

# HOW WILL STUDENTS LEARN MATHEMATICS?

All teaching and learning of mathematics in the new curriculum frameworks involve students using mathematical processes, which are interrelated.

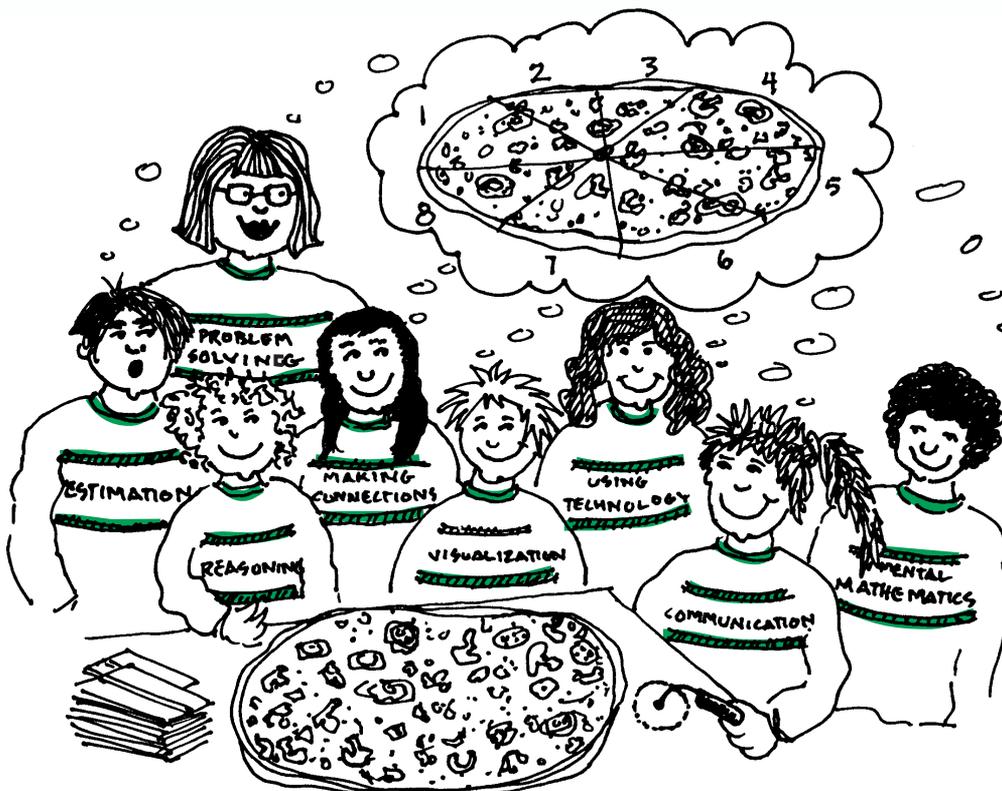
There is less emphasis on memorization and rote learning of facts and formulae, although mental math continues to be important. Students will learn how to learn. They will learn how to think. This should improve understanding of mathematical concepts and reduce frustration and anxiety.

These process thinking skills will serve them well in all areas of their lives. They are life skills.

Problem solving is the focus of mathematics at all grades. It provides an opportunity for children to be active in constructing mathematical meaning, to learn problem-solving strategies, to practise a variety of concepts and skills in a meaningful context and to communicate mathematical ideas.

## Mathematical Processes

- problem solving
- estimation
- making connections
- visualization
- using technology
- communication
- reasoning
- mental mathematics



# USING THE **NEW** MANITOBA CURRICULUM FRAMEWORKS FOR MATHEMATICS

- **problem situations** might be used to introduce new topics.
- **problem solving** becomes a thread woven through all instruction, in every strand.
- **problem situations** might also be used to check if the student is successful in applying what has been learned to solve problems.

Many word problems in textbooks are not true problems. They are often just factual math exercises surrounded by words. The only thinking involved is deciding which number operation (+ - x ÷) is needed to solve it, then calculating the answer.

