Experimental design science olympiad practice

Below from wiki to Scioly.org is an example of an experimental design event that can be used for practice. Example 1 Topic: Gravity Material: 3 Rubber Balls (Different Sizes and Colors) 30 cm Masking Tape 10 Rubber Bands 1 Meter Stick 1 Plastic Spoon 1 Block Styrofoam 10 Popsicle Stick Example 2 Topics: None Material: 2 Toy Car 5 Rubber Band 20 Pushpin 1 Meter Stick 3 1'x 1' Sheet Cardboard 5 1'x 1/2 Sheet 5 x 1/2 Cardboard 5 1'x 1/2 Sheet Cardboard Example 3 Topics: Thermometer Hot and Cold Tap Water 1 Cup Sugar 1 Cup Salt 1 Cup MSG 3 250 ml BeeKer 10 Plastic Spoon 1 Tube Toothpaste 1 Bottle Hair Gel Example 4 Topic: 5 Marble 1 Can Sand Paper 1 Small Pegboard 1: Water Material: 10 Cotton Balls 4 Bee Car 1 Cup Sand Salt 1 Bottle Water Bottles can be used) 1 measuring cup 1 roll wrap 10 swab example 6 Topics: None Material: Gum 1 cup juice 1 cup soda water 1 cup 1 cup 1 cup 1 cup 1 case 1 meter plastic cup Example 7 Chemistry: Material material : 10 plastic spoon 1/2 cup lemon juice 4 PET bottle 1 cup Baking soda 1/4 vinegar cup Example 8 Topic: None 3 markers 1 0 plain white paper 3 pencil 3 crayon 2 ruler Example 9 Topic: Electrical material: 1 buzzer 1 lemon 1 tomato 1 battery 1 penny 1 paper clip 1 ice bath 1 hot plate 1 hot plate 1 sample meter 10 topic physics material: 10 notecard 1 cup salt 5 marble 1 toy car 30cm tape 10 paper clip example 11 topic: Pressure Material: 1 Syringe 3 Block Wood, 15cm x 3cm x 15cm 8 Textbook, Same Size Timer 30cm String Scale Cardboard Cup Paper Clip Example 12 Topics: Coder Material: 5 Marble 1 Paper Dixie Cup 1 Length 20cm Long String Example 13 Topics: Catapult Material: 6 Marble 1 Ping Pong Ball 4 Poppicle Stick 1 Plastic Spoon 1 Paper Dixie Cup Example 14 Topic: Simple Machine Material: 20 Popsicle Stick 5 Rubber Band 1 Pound Weight 2 Lbs Weight 3 Lbs Spring Scale Scrap Wood Example 15 Topics: Aeronautical/Aerodynamic Materials: Paper 1 Box Reem 1 Paper Clip 10 Washer Stack Card Stock Stack Cardboard Meter Stick 1 Meter Tape Example 16 Topic: Newton's Law of Motion Material: 1 Toy Car 3 Marble 3 Metal Ball 3 Wooden Ball 1 Meter String 1 Meter Tape 1 Spring Scale 1 Ream Paper Example 1 7 Topics Acid and Base Material: Pure Lemon Juice Water pH Paper Basic Tap Water Vinegar Milk Graduation Cylinder Example 18 Topics: Optical Material: 1 Convex Lens 1 Concave Lens 1 Flash Light 1 Meter Stick 1 Convex Mirror 1 Sheet Cardboard Example 19 Topic: Circuit Material: 6 12 Inch Wire 3 Bulb 3 Bulb1 Battery 1 Iron Nail 1 Cobalt Nail 1 Nickel Nail 6 Paper Clip Example 20 Topic: Sound Material: Styrofoam 1 Block Polyurethane Foam 1 Memory Foam 1 Heat Plate Ice Cube 1 Funnel 1 Oscyroscope 1 Ruler Example 21 Topic: Electromagnet Material: 1 Battery 2 48 Inch Wire 2 Iron Bar Magnet (Different Size) 1 Cup Iron Filing 20 Pe Par 2 chromatography material: 20 coffee filter distilled water 4 different marker plastic cups Example 23 Topics: Viscosity material: 4 became syrup olive oil ethanol water paper towel hot plate bowl ice cube Example 24 Topic: capillus action material: water paper towel (various colors) sharp (various colors) pen (various colors): The following information should not be interpreted as an extension of the rule: the memory printer's paper marker (color filling) pen (color filling) sharp (color filling) or less. A free online copy of the current rules can be found in the Science Olympia Store. The official rules of the current rules manual take precedence. The Resource Links Experiment Program has been held annually since 1995 at Division B and Division C events. In this case, the competitor describes the design, execution, and description of the experiment based on the topics and materials provided. Lab write statement in question The statement in question is a question that will be considered in the experiment. One of the formats that can be used in almost any experiment is How does (independent variables) affect (dependent variables)? Original. How does the height at which the ball is dropped from (1, 2, 3 meters) affect the rebound height (cm)? Keywords are method and reason. This section has been removed from the competition for the 2019 season, but has been added for the 2020 season. The most common method in which hypothesis hypotheses are used in scientific research is an interim, testable, tamper-tamperable statement describing phenomena observed in nature. This type of statement is more specifically called the explanation hypothesis. However, the hypothesis may be a statement describing a pattern observed in nature. In this case, this statement is called the generalization hypothesis. A hypothesis statement is followed by a specific measurable prediction that is possible when the hypothesis is valid. Therefore, in science, hypotheses are considered test descriptions or generalizations. Prediction in science is a prophecy, and if the hypothesis is valid, it is a specific measurable event that is likely to occur in the future as a result of the experiment. Teaching hypotheses incorrectly Many teachers and even many textbooks teach hypotheses in a way that teaches hypotheses,They teach students to write the words If –then about hypotheses. This approach will be in the wrong format: when I do X, Y happens. There is no hypothesis here. This is just a prediction (Y happens) after the method (if I do X). Some teachers and textbooks are . Because. If...and then . at the end of the statement. This