hematocrit that occurred with water.

We also determined that water maintained homeostasis with regard to the hematocrit better than Coca-Cola or Powerade.

Category: Medicine & Health

Student Name: AnnaJane Mason

Team Members (if any): Emma Ewell

Project Title: Posture Matters

Abstract: Question: Does correct posture make a difference in performance to a ballet dancer? Hypothesis: We believe that attention to correct posture will improve balance, direction, position, and appearance for a ballet dancer. Method: Placed 10 1/2 ft. strip of tape on floor. Subjects performed chaines along the tape line. Placed backpack (filled w/13 lbs of books) first on one then on two shoulders, then performed chaines on tape line. Results: (Without backpack) Subjects were able to follow tape line (maintaining position & appearance) and performed the most chaines. (W/Backpack on 2 shoulders) Chaines performance, appearance & position was reduced/compromised. (W/Backpack on 1 shoulder) Worst performance and appearance of all three scenarios. Observations: We observed several ballet classes, noting dancer improvements when posture was corrected by instructor. Results corresponded to our experiments.

Category: Medicine & Health

Student Name: Christian Minton

Team Members (if any):

Project Title: Nitric Oxide Gas Handwashing - Dose Response

Abstract: This project was to establish a safe and applicable dose of Nitric Oxide (NO) gas that could replace antibacterial soap, a cause of antibiotic-resistant bacteria, in handwashing. This is a continuation project from last year. I established that 20 minutes of 1,000 ppm NO was more effective at reducing bacterial hand colonization than 2 minutes of soap handwashing. Because of the potential hazardous nature of NO, this project was performed at GeNOsys, Inc. under the direction of Randy Miller, a research scientist who has used NO for 20 years and my father, a practicing Neonatologist who has used NO for 10 years. Fifteen volunteers' hands (with informed consent) were cultured pre and post handwashing and NO exposure at 1,000, 5,000 or 10,000 ppm for 2, 5 or 10 minutes. All NO exposed volunteers had continuous oxygen saturation and methemoglobin continuously throughout the procedure. All cultures were plated on blood agar petri dishes in the 3 corner dilution method and incubated at 39° for 48 hours at the UVRMC Microbiology Lab. Using a predetermined grading scale, bacterial growth was estimated. All biological materials were disposed of in the UVRMC Hazardous Waste Disposal Dump. I showed that soap, antibacterial soap, 1,000 and 5,000 ppm NO had little effect on bacterial colonization. However, 10,000 ppm at 5 to 10 minutes were effective. All doses were safe.

In conclusion, this is the first work in the literature to show NO could be developed into an alternative for soap handwashing that could reduce antibiotic-resistant bacteria.

Category: Medicine & Health

Student Name: Sydney Mower

Team Members (if any):

Project Title: Light Sight

Abstract: How does color affect night vision in humans? That is what I was trying to find out in this project. After reasearch, I decided that green would be best shortly followed by blue because human eyes are more sensetive in the middle of the color spectrum. Green is the middle, and then the two sides are yellow and blue. We found that when the eyes are adjusted to dark, they tend to shift to seeing better in the darker colors, the opposite in light. To test this, we made a box with a small lighting fixture in the back. We tunned the fixture by putting filter papper on the openings. Then we brought the subject in and asked them to read some flash cards from different distances in the different colors of light. We found out that green was definitely the best shortly followed by yellow and then blue. This is probbably because the subjects were not fully adjusted to the dark yet.

Category: Medicine & Health

Student Name: Taylor Murdock

Team Members (if any):

Project Title: Emesis is Your Nemesis

Abstract: Aspiration of emesis (vomit) in unresponsive patients remains a serious health concern. The possibility exists of using a stronger suction unit that could remove emesis from a patient's throat faster and without causing tissue damage. This could potentially save many lives. Knowing that a Shop-Vac is able to quickly suck up just about anything, it was put to the test. Measurements were taken of the suction power of a Shop-Vac, using different home-made suction catheters, as well as the suction power of an \$800.00 EMS suction unit. Various suction catheters, with and without safety ports, were thoroughly tested. Those same catheters were tested on freshly slaughtered pig throats. Those tissues were examined under a microscope for possible tissue damage. The suction catheters were tested on their ability to suck up fluids, and ultimately tested under real world conditions, sucking up actual masticated food (pizza and milk chewed up). Results were compiled and reviewed. First and foremost, there was no visible damage to any of the tissues we tested with either suction unit, even when using suction catheters without safety side air holes. Finally, in testing the ability of the suction units to actually remove vomit, the Shop-Vac won hands down, cutting times from 135 seconds to 3 seconds! Although variables remain in testing a Shop-Vac for patient use, there remains little

