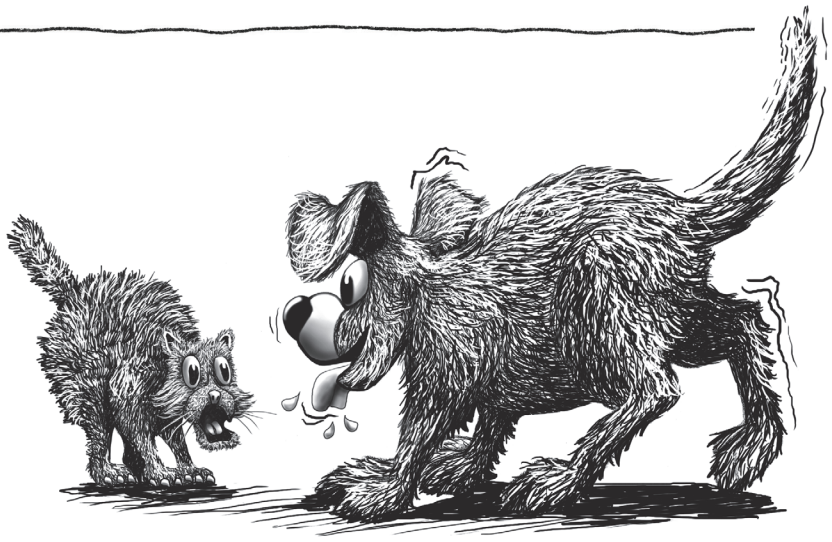
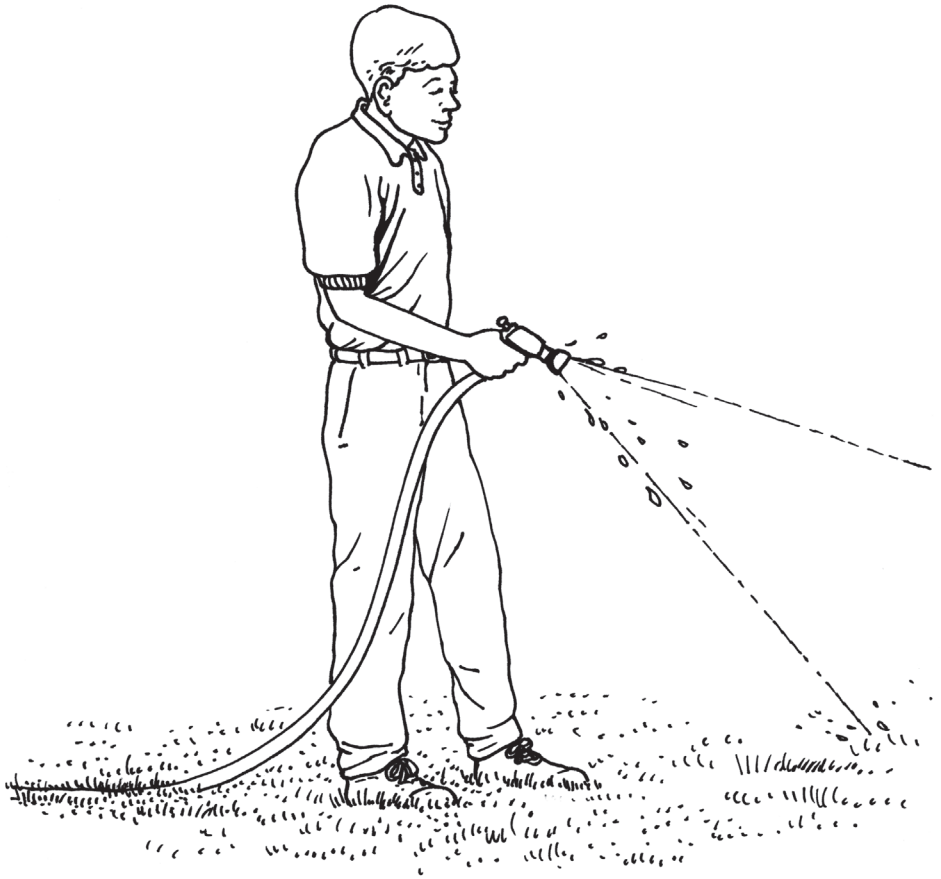
Science Fair Student Packet

Getting Started



Have you ever seen something happening and wondered how it works? Have you ever read or looked at an advertisement and wondered whether it was really true? Or have you observed an animal and wondered why it behaved the way it did?

