

# **Palm Beach County School District**

## **2010 Elementary Mathematics and Science Fair**

# **Handbook**



**Sponsored by the School District of Palm Beach County  
Curriculum Development & School Improvement**



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# 2010 Palm Beach County Elementary Mathematics and Science Fair

## DISTRICT FAIR CALENDAR OF EVENTS

Date		Time
Sept. 17, 2009	School Fair Coordinator's Meeting, Pine Jog Education Center	4:00 - 6:00 PM
Oct. 15, 2009	School Fair Coordinator's Meeting, Pew Center	4:00 - 6:00 PM
Nov. 16, 2009	 <u>Intent to Participate</u> monkey survey due (Appendix, p. 37)	3:00 PM
Dec. 18, 2009	 School-Sponsored <u>Hands-on Activity Table Request</u> reservation form deadline (Appendix, p. 36)	3:00 PM
April 19, 2010	 <u>Project Registration Spreadsheet</u> e-mail deadline	3:00 PM
May 3, 2010	 Coordinating Teachers <u>Set Up Projects and Activity Tables</u>	12:00 - 4:00 PM
May 3, 2010	Judges' Reception Dinner	5:00 PM
May 3, 2010	Project Judging (FAIR CLOSED TO THE PUBLIC)	6:00 - 8:00 PM
May 4, 2010	 <i>School Field Trips</i> - students view projects and do hands-on activities (forms e-mailed to participating schools)	9:00 AM - 1:00 PM
	<b><i>Open to the Public</i></b>	9:00 AM - 7:00 PM
May 5, 2010	 <i>School Field Trips</i> - students view projects and do hands-on activities (forms e-mailed to participating schools)	9:00 AM - 1:00 PM
	<b><i>Open to the Public</i></b>	9:00 AM - 7:00 PM
May 6, 2010	 <i>School Field Trips</i> - students view projects and do hands-on activities (forms e-mailed to participating schools)	9:00 AM – 1:00 PM
	<b><i>Open to the Public</i></b>	9:00 AM – 12:00 Noon
	 Removal of projects and activity table displays Coordinating Teachers pick-up student projects	1:00 PM - 5:00 PM

 School Coordinator's responsibility    
  Field trip dates and times    
  E-mail communications



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## INTRODUCTION

Fairs, exhibitions, and competitions are familiar features in American life. Most of us find great satisfaction in presenting our efforts to others. Project activities are successful in great part due to the participation of spectators - even for those spectators with little or no experience with the focus of the exhibition. Such competitions are pleasant and educational for everyone involved. The presenter learns a great deal in preparing the exhibit, and the viewer learns something new from seeing it.

Mathematics and science are integrated subjects in the real world. However, it is important to understand how math and science fair projects are different. Mathematics fair projects are distinct from science fair projects in that the learner's attention becomes focused on the "*relationships to mathematics*" in the project. When students become engaged mathematical problem solvers, they become confident in their ability to do mathematics. The process of developing a mathematics project provides an opportunity for learners to reason and communicate mathematically. Science fair projects focus on the scientific method, developing a hypothesis, forming an inquiry plan, experimenting, collecting and recording data, and drawing conclusions. Both types of projects include the integration of math and science, student understanding, problem solving ability and communication skills.

This handbook is designed to assist teachers, students and parents in preparing for their school and district mathematics and science fair competitions. From the initial planning of projects through the development learning phases, to entering the school and district fairs, teachers, students and parents can work together to celebrate mathematics and science.

## DEVELOPING A PROJECT

### Mathematics

A mathematics project consists of all the effort expended in solving a problem, exploring an idea, or applying a mathematical principle - the initial planning, the study and the exhibit. It should develop a mathematical concept, demonstrate the application of a mathematical idea or principle, and show the relationship of a mathematical idea or principle from a branch of mathematics or other academic area. The project itself is used to speak mathematically to the viewer and briefly share the student's idea of the mathematical concept or principle used to answer a question posed by the student.

### Science

The primary purpose of science fair projects is to involve students in critical thinking and investigative processes. Science fair projects give students the opportunity to investigate and study a subject of individual interest. The intent of the project is to support or reject a hypothesis by repeating the experiment or investigation at least three times for validity.

In completing a Mathematics or Science Fair project, students will use the scientific method. The scientific method consists of the following steps:

- identify the problem and state it carefully;
- collect as much information as possible about the problem (research);
- develop and state a testable hypothesis;
- test the hypothesis by experimentation or investigation;
- collect, organize and analyze observations and data
- write a conclusion reflecting the results that supports or rejects the hypothesis

The project board should show the whole process, as the exhibit is the tangible display that shares and explains the project to others. Within this booklet the word *project* appears again and again - and each time it appears it is used to collectively describe all investigation endeavors that may ultimately be exhibited for others to learn from and enjoy. As the project's author, the student selects the mathematical and scientific language for their exhibit: drawings, graphs, models, pictures, or words. Project may be exhibited as an investigation, experiment, or inquiry model. It may be a repetition of a benchmark concept or an entirely original work.

### As a Reminder

Before a student is required to do a mathematics or science fair project, he/she should have lots of opportunities to use the inquiry and computation process skills necessary to do such a project. Students need extensive practice in utilizing the basic process skills of observation and inference before they select a project topic. Simple class and group projects should be conducted at all grade levels before a student is assigned a class or individual project.

## CHOOSING A PROJECT

The best projects grow out of students' interests and should, therefore, be chosen by the students themselves. The projects selected should express the students' broadest knowledge and highest skills. Above all, projects should be enjoyable to do! Teachers can stimulate the students' interest through suggestions, student-teacher conferences, workshops and demonstrations, and by making lists of project ideas available to students and families.

Topic selection is undoubtedly the most difficult part of a mathematics or science fair project. To eliminate this problem, utilize the natural curiosity of students by encouraging them to ask questions. Set the stage by modeling the math and science fair process. Talk about things they might have wondered about.

### Mathematics

Why are some numbers square?  
What are even and odd numbers?  
Are all rectangles the same?  
How wide is a first grader's smile?

### Science

How does light affect crickets?  
How does color affect taste?  
How do freezing temperatures affect rocks?  
How does air pollution affect precipitation?

Most students respond quickly to this approach and begin contributing questions of their own. Introduce the concept of testable questions to which they can find answers by experimentation, versus questions that cannot be tested. Select some questions and ask the students how they could find the answers. If time permits, model more investigations by grade level or school wide. Once the students have learned to ask questions, they have conquered their biggest obstacle, "What can I do for a Mathematics or Science Fair project?"

Pose questions after science and math class investigations that help students generate thought-provoking ideas. Ask students to think about question they have, after doing an inquiry activity in class "What are you wondering about?"

