



Roller Coaster Math Key Developer

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Snapshot

Have you ever wondered how fast roller coasters go? This project takes you to roller coasters all over the world through the Internet. Students research roller coasters that interest them. They use a spreadsheet to record track length and duration of each ride, create formulas to calculate average speed, and then graph the data. This unit motivates students to learn real-life application for order of operations, formulas and how to work with a spreadsheet.

Profile



Dizzy after Roller Coaster Math.

My name is Pat Sanborn. I have been teaching at Massabesic Junior High School since 1999. I currently teach Mathematics to grade 7 students. I have a Bachelor's degree in Elementary Education with a minor in mathematics. I have had many valuable experiences in Education through the years, working as a third grade , Title 1, Alternative Education, and Adult Education teacher. I enjoy creating units and finding activities that connect mathematics to the real world. Spreadsheets and statistics are a natural link to the real world. I appreciate the opportunity to have the laptop computers, it has given me a chance to challenge myself to become proficient with the technolgy and learn with the students.

Daniel Gagner is the Co Developer of this endeavor. He has been a teacher at Massabesic Jr. High School in Waterboro Maine since 1979 and a teacher for 26 years. His degrees are in Science Education with a Masters of Education in curriculum instruction and development specializing in computer education. He has been a

technology integration specialist for four years. His job is to work with teachers in the varied curriculum areas and assist them with integrating a technology component into their regular classroom units. It's a challenging but rewarding position.

Unit Information

Primary Content Area: Mathematics

Guiding Principle 1: A clear and effective communicator.

Guiding Principle 2: A creative and practical problem-solver.

Grades Used: 7

Grades Suitable: 5-8

Target Audience:

Maine Learning Results Alignment

Content Area 1

Grade Level: Middle Grades 5-8

Content Area: Mathematics

Content Standard: K. MATHEMATICAL COMMUNICATION

Students will reflect upon and clarify their understanding of mathematical ideas and relationships. Students will be able to:

1. Translate relationships into algebraic notation.
2. Use statistics, tables, and graphs to communicate ideas and information in convincing presentations and analyze presentations of others for bias or deceptive presentation.

Content Area 2

Grade Level: Middle Grades 5-8

Content Area: Mathematics

Content Standard: G. PATTERNS, RELATIONS, FUNCTIONS

Students will understand that mathematics is the science of patterns, relationships, and functions.

1. Describe and represent relationships with tables, graphs, and equations.
2. Analyze relationships to explain how a change in one quantity can result in a change in another.

Goals

Grade 7 students will complete a series of fourteen activities to learn how to use a spreadsheet. Each activity can be done in a 45 minute class period. Information on modifications to adapt for various grade levels is included below.

Students begin by learning how to enter data into the cells of a spreadsheet. This lesson would require a simple collection of data. Examples of a lesson for 5-8 grade students would be measuring a variety of surfaces/things using Metric or English measurement. These measurements are later used to find perimeter, area or volume depending on the skill level of the students.

Once students learn how to enter data into the cells of a spreadsheet they apply the rules of order of operations to writing formulas which perform calculations with the recorded data. Teaching order of operations can be a lesson from their math textbook which provides several examples for practice. Use the data from the measurement activity that is already recorded on the spreadsheet, then students decide and set up a formula to do calculations. The type of formula that is used depends on the level of the students. For example, use area of a rectangle for lower level students and volume/surface area of a box/container for upper level students.

Next, students manipulate various parts of a spreadsheet learning how to adjust cells to accommodate data when setting up an appropriate table. Students are taught how to adjust width and columns of cells by direct teaching then are given samples of spreadsheets to independently recreate. Next, students learn how to graph measurement data from their spreadsheet. This is done by direct teaching.

In the final project, students research various speeds of roller coasters. They use a spreadsheet to record and graph data collected. Upper level students create a template from appleworks spreadsheet application for the roller coaster data. A template for the roller coaster spreadsheet can be provided for lower level students instead of creating a table for the data. Students summarize their findings by comparing average and listed speeds. They explore the relationship of the track length and duration of speed and the affect it has on the average speed. This could be done in small groups. Students write their findings.

This project can be adapted for various students in a number of ways. The introduction to a spreadsheet can use any numerical data. This could follow a scheduled class activity where students are gathering data. Their data can later be used and recorded on the spreadsheet. Teachers could give the students some or most of the formulas to use in the spreadsheet, depending on skill level and capabilities of the students. The final project can be modified by eliminating the series of activities where students adjust the cell's width and columns. In this case, the teacher could pre-make the spreadsheet table students would use for recording data on roller coasters, providing the students with a template.