is because the test statement is often close to the hypothesis being tested, but still does not carefully indicate the hypothesis from the prediction. Sure, even professional scientists can make mistakes. The reason part of a hypothesis is often referred to as a basis. In short, in order to receive the full point of this section, the hypothesis should be written as follows: if I change ______ (IV), DV will be ______ (in what direction). Original. If I drop the ball from a different height (1, 2, 3 meters), the rebound height of the high drop height (in centimeters) is greater than the lower drop height because of Isaac Newton's third law (there is an equivalent and opposite reaction to all actions). This law applies to this experiment because when the drop height is large, the ball has more force to fall to the floor, and therefore the rebound height (equivalent and opposite reaction) increases. Tip: Make sure that all parts of this section are complete and well explained. Sometimes, the rationale may sound completely in the head of a competitor, but in fact, it is not fully explained on paper and competitors will lose points based on stupid mistakes. Also, do not use words such as I, I, or I (this applies to the entire text). Try to keep it as objective as possible. There are three types of variables that you define for write values in a variable lab: independent variables, dependent variables, and control variables. (Constants have been added to the Control Variables section of the 2020 season.) Tip: Define (in units) all variables operationally. Also make them clear and concise to make sure you get all the points in such a point heavy part. Independent variable (IV) An independent variable is a variable that is changed to examine its effect on dependent variables. There is only one IV that needs to be listed with the unit. IV must be defined operationally (from an experimental point of view) and experienced (typically a future variation of the experiment). In addition, at least three different levels of independent variables must be listed except for the control level. For example, a fall height (1,2,3 meters) dependent variable (DV) dependent variable is affected by an independent variable. There is only one IV that needs to be listed with the unit. Dependent variables must have the following values:It is defined as an experience. Do not include the same level of DV as determined by the experiment. Rebound height (in centimeters) control variables (CVs) and constant control variables are factors that can affect dependent variables but are kept constant throughout the experiment. You need to list multiple control variables, but only three need to list in order to receive the full credits in this section. (This requirement was later changed to two CVs for the 2020 season.) Unlike controlled variables, the size of the ball, the material of the ball, the shape of the ball, the material on the falling surface, and the method of emitting the ball (drop, throw, etc.) cannot be changed by the person or group performing the experiment. CVs can be changed, but they remain the same during the experiment. For example, during an experiment, if the plant's exposure to sunlight remains the same, it will be a controlled variable. However, the speed of sunlight is constant because it cannot be controlled. The comparison criteria or control comparison criteria (SOCs) are normal trial or have not changed at all (there is only one). It acts as a neutral comparison for other trials. The rationale for the SOC must be included. Original. The SOC of this experiment will be at the IV level of 1 meter. This SOC was selected to be at the level closest to zero. The hypothesis predicted an increase in rebound height as the drop height increased, so this IV level would support or refute the hypothesis and help analyze subsequent experiments. Tip: Change the IV to zero or use the highest or smallest possible number of IV, a list of good SOC materials is what it sounds like. A list of materials used in the experiment. You must list all the materials used in the experiment (you do not need to include materials that are not in use). The material list should be as specific as possible. You must include the quantity of materials to be used and the brand name. A person must be able to look at the list and collect the exact material (including the exact amount) used in the original experiment. The material of the independent variable must be displayed once, including the level in parentheses. Some competitions want to list measurement devices, while others may be out of points. Event supervisors need to distinguish what they need. For example 3 pen racquetball, 3 meter stick tips: make sure all materials are listed. Sometimes accidents happen and competitors lose points of what might be the easiest section ever. If time remains after the experiment is completed, all competitors must ensure that all materials are listed. NEW FOR 2019: Do not use materials other than 1 the material specified at the prompt. You're going to do that.Points for this by the new rubric. (Excluding materials that are allowed to be brought in, such as calculators and rulers.) The step-by-step procedure is a list of experimental steps and contains at least three labeled diagrams of how to run the experiment. In the 2020 rubric, points will be drawn if more than one picture is not provided. This procedure is included in the writing so that other scientists who reproduce the experiment can know exactly how it was done for the first time. Steps should include at least three tests per IV level, clearly and also very specifically described. Example: 1. Collect all the materials necessary for the experiment. 