Application of Integer Operations

Strand: Computation and Estimation

Topic: Solving practical problems involving operations with integers

Primary SOL: 6.6 The student will
           b) solve practical problems involving operations with integers

Related SOL: 6.6a, 6.6c

Materials

- Markers
- Chart paper
- Card stock (optional)
- Practical Applications with Integers Task Cards (attached)
- Problem-solving Template (Sample) (attached)
- Problem-solving Template (attached)

Vocabulary

absolute value, integer (6.3a, 6.3c)*, order of operations* (earlier grades)

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Give students the Problem-solving Template (Sample). The template is a four-step method that requires students to:
   - Understand (U): Read and annotate the problem.
   - Plan (P): Create a plan to reach the solution.
   - Solve (S): Carry out the plan.
   - Check (C): Examine and determine the reasonableness of the obtained solution.

   A blank Problem-solving Template has been provided to meet the needs of students.

2. Place students into small groups. Provide each group with one of the Practical Applications with Integers Task Cards (attached). Consider printing on card stock to increase durability. Additional blank cards have been provided for teachers to create more problems. The tasks cards may be cut out before the lesson, or students may cut them out during the lesson. Students should use the Problem-solving Template to solve the given task.

3. Each student will be responsible for developing a sector of the template and should be prepared to share their portion of the work with the class. One student completes the U, another the P, and so on. When students are finished, have them place their work on chart paper. Then, have each group share their strategies for and solutions to the given task. Facilitate discussion using the questions below.

Assessment

- **Questions**
   - How are integers used in real life?
   - How and why is problem solving an essential skill?

- o How do you determine what is the most important information in a problem?
- o How do you determine what is not needed to solve a problem?
- o What was your plan to solve the problem?
- o Did your plan work?
- o Does creating a plan help you to become a better problem solver? Why or why not?
- o Were there any other methods that you used to arrive at your answer?
- o Is your answer reasonable? How do you know?
- o What is the most effective model for this problem, and what can we learn from it?

- **Journal/writing prompts**
  - o How does your strategy for solving a problem affect the solution that you get?
  - o How do you most effectively communicate your mathematical ideas so that others can understand?
  - o How does the nature of the problem help you to determine the most appropriate way to solve it?

- **Other Assessments**
  - o Ask students to model more than one way to solve one of the practical problems given on the Practical Applications with Integers Task Cards. Their model can include concrete manipulatives, pictorial representations, and/or an algorithm.
  - o Ask students to debate the following question: What do effective problem solvers do, and what do they do when they get stuck?

Extensions and Connections

- Before engaging in a whole-group discussion, have groups to post their chart paper of their solved problem. Give each group a different color marker (this is used to denote which group provided responses). Have groups to circulate the class using a gallery walk method. Each group should check the work of the other. If the solution is correct, place a checkmark. If there is a challenge to the solution, groups should provide their proposed solution. Students should be encouraged to add any other methods that they may use to solve the problem differently from the original group. This will help to elicit additional discussion and depth of understanding of the content.

Strategies for Differentiation

- Have students use highlighters or colored pencils to annotate each practical application problem.
- Provide students with calculators to use throughout the lesson. Demonstrate how to use the calculator when inputting negative integers.
- Provide students with the order of operations written out to use throughout the lesson.
- Review order of operations with students before introducing the lesson.

Note: The following pages are intended for classroom use for students as a visual aid to learning.
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Practical Applications with Integers Task Cards

Print on card stock for durability.

At sunrise, the outside temperature was 1° below zero. By noon, the temperature rose by 17° and then fell by 13° by nighttime. What was the temperature at the end of the day?

A submarine hovers at 240 meters below sea level. If it descends 160 meters and then ascends 390 meters, what is its new position?

Yesterday's low temperature was –3° F. Today's low temperature is 5 times as low as yesterday's low temperature. What was the low temperature today?

Carrie and Joy spent $8 for gasoline, $15 for their lunch, and $5 apiece for gifts for Grandma. If the girls left home with a total of $50, how much do they have for the return trip?

Shane is playing a board game. For his first turn, he moved ahead 3 spaces, for the second, 5 spaces, and for the third, 1 space. For his next turn, he had to go back 6 spaces. After that, he got a card that said he could move two times the biggest forward move he had done so far. Now how many spaces from the beginning is Shane's game piece?

The local movie theater reported losses of $475 each day for three days. What was the loss for the three days?

On Tuesday, the mailman delivers three checks for $5 and two bills for $2 each. If you had a starting balance of $25, what is the ending balance?

A person has a debt of $200. Five friends offer to pay all of the debt. How much does each person need to pay in order to pay off the debt?

Luke and Kim started out to visit Aunt Linda. After driving 50 miles, they saw a restaurant, and Luke wanted to stop for lunch. Kim wanted to look for something better, so they drove on for 8 miles before giving up and going back to the restaurant. After eating they traveled on for 26 more miles from the restaurant. Kim saw a sign for a classic car museum, which they decided to visit. The museum was 6 miles from their route. After returning to the main road, they drove for another 40 miles and arrived at Aunt Linda's house. How many miles is it from Luke and Kim's house to Aunt Linda's house? How many miles did they drive on the way there?

While watching a football game, Steven decided to list yardage gained as positive integers and yardage lost as negative integers. After these plays, Steven recorded 14, –7, and 9. What was the net gain or loss?

An elevator is on the 20th floor. It goes down 11 floors and then up 6 floors. What floor is the elevator on now?

During a cold front, the temperature dropped from 7° F to –4° F.

Stephanie: "I cannot believe that the temperature fell 11° F.

John: "You are incorrect. The temperature only fell 3° F."

Who is correct? Justify and explain your reasoning.

Problem-solving Template (Sample)

<u>U</u>nderstand

Read the problem. **Re-Read** the problem. **Imagine** the problem or draw a picture. **Annotate**: Underline or highlight the important information in the problem.

<u>P</u>lan

Make a Plan: Decide what to do and how to solve the problem. Will you add, subtract, multiply, or divide?

SOLUTION

<u>S</u>olve

Solve: Carry out your plan showing all work that represents your thinking.

<u>C</u>heck

Think Back: Does my final answer make sense? Is there a better way to solve this problem?

Problem-solving Template

SOLUTION	