- What other questions do you have about ...?
- What are some testable questions you could investigate independently?
- What is a possible prediction/hypothesis?
- What steps will you follow to investigate my prediction/hypothesis?
- What are the possible variables and/or controls in your investigation?
- What materials will you need?
- What qualitative and quantitative observations or data can you collect?
- How will you compare, contrast, and graph your results?
- What claims can you make - what evidence supports your claims?
- How can you share my findings?

Please refer to Appendix pages 23-25 for a list of ideas. These ideas may be used as a springboard to other topics. The Internet has many websites that suggest topics for Mathematic and Science Fair projects.

## CHOOSING A PROJECT (Continued)

To promote questions and provide ideas for areas of interest, try the following techniques:

⇒ **Take a new look around you.** Involve the students in a brainstorming session. List suggestions of familiar places, people, and things that might inspire a project like

- hobbies or free-time activities
- look in the refrigerator, under the sink, in the garage, etc.
- look in the backyard, schoolyard, neighborhood, park, or vacant lot
- look at pets, wildlife, insects, plants, etc.
- look around while going places on your bike, in the bus or car
- look through magazines, advertisements, newspapers, books

⇒ **Check the idea bank.** Allow students to contribute to a resource center.

- bulletin board - combine words and picture collages of subjects to spark ideas
- collect and post "I wonder ..." questions
- share vetted elementary science and math project website resources
- show investigation videos or DVD's

⇒ **Help! I still can't decide.** Some children will still need additional suggestions. Utilize the following:

- books of experiments
- lists of specific projects
- teacher-student conferences
- Internet websites

As soon as a specific idea or problem has been chosen, it should be thought through carefully. The successive steps should be enumerated, and a timeline for completion should be developed. The timeline should be feasible and one that establishes a comfortable working pace for project and exhibit completion. By identifying possible problems or pitfalls during the planning stage, the timeline can be adjusted to accommodate extra time if needed.

During this time, the student may wish to discuss plans with other people. Discussing an idea with someone else often gives a new and clearer perspective. The expertise of family members, community and business representatives, teachers, professional mathematicians, and other students can enhance the student's understanding and help to fine-tune the project. The comments, constructive criticism, and suggestions of others enhance the student's depth of understanding and can assist the student with self-assessment during all stages of project development.

## SUPPORT AND GUIDANCE

### THE MATHEMATICS AND SCIENCE TEACHERS

One of the most important roles of the math and science teacher is to model project development and coach their students on how to create testable math or science questions. The teacher should provide guidance, support and always be ready to reassure a student when their design process hits a snag.

Planning ahead is made easier with the following preparations:

- Make a wide selection of math and science project ideas and suggestions available to the student.
- Provide all the information students will need to select and complete a project including:
  - ◆ materials that are available at school
  - ◆ assistance that the teacher will provide
  - ◆ criteria and safety rules for the fair competition
  - ◆ timelines and due dates
- Develop a timeline of due dates for components of the project. Give the list of dates to students and send an additional copy home to family members. Due dates should be established for each of the following:
  - ◆ topic idea
  - ◆ purpose
  - ◆ hypothesis
  - ◆ approval of procedure, investigation, variables and observations
  - ◆ layout of project board display
- Plan for conferences/meetings with each student to help the student choose a project and to review the criteria for the project and the exhibit - before the work actually begins.
- Make certain that the project selected is interesting to the student and is within the student's developmental range and skills.
- Be ready to offer interesting and viable alternatives if a student selects a project that may be worthy of a Nobel Prize, but is very likely to cause many problems - and possibly end with a feeling of failure for the student. Don't move too quickly. Remember that all Nobel Prize winners were also students!
- During the development process and immediately prior to the school fair, the teacher and students should work together to check for correct use of mathematics and science principles and terms and accuracy in content, organization, grammar, and spelling.
- Although most errors will probably be identified and corrected during the development process, a final check is always necessary. If a word is misspelled, the spectators will always see it, and a dynamite project will lose some of its well-deserved attention.



## FAMILY ASSISTANCE

Studies of winners in Mathematics and Science Fairs have shown that a child's interest in mathematics and science is strongly influenced by family members - parents, guardians, brothers and sisters, aunts and uncles, and grandparents. If the family atmosphere includes enjoyment of learning and stimulating conversation, the child will likely develop such important habits and traits as independence, intellectual curiosity, perseverance, responsibility, and creativity.

Although a mathematics or science project is the student's responsibility, the family may be of assistance by showing genuine support. Generous portions of interest and encouragement should be served on a regular basis. Constructive criticism can be valuable and is more easily accepted by the child when the family has established its support for the project from the beginning.

With so many families struggling for time together due to busy schedules and multiple jobs, they often find it difficult to know "how to support a child's homework responsibilities" - let alone a mathematics or science project! Family members need to know what kinds of things they can do to support their child's efforts. Teachers and school centers can help families participate in the process by providing information and guidelines. The following considerations will be used to develop communication and establish a link between the child's family support team and the school center support team.

- The family will be informed that their child is participating in a Mathematics or Science Fair and will be working on a project or display at home and school.
- The child will explain the project - either verbally or in writing an explanation (plan) that is created at school. If your child can't explain it, then the wrong project has been selected.
- A list of the materials needed for the project can be made at home with the family or can be made at school with the teacher and reviewed at home with family members.
- If there are materials that cannot be provided by the family, the teacher needs to be made aware so that adjustments can be made. Ideally, family members should provide:
  - ◆ the necessary supplies/materials
  - ◆ an adequate place to work
  - ◆ the proper tools and appropriate supervision when tools are used
  - ◆ assistance in transporting the project display board to and from school
  - ◆ encouragement, constructive criticism, or "shoulders to cry on" if necessary

The classroom teacher is the best resource for determining how to inform and assist each student's family in supporting math and science fair. Too often opportunities for improving math and science fair participation are missed, because there is little or no communication between the school's fair coordinator and/or fair committee and the classroom teacher and parents. Most importantly, each student needs to believe that their participation is possible and important. For this reason many schools have added math and science fair competitions to their school improvement plan.

## HELPFUL HINTS FOR STUDENTS

1. The Mathematics and Science Fair is a competition! Your project should show your learning and how you think mathematically and scientifically. It will be judged along with other student projects at your grade level.
2. You will learn how and why something occurs. You will present your findings.
3. Pick a topic that interests you - a topic that you want to learn more about.
4. Your project should solve a problem, show an experiment or investigation, compare and contrast ideas, and communicate your results.
5. Review the judging criteria to make sure your project is complete.
6. Gather materials and supplies from your home or school before you purchase anything.
7. Plan your time so you do not run out of time or miss due dates.
8. Keep a log or journal and record data as you complete each step of your project.
9. Once the investigation is complete, begin creating the parts of your display board.
10. Check spelling and grammar before gluing pieces on your final display board.
11. Layout all pieces to make sure you have the correct spacing before gluing them on your display board.
12. Make sure you take your time to ensure your display board is neat and attractive.
13. Follow the rules and regulations to avoid disqualification from the competition.