2. Drop one ball at a height of 1 meter at the lowest point of the ball of 1 meter or more. 3. Record the initial rebound height and observations. 4. Repeat steps 2 through 3 twice. 5. Drop the second ball at a height of 2 meters at the lowest point of the ball of 2 meters or more. 6. Record the initial rebound height and new observations. 7. Repeat steps 5 through 6 twice. 8. Drop the last ball at a height of 3 meters or more at a minimum point of 3 meters or more. 9. Record the initial rebound height and new observations. 10. Clean up your work space Tip: Save time by using steps such as Repeat steps X through Y. The first step is to collect all the materials for the experiment. Also, the last step in the procedure must be Clean up the workspace. Also, don't forget to explain things clearly so that everyone can read and replicate experiments. Like the purpose of explaining how to fold a paper airplane, this can be difficult, but it is still an important section that is worth many points and is a possible tiebreaker section. Qualitative observation There are three types of observations that must be made to obtain complete trust: procedures, results, and observations for things that are not related to DV. (Independent of DV Requirements has been removed in the 2020 rubric.) In addition, it is necessary to make observations in the course of three experiments. Typically, the observation on this procedure is to notice a defect in the experiment that was not noticed before the experiment was run. This includes defects in measurement techniques, defects in the construction and maintenance of experimental units, and defects in actual experiments. Observations on this procedure are passed on to experimental errors and practical applications, and be sure to explain what was wrong. Original. About the procedure: Every time a competitor prepares to drop the ball, his/her hands may wobble a slight bit and affect the DV a slight bit. Competitors also found it difficult to accurately measure where the ball bounced, especially in a three-meter trial (many forces are hard to see) because the ball is always moving. About the results: During the experiment,Competitors often had to estimate the height of the rebound because it can be difficult to measure the exact height of the rebound. The results also showed, on average, that the ball bounced back to about 5/8 of the original drop height. Other: When the ball bounced off after the first rebound, the bounce pass of the ball was not exactly perpendicular and it became difficult to get the ball out. Also, when each of the balls hit the floor at different heights, they made a different sound. The three-meter ball was bigger than the two-meter and one-meter balls. Tip: Do not confuse these with errors. It is easy to combine qualitative observation with errors and remove points from the experiment. One way to organize quantitative data data is to create two tables. First, you're going to create a table of four rows and four columns. The first column must consist of a blank box, IV 1, IV 2, and IV 3, from top to bottom. The second column is labeled Trial 1, and the box is entered accordingly. The following two columns follow the same layout as the Trial 1 box, but trials 2 and 3 are displayed. Title the chart to fit the data. Draw a condensed table (on the right) with one column and four rows next to the table. Name Average (AVG for short) and average the data for each IV. Place an arrow from the second row of the first table to the second row of the condensed table. Perform a sample calculation of the average (Trial 1 + Trial 2 + Trial 3) / 3 below the table or above the arrow. Don't forget to title both tables. Also, if you are using department C (data, graphs, statistics), be sure to use important numbers to maintain a consistent and logical state. If the ruler can only accurately measure decimal numbers, you don't need to set a number to three decimal places. For more information about important numbers, see Important Numbers. Ex. DV - Rebound Height Trial 1 Trial 2 Trial 3 1 m 78 cm 96 cm 69 cm 2 m 160 cm 171 cm 162 cm 3 m 220 cm 220 cm 220 cm 220 cm DV - Rebound height average. 1 m 81 cm 2 m 163.3 cm 3 m 222.3 cm Formula x_2 x_1: [Mathematics] x_k:[/Mathematics] Sample: [Mathematics]/textrm>Avg.value>&;<a1></a1>{243}{3}</a0><a2></a2><a4></a4></a5> <a5></a5>{3}</a5> <a5></a5></a1><a5></a5></a1> <a5></a5></a1></a0> These are worth a lot of points and don't take much time. Also, label the table appropriately. NEW FOR 2019: You need to report the most relevant data from your experiment. Mid point (Part 2) In the new rule, you can only work on the section up to this point for the first 20 minutes. After 20 minutes, the second half of the newspaper disappears. This is to make sure that people have more complete experiments. Use every nanoseconds for the first 20 minutes in the experiment. Chart standard bar, line, and scatter charts work almost universally at the conflict level.Therefore, be sure to use the correct type for your data. Also, if the data starts with a non-zero amount, you can draw a zigzag above the zero mark to skip to the data. Tip: Label the axis (x +Y), use THE graph title, DV as