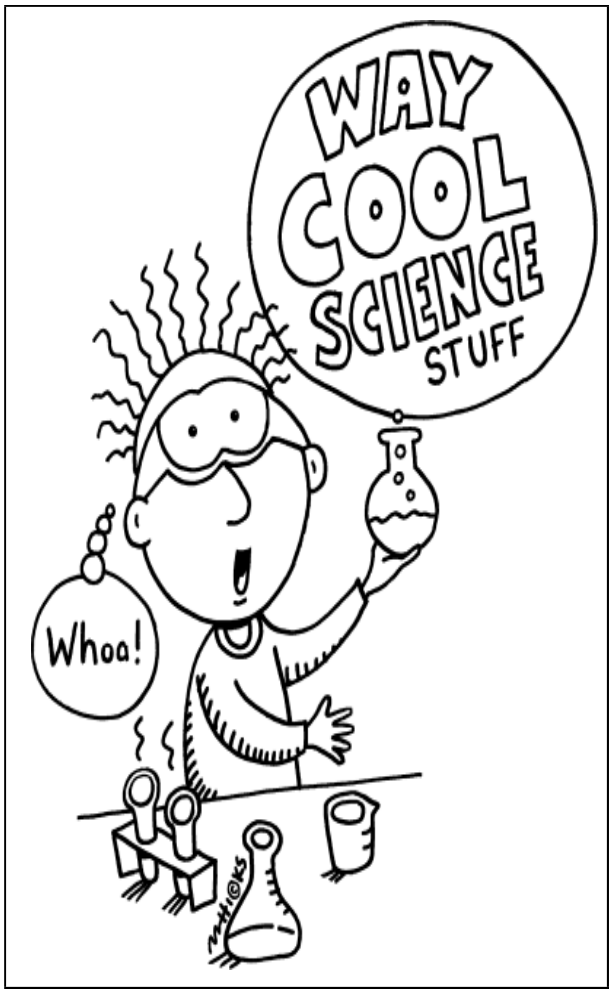
Okay, now get to work on your project!!
What's that? You still need help getting started?



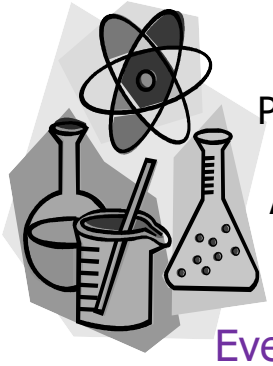
Introducing:
The Most Fabulous, Scientific, All Helpful, Kid Friendly and Most Excellent Science Fair Project Planner Known to Kid Kind:

Horizon Elementary Science Project Guide

Just follow these easy steps and you too can create a wonderful award-winning science project, thought up entirely by you!!!

Name(s) _____

From this point forward you are now… A SCIENTIST!!



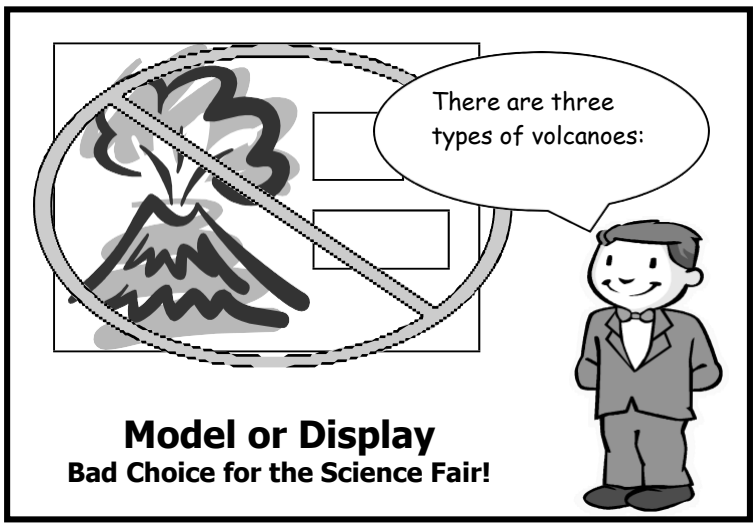
Projects must be turned in to the multipurpose room **by 8:30 am January 22, 2020**.
Awards will be presented in a 5th and 6th grade awards assembly January 22, 2020 at 1:00 pm.

