

What is a Mathematics Project?

A mathematics project is the whole PROCESS of solving a problem, exploring an idea, or applying a mathematical principle.

The PROCESS begins with choosing and planning a topic of interest to the student, investigating (studying, experimenting, researching...) the topic, exhibiting, and writing a report.

The project may develop a new mathematical concept, relate an idea to another branch of mathematics/science, or show an application of mathematics in the real world.

Choosing a Project Topic

Many project ideas are generated from interesting classroom examples and problems. A student may enjoy extending the problem to his/her highest skill level.

Some examples of ideas that can be explored might be:

- Original games, puzzles, number theory...
- Arithmetic, algebraic, or geometric explorations and experiments
- Applications of mathematics in navigation, economics, music, hobbies, ...
- Concrete or visual models
- Analysis, Trigonometry, Topology, ...
- Statistics and Probability



STEPS IN DEVELOPING A MATH FAIR PROJECT

1. DECIDE WHAT YOU WANT TO DO

Method 1: Ask a question and then find the answer through mathematical processes/applications. This is the same method that is used in science projects.

Method 2: Think of a concept used in math and show how this concept holds true or use the concepts in a game. Concepts include addition, subtraction, multiplication, division, probability, statistics, percentages, ratios and proportions to name a few.

2. DATA COLLECTION

Collect your data (ex. coin flipping, roll of die, price comparisons, etc.).

Organize your resource material or data (bar graphs, circle graphs, line graphs, pictographs, charts, tables)

3. WRITE IT DOWN – the PROJECT REPORT

The report is a “project biography”. It provides clear documentation and explanation of the project. A format that may be used for mathematics and computer science projects is as follows:

- a. Purpose of the project or statement of the problem
- b. Background information; any relevant research on the topic
- c. Outline of the project development or log of activities; procedure used in project development and/or construction
- d. Discussion of concepts investigated or illustrated by the project; summary of the project

4. DISPLAY

All displays, project boards, or charts must be self-supporting. Wall space will not be available. Avoid hand lettering unless you are a good artist. Use stencils or commercially available “peel off – stick on letters”. A computer graphics program can be used to make a professional looking board. All written material should be neatly handwritten or typed. Written material should be backed with sheets of colored construction paper.

You can use photographs to trace a sequence of events. Place the photo of the earliest event on the left. Back all photographs with construction paper. If you use photographs that have people in them, all faces must be covered so that the judging remains impartial. *

The CENTER is reserved for the TITLE of the project and diagrams, photos, or drawings. On the table in front of the display backboard, place equipment used or samples of your experimental group and control group. Also, place your report in front of the display board. The SIDES can be used for a shorter version of your purpose, procedure, results, and conclusions. Under RESULTS you might display graphs or charts like the ones in your paper.

Your exhibit will have three parts: the backboard, the paper, and equipment.

* May not be necessary, depending on who the judges are.

IDEAS FOR MATH FAIR PROJECTS

Note to students: Use these ideas to help you choose a project you will enjoy doing. Some of these topic suggestions may give you another idea, and that is great! You will learn the most if you choose a topic about which you already know only a little, or if you choose a topic that extends something about which you have enjoyed learning. The library has books with information on many of these topics, and I have some information which I will share when I know what your topics are. Be an explorer! Take this opportunity to learn something new.

APPLICATIONS OF MATHEMATICS:

- in Sports
- in Art (especially geometry)
- in Music
- in Astronomy
- in Navigation
- in Economics
- in the Work Place (Ex.: Carpentry, Drafting, Auto Mechanics, Banking).
- in Codes
- in Computers (How computers work, Mathematics in Logo, etc.)
- in Architecture
- in Consumer Math (Comparisons of prices in different stores; Comparisons of Prices today with prices ten years ago, then predictions of prices ten years from now, etc.)
- in Aerodynamic Design (Experiment with paper airplane designs to discover which design flies longest in distance, longest in time, etc.)