the x-value, and include only the average of the data for each IV, where the individual axes are titled, data points are connected, or the best fit line is drawn. Also, if the value of the data is large and the majority of the data is heavily distorted, you can use a skew marking or a distorted axis for zigzaging. Statistical mean, mode, range, median - take common statistics. View work, including other relevant statistics. The best idea is to put all the stats in a neat table. New for 2019: Statistics must be age-appropriate by the new rubric. You must include an example of a calculation. This includes important figures for Division C. Your data table needs to be neat - the rulers will help a lot. Be sure to continue writing the unit. When the general statistics are complete, run a little more. The standard deviation is a very good statistic to include. The equation for calculating the standard deviation is the following formula: [Mathematics] - Sigma - sqr {2}t See Standard Deviation for a better description of what visual equations and standard deviations are (you need to know to explain the statistics). In fact, the standard deviation of sample size 1 is obviously stupid, so you really need to do the test. An important point that is easy to miss is that the deviation must be squared. Otherwise, the result will always be 0, which may look nice, but it is clear that the standard deviation of the data is not 0. As of 2015, both Division B and Division C are expected to handle more data, but in the past only C Division was required. One of the key aspects of the graph is regression, that is, creating the best line. This is a good time to invest in a nice TI-84 or similar graph calculator because both departments are allowed to bring in any type of calculator, so it is possible to calculate linear, comparable, and many other types of regression. To calculate linear regression for a TI calculator, start by adding the data to a list. Press STAT to go to the edit menu. To edit the list, press 1. Then exit and press STAT again. Go to the CALC menu and select the type of regression that best works best for your data (most likely LinReg). Place a list containing the X values in the Xlist and repeat for the Y value of the Ylist. Scroll down and press Calculate to see the regression constants. Draw a line on the chart and label it. If you can't get a graph calculator, the best fit line with questionable accuracy is made by drawing a straight line with a ruler that you think is close to all the points onOnce you find the y-section, calculate the slope. Consider which outings are important and which outings are experimental errors. If you want to make a call to such a decision, point it out and explain it in the Analysis section. Also, make sure that the units of the experiment are always the same, and if you are using milliseconds in the data table, do not change to seconds or other units if you want to continue using all other milliseconds. Don't forget that Division C competitors use important numbers in their stats. Ex. DV - Rebound height 1 m 2 m 3 m average 81 cm 163.3 cm 222.3 cm median 78 cm 162 cm 220 cm mode N/A N/A 220 cm range 27 cm 11 cm 7 cm out of value 96 cm N/A N/A Std. Deviation 10 cm 4.1 cm 3.1 cm . Tip: Graph the data. Make the chart easy to read. Use the legend if you want. Label the axis and create a chart title (we recommend including units here) NEW FOR 2019: Calculations are graded for accuracy. Analysis This section must be one extended paragraph that touches at least all data points and extends outings. Look at the data to draw a reasonable conclusion about the experiment. There should be a tendency. Point them out and explain them. Please discuss your statistics and explain them again. Guess, it's okay even if you're wrong. They show you the thought process. If you have outlyings or random bad data points, don't ignore them - write about them again. Was something wrong at the time, or was it just a fluke? It ends by mentioning if the IV is not directly, inversely proportional, or clearly proportional to DV. This section is the time for you to shine! Example: In the first IV level (1 meter), the rebound height was 78 cm, 96 cm (out of range), and the average was 81 cm at 69 cm. In the second IV level (2 meters), the rebound height was 160 cm, 171 cm, and 162 cm, the average of the last IV level (3 meters) was about 163.3 cm, the rebound height was 220 cm (mode), 227 cm, 220 cm (mode), and the average was around 222.3 cm. Overall, this brand of racquetball (pen) is likely to have a ratio of about 3:4 of the rebound height to drop the height on the linoleum floor. This trend is clearly shown in graphs with a positive slope of about 3/4. Linoleum floors are almost hard, so the floor doesn't absorb much energy and sends the ball back with most of its energy in connection with Sir Isaac Newton's third movement law: for all actions, there is an equal and opposite reaction. If Newton's third law is true, you might think the ball bounces back to its original drop height, but it's not. Many forces perform equal and opposite reactions such as gravity, friction/air resistance, and floor, and in this caseEqually, the opposite reaction almost always sends the ball to about three-fourths of the height of its drop. At the 1STV level, there was an outing. In the second study, the rebound height was 96 cm, which was significantly higher than the average. Perhaps the height fluctuated a