doubt that a Shop-Vac could possibly save many individuals from aspiration by shortening the time needed to suction their airways in times of need.

Category: Medicine & Health

Student Name: Sabrina Reilley

Team Members (if any):

Project Title: Which Pain Reliever Dissolves the Fastest?

Abstract: Abstract For my project, I wanted to find out which over-the-counter pain reliever would dissolve fastest in warm water. I used name brand, generic, and gel caps in my experiment and I recorded how fast they each dissolved in 150ml of water at 98.6 F. My hypothesis was that if I use the same water temperature and the same amount of water, I would find that the tablets dissolved faster than the gel caps. The reason I believed this is because the coating on the outside of the generic tablets appeared to be very thin, thus the tablets should dissolve faster. In all three trials I found that name brand Aspirin, Bayer, had the fastest rate of dissolution. On the other hand, generic Aleve, Naproxen, had the greatest rate of dissolution. Originally, this experiment interested me because I recently broke my femur. Being in a cast for 8 weeks, at times I had to take different types of pain relievers. I always wondered if the pain reliever I was taking was the most effective. After finishing my project, I have found which pain relievers are faster acting and which take longer to dissolve and start working in your blood stream.

Category: Medicine & Health

Student Name: Caitlin Wadley

Team Members (if any):

Project Title: Ready, Set, Wrinkle!

Abstract: Question: What effect does different types of water have on human skin? Hypothesis: I believe that soft water will have the greatest and fastest effect on human skin. Methods and results: I had 3 volunteers soak their hands in 1/2 gallon of 3 different types of water for 15 min. intervals. I repeated the process 3 times, each time having my volunteers rotate to a different type of water. My results varied greatly but when results were averaged, soft water had the slowest effect with hard water next, and the fastest was pure water.

Category: Medicine & Health

Student Name: Brady Anderson

Team Members (if any):

Project Title: Sports Science: Baseball Edition

Abstract: My question is whether or not the relationship between dominate eyes and dominate hands has an effect on your ability to throw a baseball accurately. In simpler terms, I wanted to know whether having your dominate eye on one side of your body, and having your dominate hand on the other side gives you an advantage or disadvantage. To test this I had six people of both types of eye-hand dominances, (six with their dominate eye and dominate hand on the same side, and six with their dominate eye and dominate hand on opposite sides,) and had them throw ten balls at a target I made from twenty feet away. The target had a point system based on how close they were to the middle of the target (like a bulls-eye target). They were given 10 points each time for hitting the bulls-eye and then the points went down by two each ring around the bulls-eye. What I found out was that people that had their dominate eye and dominate hand on the opposite sides of each other, scored about five points better out of one hundred on my scoring system.

Category: Medicine & Health

Student Name: Shelby Barlow

Team Members (if any): Joshua Johnson

Project Title: Do 2 Cochlear Implants improve hearing for the deaf?

Abstract: My question was does two cochlear implants improve hearing for the deaf??? I have two cochlear implants. We wanted to know if it makes a difference with hearing. So one cochlear implant (a hearing device for the deaf) only hears from one ear. Either left or right. Mine was right. So we tested how well I could hear sounds from certain directions. While we do the test we total the fifteen trials up. If I had two which now I have, will I hear better at hearing sound waves from certain directions. Most likely I would get most right or pretty close to the correct direction. We only used four snare drums, drum sticks, a chair and me. What we did was that I was in the center and Shelby played the drums with four beats. We do this for fifteen trials with every direction. So that would be about sixty times we played in total for first set of trials. Then we total up the trials and wait for the second time. After that we compared them and see if we actually found the difference. The results were a big difference. The first trial was eight out of fifteen for front. Back was six. Right was ten. Left was five. The second trial was thirteen for front. Back was eleven. Right was thirteen. Left was nine. So the right and front was a big improvement. The left wasn't because I just got the left one.