Researching roller coasters is a hook for students. The students enjoyed going through the database of roller coasters by looking at their statistics and virtual pictures. [http:// www.rollercoasterdatabase.com](http://www.rollercoasterdatabase.com) is a great database for researching the fastest roller coasters in the world. It is easy to use and dependable.

Standards and Assessment

Mathematical communication was chosen for a content standard. This project provides real-life application of order of operations when writing equations for the needed formulas. Students collect and communicate the data information on a spreadsheet table, then display that same data on a graph. They will be assessed on writing an appropriate formula for average speed and number of seconds for duration of ride. Students will be assessed on whether they can describe and analyze the data by using the tables and graphs that they created.

Patterns, relations and functions was chosen for a content standard. Students use a spreadsheet and graph to represent and describe the data of listed and average speed of the roller coasters. Students can manipulate the track length and duration of ride to see how the changes directly affect average speed of the roller coaster. Students meet in a group to discuss how change in one quantity can affect change in another then write their findings.

Students are evaluated on their performance by using an appropriate four point rubric. Students know the criteria of the project by rechecking their project with a product descriptor and rubric. Part of the criteria requires students to write a paragraph where they report their findings when comparing listed/average speeds. Students discover what might be interpreted as deceptive representation when reading the listed speed on the database compared to their calculations of average speed of the roller coasters.

Another part of the criteria requires that the student analyze the relationship of the track length and duration of the ride. Manipulating the data on the spreadsheet (track length and duration of ride) helps the student to think about the relationship of the track length and the duration of the ride. For example, when the track length is increased the average speed is decreased. Students meet in pairs or a group to discuss how change in track length or duration of ride can affect change in average speed when manipulating the data of track length and duration of ride.

Content

Content standard is Mathematical Communication; Students will be able to:

1. Translate relationship into algebraic notation.
2. Use statistics, tables and graphs to communicate ideas and information in convincing presentations and analyze presentation of others for bias or deceptive presentation.

The content aligns with the content standards by involving the students in an activity where they need to communicate their information and ideas using spreadsheets/tables and graphs. The project also involves the students in an activity where they need to find perimeter or average speed. They translate that relationship into a formula where they do calculations using a spreadsheet. They compare listed and average speed which gives them the opportunity to analyze the deceptive presentation of the listed speed which is advertised on the Internet.

Content Standard:

G. PATTERNS, RELATIONS, FUNCTIONS

Students will understand that mathematics is the science of patterns, relationships, and functions.

1. Describe and represent relationships with tables, graphs, and equations.
2. Analyze relationships to explain how a change in one quantity can result in a change in another.

The content aligns with the content standard for one of the same reasons mentioned above, students describe and represent relationships of the average speed and perimeter using a spreadsheet/table and then a graph. In order to do this on a spreadsheet, they need to create and type in an appropriate formula/equation. Students share their observations when explaining how change in track length and duration of ride affects the average speed. The content of this unit is important because it provides the students with a vehicle to learn how to communicate their mathematical ideas in other ways besides just writing on worksheets. This teaches the students how to use another tool to find and display mathematical information. It also relates creating formulas and using order of operations to real life application. Instead of teaching order of operations in isolation, it shows a real life application. Using formulas and order of operations are important pre-algebra skills. Average speed, perimeter and area are familiar concepts for students to use, which provides the building blocks to understanding that is needed for all learners. The subject area of roller coasters provides a strong motivation piece for the students.

Students develop higher order thinking skills as they create tables/spreadsheets and then formulas which calculate the information needed. Higher order thinking skills are needed when analyzing and comparing the listed vs. average speed of the roller coasters.

The skills learned in this unit will transfer into other academic areas because students will need to learn how to communicate their knowledge using tools of technology. Science demands the use of graphs and tables. The business world demands the use of spreadsheets, tables and graphs. Students will need to be proficient with computers in every future career.

Strategies

There are a variety of instructional strategies that are used to teach this unit. Seventh graders, in the year 2004, are fortunate to each have a laptop computer. This makes it very convenient to teach skills for using a spreadsheet application.