Every student that turns in a completed project and is judged in the fair, will be invited to attend a special field trip.

Types of Science Projects:

There are two types of science projects: Models and Experiments. Here is the difference between the two:

BORING !!!!!
DON'T DO THIS……



A Model, Display or Collection:

Shows how something works in the real world, but doesn't really test anything

Examples of display or collection projects can be: "The Solar System", "Types of Dinosaurs" , "Types of Rocks", "My gum collection…" Examples of models might be: "The solar system" or "How an Electric Motor Works", "Tornado in a Bottle"

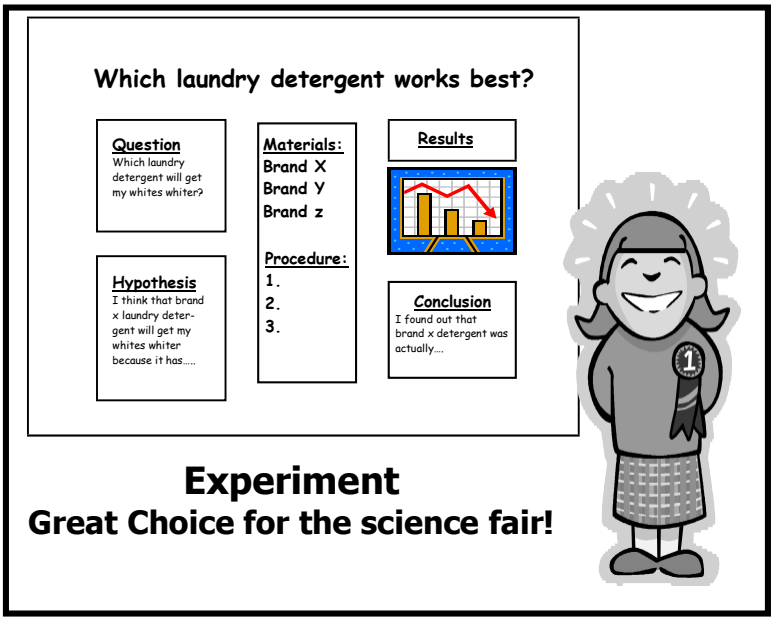
COOL!!!!! DO THIS

An Experiment:

Lots of information is given, **but it also has a project that shows testing being done and the gathering of data.**

Examples of experiments can be: "The Effects of Detergent on the Growth of Plants", "Which Paper Towel is more Absorbent" or "What Structure can Withstand the Most Amount of Weight"

