Number Sense
Adding and Subtracting Integers
Grade 7

Rationale

- Using authentic data to teach mathematics gives students the opportunity to learn a new skill in an interesting way. In this lesson students will solve problems by adding and subtracting real data to answer questions about extreme temperatures and elevation levels. Since students' answers will be attached to a concept, they will be able to use logic to determine whether their answers are correct. They can then use this experience to help them generalize procedures for adding and subtracting integers.

Goal

- To develop strategies for adding and subtracting integers

Standards

- **7.NS.1b** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
    - **b**. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

Objectives

- Students will add and subtract integers.
- Students will summarize procedures used for adding and subtracting integers.

Materials

- Activity Sheet, *Using Data to Answer Questions*, 1 per student
- Pencils
- Scratch paper
- World Map or Globe

Procedures

- Put students into pairs and distribute the activity sheet, *Using Data to Answer Questions*.
- Introduce students to the town of Oymyakon, Russia, the coldest inhabited place on Earth. On a world map, globe, or SmartBoard briefly show students Oymyakon's location (in the Eastern side of Russia, north of the Sea of Okhotsk).

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Say, "Imagine what it would be like to live in the coldest inhabited place on Earth. How would your lives differ?"

- Direct students' attention to the activity sheet and pose the following questions to the students, one at a time. Ask students to work in pairs to solve the problems, using whatever strategies they find useful. After students have found the answer to the question, hold a brief discussion about solution strategies.
  - How much warmer is Sunday's high temperature than Sunday's low temperature?
  - How much cooler is Tuesday's low temperature than Tuesday's high temperature?
  - Which day has the greatest difference between its high and low temperatures?
  - Which day has the smallest difference between its high and low temperatures?
  - If you add each day's high and low temperatures, which day would equal 0?
  - (Find out today's highs and lows in your city). How much colder is Thursday's low temperature than our low temperature today?

- Next, move on to larger numbers with the elevation activity. Direct students' attention to the elevation chart. Ask students the following questions, stopping between each one to allow students to find the answer and for a brief discussion about solution strategies.
  - How much higher is Mt. McKinley than Death Valley?
  - What is the difference in elevation between Mt. Everest and the Dead Sea shore?
  - How much lower in elevation is Lake Assal than Mt. Kilimanjaro?
  - What is the difference in elevation between Vinson Massif and Deep Lake?
  - If Death Valley and the Dead Sea were stacked together, how far below Sea Level would they be?

- Continue to pose problems to the students if more practice is needed.
- To wrap up, ask students to develop a procedure for adding and subtracting rational numbers. Have them apply their procedures to several addition and subtraction problems such as –16 + 7, –82 –15, –26 –(–40).

Teacher Tips
- Instead of making copies of the activity sheet, you can put it up on the SmartBoard or overhead projector.
- More advanced students can skip the first temperature activity and begin with the more challenging numbers in the elevation activity.
- Do not teach students how to add and subtract negative numbers. Let them discover the process using whatever solution strategies make sense to them. Have them use common sense and context to determine whether their answers make sense and, if they don't, to revise their answers. Have them look for patterns and trends in the problems.

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Extension Activities

- Plan a Social Studies unit on Oymyakon, Russia – the coldest inhabited place on Earth.
- Have students plot the temperatures or altitudes on a number line.
- Present problems to the students using cities' latitudes. Ask questions such as: How many degrees further from the Equator is San Francisco than Sydney?
- Present students with challenges such as, "Write a subtraction problem that will have a negative answer (or positive answer.)" Compare all of the students' problems. Hold a discussion about what they have in common, and what is different?
- Extend these concepts to problems involving negative fractions and decimals. Have students investigate to see if the same procedures would be used.

Using Data to Answer Questions

Oymyakon – The coldest inhabited place on Earth!

This week's weather forecast:

Day	High Temp.	Low Temp.
Sunday	9°F	– 6°F
Monday	7°F	– 9°F
Tuesday	10°F	– 9°F
Wednesday	– 5°F	–11°F
Thursday	– 6°F	–12°F
Friday	7°F	–11°F
Saturday	4°F	– 5°F

The Earth's Highest and Lowest Elevations

Location	Elevation
Mt. Kilimanjaro, Tansania	19,334 feet above Sea Level
Lake Assal, Djibouti	509 feet below Sea Level
Vinson Massif, Antarctica	16,050 feet above Sea Level
Deep Lake, Antarctica	164 feel below Sea Level
Mt. Everest, Nepal	29,035 feet above Sea Level
Dead Sea Shore, Israel	1,391 feet below Sea Level
Mt. McKinley, Alaska	20,335 feet above Sea Level
Death Valley, California	282 feet below Sea Level