1.5

Focus on Selecting Tools and Computational Strategies

Strand:
Number Sense and Algebra

Student Text Pages
23 to 28

Suggested Timing
160 min

Tools
- square tiles
- linking squares
- grid paper
- geoboards
- square dot paper
- tangrams

Related Resources
BLM A5 Problem Solving Checklist
BLM 1.5.1 Practice: Focus on Selecting Tools and Computational Strategies
BLM G10 Grid Paper
BLM G7 Square Dot Paper
BLM 1.5.2 Tangram

Mathematical Process Expectations Emphasis

- ☐ Problem Solving
- ☐ Reasoning and Proving
- ☑ Reflecting
- ☑ Selecting Tools and Computational Strategies
- ☑ Connecting
- ☑ Representing
- ☑ Communicating

Specific Expectations

Manipulating Expressions and Solving Equations

NA2.01 simplify numerical expressions involving integers and rational numbers, with and without the use of technology;

NA2.02 solve problems requiring the manipulation of expressions arising from applications of percent, ratio, rate, and proportion.

Link to Get Ready

The Get Ready segments Operations With Fractions, Operations With Integers, and Order of Operations provide the needed skills for this section. Students should complete all the Get Ready questions before starting this section.

Warm-Up

Have students work through the Get Ready sections mentioned above, or similar examples.

Teaching Suggestions

- This section focuses on the process of selecting the right tools and computational strategies for the problem at hand. You may wish to use **BLM A5 Problem Solving Checklist** to assist you in assessing your students. The use of graphing calculators and dynamic software, such as *The Geometer's Sketchpad*® and *Fathom*™, are left to the appropriate sections in future chapters.
- This section also focuses on operations with rational numbers, as this expectation is barely touched upon in grade 8 and is to be embedded as needed into problems in grade 9.

Day 1:

- Have students use pentominos to act out the problem in Investigate A. Have students work with a partner for this investigation. (15 min)
- Investigate B allows the student to select the appropriate tool. Most students will select a calculator. Others will do the calculations in their head or on paper. Allow the students to develop their own strategies for solving this problem. Students will end up with different descriptions of their patterns. (15 min)
- Have a class discussion on how and when to select the appropriate tools. Explain to students that not all problems require a model or diagram in order to visualize it. Calculators need not be the tool of choice for calculations. It is recommended that grade 9 students have calculators, graph paper, a ruler, and a variety of writing implements available. (10 min)
- Discuss question C1 in Communicate Your Understanding with the class before assigning exercises. (10 min)
- Assign and take up Practise questions 1a) to d). (10 min)

Common Errors

- Some students may have difficulties with adding and subtracting rational numbers.

R_x Remind students to find the common denominator, as they did with positive fractions. Place the sign in the numerator, and then hide the denominator to perform the operations as if the numerators were integers.

- Some students may have difficulties selecting the right tools.

R_x This may stem from a lack of ability with the tools. Have the students review their solutions in previous sections, looking at how they used diagrams, in particular. The key is selecting the right tool, so having a list of available tools will help, along with an explanation and example of when it is appropriate to use each tool. Question 5 in Practise will help.

Ongoing Assessment

- Communicate Your Understanding questions can be used as quizzes to assess students' Communication skills.

Accommodations

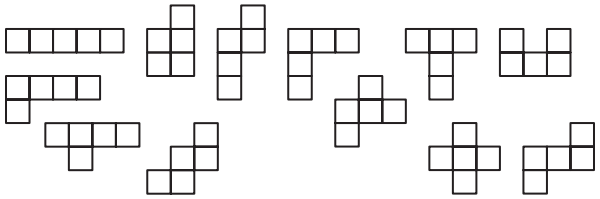
Memory—Encourage students to use cards to memorize the multiplication tables.

Day 2:

- The Example develops computational strategies that can be used with operations involving rational numbers. You may wish to supplement with more examples of a similar type. (15 min)
- Discuss question C2 in Communicate Your Understanding before assigning exercise questions. (10 min)
- Assign and take up Practise questions 2, 7, 9, and 10. (20 min)
- You may wish to use **BLM 1.5.1 Practice: Focus on Selecting Tools and Computational Strategies** for remediation or extra practice.

Investigate Answers (page 23)

A. 1. a)



c) There are 12 possible pentominos.

2. Answers will vary. A sample answer: Square tiles, linking squares, and grid paper are all effective tools.

B. 1. a) $1^3 + 2^3 = 9$

b) $1^3 + 2^3 + 3^3 = 36$

c) $1^3 + 2^3 = 9 = 3^2 = (1 + 2)^2$
$1^3 + 2^3 + 3^3 = 36 = 6^2 = (1 + 2 + 3)^2$
$1^3 + 2^3 + 3^3 + 4^3 = 100 = 10^2 = (1 + 2 + 3 + 4)^2$
The sum of the cubes of the natural numbers is the sum of the natural numbers squared.

2. a) Answers will vary.

b) The sum of the cubes of the first 15 natural numbers is 125 600.

3. Answers will vary. A sample answer: Once the first few sums were solved and the equations written out, I used logic and reasoning to look for new ways to write the numbers $(\text{e.g., } 36 = 6^2,\ 3 = 1 + 2)$, and I started to see patterns.

Communicate Your Understanding Responses (page 25)

C1. Answers will vary. A sample answer: Calculator, speedometer, odometer of the truck, and metre stick.

C2. Ted's error was rounding off the repeated decimals. He should use the $a^b/_c$ function on his calculator.

Practise

You may wish to use **BLM G10 Grid Paper** for questions 1b) and c). Most questions are fairly straightforward, as the tools are suggested.

Question 3 requires the student to visualize in three dimensions. A good tool is to build a model.

In questions 7 and 8, students will use varying strategies. Ask students who did the questions in their heads to explain how.

Connect and Apply

Assign and discuss question 11 before assigning question 12.

For question 13, have students try the folding activity with different sizes and thicknesses of paper to show that the size does not matter. Allow them to come up with their own hypotheses as to why they can't fold it more than eight times. Scientifically, it is because 256 sheets of paper are being stretched as they are folded, with the outer ones being stretched much farther than the inner ones.

A geoboard with elastics is a valuable tool to have available to answer question 15. Alternatively, you may wish to use **BLM G7 Square Dot Paper**.

In questions 16 and 17, students should be familiar with a tangram. It is a good visual tool for students to use to understand operations with rational numbers. Use **BLM 1.5.1 Tangram** for questions 16 and 17.

Extend

Question 21a) is a good indicator of level 4 reasoning, especially with justification.

In question 22, students could build a model by rolling up a piece of paper for a tube and using string. Alternatively, students could draw an opened and flattened version of the tube. Students will need to know the formula for the circumference of a circle and the Pythagorean theorem.

Exercise Guide

Category	Question Number
Day 1:	
Minimum (essential questions for all students to cover the expectations)	1, 3–6, 13
Typical	1, 3–6, 13, 15
Extension	18–21
Day 2:	
Minimum (essential questions for all students to cover the expectations)	2, 7–12
Typical	2, 7–12, 14, 16, 17
Extension	22