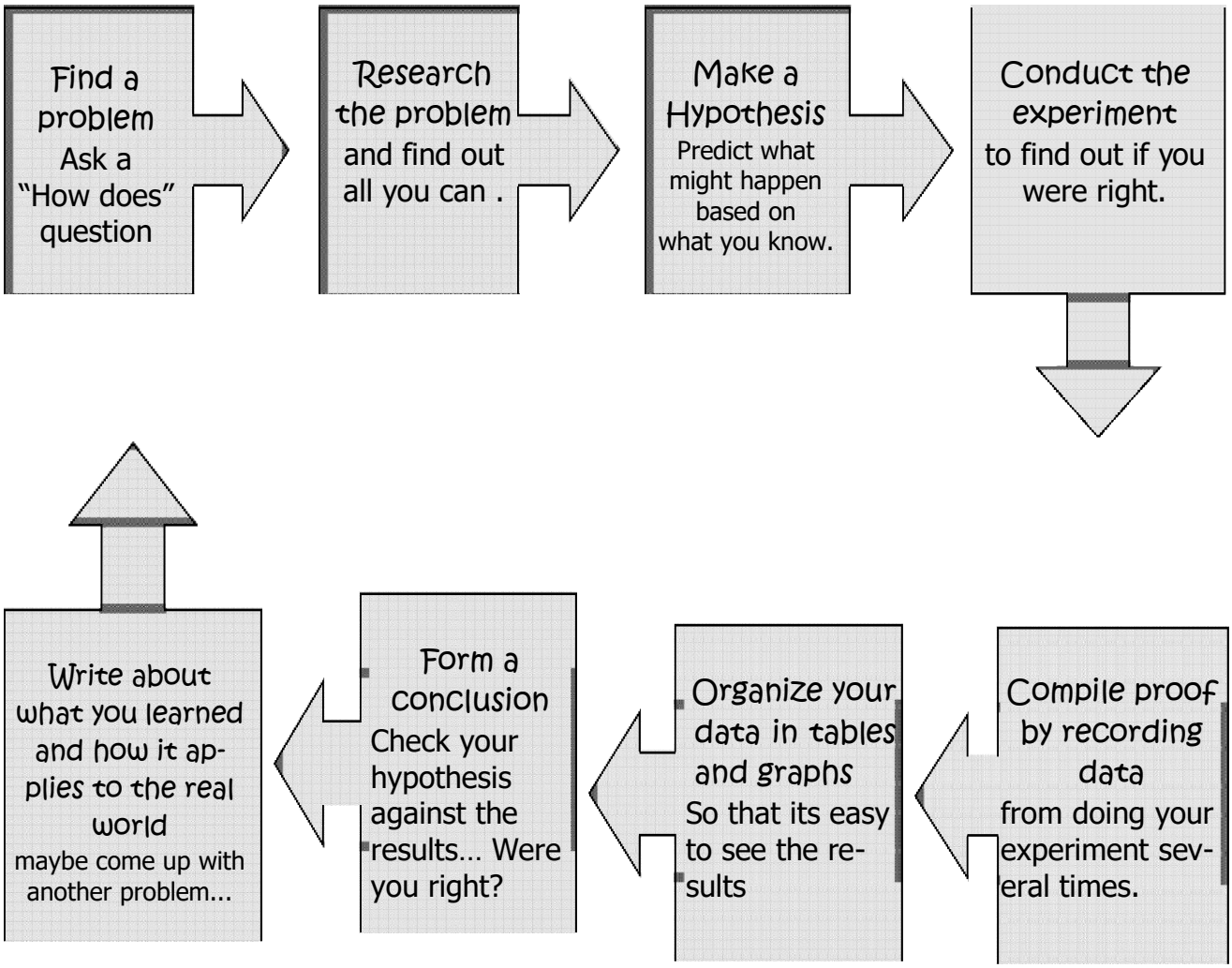
You can tell you have an experiment if you are testing something several times and changing a variable to see what will happens. We'll talk about variables later….



So, What Type of Project Should You Do?

Even though you can learn a lot from building a model or display, we recommend that you do an **Experiment!!!** Why? Well, they are fun, they are more interesting and most of all, they take you through the **SCIENTIFIC METHOD,** which is the way real scientists investigate in real science labs. Besides that, the **scientific method** is what the judges are looking for!!

So, What is the Scientific Method?



Choosing a category that interests you...

All Great Projects start with great questions but before you get started on a great question you need to pick a subject or topic that you like. There are three different categories of the Science Fair to choose from. They are:

Life science: This category deals with all animal, plant and human body questions that you might have and want to do an experiment about. Remember that it is against Science Fair Rules to intentionally hurt an animal during an experiment. If you are dealing with animals, please let an adult assist you. It is okay to do experiment on plants, as long as they don't belong to someone else, like don't do an experiment on your mom's rose bushes unless you ask her first...

Life science also includes studying behaviors, so its a perfect category to try taste tests, opinion surveys, animal behavior training (or even training behavior in humans...like baby brothers or sisters...)

Physical Science: If you like trying to figure out how things work, then this is the category for you! It includes topics about matter and structure, as well as electricity, magnetism, sound, light or anything else that you might question, "How does it work and what if I do this to it, will it still work?" *But remember, you always need to ask an adult first (and always make sure there is one of those adult guys with you when you try it.)*

Physical Science also includes the composition of matter and how it reacts to each other. These are the science experiments that may have bubbling and oozing going on, like figuring out what is an acid and what is a base. It is a perfect category to try to mix things together to see what will happen. *Again, if you are experimenting with possibly dangerous things, you need to recruit an adult to help you out.*

Earth and Space Sciences: This category is really awesome because it covers all sorts of topics that deal with the Earth or objects in space. This includes studying weather, Geology (which is the study of everything that makes up the Earth, like rocks, fossils, volcanoes, etc..), and the study of all that is in space, including the stars, our sun and our planets. Unfortunately, this topic is also where most kids mess up and do a collection or model project instead of an "Experiment," so be careful!!!