Category: Medicine & Health

Student Name: Braden Bennett

Team Members (if any):

Project Title: Arm Span vs. Height

Abstract: My question is does arm span vs. height. The method was I got a tape measure and measured them finger tip to finger tip and head to toe. I found out that arms are longer

Category: Medicine & Health

Student Name: Kennen Brooks

Team Members (if any):

Project Title: Night Vision: The Effects of Age on the Eyes

Abstract: Question: Does age affect how fast your eyes adjust to a darkened room? Hypothesis: The eyes of adults age 26-50 will adjust to the dark faster than others. Method: Draw three simple shapes on a piece of paper. Tape it on a wall in a room with no outside light. Cover the paper with a blank piece of paper so that the test subjects cannot see the shapes. Take a person into the room and have them stand 6 feet from the paper. Turn on a flashlight 2.5 feet behind the person. Have them look at the lights that are on in the room for 10 seconds and then turn them off. Uncover the paper with the shapes. Have them look at the paper and tell you when they can see the three shapes. Time how long it takes them to see the shapes after you turn off the light. Test people from four different age groups: 5-11, 12-25, 26-50, 51 and up. Average the times for each age group. Results: The average time for ages 5-11 was 35.54 seconds, ages 12-25 was 27.22, 26-50 was 28.38, and 51 and up was 87.36. Conclusion: The eyes of teens, young adults and adults adjust quicker to the dark. As you get older it takes longer for your eyes to adjust to the dark.

Category: Medicine & Health

Student Name: Jordyn Earl

Team Members (if any):

Project Title: The Power of the Toothbrush

Abstract: My problem was Does my manual toothbrush clean my teeth as good as an expensive electric toothbrush, a five dollar crest spin brush or my index finger? My hypothesis was I think that my manual toothbrush will clean my teeth better than an expensive electric toothbrush, a five dollar crest spin-brush, and my index finger. For my procedure I had a registered dental hygenist scrape plaque off of my teeth after using the different tools. I then would measure how much plaque was scraped off, and I would keep track in a log. The toothbrush that did the best was the cheap five dollar spin-brush.

Category: Medicine & Health

Student Name: Jacob Eisert

Team Members (if any):

Project Title: Why Two Eyes?

Abstract: Why two eyes? Got me thinking if having two eyes affects our field of vision and things we see in three dimensions, what would happen if we only had one eye? Could we continue to do the same things we do every day with out trouble? After doing some research I came up with an idea to test hypothesis having two eyes helps us see in three dimensions and increases our field of vision. I built a wobble detector that would help me to determine and see how two eyes affect our depth perception and what we see in three dimensions. Setting up the wobble detector on a flat table I asked family and friends to come and move the hoop over the wobble detector with out touching it. The first time through I asked them too cover their left eye, and then their right eye and for the last time through I had them use both eyes. As they moved though the wobble detector I wrote down the number of times the bumped the wobble detector. I found out that having two eyes truly helps us to see in three detentions and increases our field of vision. For when we close one eye some things will appear farther away and our field of vision is decreased.

Category: Medicine & Health

Student Name: Merisa Gleave

Team Members (if any):

Project Title: Does exercise increase lung capacity?

Abstract: I am trying to figure out if exercising will increase a person's lung capacity. I think it will increase their lung capacity. What I did was I found 20 volunteers and classified them as athletes or non-athletes. I then measured each participants tidal capacity-the actual volume of air inhaled and exhaled in a single breath. I also measured their vital capacity-the amount of air that can be forcibly expelled from the lungs after breathing in as deeply as possible. Then I found the average of the tidal and vital capacity. Over the next week the non-athletes were asked to increase their exercise by 10%. The athletes had to maintain their amount of exercise. At the end of the week their tidal and vital capacities were taken again. After looking at the results I realized that almost every non-athlete had an increase in their tidal and vital capacities.