In the initial stage, any activity that gathers numerical data is used. The teacher is at liberty to choose. I chose measuring rectangular items with millimeters and centimeters, recording width and lengths of items such as desk, textbook, laptop computer, reading book, shoe box and giftbox covers, recyclable grocery boxes

(cereal, frozen food entrees, cracker boxes). This is a simple activity and provides practice measuring then recording decimal numbers, writing ones and tenths place. I measured the items prior to class so I would recognize in class the students' accuracy in measuring with millimeter and centimeter units. Once data is gathered the teacher demonstrates to the class how to enter data onto the spreadsheet. Students, after the teacher directed lesson, continue to enter their data independently. Second step, teach order of operations. A math textbook is an appropriate resource to use for this lesson, giving the students exercises to practice and perfect the skills. Once the students are familiar with order of operations, the students pair up or work in groups to brainstorm formulas for perimeter and area. This can be done as a whole class activity also. They continue to brainstorm ways to use order of operations to set up each formula, applying the learned rules of order of operations. Then they write appropriate formulas for perimeter and area to be used on a spreadsheet. This provides a valuable real-life application.

Third step, provide instruction on how to enter the formulas onto a spreadsheet. Students type the formulas in the cells of the spreadsheet. In the fourth step, the students are taught how to adjust rows and columns of cells by direct instruction. Students are given samples of spreadsheets which they independently recreate.

Another example of a spreadsheet lesson which gave students practice in creating a working tool is to create a gradesheet. Students record their assignments and grades daily. Formulas are entered for calculating averages. This gradesheet is used throughout the year to record and keep the students informed of their average grade in math class. In the fifth step, teach students how to graph from a spreadsheet. Teachers prior teach the graphing process; how to label the graph such as the title, x and y axis. Students explore this application by trying to graph their spreadsheet without any prior instruction. Then students are provided with a template giving them data to graph, for example how many years each of their teachers have taught. This allows them to use data which can easily translate to a graph.

The final project can be presented in various ways. First day, allow the students to bookmark and then explore <http://www.rcdb.com>. Students use stickie notes on their laptops to record roller coasters they are interested in.

Second day of project, the teacher decides whether students will create their own template by recreating a sample or use a prepared template to be used to enter the roller coaster data. There are three versions available in the Packet Resources. Less time will be needed if students are provided with a prepared template.

Third day, students learn how to write various formulas. Each student uses order of operations to write formulas for average speed. They also learn to write a formula that converts minutes/seconds to seconds for duration of ride. Class time is needed to discuss writing the feet as a fractional part of a mile (number of feet in track length divided by number of feet in a mile) so the students can compare listed speed with average speed. This ratio can be set up on the spreadsheet so it calculates the decimal to represent the number of miles for the track length of the roller coaster. The same is true for the duration of the ride which is given in minutes and seconds. A

formula needs to convert minutes and seconds to seconds.

Fourth and fifth day students need to write formulas on their spreadsheets and begin researching the roller coasters using the website. Students select name of roller coaster and record track length, listed speed, and duration of ride. Spreadsheet template should be prepared and ready to use before students enter data. Once data is recorded, all formulas should work so that average speed is calculated and available for next activity which is graphing.

Sixth day, students will graph average/listed speed using an appropriate graph with the appropriate labels.

Final day, students work in groups to discuss first, what happens to the average speed when either the track length or duration of ride increases or decreases, and second make a comparison of average/listed speed hopefully discovering the deceptive presentation of the listed speed from reading the statistics on the database. They then write in paragraph format to report their findings. This provides students with the opportunity to reflect on their learning. Final copy of complete template, written paragraphs and graph passed in for evaluation.

This project involves the learner in a real-life application of using a spreadsheet to record data, do calculations by creating and using formulas then graph to display information. It engages the learner one-on-one with the application of technology, using a spreadsheet, which is a tool used by many people in the business world today.

Steps

The overall time frame for this project requires the students to have several activities and experiences using a spreadsheet. The lessons integrate many skills that are taught in class and provide real-life application by using the spreadsheet. There are 14 lessons that can be done in a 45 minute class period.

Lesson 1: *Students create a simple table using a spreadsheet to record data.

Lesson 2: *Students learn the order of operation and insert formulas in appropriate cells on a spreadsheet for area and perimeter to do calculations.

Lesson 3: *Students learn how to adjust columns and widths of the spreadsheet and create a table using a spreadsheet which will be used as a grade sheet.

Lesson 4: *Students learn how to use formulas and insert formulas into their grade sheets to calculate grade averages for the quarter. Students use their grade sheet daily to record assignments and grades.

Lesson 5: *Students are provided with a simple table and learn how to graph the data.

Lesson 6: *Students prepare to research 10 roller coasters by going on the Internet to explore the web site <http://www.rcdb.com>.

Lesson 7: *Students download a spreadsheet table from the server to record data for the roller coasters.

Lesson 8 and 9: *Students explore formulas and decide on appropriate formulas to

use for average speed of roller coasters.

Lesson 10: *Students insert appropriate formulas for average speed into the roller coaster's spreadsheet.