## RULES AND REGULATIONS FOR ELEMENTARY MATHEMATICS AND SCIENCE FAIR PROJECTS

1. All projects boards must have a purpose and hypothesis that is testable by experimentation. Project board displays should have all the following judged labels and description.
  - a. **Purpose**  
What did you do? Why did you do it?
  - b. **Hypothesis**  
What is your prediction? What is your testable statement?
  - c. **Materials**  
What tools and materials did you use to conduct your investigation? Write a list of what and how much you used.
  - d. **Procedure**  
How did you do your experiment? Write the steps you used for your procedure. Remember to REPEAT EACH TEST 3 TIMES and use averages when possible.
  - e. **Observations and/or Data**  
Write descriptions of any qualities or quantities you observe before, during and after experimenting. Use a table or log to record (write) your observations.
  - f. **Graphs**  
What graphs can be used to compare and contrast (*analyze or synthesize*) the observations and data collected in your experiment?
  - g. **Relationship to Mathematics** – **MUST BE EXPLAINED ON ALL MATH PROJECT BOARDS.** Write a statement explaining how/why mathematics, numbers, measurements, calculations and graphs are important in your investigation.
  - h. **Conclusions**  
Write a statement about the results of your investigation, observations, and data analysis. Explain how or why your hypothesis was either supported or rejected by the observations and data you collected during your experiment.
2. School leaders and District officials reserve the right to prohibit the public display of any projects that are “unsafe” or “inappropriate for elementary audiences.”
3. Each project should be examined by the school’s Mathematics and Science Fair Coordinator and/or committee and “approved for display” before both the school and district fairs.
4. Any student enrolled in a public or private school or Parents Educating Children program may enter projects prepared by students during the current school year.
5. Students in grades K-3 may enter a class project as well as individual student projects.

## **RULES AND REGULATIONS (*Continued*) FOR ELEMENTARY MATHEMATICS AND SCIENCE FAIR PROJECTS**

6. Students in grades 4-5 can only submit individual student projects.
7. Grades 4-5 projects should reflect the student's individual work. Professional or technically trained adults, including teachers and parents, may only advise and/or supervise.
8. Teacher and school name labels may only be placed on the back of the project board. **No student and/or school name may be on the front of the project board** and will be removed at the District Fair.
9. Photographs of the experiment or tools used in the investigation are permitted on the display board but **no photographs that show student faces** are permitted and will be removed at the District Fair.
10. All projects must be mounted to a standard size (36" H x 48" W) cardboard display board. No ancillary objects (other than paper and/or pictures) should be glued, mounted or displayed on the project board. No objects are permitted to be displayed in front of the display board.
11. Project display boards cannot be larger 36" H x 48" W.
12. Projects entered in the District Fair must be self-supporting (able to stand-up vertically themselves). Use of the floor or walls for projects, signs, posters, charts, etc., is prohibited at the District Fair and could result in disqualification.
13. A student may only enter one project per subject (math and science) in the District Fair.
14. Project display boards written in any languages other than English will be accepted provided that all district rules and regulations are followed and **a translation sheet in English is attached to the project board for judging**. (See appendix, p. 35)

## **RULES ON SECURITY AND SAFETY FOR ELEMENTARY MATHEMATICS AND SCIENCE FAIR PROJECTS**

The school's coordinating teacher(s) should inspect all projects before registering them into the District Fair. PROJECT BOARDS SHOULD NOT INCLUDE ANY ITEMS WHICH MIGHT BE EASILY REMOVED OR BECOME DANGEROUS TO THE PUBLIC.

1. NO LIVE ANIMALS, PRESERVED ANIMALS OR PARTS MAY BE DISPLAYED. Projects involving the use of animals may display appropriate drawings, pictures, charts, or graphs. NO HUMAN PARTS MAY BE DISPLAYED. Projects involving the use of humans may display appropriate drawings, pictures, charts, or graphs but **no photographs that show student faces**.
2. Photographs or other visual presentations of surgical techniques, dissections, autopsies and/or other laboratory techniques, depicting animals (including humans) in other than normal conditions may not be displayed on a project board.
3. THE FOLLOWING ITEMS ARE **NOT PERMITTED** ON DISPLAY BOARDS:
  - ANY MATERIAL NOT APPROPRIATE FOR GENERAL PUBLIC VIEWING
  - any organisms (living or dead)
  - preserved specimens, parts, or taxidermy
  - dirt, soil, minerals or compost samples
  - chemicals or liquids (including water)
  - any type of food, human or animal (including candy or treats)
  - any sharp items of any kind
  - medicines, poisons, drugs
  - dry ice or other sublimated solids
  - flammable materials, flames, or heating objects
  - batteries of any kind
  - school awards, ribbons, or medals from other fairs
  - real money coins or currency
  - photographs of students
5. THE SCHOOL DISTRICT MATHEMATICS AND SCIENCE FAIR COMMITTEE RESERVES THE RIGHT TO REMOVE ANY PROJECT CONSIDERED UNSAFE OR INAPPROPRIATE FOR PUBLIC DISPLAY FROM JUDGING AND/OR VIEWING.

## HOW TO SET UP A SCHOOL MATHEMATICS/SCIENCE FAIR

Determine the date and location of the school fair. Schools may hold their fair in the cafeteria, media center or hallways or rotate from classroom to classroom. The school fair may be held any time during the school year prior to Friday, **April 16, 2010**. Winning school projects registered in the District Fair should be stored at the school until delivered to the District fair on Monday, **May 3, 2010** between 1:00 and 4:00 PM.

All School Fairs should be judged by **April 16, 2010** so winning projects can be registered in the District Fair. Schools may separate their Math and Science Fairs or they may choose to combine both into one fair.

Enlist volunteers to serve as judges. **Projects should be judged by grade level and category.** Try to have at least two to three judges per grade level. Judges may judge more than one grade level. **REFRAIN FROM USING PARENTS AS JUDGES.**

Enlist the following people to serve as judges:

- teachers from middle and high schools; college professors
- high school and college science students
- local professionals
- retired principals and teachers
- representatives from the community with interest in mathematics and science (e.g., Pine Jog Environmental Education Center, Gumbo Limbo Nature Center, the Science Museum, the Palm Beach Zoo at Dreher Park, Solid Waste Authority, Palm Beach Soil and Water Conservation District, South Florida Water Management District, banks, medical offices, etc.)

Order school ribbons and certificates - it is recommended that each student who participates be given a certificate of participation. Consider awarding first and second place at each grade level as well as honorable mentions for deserving projects.

Conduct a Mathematics and Science Fair Parent Workshop during a PTO or PTA meeting prior to the your School Fair.

It is highly recommended that the District Fair judging criteria and judging forms be used at the school level. (Appendix, pp. 27-29)

Establish a time frame for setting up and taking down projects.