Curiosity is a trait God has given to us that makes us want to investigate things around us. You may have seen your neighbor watering his lawn more than other people water their lawns. Perhaps you think to yourself that this neighbor's lawn is greener than the other lawns because of the amount of water he puts on it. However, the type of soil, the amount of sunlight, the amount and kind of fertilizer, or other factors may be what really make the difference. How could you find out if the water is what makes his lawn so green? You could conduct an experiment where you change the amount of water but keep all the other possible factors, or variables, the same. This would help you determine if the amount of water really made a difference in the color of your neighbor's lawn.



Choosing a Topic

Think about a topic that is interesting to you. What have you been studying in science class? What caught your attention or interested you? There are many science areas from which to choose. There are many living things, from small plants to large animals. Other science areas you might consider are electricity, space, weather, machines, health, and ecosystems.

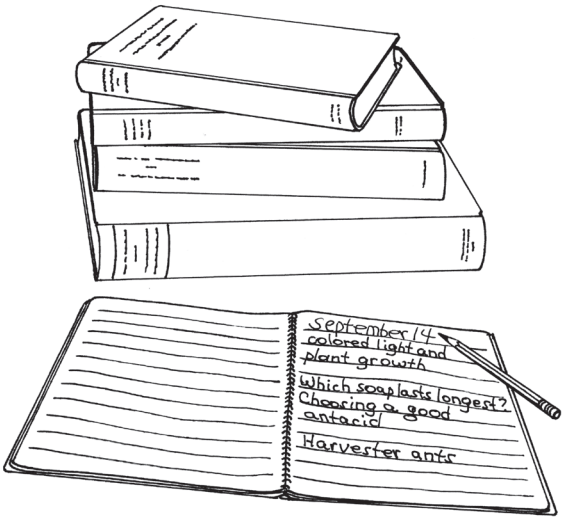
Sometimes you have too many ideas. Other times it seems hard to get any ideas. Take a week or two to consider some ideas. You may come across some ideas that are not practical because of the restrictions. For example, experiments with dangerous chemicals or high-voltage electricity do not usually make good science fair projects. Other ideas may require too much time or too many resources. If you choose to do an experiment with animals, you must consider the guidelines for proper treatment of animals. Discuss your ideas with adults and science experts to know what your limitations are.

Start with the area of science that you like the best. Once you have chosen the area of science you are interested in, try to narrow the area down a little. You might find topic ideas online, in the news, in books, or in magazines. For example, if you are interested in life science, you may be intrigued with insects. Insects are still a large category, though, and some are hard to find or observe at certain times of the year.

Perhaps you choose to study ants. Now you have to decide which species of ants is most interesting to you. There are fire ants, harvester ants, leaf-cutter ants, farming ants, and many more. You can search for information about your choice in science textbooks, in the library, and online. You can also contact some experts on your topic. Many state colleges have extension agents who are willing to help.

Developing a Logbook

Your logbook is a record of everything that you do throughout your project. Start by listing possible topics that interest you. Cross out the ones that you decide not to do. Explain how you chose your topic and list the names of any books and articles you used to come up with your final idea. As you continue working on your project, you will write down in your log everything that you are doing. Make notes to yourself about what you discovered and what you did. Be sure that you write the date at the top of each entry. Do not erase information, but cross out things that become unimportant as you go along.



Forming a Research Question

This is an extremely important step. The way you word your question will guide you in all the other steps you will take toward a successful project. The question needs to explain what you are trying to find out. Suppose you chose harvester ants as your topic. Harvester ants are important to many grassland ecosystems.