SEE **sciencebuddies.org** for great project ideas!

Now It's Your Turn:

Write down your favorite Science Fair Category and what it is you want to learn more about:

My favorite Category was _____

(Life Science, Physical Science, Earth and Space Science)

I want to do an experiment involving

_____

_____

_____

_____

Step 1: Coming up with a Good Question…

Now that you have picked out a topic that you like and that you are interested in, it's time to write a question or identify a problem within that topic. To give you an idea of what we mean you can start off by filling in the question blanks with the following list of words:

The Effect Question:

What is the effect of_____on_____?

sunlight	the growth of plants
eye color	pupil dilation
brands of soda	a piece of meat
temperature	the size of a balloon
oil	a ramp

The How Does _____ Affect Question:

How does the_____affect_____?

color of light	the growth of plants
humidity	the growth of fungi
color of a material	its absorption of heat

The Which/What and Verb Question

Which/What (verb)_____?

paper towel	is	most absorbent
foods	do	meal worms prefer
detergent	makes	the most bubbles
paper towel	is	strongest
peanut butter	tastes	best

Now it's your turn:

Create your Science Fair question using either the "Effect Question", the "How does Affect Question" or the "Which/What and Verb Question":

_____

_____

_____

Step 2: Doing the Research and forming a Hypothesis

So, you've picked your category and you've chosen a topic. You even wrote a question using our cool fill in the blank template. Now it is time to research your problem as much as possible. Becoming an expert at your topic is what real scientists do in real labs.

So How do you become an expert?

YOU READ!!!!
READ about your topic. READ encyclopedias. READ magazine articles and books from the library. READ articles from the internet. Take note of any new science words you learn and use them.

YOU DISCUSS!!
Talk about it with your parents. Talk about it with your teachers. Talk about it with experts like Veterinarians, Doctors, Weathermen or others who work with the things you are studying.

Whew.....

Then when you think that you can't possibly learn anymore, and the information just keeps repeating itself... You are ready to...

Write a Hypothesis

Now it is the time to PREDICT what you think will happen if you test your problem. This type of "SMART GUESS" or PREDICTION is what real scientists call A HYPOTHESIS. Using this fancy word will amaze your friends and will have you thinking like a full-fledged scientist.

So how do you begin? Well, just answer this very simple question:

What do you think will happen, (even before you start your experiment)?

Example Problem: *Which Paper Towel is more absorbent?*

Example Hypothesis: *I think Brand X will be more absorbent because it's a more popular brand, it is thicker and the people I interviewed said that the more expensive brands would work better*

(This hypothesis not only predicts what will happen in the experiment, but also shows that the "Scientist" used research to back up his prediction.)

Now it's your turn:

Write down the problem and create a Hypothesis based on what you have researched.

Problem: _____

_____

Research: My problem is about this subject: _____
(sample topics could be magnetism, electricity, buoyancy, absorbency, taste, plant growth, simple machines or other scientific topics that relate to your problem. If you are having problems finding out what the topic is, ask your teacher or an adult to help you on this one….) Use at least three sources.

Books I found in the library on my topic are:
Title: Author:

_____

_____

_____

Internet sites that I found on my topic are:

_____

_____

_____

People I talked to about my topic are:

_____

_____

_____

Some important points that I learned about my topic are

- _____
- _____
- _____
- _____

Hypothesis: I think that _____

(will happen) because (my research shows…)_____

_____

_____

_____

Step 3: Testing your Hypothesis by doing an experiment

Now we've come to the good part. The part that all scientists can't wait to get their grubby little hands on… you guessed it… The EXPERIMENT!

Designing an experiment is really cool because you get to use your imagination to come up with a test for your problem, and most of all, you get to prove (or disprove) your Hypothesis. **Now Science Fair Rules state that you cannot perform your experiment live, so you'll have to take plenty of pictures as you go through these seven very simple steps.**

First: ***Gather up your materials***: What will you need to perform your experiment? The safest way to do this is get that adult you recruited to help you get the stuff you need. Oh, did we mention to take pictures or draw pictures of your materials. This will come in handy when you are making your board display.