Establish coverage for teachers monitoring the activities during the day of the fair.

Set up a schedule so that all classes may visit the fair after judging is completed.

Schedule an Open House or a Mathematics and Science Fair Night to enable parents to view projects.

**SCHOOL LEADERS RESERVE THE RIGHT TO PROHIBIT PUBLIC DISPLAY OF ANY PROJECTS WHICH ARE "SENSITIVE IN NATURE" OR "INAPPROPRIATE FOR AN ELEMENTARY LEVEL AUDIENCE."**

## SCHOOL AND DISTRICT FAIR PROCEDURES

A School Fair or some competition must occur at each participating school before the District fair. Each school may enter the following number of winning projects from their school competition into the District Fair.

Type of Project	Category	Grades	Number of Entries Per Grade
<b>CLASS</b> School first place winners	ESE	K-3	1 math and 1 science project <i>(first place school winners)</i>
	ELL		
	REGULAR		
	GIFTED		
<b>INDIVIDUAL</b> School first & second place winners	ESE	K-5	2 math and 2 science projects <i>(first &amp; second place school winners)</i>
	ELL		
	REGULAR		
	GIFTED		

✓ Ties at the school fair should be settled by the School Science Fair Coordinator.

✓ Three “Special Award” categories will be offered at the District fair this year.

**Aviation Award** – individual math or science projects from grades 3-5 with a “*flight or flight safety theme.*” Three awards available, first, second and third place.


**Green Award** – individual math or science projects from grades 3-5 with a “*reduce, reuse, recycle theme.*” Three awards available, first, second and third place.

**Physical Science Award** – individual math or science projects from grades 3-5 with a “*physical science, simple machine or engineering theme.*” Three awards available, first, second and third place.


✓ Schools should follow all district guidelines, rules, regulations, and judging criteria to guarantee a smooth transition for projects entered by the school into the District Fair.


**THE SCHOOL DISTRICT’S ELEMENTARY MATH AND SCIENCE FAIR COMMITTEE CAN DISQUALIFY AND/OR REMOVED ANY PROJECT THAT IS UNSAFE OR WHICH DOES NOT COMPLY WITH THE HANDBOOKS RULES AND REGULATIONS.**

## GUIDELINES FOR ENTERING THE DISTRICT ELEMENTARY MATHEMATICS AND SCIENCE FAIR


 An ***Intent to Participate*** online *monkey survey* must be completed by **November 16, 2009**, by all participating schools.


Upon the receipt of your Intent to Participate survey you will be emailed the ***Student/Parent Packages*** in the languages you request, ***Field Trip Reservation Forms*** for the dates you request and a ***Project Registration Spreadsheet*** to enter your project in the District Fair.


 Schools willing to sponsor a hands-on activity table(s) should submit the ***School-Sponsored Hands-on Activity Table Registration*** form (Appendix, p.36) by **December 18, 2009**.


 All projects entered in the District Elementary Mathematics and Science Fair should first be judged in a School Fair competition completed by **Friday, April 16, 2010**.

Each project entered in the District Fair will receive a “*Certificate of Participation*”. Projects will be judged and first and second place ribbons awarded in every grade level category. Honorable mention ribbons will also be awarded by the District Fair Committee.

 School projects must be entered in the District Fair by the School’s Fair Coordinator. Each participating school must email a ***Project Registration Spreadsheet*** before 3:00 P.M. **Monday, April 19, 2010**. **THIS DEADLINE IS FINAL!** A sample of the *Project Registration Spreadsheet* is in the Appendix, p. 30. (The school fair coordinator will be e-mailed a spreadsheet after they complete the online *Intent to Participate* survey.)

 The school coordinator is responsible for labeling and setting up their projects at the fairgrounds. Set-up will begin at 1:00 PM and must be completed by 4:00 PM on **Monday, May 3, 2010**, in the *Americraft* Expo Center at the South Florida Fair Grounds..

 School coordinators must complete an ***English Translation Form*** (Appendix, p. 35) for all projects in any language other than English. Translation Forms must be clipped to the project board **Monday, May 3, 2010, by 4:00 PM** or they cannot be judged.

 The coordinator should furnish any tools or materials necessary to set-up their projects.

All projects will on displayed to the public Monday through Wednesday, May 3-6, 2010, from 9 AM to 7 PM and on Thursday, May 6, 2010, from 9 AM to 12 Noon.

 **ALL PROJECTS MUST BE REMOVED FROM THE FAIRGROUNDS BY THE SCHOOL COORDINATORS BETWEEN 1:00 and 5:00 P.M. on THURSDAY, MAY 6, 2010.**

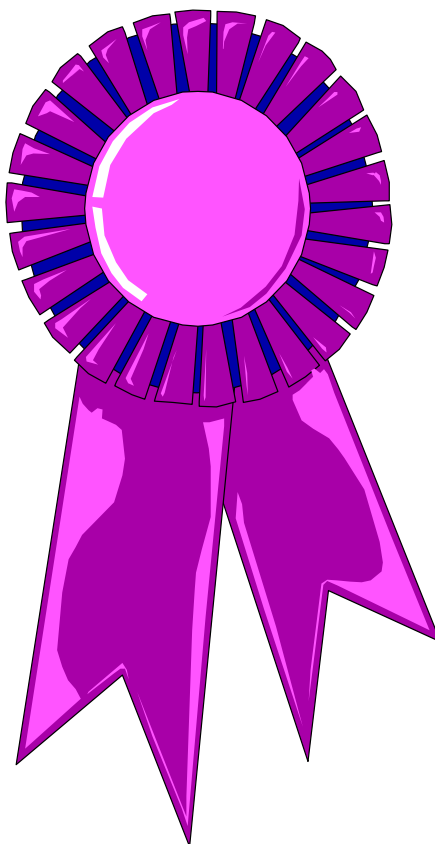
**THE DISTRICT MATHEMATICS AND SCIENCE FAIR COMMITTEE RESERVES THE RIGHT TO DISQUALIFY AND REMOVE ANY PROJECT CONSIDERED UNSAFE OR UNACCEPTABLE FOR PUBLIC DISPLAY. SEE PAGE 13-14 OF THIS HANDBOOK.**

## DISTRICT FAIR JUDGES

The men and women who take time from their busy schedules to judge projects do so because they value our young students and are interested in mathematics and science. Judges are encouraged to tentatively evaluate each project independently without the exhibitors or the public being present. Each judge is provided with a criterion (Appendix, p. 27) by which to evaluate and determine scores for each project. The individual ratings may be discussed and re-evaluated if the judges determine that additional considerations are necessary.

At the completion of their duties, judges leave the fair amazed, still discussing and sharing the excitement generated by the students' projects.