You may have observed that harvester ants come out and forage, or search for food, at certain times, but at other times you seldom see them. When do the ants forage most? Thinking about this will help you form your question. Does temperature affect foraging? Does the amount of light affect their foraging?

Be sure that your question is testable. A good question is specific, indicates the subject to be studied, and includes the variables that will be tested. Many books and websites have samples of questions to ask. As you continue working on your project, you may want to modify your question.

Following the Scientific Method

Problem

The first step in the scientific method is to state your **problem**. The problem is the question for which you are seeking a solution. In the case of the harvester ants, you want to know the conditions under which the ants forage for food. Your problem is written as a question. For example: "How does temperature affect when harvester ants forage?"

Now begin your specific research. Your question will help you narrow your research. For harvester ants, you would continue reading about harvester ants, but you would focus on information about foraging.

Hypothesis

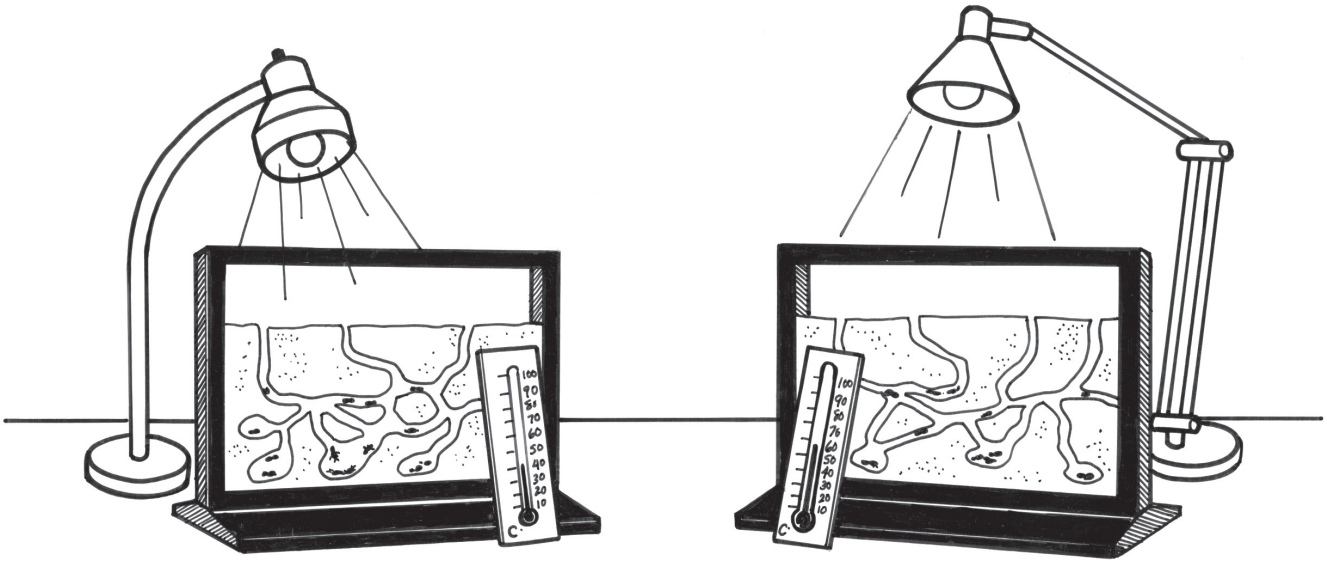
The next step is called a **hypothesis**. This is a statement or prediction about the problem. Based on what you have learned and observed about harvester ants, you predict that they forage more at warmer temperatures than they do at colder temperatures. After you do further research, you may adjust your hypothesis based on additional knowledge. The hypothesis is written as a statement. For this harvester ant experiment, your hypothesis might be "Harvester ants will forage the most when the temperature is between 35–45°C (95–113°F)."