bit, the rebound height was higher, and the average was 73.5 just below what the trend suggested. Otherwise, this IV level will be at the expected level. In the second IV level, all of our results were higher than those indicated by the trend (the trend is 3/4 of the drop height of 150 cm in this case). This may be because most people struggle to measure the exact rebound height, which is shorter than 2 meters. As the rebound height increased, these results were still expected. In the last IV level, there was a mode of 220cm. Probabilistically, due to the high drop height and the high rebound height, this possibility is very rare, but the syringe was able to get a brief approximation of what the rebound height is. They were approximated because it seemed that both the first and third tests had a rebound height of 220 centimeters. This IV level fits perfectly into the trend, with an average of about 223.3 and about 1.7cm under the 3:4 mark of 3 meters, 225cm, which was just what was expected. To summarize everything, the ratio of rebound height to drop height tended to be about 3:4, and all three IV levels fit perfectly. Overall, IV was directly proportional to DV. Tip: Please explain everything clearly. This is the point heavy part that depends on the clearness. We'll also explain everything. Include all of the experiments because they can be related to the analysis. NEW FOR 2019: Interpretations are graded in regard to accuracy and completeness. Look for all possible causes of experimental errors that are wrong in the experiment setup. How did the data become inaccurate? This is very useful because you can redeem them by showing that you are aware of the mistakes you made before the event. Sometimes you can even get the points back. Try to focus on the experimental causes of errors such as being able to say that they are still used and related to temperature, away from human error (what humans cause). Your object's container may have insulated it. It says that there is a possibility of changing the result of the experiment. The following describes how the error is thought to affect the data: an increase from the normal, a decrease from the normal, or one. You can also identify some of the errors to indicate that they are aware of the error that occurred. You can also write this section before the data is actually collected, and you can add it if there are obvious errors in the unpredictable data collection. I don't know how the experiment will change.This is a good thing to write first, but errors included in qualitative observations should be commented out. Original. There were some errors in this experiment. First, one human error is that the rebound height was not measured to be spot-on. That was a guess. The ball moved at high speed and often did not move through speed, so it was not possible to make the exact height of the rebound. This is an experimental error because there was no easy way to measure due to the lack of electronics to fully measure the height. This sometimes increases and decreases the rebound height, usually astring the mean, but increasing the standard deviation. Another human error was that the experimenters who dropped the ball often had their arms shaking, which sometimes increased the speed of the ball and sometimes the height of the drop fluctuating. This is a human error because the syringe made the mistake of not dropping the ball at the same speed and height. This mainly increases the height of the rebound because the eyedropper's hand was higher than normal, but rarely decreases if the eyedropper's hand is lower than normal. Tip: Don't confuse errors with quality data. This is an easy way to reduce your total score of your experiments. You should also include multiple errors if possible, even if only one error is required. The conclusion is not to say that your hypothesis was correct or wrong, it is only whether it was supported by the data. After one experiment, the hypothesis is either supported or not supported in the data. Before you draw a conclusion on either method, change the hypotheses based on the state in which the description was drawn. Here's why we came to that conclusion with data as support: Don't estimate anything. Even if you think the result is wrong, stick to what you observe. You may try to explain why your data has changed from hypothesis using appropriate scientific terms that were not considered while writing the hypothesis, but the majority of the explanations should be databases. Original. If the ball is dropped from a different height, the ball dropped at the maximum height will have a larger rebound height. The data supported this hypothesis at a drop height of 1 meter, with an average of 81 centimeters, a 2 meters average of about 163 centimeters, and an average of 3 meters of about 222 centimeters. Also, the graph showed a positive trend that had a larger rebound height when the drop height was large. For these clear reasons, the hypothesis was accepted. Tip: Be sure to include a possible reason. This is an important part of this section. Also, make sure that all statements are true and supported by the data. When writing this section, consider variations of the experiment that produce more accurate results. Three variations must be displayed: 1It is for certain aspects of experiments, aspects that approach hypotheses in other ways, and future experiments related to DV. Finally, let's think about the practical application