Second: ***Write a PROCEDURE***. A procedure is a list of steps that you did to perform an experiment. Why do you need to write it down? Well it's like giving someone a recipe to your favorite dish. If they want to try it, they can follow your steps to test if its true. Scientists do this so that people will believe that they did the experiment and also to let other people test what they found out. Did we mention to take pictures of yourself doing the steps?

Third: ***Identify your variables.*** The variables are any factors that can change in an experiment. Remember that when you are testing your experiment you should only **test one variable at a time** in order to get accurate results. In other words, if you want to test the affect that water has on plant growth, then all the plants you test should be in the same conditions, these are called **controlled variables:** same type of dirt, same type of plant, same type of location, same amount of sunlight, etc. The only variable you would change from plant to plant would be the amount of water it received. This is called the **independent or manipulated variable.** The independent variable is the factor you are testing. The results of the test that you do are called the **dependent or responding variables.** The responding variable is what happens as a result of your test. Knowing what your variables are is very important because if you don't know them you won't be able to collect your data or read your results.

Fourth: ***TEST, TEST, TEST.*** Remember that the judges expect your results to be consistent in order to be a good experiment, in other words, when you cook from a recipe you expect the outcomes to be the same if you followed the directions (or procedure) step by step. So that means you need to do the experiment more than once in order to test it properly. We recommend five times or more. More is better! Don't forget to take pictures of the science project being done and the results.

Fifth: ***Collect your DATA.*** This means write down or record the results of the experiment every time you test it. Be sure You also need to organize it in a way that it is easy to read the results. Most scientists use tables, graphs and other organizers to show their results. Organizing makes the results easy to read, and much easier to recognize patterns that might be occurring in your results. (Besides, it impresses the judges when you use them.) But don't make a graph or table because we asked you to, use it to benefit your project and to help you make sense of the results. There is nothing worse than having graphs and tables that have nothing to do with answering the question of a science project.

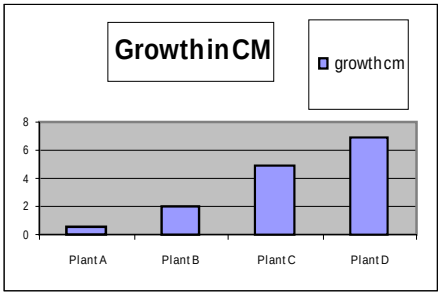
Time out: How Do You Collect Data?!!?

- **Keep a science journal:** A science journal is a type of science diary that you can keep especially if your experiment is taking place over a long period of time. We suggest you do that if your experiment is over a period of a week or more. In your journal you can record observations, collect research, draw and diagram pictures and jot down any additional questions you might have for later.
- **Have the right tools to do the job:** make sure you have the stuff you need to take accurate measurements like rulers, meter tapes, thermometers, graduated cylinders or measuring cups that measure volume. The recommended standard of measurement in science is metric so if you can keep your measurements in meters, liters, Celsius, grams, etc, you are doing great!
- **Tables, charts and diagrams** are generally the way a good scientist like you would keep track of your experiment trials. Remember you are testing at least 5 times or more. A table is organized in columns and rows and **ALWAYS** has labels or headings telling what the columns or rows mean. You will probably need a row for every time you did the experiment and a column telling what the independent variable was (what you tested) and the responding variable (the result that happened because of the independent variable)

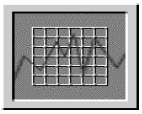
Plant	Amount of water per day	Size it grew in two weeks
(controlled variable)	(independent variable)	(responding variable)
Plant A	none	.5 cm
Plant B	5 ml	2 cm
Plant C	10 ml	5 cm
Plant D	20 ml	7 cm

- **Be accurate and neat!** When you are writing your tables and charts please make sure that you record your data in the correct column or row, that you write neatly, and most of all that you record your data as soon as you collect it **SO YOU DON'T FORGET WHAT HAPPENED!!!!** Sometimes an experiment might be hard to explain with just a table, so if you have to draw and label a diagram (or picture) to explain what happened, it is recommended that you do.
- **Use the right graph for your experiment**. There is nothing worse than a bad graph. There are all types of graph designs, but these seem to be easy to use for science fair experiments.
  - **Pie graphs** are good to use if you are showing percentages of groups. Remember that you can't have more than 100% and all the pieces need to add up to 100%. This type of graph is great if you are doing surveys