Procedure

The next step is the **procedure**, or how your experiment will be conducted. In this step, you plan and describe how you will set up the experiment to test your problem. This step tests your knowledge about your topic and research findings.

If you were doing the harvester ant project, you would need to test your hypothesis. As you plan your procedure, you realize that you need at least three identical habitats of harvester ants. You would place one ant habitat in normal room-temperature conditions. Place the other two ant habitats near different heat lamps or lamps with different watt light bulbs. You will want to choose one heat source that falls within the temperature range of your hypothesis and one that is above it.

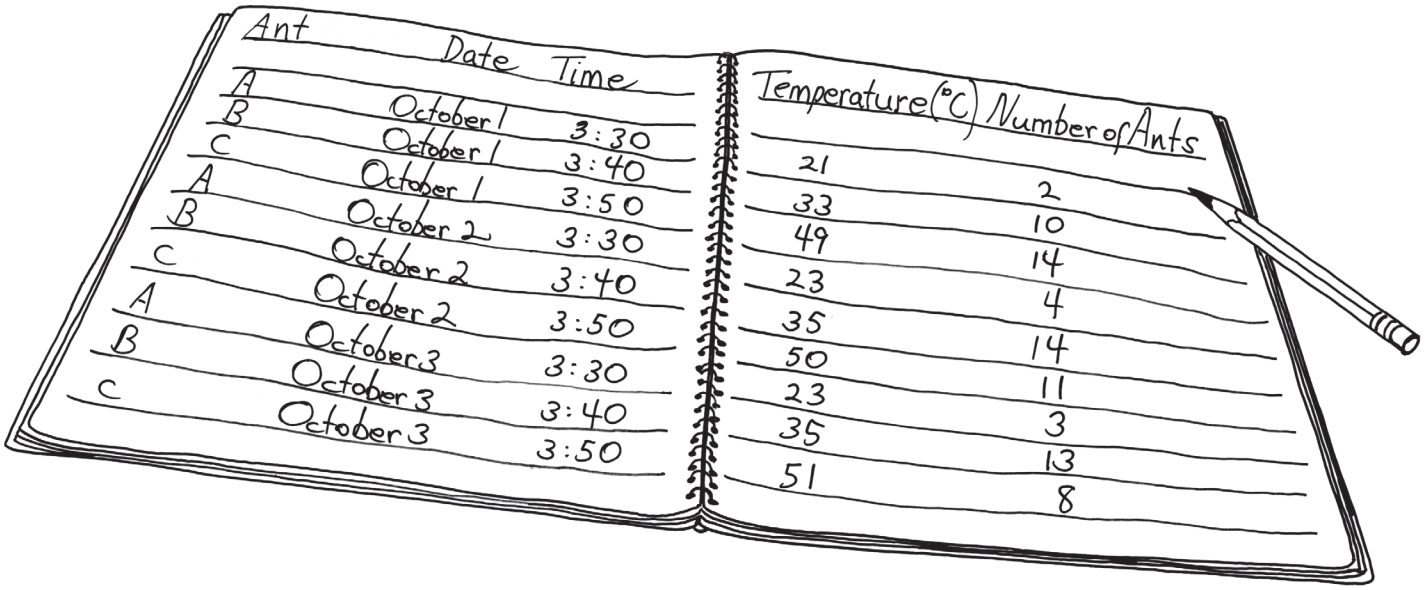
You will need to make sure that other variables—such as size, soil conditions, access to food, and the amount of light—are the same for all the habitats. It will be important to keep regular temperature data and observation times throughout the experiment. You will record all this information in your logbook.



Conclusion

The final step in the scientific process is the **conclusion**. This is the point where you review the evidence collected during your experiment. Your conclusion is a statement of what you discovered. It may agree or disagree with your hypothesis.

Perhaps after your experiments with the harvester ants you concluded that, based on the data you collected, harvester ants forage the most when the temperature is at least 35°C. You also noticed that the ants return to their nest and stop foraging when the temperature is about 52°C. Your data can help you determine the temperatures at which the ants forage the most.