**A goal for classrooms** is to try to encourage a problem-solving "spirit" in all that is done. Teachers take risks and learn along with students. Together, they can experience the joy and satisfaction of trying hard and solving a problem. Together, they can become "hooked" on thinking.

**A problem** is when you are stuck and don't know what to do. You don't know what the solution is. It is not obvious to you. **Problem solving** is what you do in that situation.

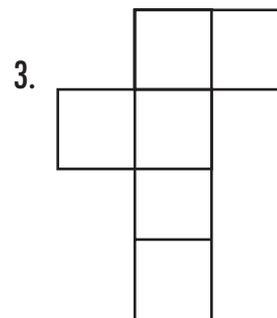
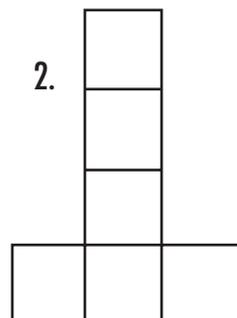
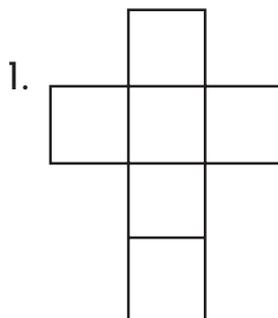
**For example:** Bob had \$2.00. He bought a bottle of Tahiti Treat for \$1.25. How much change will Bob get?



**Two examples** of problems that involve more complex and higher-level thinking are:  
I have six coins worth \$0.42. What coins do you think I have? There is more than one correct answer.

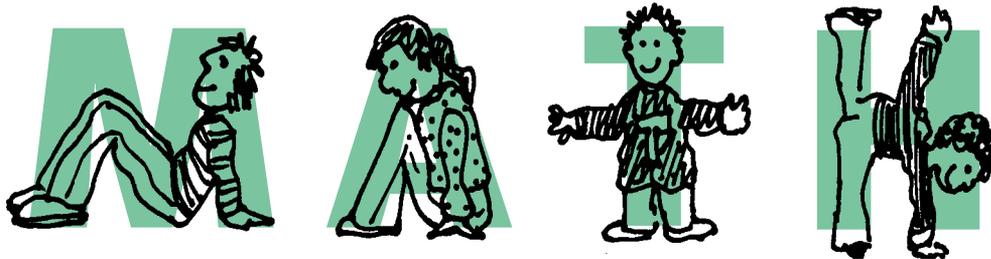


**Cut out** each of the following. Fold each one to make an object. What object does each make?  
Create a different arrangement for the same object.