of the experiment. You can write this section without knowing how the experiment will take place, so you can write it before the data is collected. Original. For further experiments, this experiment can do a few things. First, it is difficult to measure the rebound height, so you need to provide a more accurate way to measure it. This makes the results more accurate and improves the reliability of the data. To change the IV of this experiment, instead of changing the drop height, the size of the ball may be IV. This provides a different experiment and will probably be more useful in the real world. To change the DV, the number of times the ball bounces is measured instead of measuring the rebound height. This provides an interesting trend and may apply to many things such as sports. This experiment may help in the outside world in several ways. First of all, it can be applied to basketball dribbling in basketball sports. If the ball is dribbled high, it bounces high and therefore it becomes difficult to control. When the ball dribbles low, it bounces low, which makes it hard to move. It can be used to teach aspiring basketball players to dribble well. Also, in basketball sports, this experiment may be useful in a different way. The term rebound refers to the distance a basketball moves after it hits the backboard of a basketball hoop and misses the hoop. When the ball is hit hard against the backboard, more force is added, so more force enters the reaction and the ball is promoted to a larger distance. For example, if you know that a basketball player can't shoot, you can bounce off the backboard and calculate the amount of perfect power against the controls of other teammates. Finally, this experiment can be used in the tennis industry. When many tennis players hit the ground with too much force, the ball was flying over the court. All tennis players know that the principles shown in this experiment do not hit too strongly or too soft. Tip: Be sure to include applications and recommendations that will help you. If you say something unrelated, the point may be drawn. Abstract is a new section of Division C that was added in the 2020 season. One of the most important things to remember about this section is to keep it very concise. Explain the purpose of the experiment, address problem and hypothesized statements, and summarize processes and findings. It is essentially a summary of the whole experiment, but try to keep it below paragraph (or 2 if necessary) as a pointIt is drawn for a very long abstract. This is not a class essay - don't feel like you need to write more. The complete write statement for the problem (1, How does the height at which the ball is dropped from 2, 3 meters) affect the height of its rebound (cm)? This law applies to this experiment because when the drop height is large, the ball has more force to fall to the floor, and therefore the rebound height (equivalent and opposite reaction) increases. variable independent variable descent height (1, 2, 3 meters) rebound height of dependent variables (in centimeters) The control variable size of the ball, the material of the ball, the shape of the ball, the material on the falling surface, the standard of comparison (fall, throw, etc.) of how to release the ball The SOC of this experiment is at the IV level of 1 meter. This SOC was selected to be at the level closest to zero. The hypothesis predicted an increase in rebound height as the drop height increased, so this IV level would support or refute the hypothesis and help analyze subsequent experiments. Material 3 pen racquet ball, 3 meter stick procedure 1. Collect all the materials necessary for the experiment. 2. Drop one ball at a height of 1 meter at the lowest point of the ball of 1 meter or more. 3. Record the initial rebound height and observations. 4. Repeat steps 2 through 3 twice. 5. Drop the second ball at a height of 2 meters at the lowest point of the ball of 2 meters or more. 6. Record the initial rebound height and new observations. 7. Repeat steps 5 through 6 twice. 8. Drop the last ball at a height of 3 meters or more at a minimum point of 3 meters or more. 9. Record the initial rebound height and new observations. 10. Clean up your work space Qualitative observation of the procedure: every time a competitor prepares to drop the ball, his/her hands may wobble a slight bit and affect a slight bit on the DV. Competitors also found it difficult to accurately measure where the ball bounced, especially in a three-meter trial (many forces are hard to see) because the ball is always moving. About the results: During the experiment, when competitors measured the rebound height, it was often necessary to estimate the exact height of the rebound because it can be difficult to know. The results also showed, on average, that the ball bounced back to about 5/8 of the original drop height. Other: When the ball bounced off after the first rebound, the bounce pass of the ball was not exactly perpendicular and it became difficult to get the ball out. In addition, when each ball hits the floorheight, they made a different sound. The three-meter ball was bigger than the two-meter and one-meter balls. Quantitative Data IV Level (Drop Height) DV - Rebound Height Trial 1 Trial 2 Trial 3 1m 78 cm 96 cm 69 cm 2 m 160 cm 171 cm 162 cm 3 m 220 cm 227 cm 220 cm DV - Rebound Height Average. 1 m 81 cm 2 m 163.3 cm 3 m 222.3 cm Formula x_2 x_1: [Mathematics] x_k[/Mathematics] Sample: [Mathematics] -textrms>Avg.