Lesson 11: *Students type in track length, duration of ride and listed speed of their 10 favorite roller coasters. Formulas should be working and calculating average speed.

Lesson 12: *Students graph the data from their roller coaster spreadsheet.

Lesson 13: *Students analyze data by comparing listed and average speed of roller coasters then write their conclusions.

Lesson 14: *Students manipulate the data on their spreadsheets; by increasing or decreasing track length and leaving duration of the ride the same. Also changing duration of the ride and leaving track length the same to see the affect on the average speed of the roller coasters.

They then write their conclusions.

Lesson 1: Student's goal is to be introduced to the application of a spreadsheet. Teach students area and perimeter of rectangles prior to this activity. Before class teacher selects 8-10 rectangular boxes. Pre-measure length and width of each box and record where students will not see dimensions. Prepare poster paper with four columns labeled; length, width, perimeter, area.

Class begins: Pair the students for the following activity.

Each pair is given one rectangular shaped box to measure in centimeters the length and width of each side. In order to know the accuracy of the student's measuring, teacher should know the dimension's of each of the boxes. Students use ones and tenths place to represent centimeters and millimeters of length & width. Each student pair records dimensions of their rectangular box in appropriate columns on poster paper placed in classroom. Students go to their computers, use a word processing program and from windows menu select show tools. From there students create a small spreadsheet; 4 columns by 10 rows. Students can label columns appropriately by recreating the poster paper that is displayed in front of the room. Students continue to complete spreadsheet table by typing in length and width of student's rectangular boxes which is on the poster paper. Students save this spreadsheet to be used in lesson 2.

Lesson 2: Student's goal is to learn order of operations and apply to real-life application.

This skill can be taught easiest by using a math textbook. Students can get practice by doing the exercises that are in the textbook. Rules for order of operations can be posted in the class. Students discuss ways of writing formulas for area and perimeter . Students write formulas for area and perimeter using order of operations. The formulas can be recorded on the poster from lesson 1 in the classroom. Students type formula in appropriate cells on their spreadsheet table.

Lesson 3: Student's goal is to learn how to adjust columns and rows on a spreadsheet table to accommodate data.

This lesson is a direct teaching activity. Students go to their computers, use a word

processing program and from windows menu select show tools. From there, students can create a spreadsheet that is 5 columns by 40 rows. Students manipulate this spreadsheet by highlighting and adjusting different columns and rows. Students are given a handout of a prepared grade sheet template. Students recreate the grade sheet on their computer using the word processing program then spreadsheet application. Students adjust columns so that columns a, c, e are 100 pts. and column b, d are 72 pts. They continue to type in headings, name and general information into their grade sheets. Students save the grade sheet by selecting save as and naming the file with their name. These are collected and corrected from a math folder that is on the server.

Lesson 4: Student's goal is to learn mean and apply skills to writing a formula appropriate to calculating their math average on their grade sheet. This lesson is easiest taught with a textbook. Students can practice finding the mean by doing exercises in the book. Students discuss how to write a formula appropriate for finding their math average. The grade sheet can be set up in various ways. The grade sheet that is available with this SEED packet is set up to average homework and quiz/test separately then average those grades together. Students type in appropriate formulas on their grade sheets.

Lesson 5: Student's goal is to learn how to display their data by graphing from a spreadsheet. Students need to have had prior lessons on coordinate systems so that they can identify and label the x and y axis. This lesson on graphing using a spreadsheet is a direct teaching activity. Students can be introduced to the idea by using a prepared table. For example, height of ten students who they would know at school would be appropriate data. Students download this prepared template from the school server. Allow time for the students to explore how they might graph this data. Questions to ask the students would be: what type of a graph should be used (bar or circle graph, scatter plot, etc.), what is the title, labels for x & y axis, how would we begin to graph, how do we tell the computer what to graph? Follow through and answer the questions with the class. Students can explore how to do this by using the table of students and their heights. Provide them with another table of data so they can independently make another graph. I used teachers and how many years that they had taught.

Lesson 6: Student's goal is to learn about the project of researching 10 roller coasters and to explore the web site, <http://www.rcdb.com>. Teacher explains to the students that they will be researching 10 roller coasters of their choice. They will be investigating the average speed by recording the track length and duration of the ride for each roller coaster. They will use a spreadsheet table to record, calculate average speed and graph the data that they collect over the Internet. Students need time to explore the web site. Encourage them to check record holders or search for a roller coaster that they have been on. They really enjoy this web site.

Lesson 7: Student's goal is to recreate a table from a spreadsheet that they will use to record roller coaster data.