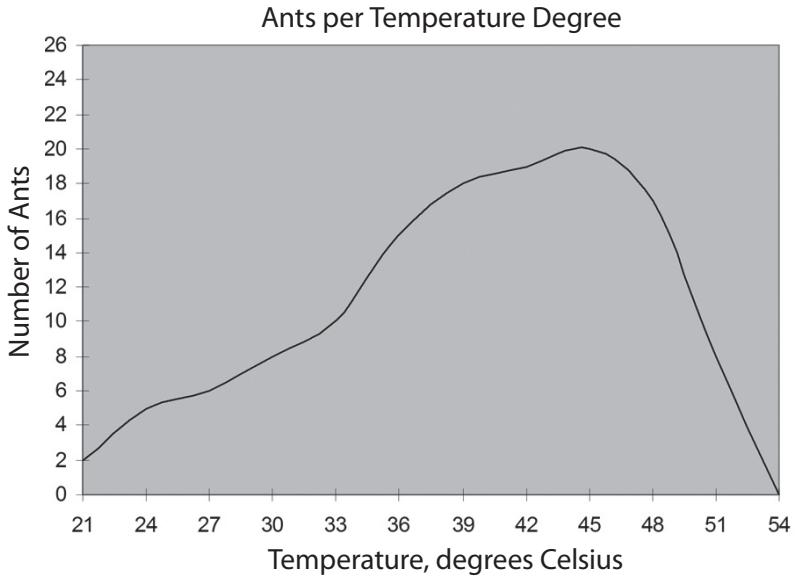


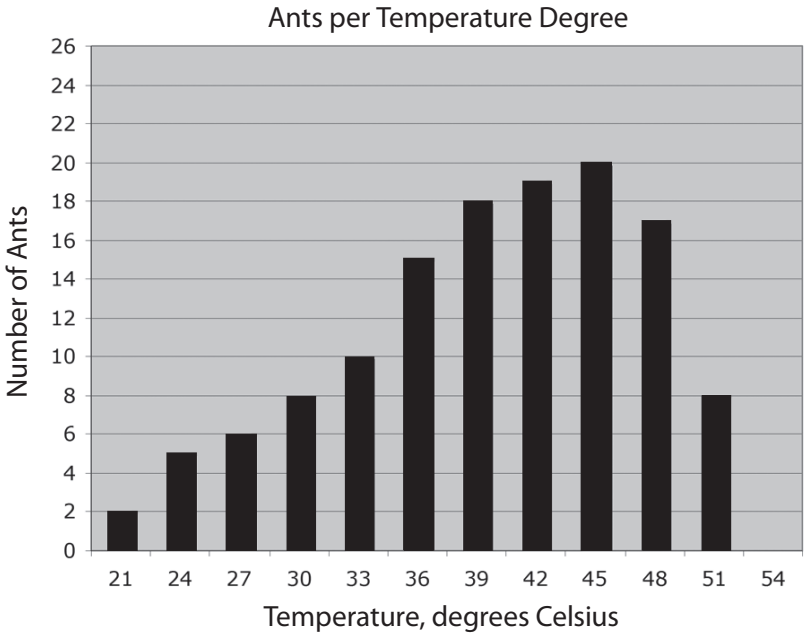
Finishing Up

Presenting Your Data

You have been keeping records in your logbook over several days or weeks, depending on the project that you chose. Now you need to present your data and conclusions in an easy-to-read format. Determine which kind of graph, chart, or illustration best suits your project.

The type of graph you use depends on the kind of information you are trying to present. You could use a line graph to show how the forage activity increased or decreased with the change in temperature. You could use a bar graph to show the number of ants that forage at various temperatures. There are also other ways to present and analyze data. Check with your teacher or another adult for ideas about how to present the data from your project.