  - **Bar graphs** are good to use if you are comparing amounts of things because the bars show those amounts in an easy to read way. This way the judges will be able to tell your results at a glance. Usually the bars go up and down. The x axis (or horizontal axis) is where you label what is being measured, (like plant A, B, C and D) and the y axis (or vertical axis) is labeled to show the unit being measured (in this case it would be centimeters that the plant grew)



  - **Line graphs** are good to use if you are showing how changes occurred in your experiments over time. In this particular case you would be using the x axis to show the time increments (minutes, hours, days, weeks, months) and then you would use the Y axis to show what you were measuring at that point in time.



....And Now back to the Experiment Steps

Sixth: ***Write a Conclusion:*** tell us what happened. Was your hypothesis right or wrong or neither? Were you successful, did it turn out okay? Would you change anything about the experiment or are you curious about something else now that you've completed your experiment. And most of all, **TELL WHAT YOU LEARNED FROM DOING THIS.**

Seventh: ***Understand its Application***. Write about how this experiment can be used in a real life situation. Why was it important to know about it?

Now it's your turn

Materials: (take pictures!)

List the Materials that you will need for your science experiment here:

1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

Variables:

List the variables that you will control, the variable that you will change and the variables that will be the results of your experiment:

My controlled variables are (the stuff that will always stay the same): _____

_____

_____

My independent variable is (this is the thing that changes from one experiment to the next, it is what you are testing): _____

My responding variables might be (in other words, the results of the experiment)

Procedure: **(the steps…. Don't forget to take pictures)**

List the steps that you have to do in order to perform the experiment here:

1st…. _____

2nd _____

3rd _____

4th _____

5th…. _____

_____

_____

_____

Design a table or chart here to collect your information

(Did we mention that you needed to take pictures of you doing the actual experiment?)

Conclusion:

Now tell us what you learned from this and if you were able to prove your hypothesis. Did it work? Why did it work or why didn't it work? What did the results tell you? Sometimes not being able to prove a hypothesis is important because you still proved something. What did you prove?

Application:

(How does this apply to real life?)
It's important to know about this experiment because……

Step 4: The Presentation or Why you needed all those pictures….

But First, a school Fable….

Sammy and Sally both baked cakes for the bake sale with the same cake mix and by following the same directions. When Sammy got his cake out of the oven, he carefully took it out of the pan, smoothed the chocolate frosting neatly and decorated his cake so that it looked delicious. Sally on the other hand, smashed her cake slightly when getting it out of the pan and globed the frosting on parts of the cake. As you may have already guessed, everyone wanted some of Sammy's cake and no one wanted Sally's. Sally couldn't figure out why, because she tasted both and they both tasted the same…