This goal can be attained in different ways depending on how much time you want the students to spend on the spreadsheet table itself. There are four versions of the Roller Coaster project to choose from. Students download the appropriate version from the school server.

For my advanced math students, I used version 2. I only completed the column and row widths so the page was set up without column titles and formulas. I did this to save time in class. Students can continue to explore the roller coaster web site when they have completed this assignment. Encourage them to take notes on their favorite roller coasters using their computers. These will be used in the next lesson.

For my regular math students, I used version 1. I completed the titles and most of the formulas except for two formulas; converting minutes and second into seconds and average speed formula. The students were expected to create and write these two formulas (Lesson 8). Students can continue to explore roller coaster web site when they have completed this assignment. Encourage them to take notes on their favorite roller coasters using their computers. These will be used in the next lesson.

Version 3 was designed by Dan Gagner. It is set up to be teacher and student friendly. This could be downloaded from school server without using class time to create a table for the roller coaster. It would be used for regular math students.

Lesson 8 and 9: Student's goal is to decide on the appropriate formulas for converting minutes/seconds to seconds.

Decide on appropriate formulas for using track length and duration of ride to find average speed (in mph) of each roller coaster. The web site <http://www.rcdb.com> is easy to use. The posted/listed speed is given in miles per hour but the track length is given in feet. Class time is needed to discuss writing the feet as a fractional part of a mile (number of feet in track length divided by number of feet in a mile) so the students can compare listed speed with average speed. This ratio can be set up on the spreadsheet so it calculates the decimal to represent the number of miles for the track length of the roller coaster. The same is true for the duration of the ride which is given in minutes and seconds. A decimal is needed to represent the seconds as a fractional part of an hour (number of seconds of ride divided by number of seconds in an hour). There is a column provided on the spreadsheet for this information. Average speed, for understanding the relationship of the track length and duration of ride is assessed. Also the formula for converting the minutes and seconds to only seconds is assessed. Once they insert formulas into the appropriate cells, teach students how to use calculate menu and fill down, so they do not need to type each formula in for each roller coaster. To teach the formula for average speed, I would recommend doing a lesson from your text book on application of formulas. Review with the students formulas that they are familiar with such as formulas for area, circumference and perimeter. To teach average speed, present a problem; for example, a car is traveling 60 mph and it travels for 2 hours, how far would it travel? Most students are familiar with the concept of distance, time and rate relating to speed of cars. Write the formula $d = rt$ and then insert the values

in from the problem you presented to them with ($d = 60 * 2$). Lead the discussion in the direction... what if distance was given and time was given, how could we find rate? ($120 = r * 2$). This should help them to understand how to set up the formula to find average speed. Next, relate average speed to the roller coaster. What information would they need from the web site in order to calculate average speed? How would the formula be set up on the spreadsheet to calculate this? Students create and write in formulas on their spreadsheet.

Lesson 10: Student's goal is to record data for track length, duration of ride and listed speed on the spreadsheet table.

Students each have their table completed with column titles and appropriate formulas. Next they use the notes on their favorite roller coasters or use the web site for the statistics to record the needed data. Students complete the table.

Lesson 11: Student's goal is to graph name of roller coaster, average and listed speed.

Student's create a bar graph displaying name of roller coaster, average and listed speed, appropriately labeling title, x and y axis. Select page break and move their graph to page 2.

Lesson 12: Student's goal is to analyze data, comparing average and listed speed. Describe average speed and listed speed. Students pair up in class to describe and explain to each other. Next they will independently write their findings. This can be typed on the page with their graphs.

Lesson 13: Student's goal is to use their spreadsheets to manipulate the track length and duration of ride to explore what happens with average speed when one quantity changes.

Students pair up and explore average speed by using their spreadsheets to change track length and note what happens to the average speed with these changes. Also change duration of ride and note what happens to the average speed with these changes. Students work in pairs and then independently to describe these changes. Students write an analysis of their findings on the same page as their graph. This completes the final project.

Print out a final copy or pass in to a math folder that is on the school server.

Modifications

Students each have their own laptop but it is extremely beneficial for students who have special needs to sit beside a productive partner when doing activities on new computer applications. Also pair students according to their proficiency on the laptop computers. It is also recommended that a Technology Teacher be available for technical support.

The following modifications could be made to accommodate learners with special needs:

Initially, students learn how to enter data into the cells of a spreadsheet. Writing the steps out on the board or a handout would be helpful for many learners. Provide them with a handout which looks exactly like the spreadsheet to follow. Teachers need to be aware of each learner's needs and be attentive during these activities. Teachers should use an overhead or TV/computer to demonstrate directions.