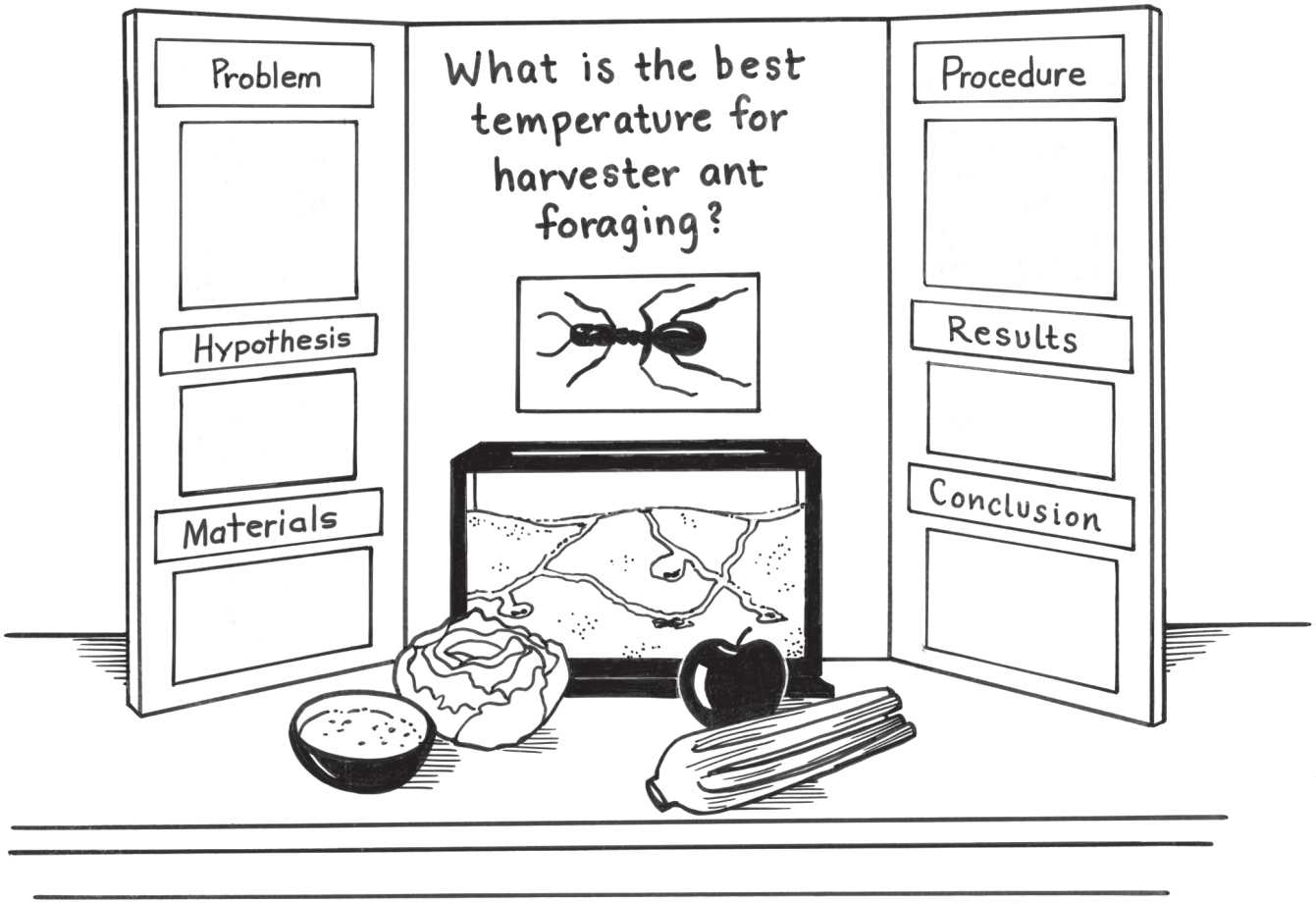


Making Your Display

The display should capture attention and provide a clear and simple explanation of your project. An upright display board should clearly show the title of the project, your problem and hypothesis, and any graphs, charts, photos, or explanations. Your science fair may also require you to include a Bible application about your project. The size of your display board depends on the amount of information you are going to display.