If you are interested in serving as a Palm Beach County School District Elementary Mathematics and Science Fair judge, please email Thomas Medcalf, District Fair Committee Chairman, [medcaltf@palmbeach.k12.fl.us](mailto:medcaltf@palmbeach.k12.fl.us) or call (561) 357-7626.



## SCHOOL AND DISTRICT JUDGING CRITERION

The reasons for selecting a particular project should come from interest and curiosity. However, determining the format for exhibiting the project is not always an easy task because the interdependence of topic, required materials, and ease of explanation influences the ultimate display. Rather than discourage a project because a finished exhibit can't be visualized immediately, the teacher should encourage adequate time for brainstorming ideas for the display. By considering various options, the student has additional opportunities to develop skills in communicating.

During the brainstorming process, the criteria and standards used by the judges at the District competition should be provided as guidelines for the student. The District fair judging criteria are listed below.

### **Mathematics or Science Investigation (40 points)**

Is the purpose and hypothesis stated on the display board?

Is the procedure that was used in developing and obtaining the solution explained?

Is the method of data acquisition or analysis explained?

Does the data support the conclusion?

Does the project include all these parts - **purpose, hypothesis, procedure, list of materials, observations/data, relationship to math** (*math projects only*) and a **conclusion**?

### **Creative Ability (20 points)**

Did the student design and construct the equipment or was it purchased?

Does the project display originality or is it one that has been performed many times?

Does the project rely on the research of others?

Is the data originally presented?

How creative is the display?

### **Thoroughness (15 points)**

Was the experiment or investigation repeated at least three (3) times?

Does the display physically demonstrate the operation or results of the project?

Have variables affecting outcomes been considered?

Are the materials listed by amount?

How complete are any samples?

### **Skill (15 points)**

Is the skill commensurate with age and grade level?

How attractive is the exhibit compared to others?

Does the project catch the eye?

### **Clarity/Neatness (10 points)**

Is the written material clearly presented and data easy to understand?

Is the display well organized?

Is the material readable and logically arranged?

Is the spelling and grammar correct?



## HANDS-ON ACTIVITY TABLES

Each participating school center is invited to sponsor a Hands-on Activity Table(s) that showcases fun and excitement of mathematics and/or science at their school. The hands-on activities should allow students and guests at the fair to engage in the activities in mathematics and science and expand their knowledge through investigation.

The "sky's the limit" for the type of activities that could be used. The following list provides just a few examples of classroom activities that have been provided by schools at previous District Fair competitions:

Are You a Square? (AIMS)	Measurement Activities
Fishing for Facts	Microscope Activities
Golfing for Facts	Density Is Delightful
Algeblocks	Static Electricity
Pentominoes	Paper Airplane Throw
Tangrams	Fun with Magnets
Comparative Shopping	Newton's Laws of Motion
"Math Toss" Games	Buoyancy Is Baffling
Multiplication Bingo	Science Bingo
Mini-Metric Olympics (AIMS)	Mathematics/Science Card Activities

Requirements for setting up a Hands-on Activity Table:

-  All activity tables must be staffed during the school field-trip hours of the District Mathematics and Science Fair, 9 AM - 1 PM. Teachers and students are encouraged to enlist assistance from school staff, volunteers, and parents.
-  Each School Coordinator is responsible for supplying all the necessary materials (such as extension cords, tablecloths, tape, pencils, hand-outs etc.) needed for their tables.



## PARTICIPATING IN SCHOOL FIELD TRIPS



Only schools that enter projects and/or sponsor Hands-on Activity Tables at the District Mathematics and Science Fair are eligible to bring students to the South Florida Fairgrounds *Americraft* Expo Center for field trips.



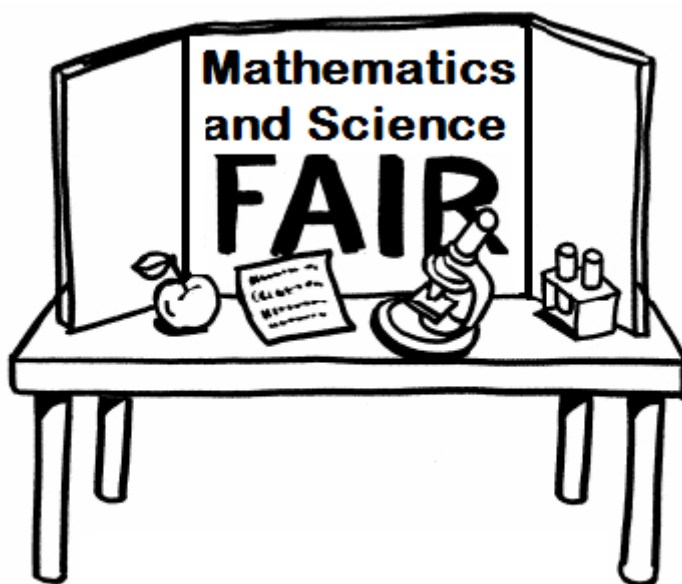
School Coordinators that indicate they are planning on reserving a field trip date for their school on their *Intent to Participate* survey will receive e-mails with directions and the necessary forms to make their reservations.



Any questions or concerns regarding field trips to the fairgrounds should be emailed to Thomas Medcalf [medcalf@palmbeach.k12.fl.us](mailto:medcalf@palmbeach.k12.fl.us), (561) 357-7626.

Coordinating teachers should prepare students from their school for the field trip by identifying "learning tasks" to be accomplished while at the District Fair. Those students who arrive at the Fair prepared with a list of questions to answer, and a "scavenger's list" of things to find, will have a great opportunity to benefit from all the mathematics and science around them. When students are unprepared, they wander around and look, but often do not understand, enjoy or learn anything from what they see. With preparation, teachers can make this field trip an exciting experience that provides mathematics and science learning for all students!

# Appendix



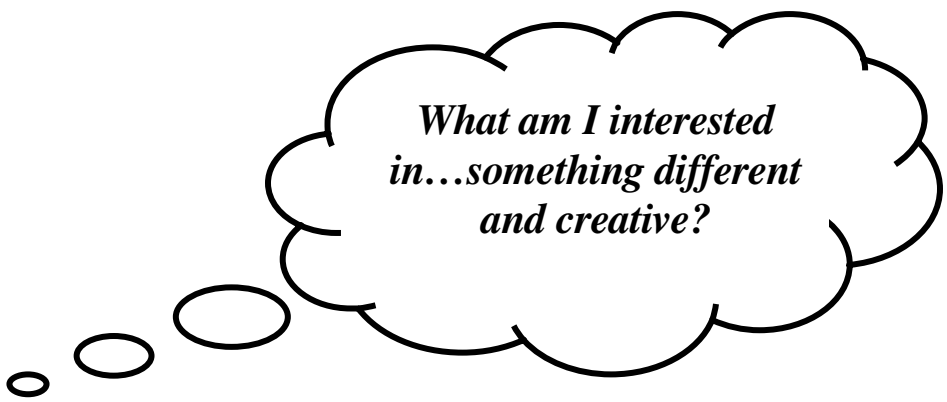
# TOPICS FOR MATHEMATICS FAIR PROJECTS

Projects for Mathematics Fair need to focus on the role of mathematics — its role in the investigative process, comparison of quantitative data, use of observations, and the possible solution of a problem. When selecting a mathematics project, foremost consideration should be given to how mathematics is used in developing the project.