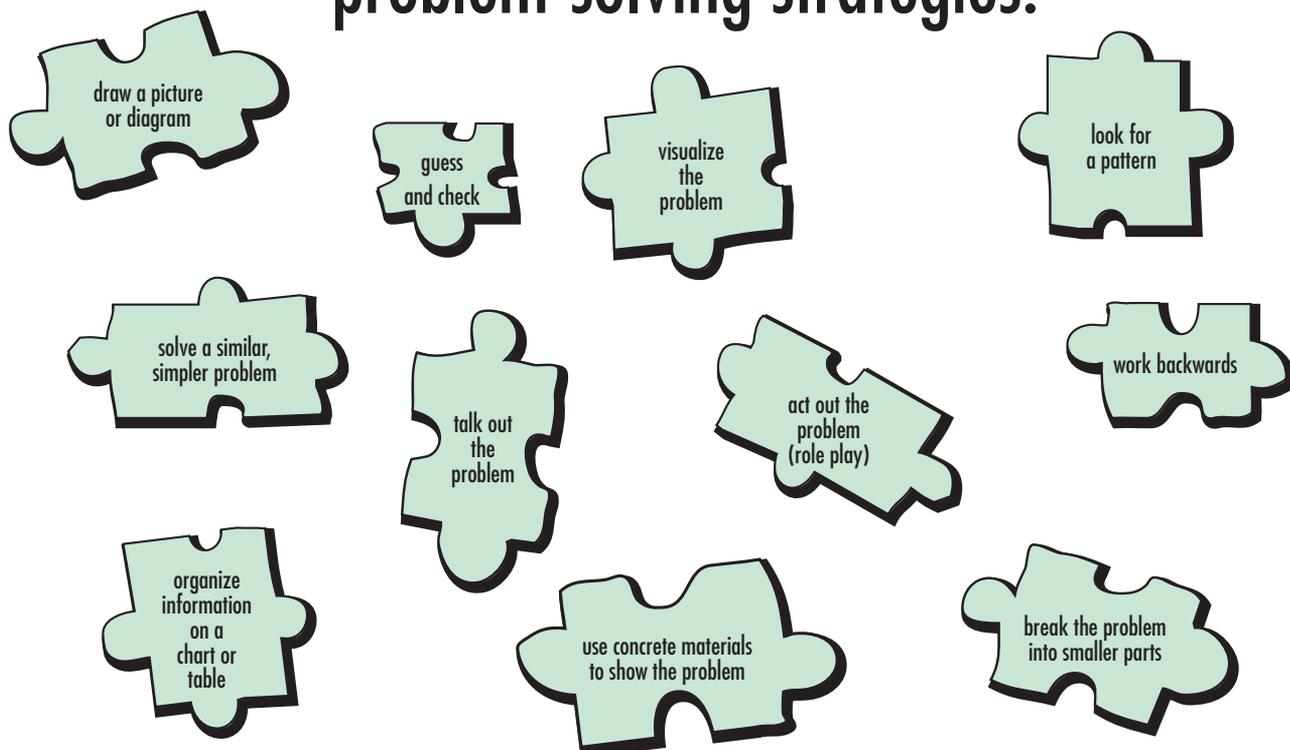


# Students learn steps to solving problems that help them to organize their thinking:

- Make sense of the problem (understand what you need to find out).
- Attempt several strategies (find possible ways of solving the problem).
- Try to solve (decide on the best strategy, make a plan, carry it out).
- How did you do? (look back, think, discuss how the problem was solved).



# Students create their own set of problem-solving strategies:



# MATH TALK

Most of us remember our own math classes as being a very quiet time of the school day. Teachers did most of the talking: explaining a concept, asking questions and giving instructions. Students worked independently and silently at their seats. There was little opportunity for “math talk” and student interaction.

The new curriculum frameworks recognize that mathematics is a way of communicating. Communication is an important mathematical process that should be encouraged in all teaching and learning activities.

Students need opportunities to talk to each other about math. They need to feel free to ask questions of the teacher and of their peers. As children are busy doing their math activities, they need to talk about what they are doing, why they are doing it, how they are thinking and what they are learning. When children put their thinking into words, it helps them understand concepts more successfully.

Talking about math is not just giving answers to questions like  $8 + 6 = ?$ . It's students using their own language to make sense of what they are learning. It helps them to clarify their ideas. It helps them to connect new concepts to what they already know.

Teachers and parents can encourage math talk by being good listeners. When we listen to a child talk about how he or she figured out a particular answer, we get a picture of how the child is thinking and at what level of understanding. We can encourage children to explain their ideas clearly. We can help them organize their ideas by asking questions that focus their thinking. We can ask open-ended questions that promote math talk.

# MATH TALK

Students, Parents and Teachers

# COMMUNICATING



talking through the thinking involved in solving a problem helps to clarify and improve thinking



demonstrating with concrete materials



listening to and respecting the ideas of others



discussing how to go about solving a problem: - what should be done? - what would be a reasonable answer?



asking questions

thinking aloud, talking to oneself



sharing ideas, explaining clearly their thinking in solving a problem



talking about what they are doing during a math task gives the teacher a clearer picture of students' thinking and understanding of the activity



discussing math activities helps develop thinking and broaden understanding



sharing writing and records (diagrams, graphs) used in solving a problem

