Problem Solving in Mathematics - Overview

“We can’t solve problems by using the same kind of thinking we used when we created them.” – Albert Einstein

What is a math problem?

A math problem is a task that has the potential to provide intellectual challenges that can enhance students’ mathematical development (NCTM Problem Solving Research Brief, 2010). A true problem requires students to use prior learnings in new ways and contexts (AB Ed. Mathematics K-9 Program of Studies).

What might be some elements of a math problem?

- Set in contexts that are intriguing or the mathematics that emerges is intriguing
- Accessible for a wide range of learners
- Challenging for learners at different levels
- Allow for different methods and alternative solutions
- Allow students to broaden skills or mathematical content knowledge
- Have the potential for revealing patterns or leading to generalizations
- Have the potential for making connections between areas of mathematics
- Encourage creativity, collaboration and discussion
- Encourage learners to develop confidence and independence

Examples:

For Division 1 students:

Place each of the numbers 1 to 5 in the V shape below so that the two arms of the V have the same total. How many different possibilities are there? What do you notice about all of the solutions you find?
For Division 3 students:

Can you find every number between 1 and 20 using only four 4’s and any operation? For example, we can write $5 = \sqrt{4} + \sqrt{4} + \frac{4}{4}$. Can you go beyond 20? Can you use four 4’s to find negative integers?

**Why do we study problem solving in math?**

Learning through problem solving is the focus of mathematics at all grade levels. Students build conceptual understanding and procedural fluency through rich questions that foster engagement and curiosity in learning mathematics. As students discuss and explain their methods and solutions, they become confident and capable critical thinkers and risk-takers.

**How can I support my child in problem solving at home?**

You can help support your child at home to make sense out of the problem being studied. Ask questions about why a particular procedure works. When looking over your child’s work, focus both on right answers and on how they got them. If you have another way to do something, share it. Help your child see mathematics as being user-friendly. Try asking them the following questions:

- Can you show me how you got that?
- Is that answer reasonable? Does that make sense?
- What are you trying to find out?
- What could you do as a first step? Would a diagram help?
- What questions do you still have?

**References:**

Alberta Education Mathematics K-9 Program of Studies
NRICH - enriching mathematics [http://nrich.maths.org/frontpage](http://nrich.maths.org/frontpage)