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EDCI 405

Mini Lesson: **Integers**

Grade 7

LEARNING OBJECTIVES

This lesson is an introduction to integers and negative numbers. By the end of the lesson, students will be able to:

- locate negative integers on a number line,
- name a real world example for using negative integers,
- describe the meaning of an opposite pair,
- and successfully add single-digit negative and positive integers.

INTRODUCTION

A positive approach to negative numbers! The introduction of negative integers in Grade 7 can seem like an earth-shattering concept, it's often a whole new portion of the number line that students have never been exposed to. But these numbers were always there and we want to approach negative numbers in a way so that students understand why they exist, what they represent, and how they are used. To do this, we have based this lesson on an exploration of real world negative numbers.

This lesson involves discussion and brainstorming. We want the students to talk about their ideas for negative numbers and how they fit on the number line. We believe that taking time in math class to validate student ideas and allow them to share strategies and learn from one another is one of the most powerful ways for students to learn math.

We approach teaching negative integers using temperature as an example of a real world use of negative numbers that most students should be familiar with. The School-Based Weather Station Network provides weather data for most of the schools in Greater Victoria. This is a great opportunity to use temperature data from the students' own school, or one nearby. In an ideal world, students would be familiar with this data and would understand how weather variables can be measured and analyzed. In this case, negative numbers would certainly come up on a regular

basis. However, for the sake of this lesson, we start with the basics to provide students with a solid understanding and to clear up any misconceptions.

Prior Knowledge

- Students will have fluency in basic number facts.
- Students will understand the difference between whole numbers and fractions

Terms to be introduced:

Integer - a whole number that can be positive, negative o**r zero**

Negative number - a real number that is less than zero

Opposite pairs, or zero pairs - a pair of numbers whose sum is zero. Numbers that are equal distance from zero, on opposite sides.

CONNECTIONS TO MATHEMATICS 7

Big Idea:

Computational fluency and flexibility with numbers extend to operations with integers and decimals.

Curricular Competencies:

- Use reasoning and logic to explore, analyze, and apply mathematical ideas
- Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
- Use mathematical vocabulary and language to contribute to mathematical discussions
- Represent mathematical ideas in concrete, pictorial, and symbolic forms

Curricular Content:

Operations with integers

- Addition, subtraction, multiplication, division, and order of operations
- Concretely, pictorially, symbolically

First Peoples' Principles of Learning:

Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).

DIFFERENTIATION & PERSONALIZATION

- Students can make use of a physical number line to work through math concepts
- A variety of manipulatives will be provided during the game to further understanding

ASSESSMENT

This is an introduction lesson for integers, so all assessment will be formative. Negative integers can be confusing so we will be listening and observing closely to see which students are getting it, which aren't, and where any difficulties are arising. We will:

- Note who is actively participating in class and group discussion;
- Observe and listen for understanding.

As students work, we will prompt discussion with questions such as;

- *What kinds of integers do we use to represent temperatures above zero? Below zero?*
- *How do we know that an integer is positive/negative?*
- *What words indicate a situation that can be represented by positive integers?*

TOPIC INTRODUCTION

Initial Discussion

- Ask the students if anyone knows what an integer is.
    - *a whole number, a number that is not a fraction, it can be above or below 0.*
- Talk briefly about negative integers, and that we will be dealing only with whole numbers for now.

Real World Example: Temperature

- Why do negative numbers exist?
- What do we use them for? - *brief discussion, if no one suggests temperature we bring it up ourselves*
- A real world example of negative integers that you might be aware of is temperature. In Canada, and most other countries in the world, temperature is measured in degrees celsius (°C).
- Who knows what temperature water freezes at? *0* °C
- Are there temperatures below 0 °C?
- What are the coldest temperatures our class has experienced? *Write these on the board*
- Who remembers all the snow in January this year?
- Post some of the daily temperatures from January at your local school (we have used Lansdowne School here from Jan 7 to Jan 20, 2020), rounded to whole numbers, available from the School-Based Weather Station Network.

Date	Temperature	Date	Temperature
07-Jan	5 °C	14-Jan	-6 °C
08-Jan	-1 °C	15-Jan	-5 °C
09-Jan	-1 °C	16-Jan	-1 °C
10-Jan	3 °C	17-Jan	-3 °C
11-Jan	4 °C	18-Jan	4 °C
12-Jan	-3 °C	19-Jan	5 °C
13-Jan	-5 °C	20-Jan	7 °C