## A FEW IDEAS to trigger the imagination...

Symbols Past and Present  
Magic Squares  
Comparison Shopping  
Napier Rods  
Number Cubes (probability)  
Probability and Predictions  
Triangular and Square Numbers  
Temperature  
Printing Shapes  
Scale Drawings  
Famous Mathematicians  
Roman Numerals  
Peasant Multiplication  
Combinations of Sets  
Collecting Data  
Computer Languages  
Mathematical Analogies & Patterns  
Music Notation & Fractions  
Tangrams  
Stock Market  
Time Zones  
Investigate "Big" Numbers  
Catalan Numbers  
Triangular Numbers  
Fibonacci Numbers

Fractions in Advertising  
Bank Services  
Unit Pricing  
Scientific Numbers  
Measuring the Planets  
Providing the Area of a Circle  
Angles of a Triangle  
Perfect Squares & Square Root  
Graphs  
Calculator Activities  
Least Number of Coins  
Money around the World  
Binary Numbers  
Divisibility  
Weather Reports & the Almanac  
Ordered Pairs in Art  
Venn Diagrams  
Symmetry in Nature  
History of the Calendar  
Optical Illusions  
Abacus  
How Computer Barcodes Work  
Infinity  
The Golden Mean



*What am I interested  
in...something different  
and creative?*

# TOPICS FOR SCIENCE FAIR PROJECTS

## PLANT PROJECTS

How does the duration of light affect plant growth?  
How does the color of light affect the growth of plants?  
What are the effects of temperature the germination of bean seeds?  
What is the effect of spacing on the growth of radish seeds?  
How does magnetism affect the height of bean seeds?  
To what extent does pH affect the germination of rye grass?  
What is the effect of different soil mixtures on plant growth?  
What is the effect of planting depth on the germination of seeds?  
To what extent do various concentrations of salt water affect plant growth?  
How does acid rain affect leaf development?  
What is the effect of detergents on the germination of bean seeds?  
What is the effect of gravity on the roots of a plant?  
What is the effect of temperature on the ripening of a banana?

## ANIMAL PROJECTS

How does temperature affect the activity of meal worms?  
To what extent does the amount of food affect the population size of mealworms?  
How does different colored light affect the behavior of earthworms?  
How does the intensity of light affect crickets?  
What is the effect of background color on the color of a chameleon?  
What is the effect of temperature on the behavior of goldfish?  
How do different levels of salinity affect brine shrimp?  
What is the effect of different pH on snails?  
How do vibrations affect the behavior of ants?  
What is the effect of height above ground on the attraction of birds to a feeder?

## HUMAN BODY PROJECTS

Who generally have bigger hands (feet), boys or girls?  
Who are generally taller, boys or girls?  
Who generally have larger lung capacity, boys or girls?  
How does vision effect the sensation of taste?  
What is the effect of age on reaction time?  
To what extent does age effect the sensation of hearing?  
To what extent does age effect the sensation of smell?  
What is the effect of exercise on pulse rate (or blood pressure)?  
What is the effect of walking/skipping/running on respiration rate?  
What is the effect of left/right handedness on reaction time?  
To what extent does the amount of light affect the acuity of vision?  
How does color affect the perceived taste sensations of noncarbonated beverages?  
Does listening to different types of music affect how well you can perform mental tasks?  
Does watching T.V. affect how well you can perform mental tasks?

## EARTH & SPACE SCIENCE PROJCTS

Does the sun rise at the same time and in the same location in the sky?  
Are the amount of hours of daylight and night the same year round?  
Does the moon rise at the same time and in the same location in the sky?  
What is the effect of freezing temperatures on rocks?  
To what extent do different types of soils retain water?  
What is the effect of rain on soil covered with different types of foliage?  
What s the effect of wind on different mixtures of soil?  
What is the effect of temperature on crystal growth?  
What is the effect of temperature on the evaporation of water?  
What is the effect of air pollution on precipitation?  
What is the effect of the length of a wing on the length of flight of a paper airplane?  
To what extent does sunlight affect the temperature of soil?

# TOPICS FOR SCIENCE FAIR PROJECTS (Continued)

## **EARTH & SPACE SCIENCE PROJCTS (Continued)**

To what extent does sunlight affect the temperature of water?  
To what extent does humidity affect evaporation?  
How does the pH of rain affect limestone?  
What is the effect of time of day on shadows?  
To what extent does the season affect shadow length?  
To what extent does season affect shadow direction?  
How does the angle of the sunlight affect the temperature of soil or water?  
How do different surfaces absorb the sun's energy?

## **PHYSICAL SCIENCE PROJECTS**

What is the effect differently shaped prisms on the production of a color spectrum?  
What is the effect lenses shape has on the refraction of light?  
How do color light filters affect perception of color of objects?  
How does length, tension, or mass of a guitar string affect the pitch of sound?  
How do different solids affect the transmission of sound?  
How does the length of a vibrating body affect the sound?  
To what extent do different solids (wood, plastic, metal) conduct heat?  
What is the effect of temperature on the volume of air?  
What is the effect of heat on different liquids?  
To what extent do different insulating materials affect heat loss/gain of water?  
How does the color of an object affect its reflection and absorption of solar energy?  
What is the effect of household liquids and powders on red cabbage juice?  
How is the strength of a magnet affected by different materials (glass, cardboard, paper)?  
What is the best shape for a kite to lift off quicker?  
How is the distance a skateboard rolls affected by the amount of mass on the skateboard?  
How does wattage affect the radiation of heat from a light bulb?  
How do different fabrics affect heat loss from an object?  
To what extent does temperature affect the height that a ball will bounce?  
How do the number of batteries and the way they are connected affect the brightness of a bulb?  
How do the number of batteries and the way they are connected affect the strength of an electromagnet?  
How does the number of wraps of wire around an electromagnet affect its strength?  
What is the effect of the size of the iron core on the strength of an electromagnet?  
What is the effect of density of an object on the buoyancy of an object?

## **ENVIRONMENTAL (GREEN) SCIENCE PROJECTS**

What is the effect of recycling on the amount of wastes that goes to the landfill?  
What materials that are thrown away at home could be reused at school for learning projects?  
How do oil spills affect feathered animals, furry animals, fish, sand and shells?  
Which plant and food wastes breakdown and can be composted easily into new garden soil?  
Which native plants will attract hummingbirds, butterflies, or more birds into an environment?  
Which native plants require less irrigation water and provide year round color to a landscape?  
What natural remedies are effective at controlling harmful insect that attack garden plants?  
What native plants can be introduced into irrigation ponds to promote aquatic habitats?  
What steps can be taken at home or school do to reduce the trash sent to the landfill?  
What steps can be taken to reduce energy consumption in your home or school over time?  
What steps can be taken to reduce potable water use at home or school?