{243}{3} {3} value<a1></a1></a0><a2></a2><a4></a4></a1> <a5></a5></a1><a5></a5></a1><a5></a5></a1><a2></a2></a3><a5></a5></a1><a5></a5></a1></a0> 3 m average 81 cm 163.3 cm 222.3 cm median 78 cm 1 62 cm 220 cm mode N/A N/A 220 cm range 27 cm 11 cm 7 cm out of value 96 cm N/A N/A Std. Deviation 10 cm 4.1 cm 3.1 cm analysis Our first IV level (1 meter) rebound height was 78 cm, 96 cm (out of range), an average of 81 cm at 69 cm. In the second IV level (2 meters), the rebound height was 160 cm, 171 cm, and 162 cm, the average of the last IV level (3 meters) was about 163.3 cm, the rebound height was 220 cm (mode), 227 cm, 220 cm (mode), and the average was around 222.3 cm. Overall, this brand of racquetball (pen) is likely to have a ratio of about 3:4 of the rebound height to drop the height on the linoleum floor. This trend is clearly shown in graphs with a positive slope of about 3/4. Linoleum floors are almost hard, so the floor doesn't absorb much energy and sends the ball back with most of its energy in connection with Sir Isaac Newton's third movement law: for all actions, there is an equal and opposite reaction. If Newton's third law is true, you might think the ball bounces back to its original drop height, but it's not. Many forces perform equally opposite reactions such as gravity, friction/air resistance, floor, and in this case, equally opposite reactions almost always send the ball to about 3/4 of its drop height. At the 1STV level, there was an outing. In the second study, the rebound height was 96 cm, which was significantly higher than the average. Perhaps the height fluctuated a bit, the rebound height was higher, and the average was 73.5 just below what the trend suggested. Otherwise, this IV level will be at the expected level. In the second IV level, all of our results were higher than those indicated by the trend (the trend is 3/4 of the drop height of 150 cm in this case). This may be because most people struggle to measure the exact rebound height, which is shorter than 2 meters. As the rebound height increased, these results were still expected. In the last IV level, there was a mode of 220cm. Probabilistically, due to the high drop height and the high rebound height, this possibility is very rare, but the syringe was able to get a brief approximation of what the rebound height is. because it seemed that both the first and third tests had a rebound height of 220 centimetersIt was approximated. This IV level fits perfectly into the trend, with an average of about 223.3 and about 1.7cm under the 3:4 mark of 3 meters, 225cm, which was just what was expected. To summarize everything, the ratio of rebound height to drop height tended to be about 3:4, and all three IV levels fit perfectly. Overall, IV was directly proportional to DV. Source of possible experimental errors There were several errors in this experiment. First, one human error is that the rebound height was not measured to be spot-on. That was a guess. The ball moved at high speed and often did not move through speed, so it was not possible to make the exact height of the rebound. This is an experimental error because there was no easy way to measure due to the lack of electronics to fully measure the height. This sometimes increases and decreases the rebound height, usually astring the mean, but increasing the standard deviation. Another human error was that the experimenters who dropped the ball often had their arms shaking, which sometimes increased the speed of the ball and sometimes the height of the drop fluctuating. This is a human error because the syringe made the mistake of not dropping the ball at the same speed and height. This mainly increases the height of the rebound because the eyedropper's hand was higher than normal, but rarely decreases if the eyedropper's hand is lower than normal. Conclusion If the ball is dropped from a different height, the ball dropped at the maximum height will have a larger rebound height. The data supported this hypothesis at a drop height of 1 meter, with an average of 81 centimeters, a 2 meters average of about 163 centimeters, and an average of 3 meters of about 222 centimeters. Also, the graph showed a positive trend that had a larger rebound height when the drop height was large. For these clear reasons, the hypothesis was accepted. Applications and recommendations for further experiments For further experiments, this experiment can do several things. First, it is difficult to measure the rebound height, so you need to provide a more accurate way to measure it. This makes the results more accurate and improves the reliability of the data. To change the IV of this experiment, instead of changing the drop height, the size of the ball may be IV. This provides a different experiment and will probably be more useful in the real world. To change the DV, the number of times the ball bounces is measured instead of measuring the rebound height. This provides an interesting trend and may apply to many things such as sports. This experiment may help in the outside world in several ways. First of all, it can be applied to basketball dribbling in basketball sports. If the ball is dribbled high, it will bounceTherefore, it is difficult to control. When the ball dribbles low, it bounces low, which makes it hard to move. It can be used to teach aspiring basketball players to dribble well. Also, in basketball sports, this experiment may be useful