- Which of these integers show the coldest temperature? How do you know? *This value is the smallest although the absolute value of the number is not. The lowest integer is the number that is the farthest away from zero in the negative direction*
- Ask students to think about the following ideas:
    - One day in January it was -5 °C and there was 10 cm of snow in my yard, the next day it was 0 °C and there was 0 cm of snow in my yard. What do you notice about these numbers?. *5 degrees warmer, 10 cm less snow*
        - Do the zeroes on the second day mean different things in terms of °C or cm? *0 cm of snow means that there was no snow, but 0 °C does not mean there was no temperature. Discuss with students how the concept of 0 can mean different things in different contexts.*
    - In January my dad went to Botswana, the day he flew home it was 30 °C in Botswana. He landed in Calgary for a layover and it was -30 °C. What do you notice about these numbers? What difference in temperature did he experience? *The numbers are "opposite pairs". They add to zero when they are equal distance from zero. Also called zero pairs.*

Brainstorming Words

As a class we are going to create a list of words that represent positive and negative numbers

Negative
Below Down Minus Subtract Less Decrease Loss Behind Lower Backward Fall Withdraw

Positive
Above Up Plus Add More Increase Gain Ahead Higher Forward Rise Deposit

Addition with Negative Integers

We can do many of the same operations with negative numbers that we do with positive numbers. This includes addition, subtraction, multiplication and division. Today we are going to be looking at addition.

- As we add positive numbers (we go right or up on the number line), the value increases. What do you think happens when we add negative numbers? *Prompt with a reminder about "opposite pairs" that we talked about earlier. We are looking for students to suggest that we go left, or the value decreases.*
- So when we add a negative number, we count that number of steps in the negative direction. Does this remind you of anything? *This is like subtraction.*
- As a class, do some single digit addition using both positive and negative numbers, using a number line to demonstrate. Ensure that some examples will require students to count past zero on the number line.
- When the majority of students seem to be understanding this conceptual approach, do a demonstration with different coloured ones cubes on the document camera. Show how two parts of the equation can be added, and that parts of the numbers will "cancel each other out". Whatever is left is the result.
- The following problems can be used as samples for demonstrations of both addition approaches above:

    - +4 + -10 = -6
    - -5 - +6 = -11
    - +3 + -7
    - -4 + -11
    - 2 + -9
    - -3 + 8

ACTIVITY: THE WITCHES' MAGICAL SOUP

Read Aloud

In a far-off land, there was once a team of good witches who cooked up the most wonderful soups ever imagined. They prepared their mixtures over a huge cauldron, and their work was very delicate and complex.

During the cooking process, they frequently had to change the temperature of the cauldron in order to bring out certain flavors and cook the soup to perfection. They adjusted the temperature of the soups either by adding special hot cubes or cold cubes to the cauldron or by removing some of the hot or cold cubes that were already in the cauldron.

The cold cubes were similar to ice cubes except they didn't melt, and the hot cubes were similar to charcoal briquettes, except they didn't' lose their heat. If the number of hot cubes in the

cauldron was the same as the number of cold cubes, the temperature of the cauldron was 0° on their temperature scale.

For each hot cube that was put into the cauldron, the temperature went up one degree. Similarly, each cold cube put in lowered the temperature one degree.

The witches used positive and negative numbers to keep track of the changes they were making to the temperature.

For example, suppose 4 hot cubes and 10 cold cubes were dumped into the cauldron. Then the temperature would be lowered by 6° altogether shown as:

+4 + -10 = -6

Show work for these problems on another sheet of paper (if needed).

1. Each of the problems below describes an action taken by the witches. Figure out how the temperature would change overall in each of these situations and write an equation to describe the action and the overall result.

a. Three cold cubes were added and five hot cubes were added.
b. Six hot cubes were added and eight cold cubes were added.
c. Nine cold cubes were added and two more cold cubes were added.

2. Describe and solve (similar to the word problems above) involving hot or cold cubes that is represented by each of the following arithmetic expressions and state how the temperature would change overall.

a. +23 + +5 =
b. +3 + -7 =
c. -4 + -10 =

Card Game

Using the concept of the Witch's Magical Soup, the class will play a card game. You will need one deck of cards per four students. Remove all face cards from the decks. It will be two against two in a group.

1. Ask the students to get groups of 4.
2. Two of the students will be Team Positive Poisons, the other two will be Team Negative Newts.
3. The temperature of the soup will start at 0°C.

4. The value of the cards will tell the students how many cubes to add to the soup. Red cards will count as positive numbers (hot cubes), black cards will count as negative numbers (cold cubes).
5. Students will take turns playing a card, adding the value to either decrease or increase the temperature of the soup. After playing a card, they will draw another from the pile.
6. Each player will be dealt 5 cards, and then the person with the next birthday will start..
7. Students will continue playing (placing cards, adding hot/cold cubes) until one player exceeds either +10 °C or -10 °C.
8. Students can keep track of the current temperature using a thermometer number line, or using ones cubes as manipulatives.
9. Teachers will demonstrate playing a few cards of the game to ensure students understand the rules.

REFERENCES

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THERMOMETER HANDOUT