PATTERNS

- number sequences
- in nature (Explore snowflakes, leaves, flowers, sunrise/sunset, etc.)
- Fibonacci Sequence
- in geometry

RECREATIONAL MATHEMATICS

- Make a math game
- Design a logic puzzle
- Explore logic questions: Learn about famous mathematical problems like the Seven Bridges of Konigsberg, or others
- Explore and create Magic Squares (See Durer's work)
- Origami and Mathematics

GEOMETRY

- in Art or Architecture
- Geoboard Designs - What math do you see?
- Symmetry (Create designs, find examples in nature, art, etc.)
- Triominoes, tetrominoes, Pentominoes, and other shapes made with a given number of squares
- Explore the Quadrilateral Family
- 3-D Constructions with Tinker Toys, straws and clay, etc.
- Build a scale model of a building, a playground, etc.
- String Art or Line Design
- Tesselations (See M.C. Escher's work)
- Explore and Illustrate the Pythagorean Theorem

MATHEMATICS HISTORY

- The history of mathematics
- Ancient Number Systems (Egyptian, Mayan, Roman, etc.)
- Research Famous Mathematicians
- The History of Zero
- Number Systems in Bases other than 10: Uses for such systems

More Project Ideas

MATHEMATICAL CURIOSITIES

- Palindromes (EX. 33, 12921, 405504, MOM, DAD)
- Prime numbers
- Sieve of Eratosthenes
- Goldbach's Conjecture
- The Mobius Strip
- Soma cubes
- Optical illusions
- Perfect numbers
- Irrational numbers
- Imaginary numbers

MEASUREMENT

(This is a very broad area of mathematics. Here are just a few ideas to help you think of others.)

- Test the strength of a variety of "strings" (cord, thread, yarn, rubber band, paper, etc.)
- Figure out how much you are worth if you are worth your weight in dimes or some other amount.
- Record your pulse after doing a range of activities.
- Find ways to show how big a million is (or 1,000 or one billion).
- Measure an object in as many different ways as possible (Ex.: circumference, wt., volume, area, ht., etc.)
- Measure distances or areas in your home or neighborhood with a variety of non-standard instruments.
- Compare weights of the same amount of different substances. (Ex.: a cup of rice, water, flour, potatoes, sugar, popcorn, etc.) Does risen dough weigh the same as it did before rising? Does sifted flour weigh the same as unsifted flour?

PROBABILITY AND STATISTICS

- Formulate a problem to be solved and run an actual or a simulated test.
- Actual test example: If you threw a paper cup into the air 50 times, what are the chances it would fall on its side, on the bottom, on the top?
- Simulated test example: If you had to get each of six prizes from boxes of cereal, how many would you expect to have to buy to collect all six prizes? (Simulate with a die representing the six prizes.)

SURVEYS AND EXPERIMENTS

- Conduct an opinion poll (favorite pizza, ice cream, etc.)
- How many pets do you have?
- What kinds of pets do you have?
- Present the results of your poll or survey in several ways, including graphs, charts, percents, pictures, etc.
- Conduct an experiment, scientific or other. Display the results using mathematics.

YOUR EXHIBIT

Your exhibit is the way of showing others what your project is about. The exhibit alone is not the project, but it is nevertheless very important. As with all parts of your project, you should take time to do it right.

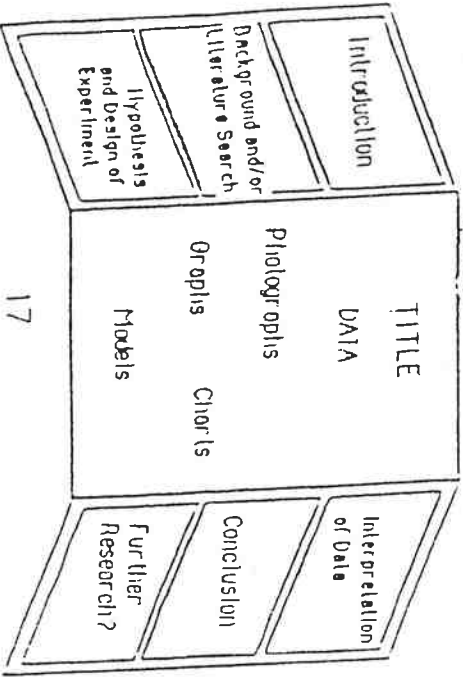
One type of exhibit has three sides and stands by itself (without other means of support). The center part is reserved for the TITLE of the project and diagrams, photos, or drawings. On the table in front of the display backboard, you could place equipment that you used or samples of your experimental group and control group, such as, petri dishes, soil samples, plants, etc.

The two side wings of the display could be used for a shorter version of your purpose, procedure, results, and conclusions. Under the RESULTS section you might display graphs or charts like those in your paper. Your complete paper can be placed on the table in front of the backboard. Thus, the backboard, paper, and equipment comprise your EXHIBIT.

