

## Guidelines for Projects in Mathematics

*These guidelines are intended to serve the student and supporting teacher in the preparation of Science Fair projects in the category of Mathematics. In the following paragraphs are suggestions for steps to be followed to produce a finished project.*

The first and most important step is to come up with a project idea which is achievable. Discovering a previously unknown result or formula would be the ideal Mathematics project. However, a new approach to deriving or obtaining a known fact, or a new way of looking at a known concept are also perfectly acceptable ideas.

Topics from newer branches of mathematics such as Fractals, Fuzzy Sets, Chaos, and Game Theory are well within the capabilities of high school students and offer a relatively untapped re- source for project ideas.

Searching through recent books, journals and magazines and the internet can also provide ideas. Students can talk over these ideas with their math teachers, parents, and other students to clarify their approach. Simply performing an experiment and tabulating results (e.g. counting the number of heads which occur in N flips of a coin) does not rate highly. Analysis of experimental results, including computing means and variances, makes a better project. Computers can be used to help analyze data when appropriate.

After the idea has been formulated, it should be researched to determine whether the project has already been done, or whether the approach is already known. Repeating a project which has already been done does not rate a very high score. For example, tabulating coin flips, dice rolls, the Pythagorean Theorem, Pascal's Triangle are well worn ideas.

Students should talk to their teachers or consult previous Science Fair programs to see whether they are repeating old projects. Once the student is satisfied with the originality of the project, research should be performed to find all known facts related to the project idea.

The next step is to derive or calculate the results. This is usually the most time consuming part of the project. Originality and innovation during this step will result in higher scores for the project.

Finally, the project must be written up and a project display produced according to Science Fair guidelines (GSDSEF Rules & Regulations). The project write-up and display should include the following items:

- A statement of the objective - a clear description of the main idea of the project
- A summary of the research done to find previous related results
- A statement of what is new, better, or different from previous results
- Details of the development of the project
- A statement of the results or conclusions
- Critique of the results and ideas for future research or extensions of the results