# SAMPLE PARENT LETTER

Dear Parent/Guardian:

Your child will soon have the opportunity to compete in our School Mathematics and Science Fair. I will assist them by providing suggestions of project ideas and modeling the project procedures. I encourage you to provide your support to this process.

Completing a project can be a memorable experience for your child. The Mathematics and Science Fair is an adventure in learning, and the development of a project is an excellent activity for applying your child's understanding of math and science.

Your child should select a project appropriate for their age and grade level. You should assist by providing encouragement, praise, necessary materials, and a place and quiet time to complete their work. Your child may ask you to take them to the public library to research project activities. Please limit your involvement in their experimental process to encouraging your child to predict, experiment, and draw conclusions on their own. Emphasize the mathematical or scientific thinking and process skills they should use.

Their final project display board should measure 36" (high) x 48" (wide), must be self-supporting and should be made of standard cardboard. Science Fair display boards are available at many stores. Displays should not exceed these dimensions. Please remind students that certain items are not permitted on display boards such as food, candy, medicine, animals, plants, money, or chemicals. A complete list of rules, regulations and safety considerations are included in this letter for you to review.

I look forward to seeing what questions your child will be investigating!

Sincerely,

## JUDGING CRITERIA

The questions under each of the following components of judging are guidelines for evaluating that component. Other related factors may be considered.

### **MATHEMATICS OR SCIENCE INVESTIGATION - 40 points**

- Is the purpose and hypothesis stated on the display board?
- Is the procedure that was used in developing and obtaining the solution explained?
- Is the method of data acquisition or analysis explained?
- Does the data support the conclusion?
- Does the project include all these parts - **purpose, hypotheses, procedure, list of materials, observations/data, relationship to math** (Math projects only) and a **conclusion**?

### **Creative Ability (20 points)**

- Did the student design and construct the equipment or was it purchased?
- Does the project display originality or is it one that has been performed many times?
- Does the project rely on the research of others?
- Is the data originally presented?
- How creative is the display?

### **Thoroughness (15 points)**

- Was the experiment or investigation repeated at least three (3) times?
- Does the display physically demonstrate the operation or results of the project?
- Have variables affecting outcomes been considered?
- Are the materials listed by amount?
- How complete are any samples?

### **Skill (15 points)**

- Is the skill commensurate with age and grade level?
- How attractive is the exhibit compared to others?
- Does the project catch the eye?

### **Clarity/Neatness (10 points)**

- Is the written material clearly presented and data easy to understand?
- Is the display well organized?
- Is the material readable and logically arranged?
- Is the spelling and grammar correct?



### SCHOOL SCIENCE JUDGING SHEET

<b>Grade:</b> <input type="checkbox"/> K <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5		SCIENCE INVESTIGATION	CREATIVE ABILITY	THOROUGHNESS <i>Is the hypothesis confirmed or denied?</i>	SKILL	CLARITY AND NEATNESS	<b>TOTAL</b>
<b>Division:</b> <input type="checkbox"/> Individual <input type="checkbox"/> Class							
<b>Category:</b> <input type="checkbox"/> Regular <input type="checkbox"/> Gifted <input type="checkbox"/> ESE <input type="checkbox"/> ELL							
PROJECT #	PROJECT NAME	40 pt	20 pt	15 pt	15 pt	10 pt	100 pt

**SAMPLE OF THE DISTRICT PROJECT REGISTRATION SPREADSHEET FORM**

## 2010 PBC District Elementary Math and Science Fair Registration

School Number

School Name

School PX  
or Phone

Contact Name

Contact E-mail Address

Science or Math	Individual/Class	Grade	Category	Student First Name	Student Last Name	Teacher First Initial	Teacher Last Name	Project Title	Special Category A = Aviation G = Green P = Physical
S	C	K	ESE						
S	C	K	ELL						
S	C	K	REG						
S	C	K	GIFT						
S	C	1	ESE						
S	C	1	ELL						
S	C	1	REG						
S	C	1	GIFT						
S	C	2	ESE						
S	C	2	REG						

**SAMPLE ONLY**  
**An excel spreadsheet will be emailed to each coordinator after they complete their "Intent to Participate" survey.**

## MATHEMATICS PROJECT BOARD LAYOUT

### PURPOSE

Explain why you are doing the investigation in one, two or three sentences.

#### Example

"The purpose of this project is ..."

### HYPOTHESIS

Prediction of what you think will happen when you perform your investigation.

#### Example

"I think ..."

### MATERIALS

Provide a list of all the materials you used in your experiment.

### TITLE OF PROJECT

**Hint:** Think of something creative and catchy.

### TABLES AND/OR GRAPHS

Tables and graphs are a visual way to display the data you have collected.

### SAMPLES

A sample or photographs of your experiment may be attached to your project board. **NO PICTURES OF STUDENT FACES ARE ALLOWED**

**NOTE: See page 14 of this handbook for list of items not permitted on display boards.**

### PROCEDURE

Give step-by-step "recipe" directions of everything you did in performing your experiment.

**Hint:** Conduct the experiment at least three times.

### RELATIONSHIP TO MATH

Explain the relation of the investigation to mathematics.

### CONCLUSION

Review and briefly describe the results of your investigation.

#### Answer this question:

Did the results agree with the original hypothesis?

# SAMPLE MATHEMATICS PROJECT

## PURPOSE

The purpose of this project is to identify the most common shape used for street signs.

## HYPOTHESIS

I think the square will be the most popular shape used for street signs.

## MATERIALS

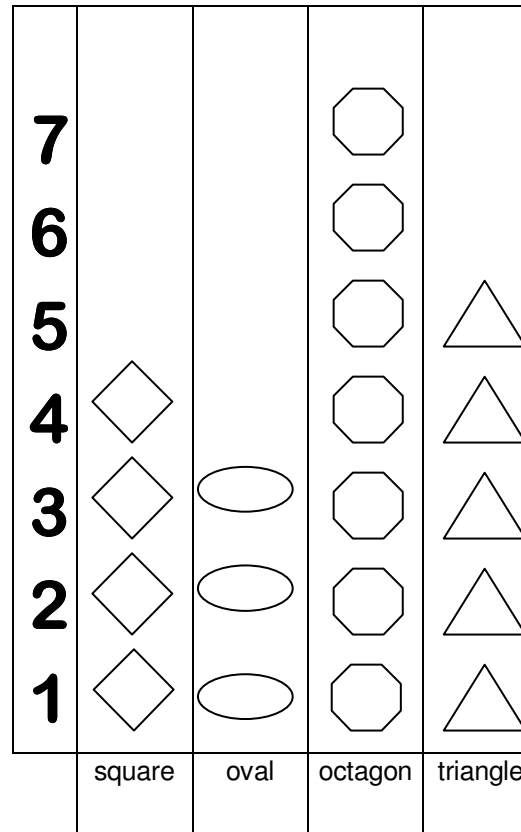
Paper, pencil, markers, ruler, film, camera, glue

## PROCEDURE

After identifying what shapes are used to create signs by taking pictures of the shapes, I will have mom drive to school in three different directions. I will tally how many of each shape I see along the way.