It is important to make your display attractive and organized. You should use some sturdy material for the backboard, such as corkboard, foam board, or pegboard. Your board will need to be able to stand upright on a table. Cardboard and poster board do not work well for science fair displays.

Most science fairs allow you to use purchased stick-on letters for the headings. You may also create your own lettering using the computer. Be sure that the lettering is done neatly and is the proper size. The title of your project should have the largest letters. You may choose to cut out squares, circles, and rectangles of various dimensions from colored paper. This will help you organize your information on the display board. Use color carefully. Too much color will distract from your information. Using color appropriately, however, can draw attention to your information.



Writing Your Report

Your display will also include a written report. Usually the written report is typed and double-spaced. Your report should include the following:

- ☐ 1. Title Page: gives the title of your project, your name, and your grade level
- ☐ 2. Contents Page: lists the sections of your paper and the corresponding page numbers
- ☐ 3. Purpose: explains your idea and states the problem and the hypothesis
- ☐ 4. Procedure: explains the procedure step by step; lists materials and instructions as if someone were following your directions
- ☐ 5. Results: includes a discussion of your results and any charts, graphs, or pictures; mentions any errors that were made in the experiment or any difficulties that you had while doing the experiment
- ☐ 6. Conclusion: draws conclusions from your results
- ☐ 7. Bibliography: lists references that you used, such as books or articles; acknowledges any help received from parents, professionals, or businesses; acknowledges any people or businesses who donated supplies

