

Part One

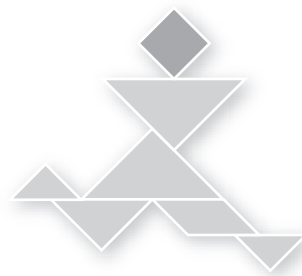
# Implementing Math Projects in Your Class

COPYRIGHTED MATERIAL





# An Overview of Using Math Projects



**Computation, problem-solving, and critical-thinking** skills are important components of any successful math class. Rather than learning skills in isolation, by working on math projects students study math in context so they can see it applied in real situations. They come to appreciate the importance of math in their lives, and to see the many connections between math and the world.

A successful math project transforms a classroom into a center of learning, collaboration, cooperation, and sharing. The classroom bustles with enthusiasm and activity as students work alone, together, and with the teacher. Along with learning basic math skills, students are encouraged to think logically, analyze data, make decisions, and solve problems that arise from real-life situations, and thus learn and utilize mathematical concepts and skills in meaningful ways.

### **Your Role as Teacher and Facilitator**

---

To some extent, you must step out of your traditional role when your students work on math projects. In addition to being responsible for introducing concepts, demonstrating skills through example, and grading the work of your students, you will also become a facilitator and promoter. Your goals and methods will broaden. During project work, much of your time will be spent working directly with individuals and groups. As your students work on the projects, you will circulate around the room, offering suggestions, asking questions that lead to insights, and giving encouragement and praise. Sometimes you may simply observe a group's efforts or model appropriate behavior. Occasionally you

may need to pull a group back on task. The following list gives some additional components of your new role:

- Organizing and monitoring groups so that your students can work together effectively
- Brainstorming with groups
- Guiding your students in their research efforts
- Offering suggestions to solve problems
- Providing assistance and acting as a resource
- Modeling appropriate behavior and demonstrating skills
- Offering encouragement and applauding efforts
- Explaining that everyone makes mistakes and that mistakes should be viewed as steps to finding solutions
- Helping your students to organize their thoughts as they consider problem-solving strategies
- Showing your students that various strategies may be used to solve the same problem
- Providing time for sharing results

You can incorporate projects into your curriculum in various ways. You can build time for them into your schedule, for example, a period or two each week; or you can reserve time for projects intermittently throughout the year. Some teachers introduce a math project and then give students time to work on it in class over the next few days or after school. Math projects can also be included in an interdisciplinary unit. No matter how you include math projects in your teaching program, however, you should be consistent. Students not only need sufficient time for working on projects, but they also need to know in advance when they will be working on them so they can come to class prepared and ready to work.

## **Solving Multistep Problems**

---

The problems presented in the math projects contained in this book require skills in computation, analysis, critical thinking, and decision making. Because the types of problems vary, no specific plan for finding solutions applies to all of the problems. You should familiarize your students with various strategies they can use as needed. Explain that strategies are methods or procedures that can be used alone or with other strategies. If a student asks what strategy is best for solving a particular problem, a good answer is, "the one that works best for you." You will likely find that different students will use different strategies to solve the same problem.

Although some of your students may have a knack for problem solving, many will need guidance, and you may wish to distribute copies of the following reproducible: Strategies for Solving Problems. This guide can help students begin their problem-solving efforts and keep them moving forward. There is also much you

can do in your regular lessons to help your students acquire sound problem-solving skills. Here's a list of suggestions:

- Assign real-life problems to which your students can relate.
- Present problems that have multiple solutions and that can be solved through several strategies.
- Encourage your students to try various strategies in solving problems.
- Organize your students into cooperative teams.
- Encourage your students to brainstorm for ideas that might lead to solutions.
- Provide problems that have missing information or too much information. Such problems will require students to supply or eliminate data.
- Give problems that connect to other subjects.
- Encourage your students to keep notes on their efforts at solving difficult problems.
- Encourage your students not to give up; persistence is a major factor in successful problem solving.
- Require your students to write explanations of how they solved problems.
- Remind your students always to check answers for logic and accuracy.
- Provide time for discussion and the sharing of solutions.

An essential part of any project is the sharing of solutions and results at the end of an activity. When results are shared, students have the opportunity to hear other viewpoints, to learn about other methods that might have been used to solve problems, and to realize that others may have experienced similar obstacles in solving problems. Not only does sharing help reduce students' feelings that they are the only ones having trouble, it also helps build a sense of class community and fosters an environment that is supportive of problem solving.

Sharing may take many forms. It may be oral, such as a presentation or discussion; written in logs or reports; or illustrated in a drawing, table, or model. Through the various forms of sharing, speaking and writing become essential components of your math class.

Problem solving is hard work, and your students will benefit from your encouragement and advice. Explain that problem-solving skills develop with practice. Just as with anything else—learning to play a musical instrument, excelling at a particular sport, or playing computer games—the more your students work at solving problems, the better they will become. Distribute copies of the reproducible *How to Become a Great Problem Solver* to highlight some of the characteristics that successful problem solvers share.

## Strategies for Solving Problems

There are many ways to solve problems. Following are some strategies.

- Make sure you understand the problem. You may have to read it several times.
- Be sure you understand the question.
- Find the important information in the problems. (Sometimes problems contain facts you do not need.)
- Research and find information.
- Look for patterns, relationships, and connections.
- Use guess and check (also called trial and error).
- Make a table or chart.
- Think logically. Look for connections between ideas and facts.
- Sketch or draw a model to help you "see" the problem better.
- Try to solve a simpler or smaller problem.
- Look at the problem in different ways.
- Estimate. Rounding off numbers can make finding a solution easier. Using whole numbers rather than fractions may help you to see operations more clearly.
- Keep notes as you try to solve the problem. Check your notes to see if you might have missed something.
- Do not give up. Only through hard work can you find answers.
- Double-check your work and make sure your answers make sense.

## How to Become a Great Problem Solver

You can become a great problem solver. All it takes is practice. Following are some of the traits of great problem solvers. Try to develop as many of these traits as you can.



Copyright © 2009 by Judith A. and Gary Robert Muschla

### Great problem solvers

- Believe they can solve just about any problem.
- Do not give up.
- Try different strategies to solve problems.
- Find important information that helps them solve problems.
- Look at a problem from various viewpoints.
- See patterns, relationships, and connections.
- Are open to new ideas.
- Write notes to keep track of their attempts at solutions.
- Solve problems one step at a time.
- Use their experiences in solving problems.
- Use logic and common sense.
- Double-check their answers.

## Developing Math Projects of Your Own

---

Although this book contains a variety of projects, you, as well as your students, may eventually wish to create projects of your own, designed specifically for the needs of your class. As you develop projects, keep in mind the following points, which will help ensure that students will find the projects stimulating and exciting:

1. Build projects around real-life situations that students will find meaningful.
2. Create projects that capture the interest of your particular students.
3. Be certain that your students possess the mathematical skills necessary to solve any problems in your projects.
4. Develop projects that require analysis, critical thinking, and decision making.
5. Design projects that require students to formulate a plan.

Math projects offer students many benefits. Perhaps the most important benefit is that when students work on problems that are based on real-life situations, they see how the math skills they are learning may be applied to the real world. Math projects open the door to bringing other subjects and disciplines into the math class, and students quickly recognize that math is essential to their lives. Math projects also provide students with the opportunity to work together cooperatively to solve problems that might be overwhelming for one person to manage. Furthermore, when they collaborate on a project, students of all abilities have the chance to contribute to the solution. Everyone can share in the success.