## Signs on the Road

What is the most common shape of street signs?



## RELATIONSHIP TO MATH

I learned how to make a pictograph and understand the importance of each column initiating at the same baseline. Observers will be able to observe which shape is the most popular by finding the tallest column and which shape is the least popular by finding the shortest column.

## CONCLUSION

From observing the graph, the hexagon was the most common shape and the circle the least common shape used for making street signs. My hypothesis that a square would be most common shape used for street signs was incorrect.

## SCIENCE PROJECT BOARD LAYOUT

### PURPOSE

Explain why you are doing the investigation in one, two or three sentences.

#### Example

"The purpose of this project is ..."

### HYPOTHESIS

Prediction of what you think will happen when you test your Hypothesis through an investigation.

#### Example

"I think ..." or "If this ..., than that"

### MATERIALS

Provide a list of all the materials you used in your experiment. List the quantity (how many) of each material.

### PROJECT TITLE

**Hint:** Think of something creative and catchy.

### TABLES AND/OR GRAPHS

Tables and graphs are a visual way to analyze and display the data you have collected.

### PICTURES - PHOTOGRAPHS

Clip art or photographs of your experiment may be attached to your project board. **NO PICTURES OF STUDENT FACES ARE ALLOWED.**

**NOTE: See page 14 of this handbook for list of items not permitted on display boards.**

### PROCEDURE

Give step-by-step "recipe" directions of everything you did to performing your experimental investigation.

**Hint:** REPEAT THE EXPERIMENT AT LEAST 3 TIMES. AVERAGE ANY NUMERIC DATA.

### CONCLUSION

Review and briefly describe the results of your investigation.

**HINT: Answer this questions:**

What claims can you make? What evidence supports your claims? Did your results confirm or reject your hypothesis?

## SAMPLE SCIENCE PROJECT

### PURPOSE

The purpose of this project is to identify which brand of paper towel will hold the most weight.

### HYPOTHESIS

I think the Mounity brand towel will hold the most weight.

### MATERIALS

Paper towel (3 different brands), rolls of pennies (2-3), rubber bands (3), Styrofoam/plastic cups (3)

### Tuff Towel

#### Which Brand of Paper Towel Holds the Most Weight?

#### Number of Pennies Each Towel Held

# of P E N N I E S	8		x	
	7		x	
	6	x	x	
	5	x	x	
	4	x	x	x
	3	x	x	x
	2	x	x	x
	1	x	x	x
	Paper Towel BRAND	Lefty	Sharmin	Mounity

### PROCEDURE

Collect three different brands of paper towels. Separate each into single-ply sheets. Wrap the sheet around the opening of each cup and fully secure it with the rubber band. Begin resting pennies on the sheet until the pennies fall through the paper towel. Repeat for the other brands. Record the number of pennies from each trial.

### CONCLUSION

From observing the graph, the Sharmin brand paper towel was able to hold the most pennies. This means that it was able to hold the greatest amount of weight. My hypothesis that the Mounity brand towel would hold the most weight was rejected when compared to the Sharmin brand towel.

**School District of Palm Beach County**  
**DISTRICT ELEMENTARY MATHEMATICS AND SCIENCE FAIR**

**ENGLISH TRANSLATION FORM**

Fair coordinators are required to translate the project information into English. Once this form is completed, clip it to the back of the project display board.

**Purpose**

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**Hypothesis**

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**Materials**

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**Procedure**

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**Observation Data**

---

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**Relation to Mathematics (Math Projects only)**

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**Conclusion**

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School District of Palm Beach County  
**2010 DISTRICT ELEMENTARY MATHEMATICS and SCIENCE FAIR**  
**SCHOOL-SPONSORED HANDS-ON ACTIVITY TABLE(S)**  
**RESERVATION FORM**

School: \_\_\_\_\_

Contact Person: \_\_\_\_\_

School Phone Number: \_\_\_\_\_

School Fax Number: \_\_\_\_\_

Number of Tables Requested: \_\_\_\_\_ Will you need Electricity?  Yes  No

Please provide a **title** and **brief description** of your activity table(s)

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**All sponsoring schools are responsible for supplying their table materials  
such as extension cords, tablecloths, signs, tape, pencils, handouts, etc.**

**ACTIVITY TABLES MUST BE STAFFED BY THE  
SPONSORING SCHOOL DURING FIELD TRIP HOURS, 9 AM to 1:00 PM**

Coordinating Teacher's Name \_\_\_\_\_

**Please complete this form and return it by Friday, December 18, 2009.**

Pony to: Thomas Medcalf, FHESC, C-206  
Email to: [medcalf@palmbeach.k12.fl.us](mailto:medcalf@palmbeach.k12.fl.us)  
FAX to: Thomas Medcalf, (561) 434-8091, PX-48091

**School District of Palm Beach County**  
**DISTRICT ELEMENTARY MATHEMATICS AND SCIENCE FAIR**

**INTENT TO PARTICIPATE**

Any elementary school wanting to participate in the Palm Beach County School District's Elementary Mathematics and Science Fair needs to register for the competition by going to [http://www.surveymonkey.com/s.aspx?sm=ZmkpdnRjh8DCmzycePozJg\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=ZmkpdnRjh8DCmzycePozJg_3d_3d) and completing the Intent to Participate (School Entry Form).

All School District applications and forms are also available on the Palm Beach County School District's Web Page, [www.palmbeach.k12.fl.us](http://www.palmbeach.k12.fl.us). Click on *Instructional Websites – Division of Curriculum – Elementary – Science – Science and Math Fairs*.

The Palm Beach County School District welcomes the participation of all Palm Beach County Private Elementary and Home Schools (K-5).

For further information email Thomas Medcalf, [medcalf@palmbeach.k12.fl.us](mailto:medcalf@palmbeach.k12.fl.us), District Elementary Fair Committee Chairman, (561) 357-7626 *office*, (561) 43408091 *fax*.

THOMAS MEDCALF  
Chairman, PCSD Elementary District Fair Committee  
Curriculum Development and School Improvement  
3310 Forest Hill Boulevard, Suite C-206  
West Palm Beach, FL 33406.  
(561) 357-7626 *office*, (561) 906-0352 *cell*