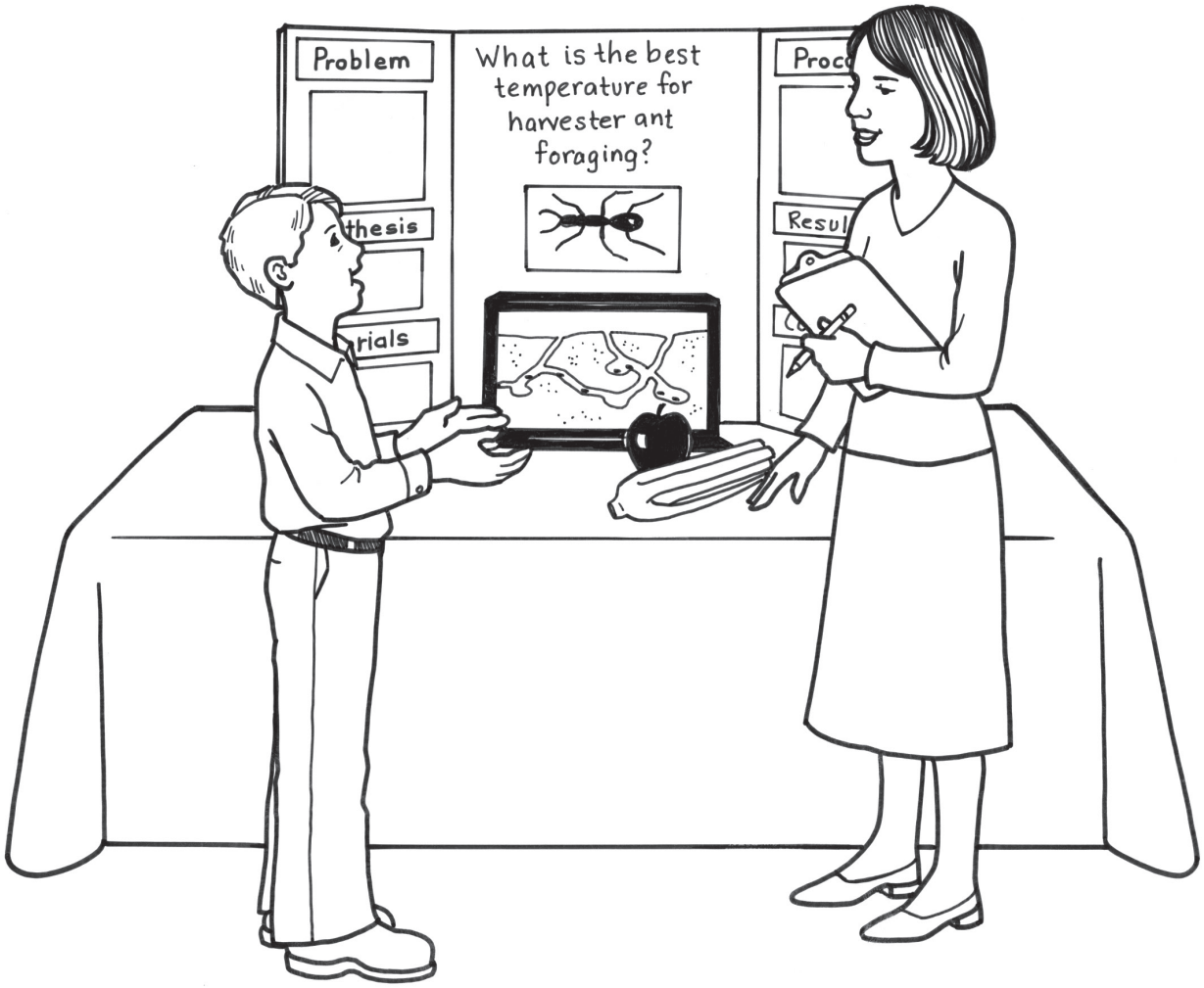
Preparing for the Fair

By the time your project is ready for the science fair, you will have worked on it for many weeks. That is one reason why it is important to choose a topic that interests you! By this time, many people may have seen your project and perhaps helped you with it. Parents, teachers, and friends may have given you their opinions about your project. However, you need to think ahead about what a judge's opinion might be.

A teacher, parent, or science fair coach encourages you to do your best work and makes suggestions about how to improve the project. A judge may also give suggestions, but he evaluates the project in a different way. A science fair judge evaluates the creativity of a project. Is your project similar to other projects that have been done before? What makes yours different? Is your project suitable for someone at your grade level? Is it too easy or too hard? The judge will also evaluate your use of the scientific method. Did you keep accurate records? Does your project show that you learned about the topic you studied?

The judge will expect you to have a thorough understanding of your project. He will evaluate both your display and your presentation of your project. Do you have any spelling or grammar errors in the written parts of your display? Does your project look like it is well done and properly prepared, or does it look like it has been done at the last minute? You will need to be able to explain your project clearly and be able to answer questions about it.

You may be nervous, but be sure that your enthusiasm and interest in your project show as you talk about your project to the judge. You are the expert on your project. Enjoy telling about what you have learned!



Science Fair Checksheet

A good science fair project involves many steps. Place a check in each box as you complete that requirement.

Choosing a Topic

- ☐ Make a list of possible topics.
- ☐ Choose one topic from your list of possible topics.
- ☐ Research your topic. Think of people who may be able to help you with your project.
- ☐ Form your research question.

Following the Scientific Method

- ☐ State your problem.
- ☐ Make a hypothesis.
- ☐ Research your topic, concentrating on things that pertain to your problem.
- ☐ Contact people who may be able to help you with your project.
- ☐ Gather supplies for your experiment.
- ☐ Plan your procedure. Record it in your logbook.
- ☐ Conduct your experiment. Remember to keep accurate records of your findings.
- ☐ Review your data and determine your conclusion.

Finishing Up

- ☐ Decide how to present your data. Prepare any graphs, charts, and illustrations that will be needed.
- ☐ Plan your display.
- ☐ Gather materials needed to make your display.
- ☐ Make your display.
- ☐ Write a rough draft of your report.
- ☐ Proofread your rough draft. Check your data for accuracy. You may want to ask someone else to also proofread your rough draft.
- ☐ Make a final copy of your report.

Presenting Your Project

- ☐ Practice what you will say about your project. Be able to clearly explain all the aspects of your project.
- ☐ Present your project.