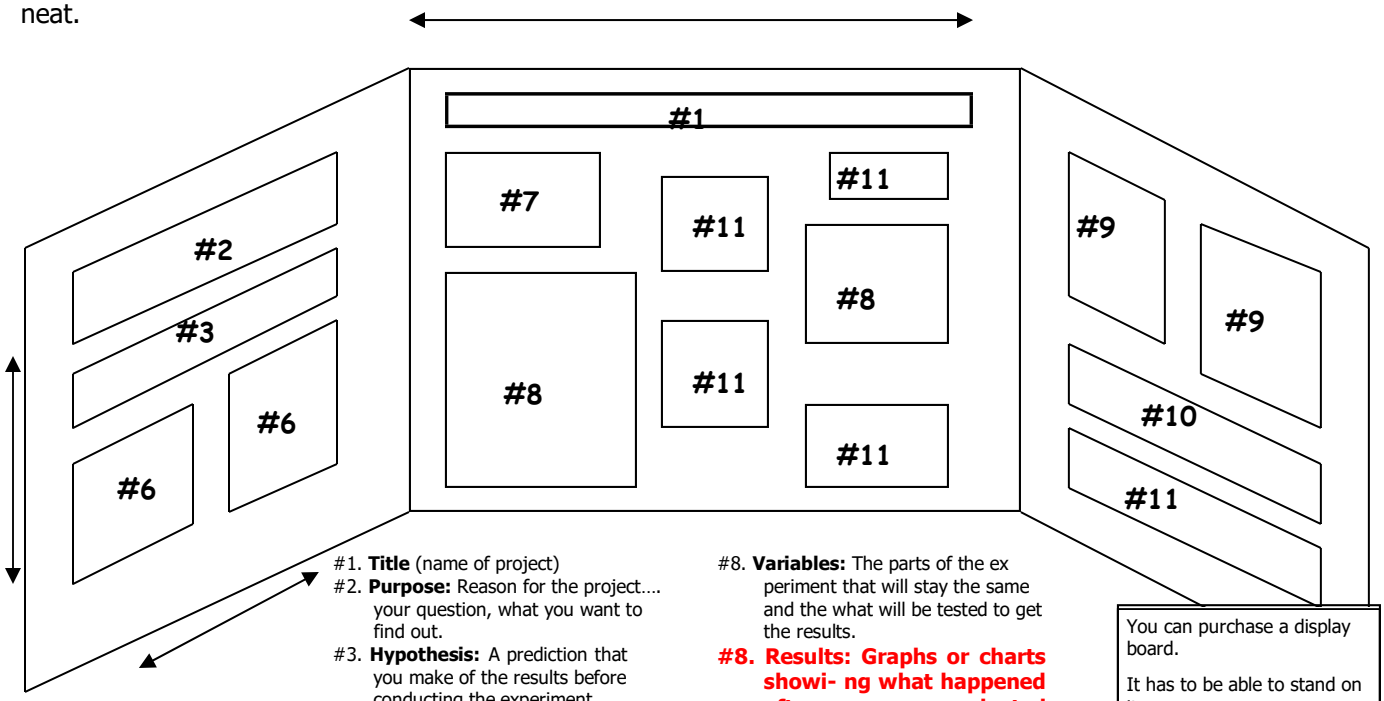
A good display is a Piece o'cake

You may have become the leading expert of your topic and had the most interesting experiment results, but if you don't make your science project look delicious for the judge's eyes to see, well, your chances of winning sweepstakes will crumble like Sally's cake. Your display board is kind of like an advertisement for all your hard work. So, take our advice: **BE NEAT!!** The judges like to see a nice, easy to read display, that has neat writing, easy to read graphs and tables and you guessed it…. lots and lots of pictures!! (Did you remember to take pictures?)

This packet must be in front of your board of judging day!

MAKING A MOUTH WATERING DISPLAY

This is an example of a neat looking Science Fair Display Board. It is just an example. Depending on your information and the amount pictures, tables and graphs, you may have a different layout. Just make sure it is neat.



#1. **Title** (name of project)
#2. **Purpose:** Reason for the project…. your question, what you want to find out.
#3. **Hypothesis:** A prediction that you make of the results before conducting the experiment.

#6. **Materials:** a list of the supplies needed for the experiment.
#7 **Procedure:** The steps or directions that you used to conduct the experiment.

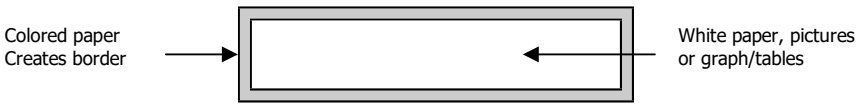
#8. **Variables:** The parts of the ex periment that will stay the same and the what will be tested to get the results.
#8. Results: Graphs or charts showi- ng what happened after you con- ducted your experiment.
#9. **Conclusion:** Telling what happened.. Did it work, were you right about the hypothesis? What did you learn?
#10. **Application:** Explain how your experiment relates to the real world.
#11. **Pictures,** pictures and more pictures...

You can purchase a display board.

It has to be able to stand on its own

Display Beauty Secrets:

- Use a computer to type out your information, but if you can't, write out your information in your best writing. Printing the titles is usually best. If you are using a computer, make sure the fonts are readable and only use one or two type faces.
- Use spray adhesive or glue stick to paste up your papers. It is less messy
- Mount white paper, pictures, graphs and tables on colored papers (making sure the colored paper is larger so it creates a border for the white paper.)