Students learn the steps of order of operations. Students apply these rules to setting up formulas for area, perimeter, and average speed. Write out the steps for order of operations and have them posted throughout this lesson. It is beneficial for students to be taking notes as teacher is instructing. Practice writing out formulas for area, perimeter, and average speed prior to using the spreadsheet application. Then, provide a handout that has the formulas written out to be used as a guide.

Students learn how to adjust cells by changing the columns and widths. Provide students with a handout that expands the menus for the command of changing the columns and widths. Teacher can also use overhead or TV/computer to demonstrate directions. Students learn how to graph data from a spreadsheet. Students practice labeling x and y axis prior to working with the laptops. Teacher can also use overhead or TV / computer to demonstrate directions.

Students complete a final project where they research various speeds of roller coasters then use a spreadsheet as a table to record track length, duration of ride, and listed speed. Formulas are inserted to do the calculations for average speed. The first accommodation that can be made is to provide a spreadsheet template instead of having the students create a table for this project.

The second accommodation is the template can have the formulas already inserted. A third accommodation is students can research 5-8 roller coasters instead of the assigned 10. Once again, teachers need to be aware of learner's needs and be attentive to those students in order to avoid frustration during these activities.

Integration

The spreadsheet w/graphing capabilities application is needed for this project. Appleworks is the program installed on the grade 7 laptops.

The technology provides the students with another tool to do the work that they previously did using paper, pencil, and graph paper. The spreadsheet application is foreign to most grade 7-8 or younger students. Spreadsheets are an easy way to make a table and to graph data. It is valuable for students to know how to use these applications for any class that they need to display or manage data such as variety of math or science classes. Students gain essential knowledge in learning the application of these tools. It provides them with another way of communicating or displaying information. These skills are expected in many businesses. This project

engages students to use the internet to research an interesting topic, roller coasters. It teaches the students to develop a project where the data that they collect is displayed on a spreadsheet/table then a graph. They can use the application to create a final project that is meaningful since they have been walked through the steps of creating it. Through the final project they create the table, research the data, and insert the appropriate formulas to calculate the average speed which leads them to the last step of analyzing the data. The technology has provided the students with an efficient and professional way to do this project. Now they can easily read their graph to analyze the misleading listed speed vs. average speed.

As an adjunct to Roller Coaster Math, there is a fun culminating activity that can be done in the classroom. At <http://www.nolimitscoaster.com>, the company produces a roller coaster simulator with fifty two of the world's best known roller coasters simulated for riding in first person 3D rendering. Your students will find some of the rollercoasters they researched and others that they can ride from beginning to end in actual time. A recommendation for fun and effectiveness is to project the program using a computer projection device and connect the computer to a sound system as the sound adds much to the effect of the ride. At the top of the screen during the ride, the rollercoaster is continually updating statistics like speed and g forces. The program called 'No Limits' has five rollercoasters in the download demo and 52 if purchased online for \$25. The authors of this SEED developer project have no affiliation with the company that produces this program and recommend it only as an adjunct as it is not necessary for the implementation of Roller Coaster Math.

Materials

Material list is:

Appropriate handouts for each lesson

Centimeter rulers

10 different sized boxes

Overhead for transparencies for demonstrating to students

Transparencies for each handout

Television to use as the computer monitor when demonstrating computer skills

Bibliography

Web Sites

Title Bar rollercoasterdatabase

Author(s) Duane Marden

Name of Site Roller coaster Database

URL <http://www.rcdb.com>

Date Browsed 02/11/2004

Title Bar Roller Coaster Simulator

Author(s) Mad Data

Name of Site No Limits Coaster

URL <http://www.nolimitscoaster.com>

Date Browsed 03/07/2004

			Qtr1 Avg		
			Qtr2 Avg		
			Qtr3 Avg	#ERROR!	
			Qtr4 Avg		
			Year Avg		
Homework Average	#ERROR!	Quiz/test Quarter	#ERROR!		

Create a table for height of people.

Graph the table onto a graph. Be sure to label graph;
Title, x-axis and y-axis.

People	Height in inches
Mr. Carbone	76
Mrs. Sanborn	60
Ms. Watson	66
Mr. Gagner	68
Mr. Zima	72
K.Smalley	61
Tom Call	62
Andrew Ferguson	61
Ms. Hussey	62
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Create a table for height of people.

Graph the table onto a graph. Be sure to label graph;
Title, x-axis and y-axis.

