How to Use This Resource

This resource gives teachers a wide variety of engaging open-ended problem solving tasks and investigations spanning grade levels 1 through 6. Having access to all these grade spans provides opportunities for differentiated problem solving experiences as well as giving teachers a menu of rich mathematical experiences for all students in these grade levels.

The tasks are grouped by content strands that reflect the NCTM Standards as well as the NCTM Curriculum Focal Points. The investigations address more than one content strand and are true problem solving applications of mathematical skills, procedures, and reasoning.

The tasks can generally be completed within a short period of time while the investigations are designed to be developed over a longer time period.

What is an investigative approach to learning math?

An investigative approach to learning math engages students in open-ended tasks and investigations that:

- encourage students to think, question, analyze, criticize, and to solve unfamiliar problems; and
- ask for more than recall of facts or the replication of processes thereby promoting a higher level of thinking.

This approach involves:

- adopting a learner-centred approach to learning and teaching;
- establishing clear expectations of students' demonstrations as a basis for monitoring the progress of student learning; and
- assisting students to work towards demonstrating their learning.

The tasks and investigations include:

Specific strategies

Draw diagrams and tables.
Work systematically.
Recall basic number facts.
Look for patterns.
Make and test predictions.
Generalize.
Look for proof.
List all possibilities.
Use trial and error.
Work backwards.
Estimate.
Collect and organize data.
Identify relevant information.

General behaviors

Discuss.
Work cooperatively.
Work independently.
Communicate using math.
Formulate key questions.
Experiment.
Identify and apply appropriate processes.
Comprehend and explain problems.
Transfer skills.
Check the reasonableness of results.
Self-correct.
Reflect.
Use resources and materials appropriately.
Persevere with problems.

When using an investigative approach, teachers support students by:

- guiding mathematical discussions;
- providing opportunities for students to develop the knowledge, procedures and strategies required for mathematical investigations;
- presenting challenges that require students to pose and solve problems; and
- providing opportunities to reflect on new learning.

Why use mathematical tasks and investigations?

Mathematical tasks and investigations link the learning of mathematical concepts to a real-world context by:

- posing problems to be solved;
- asking questions to be answered;
- describing tasks or challenges to be completed;
- defining issues to be explored in real-life or life-like contexts; and
- providing opportunities for students to use multiple pathways.

Both tasks and investigations require students to:

- identify the math required to undertake the task or investigation;
- describe what they have to do; and
- explain or justify what they have learned.

Open-ended tasks

Open-ended tasks are generally short tasks that:

- have several acceptable responses;
- provide opportunities for students to use multiple pathways to solution;
- require students to use higher order thinking skills beyond the recall of facts;
- allow teachers to observe and learn about each student; and
- can be completed within one session.

Open-ended investigations

Open-ended investigations are longer activities that generally extend over two or three sessions and require students to:

- collect relevant information;
- develop a suitable plan or strategy;
- carry out the plan and revise it when necessary; and
- summarize their results.

The importance of questioning

Questioning of students is an essential tool in the learning process. It not only helps to keep students on track but also helps them clarify and refine concepts, strategies and procedures. While students are involved in tasks and investigations, teachers may find the following discussion starters and questions useful.

Roving conference questions

Tell me about. . . .

How is this different/the same?

Do you remember how we . . .?

What will you try now?

How do you know?

What are you thinking?

Reflection questions

When have you used this before?

What did you discover in math today?

What was something that was new for you?

How did you work it out?

What would you do differently next time?

What were you really happy with? Why?