in a different way. The term rebound refers to the distance a basketball moves after it hits the backboard of a basketball hoop and misses the hoop. When the ball is hit hard against the backboard, more force is added, so more force enters the reaction and the ball is promoted to a larger distance. For example, if you know that a basketball player can't shoot, you can bounce off the backboard and calculate the amount of perfect power against the controls of other teammates. Finally, this experiment can be used in the tennis industry. When many tennis players hit the ground with too much force, the ball was flying over the court. All tennis players know that the principles shown in this experiment do not hit too strongly or too soft. To know the general strategy scoring rubric is the key to the success of experimental design. A rubric is a set of guidelines used in scoring experiments. When experimenters know what is expected in each section, it is much easier to work efficiently. At the start of the event, start the possible experiments by brainstorming. Expect to get a handful of looking random items to test and encourage them to design topic possibilities and experiments. If each team member is familiar with common scientific concepts, designing experiments is not difficult. Focus on execution and writing, not preparation. Please spend more than five minutes on this. Keep the experiment simple. Too many variables allow for more writes. Let's look at an example of a single regional tournament. Three balls (different colors), two rubber bands, masking tape feet, meter stick, mini catapult were given. Of course, you'll want to try some of the most fancy items you've been given (in this case, catapults), but there are a lot of variables to consider. Instead, we will conduct a fall experiment on how the rubber band affects the time it takes for the ball to fall. This is a much easier and definitely rewarded idea in this scenario. Teams using catapults were flying the ball anywhere throughout the event, and team members had to run around looking for them; On the other hand, teams using other equipment achieved third place out of 30 teams. The morality of the story is to ignore the urge to around complex things. Keep it simple - experiments are easier to write, test and save time. But make sure you have enough trials. By doing three to five trials on each variable, you can ensure that the data is healthy and that the statistics are benefiting. If this method has the possibility of strange data (one test)There is an experimental error section that comments on too high/low/fast/slow). Only 1 - 3 attempts means that there are not enough points to compare, so there may not be enough data to indicate that the data points are strange. Know who is doing each section before the competition. All three of you don't have to do the lab. Only one or two people should experiment. Don't spend time running the lab, 15-20 minutes should be enough to get a lot of data for the experiment. There are many ways to split the work of this event. Find out what works, each group will be different. If the experiment is terribly wrong and all the data is distorted, focus on the report as much as possible. Be sure to explain why the experiment was bad and where it didn't work. This is where possible experimental errors are really important - write down and explain all the errors that caused the experiment to go wrong. Having a bad experiment, but having a very good report can, in some cases, cancel the fact that the experiment did not work. Practice just like any other event! Spend 50 minutes creating, testing, and writing lab reports. Have a coach/teammate grade the lab based on the rubric. This gives you a great insight into where time needs to be used and improved. Possible departments of responsible writers (52 points) manage papers, A, B, C, D, E, M, other data collectors (36 points) perform experiments and manage G, H, I, J, timing and calculator analyzers (22 points) Experiments, F, K, L, material management, cleanup General tips keep experiments reasonable. Because of the limited time, the scope should be small enough for a 50-minute event. With no internet access and no camera, you're ready with several different writing instruments, rulers, stopwatches and calculators of all kinds. Study Rubrics: For safety, always look at rubrics before competition. It may be very useful for designing experiments. Please write it properly. If the judges can't read the experiment, they're not going to accept it. It is very important to write properly because one person doesn't have enough time to write everything perfectly. Think outside the box - don't do exactly what all the other teams tend to do. Set you away from other teams and build unique and intelligent experiments that offer a better chance of winning medals. Be efficient: sometimes speed is very important in the limited time of the event. When labeling a list of materials, make sure that they are correct. Nothing is too specific for this event! It's not literally, but because of the time limit, never design an experiment that's too complicated. Linked Science Olympique Experiment ProgramThe rubric rubric of Division B/C's experimental design rarely changes year by year, but has changed for the 2019 season. Sample Experimental Sample Experiments in Minnesota Div.C. (Note: PDF) Minnesota Div.B (Note: PDF) Test Exchange Experimental Design/Practical Design/Practice