People	Height in inches

Roller Coaster Math

Name;

Date: Finished on February 6, 2004

5. The listed speed is the maximum speed; which is it's fastest recorded speed. The average speed is the mean of all the speeds each time the ride runs.
6. If you decrease or increase the track length, the average speed will surely change. This is because there is less amount of space for the roller coaster to go, so the speed will be affected. When you increase the track length the average speed increases, and when you decrease the track length the average speed decreases.
7. When you decrease the duration of the ride the average speed gets higher, and when you increase the duration of the ride the average speed gets lower. This is because when you increase the duration, there is more time for the ride to run and it uses more time, and when you decrease the duration there is less time for the ride to run so it must end much faster.

Name	Track length	TIME OF RIDE		Time of ride	feet/mile	second hour	
<i>(roller coaster)</i>	<i>(feet)</i>	<i>(MINUTES AND SECONDS)</i>		<i>(seconds)</i>	<i>(miles)</i>	<i>(hours)</i>	
Falken	2040	1	54	114	0.39	0.03	
Gauntlet	2260	1	36	96	0.43	0.03	
Ragin Cajun	1377	2	30	150	0.26	0.04	
Silver Bullet	3125	2	30	150	0.59	0.04	
Storm Runner	2600	0	50	50	0.49	0.01	
Tsunami	1148	1	5	65	0.22	0.02	
Typhoon	2198	1	30	90	0.42	0.03	
Volare	1476	3	0	180	0.28	0.05	
Xtreme	1391	1	10	70	0.26	0.02	
Borg Assimilator	2766	1	50	110	0.52	0.03	
				0	0.00	0.00	
feet/mile	second/hour	feet in mile	seconds in hour		Name	Average speed	Listed speed
<i>(miles)</i>	<i>(hours)</i>				<i>(roller coaster)</i>	<i>(miles per hour)</i>	<i>(miles per hour)</i>
0.39	0.03	5280	3600		Falken	12.20	4.66000000e+1

0.43	0.03	5280	3600		Gauntlet	16.05	4.97000000e+1
0.26	0.04	5280	3600		Ragin Cajun	6.26	2.91000000e+1
0.59	0.04	5280	3600		Silver Bullet	14.20	55
0.49	0.01	5280	3600		Storm Runner	35.45	75
0.22	0.02	5280	3600		Tsunami	12.04	38
0.42	0.03	5280	3600		Typhoon	16.65	4.97000000e+1
0.28	0.05	5280	3600		Volare	5.59	3.11000000e+1
0.26	0.02	5280	3600		Xtreme	13.55	3.73000000e+1
0.52	0.03	5280	3600		Borg Assimilator	17.14	51
0.00	0.00	5280	3600			#DIV/0!	

Roller Coaster Criteria

Student name:

1. Using the prepared template, recreate a table to record track length and duration of ride using the spreadsheet application. _____
2. Decide and insert appropriate formula's to calculate time of ride in seconds and average speed of roller coasters. _____
3. Research 10 roller coasters using internet website www.rcdb.com. Record track length, duration of ride, listed speed and rider capacity. _____
4. Graph name of roller coasters, average and listed speed. Use appropriate labels for the title, x and y axis. Move all your graphs to a second page. _____
5. Describe and explain the difference between the average and listed speed.
Explain how the listed speed is a misrepresentation of the actual speed traveled on the roller coaster.
Type your explanation on the same page as your graph. _____
6. Describe and explain the relationship of the track length and duration of ride.
What happens to the average speed when you decrease or increase the track length, leaving the duration of ride the same?
What happens to the average speed when you decrease or increase the duration of the ride, leaving the track length the same?
Type your explanation on the same page as your graph.

7. **Check your project to each of the above criteria.**
Label this file with your name.
Pass in roller coaster spreadsheet and graph file to math folder that is on the server in the Blue team folder.

America's Scream Machines

Name;

Date:

Name	Track Length	Time of Ride		Time of Ride	feet/ mile	second/hour	
<i>(roller coaster)</i>	<i>(feet)</i>	<i>(minutes and seconds)</i>		<i>(seconds)</i>	<i>(miles)</i>	<i>(hours)</i>	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
					0.00	0.00	
feet/ mile	second/hour	feet in mile	seconds in hour		Name	Average Speed	Listed Speed
<i>(miles)</i>	<i>(hours)</i>				<i>(roller coaster)</i>	<i>(miles per hour)</i>	<i>(miles per hour)</i>
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		
0.00	0.00	5280	3600		0.00000000e+0		

Teacher	# years teaching
Mr. Zima	5
Mrs. Sanborn	20
Mrs. Watson	30
Mr. Crepeau	27
Mrs. McCluskey	29
Mr. Gagner	26
Average years	22.8

How long have the teachers been teachers?

DATA

How long have the teachers been teachers?

