Lesson 16

Posing Percentage Problems

Goals

- Generate questions (orally and in writing) about a real-world situation involving percent increase or decrease.
- Interpret news headlines or advertisements that include statements about percent increase and decrease.
- Solve a problem about a real-world situation involving percent increase or decrease and present the solution method (in writing and through other representations).

Learning Target

I can write and solve problems about real-world situations that involve percent increase and decrease.

Lesson Narrative

In this culminating lesson on percentages, students work in groups to examine news clippings that mention percentages and sort them according to whether they are about percent increase or percent decrease. Then they formulate questions about the situations and share their questions with other groups in a gallery walk. As students make sense of what information is given in the clipping and what information they could ask for in a question, they are reasoning quantitatively and abstractly.

Student Learning Goal

Let's explore how percentages are used in the news.

Lesson Timeline

Warm-up	Activity 1	Activity 2
10 min	10 min	20 min

Access for Students with Diverse Abilities

- Representation (Warm-up)
- Action and Expression (Activity 1)
- Engagement (Activity 2)

Access for Multilingual Learners

- MLR5: Co-Craft Questions (Activity 1)
- MLR7: Compare and Connect (Activity 2)
- MLR8: Discussion Supports (Warm-up)

Instructional Routines

- MLR5: Co-Craft Questions
- MLR7: Compare and Connect
- MLR8: Discussion Supports
- Take Turns

Required Materials

Materials to Gather

- Grocery store circulars: Warm-up, Activity 1
- Sticky notes: Activity 2
- Tools for creating a visual display: Activity 2

Required Preparation

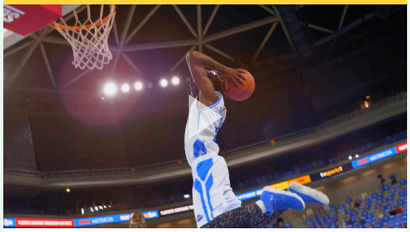
Lesson:

If possible, ask students to cut several clippings from newspapers or print advertisements that include percentages or to bring in similar items from internet searches. If not possible, bring several examples yourself. Examples include coupons, news stories, and advertisements claiming an increase in product size ("Now with 33% more soap!"). Every group of 3–4 students should have a set including a variety of contexts with some that show a percentage increase of an amount and some that include a percentage decrease in an amount.

In the final activity, each group of 3–4 students create a visual display to be used in a gallery walk based on one of the situations. Provide materials to create these displays. During the gallery walk, students will leave feedback for each group on a sticky note they can attach to the displays. Provide several sticky notes for each group.

Inspire Math

Sport Success video



Go Online
Before the lesson, show this video to introduce the real-world connection.

ilclass.com/l/614235

Please log in to the site before using the QR code or URL.

Instructional Routines

MLR8: Discussion Supports

ilclass.com/r/10695617

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Instructional Routines

Take Turns

ilclass.com/r/10573524

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Access for Multilingual Learners (Warm-up, Student Task)

MLR8: Discussion Supports.

Students should take turns finding a match and explaining their reasoning to their partner. Display the following sentence frame for all to see: "I noticed _____, so I matched ..." When students disagree, encourage them to challenge each other using these sentence frames: "I agree because ..." and "I disagree because ..." This will help students clarify their reasoning about which quantity corresponds to 100%.

Advances: Conversing, Representing

Warm-up

Sorting the News

10 min

Activity Narrative

In this group activity, students take turns sorting news clippings based on whether they involve percentage increase or decrease. This prepares students for a future activity when they will analyze some of these situations more closely.

As students trade roles explaining their thinking and listening, they have opportunities to explain their reasoning and critique the reasoning of others.

Launch

Arrange students in groups of 3–4. Provide each group with a set of newspaper clippings. Tell students that they will take turns sorting the clippings according to whether they represent a percent increase or a percent decrease and that they should explain their reasoning. If time allows, demonstrate the steps with a student as a partner. Consider demonstrating productive ways to agree or disagree, for example, by explaining mathematical thinking or asking clarifying questions.

Student Task Statement

Your teacher will give you a variety of news clippings that include percentages.

1. Take turns with your partner to sort the clippings into two piles: those that are about increases and those that are about decreases.
   a. For each clipping that you sort, explain to your partner how you decided which pile to sort it into.
   b. For each clipping that your partner sorts, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.

   No written response required.
2. Were there any clippings that you had trouble deciding which pile they should go in?

   Answers vary.

Activity Synthesis

Much discussion takes place between partners. Invite students to share how they decided the category for any clippings that were difficult to sort.

- *"What were some ways you handled ... ?"*
- *"Describe any difficulties you experienced and how you resolved them."*

If time permits, invite students to discuss any interesting contexts from the clippings.

Activity 1
Investigating

10 min

Activity Narrative

In this activity, students write questions about percent increase or decrease based on the situations that they sorted in the previous activity. They ask and answer questions based on the information given and present this information graphically. Students create questions in order to interpret a situation, then reason abstractly and quantitatively to answer their questions in the context of the situation.

Students will continue working with the questions they create in the following activity, so it is not necessary to have a whole-class discussion at this point in the lesson.

Launch

Keep students in the same groups. Tell students they will use the clippings from the *Warm-up* to write mathematical questions about the situation.

Student Task Statement

In the previous activity, you sorted news clippings into two piles.

1. For each pile, choose one example. Draw a diagram that shows how percentages are being used to describe the situation.
   a. Increase Example:
   b. Decrease Example:
2. For each example, write *two* questions that you can answer with the given information. Next, find the answers. Explain or show your reasoning.