Category: Medicine & Health

Student Name: Joshua Johnson

Team Members (if any): Shelby Barlow

Project Title: Do 2 Cochlear Implants Improve Hearing for the Deaf?

Abstract: My question was does two cochlear implants improve hearing for the deaf??? I have two cochlear implants. We wanted to know if it makes a difference with hearing. So one cochlear implant (a hearing device for the deaf) only hears from one ear. Either left or right. Mine was right. So we tested how well I could hear sounds from certain directions. While we do the test we total the fifteen trials up. If I had two which now I have, will I hear better at hearing sound waves from certain directions. Most likely I would get most right or pretty close to the correct direction. We only used four snare drums, drum sticks, a chair and me. What we did was that I was in the center and Shelby played the drums with four beats. We do this for fifteen trials with every direction. So that would be about sixty times we played in total for first set of trials. Then we total up the trials and wait for the second time. After that we compared them and see if we actually found the difference. The results were a big difference. The first trial was eight out of fifteen for front. Back was six. Right was ten. Left was five. The second trial was thirteen for front. Back was eleven. Right was thirteen. Left was nine. So the right and front was a big improvement. The left wasn't because I just got the left one.

Category: Medicine & Health

Student Name: Lauren Kelson

Team Members (if any):

Project Title: Dribble, Stroke or Dance: A study & comparison of three sports & participant conditioning

Abstract: Athletes throughout the world condition their bodies to be strong and resilient. They strive to increase their endurance and decrease their recovery time. Specifically, their physical exercise pushes peak performance through advancing heart rate, blood pressure and oxygen saturation. Among these athletes are dancers. Dancers are not only athletes, but competitive dancers are extremely well conditioned performers whose sport demands high levels of physical endurance, muscular strength and cardiovascular stamina. In terms of the pure scientific data of heart rate, blood pressure and oxygen saturation, dancers are among the top athletes in the world. I am a dancer and an athlete. However, critics of dancing have often overlooked dancers as true athletes. My 2009 science fair project sets the record straight. Hypothesis: dancers not only perform at the same level of physical conditioning as other athletes in other sports, but also often exceed them. I consulted with experts regarding the collection and examination of data. I tested athletes competing in swimming, basketball, and dance. More specifically, I tested eight athletes from each sport for heart rate, blood pressure and oxygen saturation before and after a cardiovascular workout. Performance conclusion: swimmers first,

dancers second, and basketball players third. Consequently, based on the tests I conducted, dancers often exceed the level of physical conditioning of other athletes: at least, basketball players.

Category: Medicine & Health

Student Name: Koaly Killpack

Team Members (if any):

Project Title: Breakfast Break

Abstract: My Question was Does Breakfast Affect your school performance? I made an Hypothesis that breakfast does affect how you do in school. I researched what is in breakfast and then gave two tests to some 8th graders and compared the two scores to see how they did. I found that eating Breakfast does indeed affect the how you do in school.

Category: Medicine & Health

Student Name: Abbie Siex

Team Members (if any):

Project Title: Think Before You Drink!

Abstract: The purpose of this study is to answer the question, What are the effects of commonly consumed beverages on your heart rate and blood pressure? The beverages used in the study were: water, coffee, diet cola, and energy drink. Heart rate and blood pressure were monitored after consumption and then compared to baseline readings. All results were averaged together to determine overall findings. The methods used in this study attempted to control as many variables as possible. After obtaining a baseline heart rate and blood pressure, subjects in good health, were asked to consume twelve ounces of room temperature test beverage within five minutes, after fasting for at least two hours. Heart rate and blood pressure were then monitored every twenty minutes for two hours with the subject at rest. This process was repeated for each of the test beverages with a seven day interval between testing of different types of beverage. The hypothesis stated that beverages with increasing amounts of stimulants would cause the heart rate and blood pressure to increase due to their affects on the cardiovascular system. Overall results of this study revealed that energy drink does have the greatest affect on heart rate and blood pressure. However, some aspects of the hypothesis were proven inaccurate. Overall results showed that despite lesser amounts of stimulants in diet cola, it had a greater affect

on both heart rate and blood pressure than coffee. The strength of coffee and subject's routine caffeine consumption could have affected the data.