Data table.

1. Make a new word processing document.
2. choose the spreadsheet tool at the top of the tool palette.
3. Drag and open a spreadsheet 2 columns wide and 8 rows deep.
4. Type the titles, teachers names, and their years of teaching experience.
5. In row 8 type Average years and write a formula in the second column for the average number of years of teaching for all teachers.

Graph the data

6. Choose the spreadsheet tool and drag and highlight all the teachers and their years of experience.
1. Choose 'make chart' under options in the menu bar. Use these settings:

axes

Title

General

			Qtr1 Avg	9.65000000e+1
			Qtr2 Avg	
			Qtr3 Avg	9.65000000e+1
			Qtr4 Avg	
			year Avg	
homework average	100	test/quiz average	93	

Student
 2003-2004
 Team
 period 2
 2nd quarter

Homework	grade	Test/Quiz		
p.305 10-16even 17-25all	100	5 minute check quiz	90	
handout pw3-3 and p.753-754 (6-5),(6-4) 10-12 all (6-5)	100	chunky survey test	100	
p.488-489 #10-18 all	100			
handout pw6-6	100			
Central Tendency handout	100			
handout :tic,tac,toe pw5-6	100			
P.311#12-42 even	100			
handout:pw6-7	100			
handout pw6-8	100			
p.319 14-34even 41-43 all	100			
handout: d=rt	100			
handout sg 3-4	100			
p.331 #1-12 all #15-19 all	100	Test/ quiz avg.	95	
p.336 # 12-26 even	100	notebook 1	100	
p.339-340 6-18 all	100	notebook 2	100	
p.756 (7-2) (7-3)	100			
p.342-343 #1,2,6-28 even,38-40 all	100			
p.348-349 4-44 even	100			
p.757 (7-5) #1-8 p.349 #34,36	100			
p.353 #12-30 even				
		notebook average	100	

			qtr 1 avg	98
			qtr2 avg	98
			qtr3 avg	98
			qtr4 avg	
			year avg	98
homework average	100	test/quiz average	95	

G. Patterns, Relationships, Functions	4	3	2	1
1. Describe and represent relationships with tables, graphs, and equations	Describe and represent the relationship between track length and duration of ride with tables, graphs and equations. Describe how to create a formula for either average speed or number of seconds for duration of the ride and relates to other examples of average speed.	Describe and represent the relationship between track length and duration of ride with tables, graphs and equations.	Represents the relationship between track length and duration of ride with tables, graphs and equations.	Unable to represent or describe the relationship between track length and duration of ride with tables, graphs and equations.
2. Analyze relationships to explain how a change in one quantity can result in a change of another	Analyze and explain how an increase or decrease of track length or duration of the ride results in the change of the average speed. Describe why those changes occur.	Analyze and explain how an increase or decrease of track length or duration of the ride results in the change of the average speed.	Partially analyzes and explains how an increase or decrease of track length or duration of the ride results in the change of the average speed.	Unable to analyze and explain how an increase or decrease of track length or duration of the ride results in the change of the average speed.

Roller Coaster Math Rubric

K. Mathematical Communication	4	3	2	1
1. Translate relationship into algebraic notation.	<p>Create an accurate formula for average speed and number of seconds for the duration of the ride.</p> <p>Describe how to create a formula for either average speed or number of seconds for the duration of the ride.</p>	<p>Create an accurate formula for average speed and number of seconds for the duration of the ride.</p>	<p>Create formula for either average speed or seconds for the duration of the ride.</p>	<p>Unable to create either formula</p>
<p>2. Use statistics, tables, and graphs to communicate ideas and information in convincing presentations and analyze presentation of others for bias or deceptive presentation.</p> <p>Evidence: #5 on product descriptor</p>	<p>Describe the relationship between average and listed speed based on the statistics, data, and graph.</p> <ul style="list-style-type: none"> - record track length , duration of ride, and listed speed on spreadsheet - create a graph displaying average and listed speed of each roller coaster - describe difference between average and listed speed 	<p>Describe average and listed speed based on the statistics, data, and graph.</p> <ul style="list-style-type: none"> - record track length , duration of ride, and listed speed on spreadsheet - create a graph displaying average and listed speed of each roller coaster - describe difference between average and listed speed 	<p>Describes either average or listed speed based on the statistics, data, and graph.</p> <ul style="list-style-type: none"> - record track length , duration of ride, and listed speed on spreadsheet - create a graph displaying average and listed speed of each roller coaster - describe either average or listed speed 	<p>Unable to describe average or listed speed based on the statistics, data, and graph.</p>

Roller Coaster Math Rubric