BUILDING THE BACKBOARD

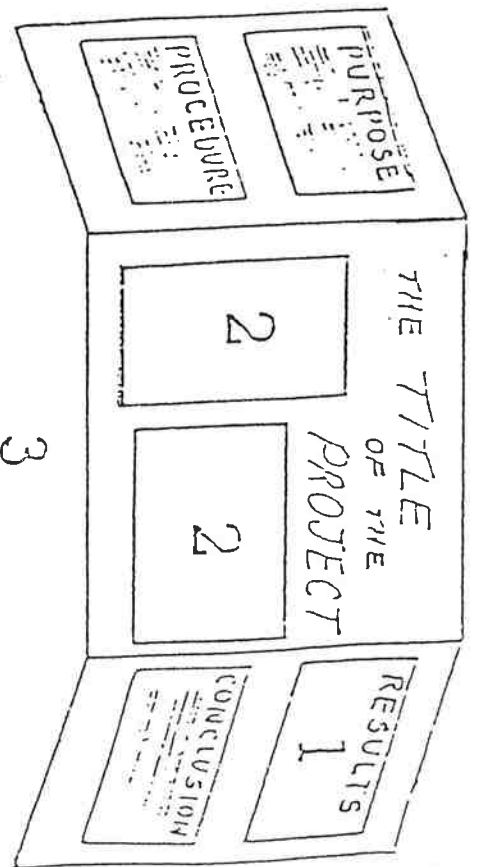
The style backboard below is the most typical. It can be one large board held up like a table picture frame, a self-supporting booth, or an aluminum frame with fabric stretched over it. Your art encouraged to use your own creative ability in designing your backboard.

The backboard below can be constructed from a 4 foot x 8 foot sheet of the materials listed on page 20.



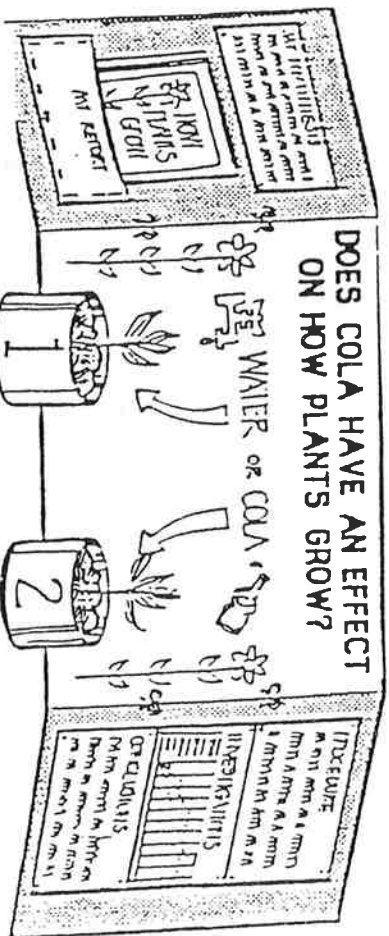
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A 3-SIDED DISPLAY



YOUR OWN CREATIVITY WILL DETERMINE HOW YOU MAKE YOUR DISPLAY. HOWEVER, THESE DIAGRAMS GIVE EXAMPLES OF A BASIC 3-SIDED DISPLAY.

1. GRAPHICS AND CHARTS
2. PERHAPS YOU WOULD CHOOSE TO DISPLAY PHOTOGRAPHS OR DRAWINGS OF YOUR WORK.
3. EQUIPMENT AND YOUR RESEARCH PAPER ARE PLACED ON THE TABLE.



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Parent Tips for Projects



Do's

Help your child plan and manage his/her time.

Help your child gather materials.

Help your child find resources.

Question your child about improvements. For example, "What could you do to make this better?"

Assist with hot gluing, sharp scissors, or dangerous tools.

Check the rubric to make sure the directions were followed.

Proofread and make your child fix grammar and misspelled words.

Make this a positive experience for your child.

Don'ts

Wait until the last minute and help your child with the work in order to finish.

Tell your child what materials to use.

Go to the library while your child is at school.

Give your child ideas and tell/him her what to do.

Construct, build, or create the project yourself.

Argue with your child about what the project entails.

Type the project at work.

Expect only a perfect grade.