STEM FAIR JUDGING SHEET

Name(s)_____

Project Title_____

Interview & Display (up to 15 points) An excellent student will be able to explain in detail their research and experiment designs as well as interpret charts and graphs. Students should be able to explain the significance of their findings, usefulness and new questions/experiments that may arise from their research.	15
The Question or Problem Statement (up to 12 points) An excellent question will be interesting, creative, worded scientifically and relevant to the world today. You should also include your thought process and preliminary research on why you selected the question.	12
Hypothesis or Design Goal (up to 12 points) An excellent hypothesis will lead on from the question, be tightly focused and build on existing knowledge and be testable. (An Engineering/Invention project will have a design goal instead of hypothesis). A hypothesis should be a concise statement.	12
Research (up to 12 points) Excellent students will undertake research to help them shape their question and hypothesis and to put their work into a relevant, real-world context. (Engineering/Invention show research how new product will meet a need better than an existing product, how it fills a need	12
Experiment or Design of Prototype (up to 20 points) Excellent students will demonstrate that they have used good experimental techniques and describe their experiment clearly and in detail. Multiple trials are an expectation in good experimentation. (Engineering/Invention should show schematics, assembly information, refining of design, prototyping)	20
Data/Observations (up to 12 points) -Excellent data will be relevant, sufficient to support a conclusion and should be recorded accurately and precisely, and be presented clearly. -Excellent observations will describe patterns or trends supported by the data. (Engineering/Invention project show evidence of testing, applications of invention)	12
Conclusion (up to 12 points) An excellent conclusion will explain how the experiment answers the question or why it fails to do so and whether or not it supports the hypothesis.	12
Works Cited Document (up to 5 points) Excellent students will acknowledge and provide clear references for sources of information that they have consulted and/or referenced and acknowledge any assistance received (e.g. to find equipment and materials, to stay safe or to use unfamiliar equipment or techniques).	5
Total	100

Science Fair Rules and Regulations

Aw! you mean there are rules? Of course, there are, silly, this is made by adults!

Safety Rules First

1. Number one rule… think safety first before you start. Make sure you have recruited your adult to help you.
2. Never eat or drink during an experiment and always keep your work area clean.
3. Wear protective goggles when doing any experiment that could lead to eye injury.
4. Do not touch, taste or inhale chemicals or chemical solutions.
5. Respect all life forms. Do not perform an experiment that will harm an animal or person.
6. All experiments should be supervised by an adult!
7. Always wash your hands after doing the experiment, especially if you have been handling chemicals or animals.
8. Do not grow any microorganisms (i.e. bacteria) without written permission from your teacher and parents.
9. Any project that involves drugs, firearms, or explosives are not permitted.
10. Any project that breaks district policy, and/or local, state or federal laws are not permitted.
11. Use safety on the internet! Never write to anyone without an adult knowing about it. Be sure to let an adult know about what websites you will be visiting or have them help you search.
12. If there are dangerous aspects of your experiment, like using sharp tools or experimenting with electricity, please have an adult help you or have them do the dangerous parts. That's what adults are for, so use them correctly. (Besides, it makes them feel important!)

Horizon Elementary STEM Fair
Things to Remember

1. Only one entry per student. Students can work in a team of a maximum **2 students**.
2. Adults can help; in fact, we want them to get involved. They can help gather materials, supervise your experiment and even help build the display. They just can't be there when the judges interview you.
3. Displays must be on display boards. They must stand alone.
4. A **completed packet** must be turned in with the display board on the day of the fair.
5. Please look at the grading rubric and make sure you have included everything.
6. On the day of the fair, the judges will ask the student questions, so the student should be prepared to explain and discuss the project on their own. Parents are not allowed at the judging.

What Parents Can Do & What Students Need To Do To Complete a STEM Fair Project

It is very important that a student do as much as he/she can when doing a STEM fair project. This is how the student learns firsthand what is involved in the planning, the experimenting, and the writing of a science fair project. A rule of thumb is if the student can do it, the student should do it.

Parents can act as a coach, but they shouldn't be in the "game" playing. In other words, the student should do all the work that is part of the project. Parents can brainstorm, share ideas, and help bring out the knowledge learned of the student. Parents can help build things that are **hard** for the student. After the parent help, final decisions should rest with the student. With this idea, the playing field is leveled where all students are doing the same work for the science fair projects.

If you completed everything in this packet you probably have a terrific science fair project, and you are now a real scientist! Good Job! But…

If you still need more ideas, go here:
www.sciencebuddies.org