Answers vary.

Activity Synthesis

Continue to the next activity.

Activity 2
Displaying the News

20 min

Activity Narrative

In this activity, students work in groups and make a poster using one of their news items. Next, students go on a gallery walk and use sticky notes to ask questions about the information presented on each poster. They practice critiquing the reasoning of others as they study information they have not themselves worked on. They then go back and study the feedback they received from their classmates and revise their own work.

Access for Students with Diverse Abilities (Warm-up, Student Task)

Representation: Access for Perception.

Ask students to read the news clippings aloud to their partners. Students who both listen to and read the information will benefit from extra processing time.

Supports accessibility for: Language, Attention

Instructional Routines

MLR5: Co-Craft Questions

ilclass.com/r/10695544

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Access for Multilingual Learners (Activity 1, Student Task)

MLR5: Co-Craft Questions.

Keep student workbooks or devices closed. Display the statement "Global human population growth amounts to around 75 million annually, or 1.1% per year" for all to see. Give students 2–3 minutes to write a list of mathematical questions that could be asked about this situation, before comparing their questions with a partner. Invite each group to contribute one written question to a whole-class display. Ask the class to make comparisons among the shared questions and their own. Reveal the questions "What was the original population before this growth?" and "What is the new population after this growth?" and invite additional connections.

Advances: Reading, Writing

Access for Students with Diverse Abilities (Activity 1, Student Task)

Action and Expression: Provide Access for Physical Action.

Activate or supply background knowledge. Provide students with access to examples of tape diagrams and double number line diagrams to support information processing.

Supports accessibility for: Visual-Spatial Processing, Organization

Instructional Routines

MLR7: Compare and Connect

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Access for Students with Diverse Abilities (Activity 2, Student Task)

Engagement: Develop Effort and Persistence.

Provide rubrics or checklists that focus on increasing the length of on-task orientation in the face of distractions. For example, provide a checklist which makes all the required components of the poster explicit.

Supports accessibility for: Attention, Social-Emotional Functioning

Access for Multilingual Learners (Activity 2, Synthesis)

MLR7: Compare and Connect.

After the gallery walk, lead a discussion comparing, contrasting, and connecting the different displays. Ask,

"What did the problems have in common? How were they different?"
"What kinds of additional details or language helped you understand the displays?"
"Were there any additional details or language that you have questions about?"

To amplify student language and illustrate connections, follow along and point to the relevant parts of the displays as students speak.

Advances: Representing, Conversing

Launch

Keep students in the same groups. Distribute supplies to make posters. Tell students that they will choose one of their news clippings and make a visual display for the information they worked on in the previous activity. The posters should include all necessary information so that somebody who has not extensively worked with the same information can understand the work. Encourage students to include details that will help others interpret their thinking, for example, specific language, use of different colors, shading, arrows, labels, notes, or diagrams or drawings.

Give students 10 minutes to create their displays.

Student Task Statement

1. Choose the example that you find the most interesting. Create a visual display that includes:
   - A title that describes the situation.
   - The news clipping.
   - Your diagram of the situation.
   - The two questions you asked about the situation.
   - The answers to each of your questions.
   - An explanation of how you calculated each answer.

   Pause here so your teacher can review your work.
2. Examine each display. Write one comment and one question for the group.
3. Next, read the comments and questions your classmates wrote for your group. Use the feedback from your classmates to revise your display.

Answers vary.

Activity Synthesis

After all groups have finished, display each group's work around the room for students to do a gallery walk. Tell students that they should leave feedback on a sticky note attached to each group's work. Feedback can include questions about the display or information as well as compliments or critiques. Comments and questions should be constructive with the goal to help the groups who made the poster improve their work. Consider displaying sentence frames for students to use when asking questions about features of the visuals displays they do not understand. For example, "Why did you ____?" "How did you ____?" "What does this part of _____ mean?" Tell each group which poster to start with and in which direction they should move.

As groups finish viewing the displays, allow them time to view the feedback left on their own display and, if necessary, time to improve their display based on the feedback.

Lesson Summary

Statements about percent increase or decrease need to specify what the whole is to be mathematically meaningful. Sometimes advertisements, media, etc. leave this part ambiguous in order to make somewhat misleading claims. We should be careful to think critically about what mathematical claim is being made.

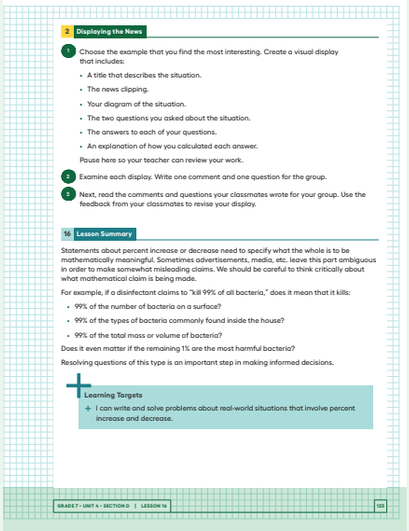
For example, if a disinfectant claims to "kill 99% of all bacteria," does it mean that it kills:

- 99% of the number of bacteria on a surface?
- 99% of the types of bacteria commonly found inside the house?
- 99% of the total mass or volume of bacteria?

Does it even matter if the remaining 1% are the most harmful bacteria?

Resolving questions of this type is an important step in making informed decisions.

Student Workbook



2 Displaying the News

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Learning Targets

+ I can write and solve problems about real-world situations that involve percent increase and decrease.

GRADE 7 • UNIT 4 • SECTION D | LESSON 16 103