Percents Make Sense

Defining and Calculating with Percents

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Grade Level	6th Grade	**Time Frame**	2-3 class period(s)
Subject	Mathematics	**Duration**	120 minutes
Course	Middle School Mathematics		

Essential Question

What is a percentage?

Summary

Students construct a definition of "percent" and learn how to calculate percentages.

Snapshot

Engage

Students use their prior knowledge to compare fractions and decimals and determine what kinds of fractions and decimals are easiest to compare and convert.

Explore

Students create a definition of "percent" and use the definition to find percentages.

Explain

Students explain why percentages are useful and then compare responses to a peer and to a prepared response before revising their own work.

Extend

Students extend their knowledge of percentages to create a method for finding percentages based on a proportion. Students calculate multiple percentages using a dice game.

Evaluate

Students write their own percentage problems and solution guides that apply percentages to three unique situations of their choosing.

Standards

Oklahoma Academic Standards for Mathematics (Grade 6)

6.N.1.3: Explain that a percent represents parts "out of 100" and ratios "to 100."
6.N.1.4: Determine equivalencies among fractions, decimals, and percents. Select among these representations to solve problems.

Attachments

- Lesson Slides — Percents Make Sense.pptx
- Percents Make Sense Evaluation Worksheet - Spanish.docx
- Percents Make Sense Evaluation Worksheet - Spanish.pdf
- Percents Make Sense Evaluation Worksheet Possible Solutions for Part 1 - Spanish.docx
- Percents Make Sense Evaluation Worksheet Possible Solutions for Part 1 - Spanish.pdf
- Percents Make Sense Evaluation Worksheet Possible Solutions for Part 1.docx
- Percents Make Sense Evaluation Worksheet Possible Solutions for Part 1.pdf
- Percents Make Sense Evaluation Worksheet.docx
- Percents Make Sense Evaluation Worksheet.pdf
- Percents Make Sense.pdf
- Percents make sense - Nets for Dice - Spanish.docx
- Percents make sense - Nets for Dice - Spanish.pdf
- Percents make sense - Nets for Dice.docx
- Percents make sense - Nets for Dice.pdf
- Possible Questions for Dice Game - Spanish.docx
- Possible Questions for Dice Game - Spanish.pdf
- Possible Questions for Dice Game.docx
- Possible Questions for Dice Game.pdf

Materials

- Graph paper
- Net for dice (attached)
- Percents Make Sense PowerPoint (attached)
- 5-10 handheld whiteboards
- Possible Questions for Dice Game (attached)
- Percents Make Sense Evaluation Worksheet (attached)
- Percents Make Sense Evaluation Worksheet Possible Answers to Part 1 (attached)

Engage

Teacher's Note

Be sure to cut out and fold up the two cube nets included in this lesson before beginning.

Group students into threes (preferred) or pairs. Display the **slide 1** of the attached **Lesson Slides**. Use the I Notice, I Wonder strategy and have students record their notices (observations) and wonders (questions) in their notebooks. Once each group has recorded at least once notice and one wondering, go around the room and have each group report one one notice and one wonder they wrote down. Record this on the board or some other place easily seen by all students.

Ask students which of the notices were mathematical. Circle these notices. Then ask students which wonderings were mathematical. Circle these wonders.

Teacher's Note

Students should wonder what fraction of the rounds the fourth team won and how many rounds were played. If these are not mentioned, you may want to add them to the list as your own wonders.

Ask students which of the mathematical wonders could be answered using the mathematical notices. Discuss which wonderings are solvable and which are not. Make sure students explain their reasoning during the discussion.

Have students work in their groups to attempt to answer any wonders that they decided were solvable using the mathematical notices made.

Teacher's Note

Students should be able to determine what fraction of the rounds the fourth team won. However, they cannot solve for the number of rounds played. They could determine that at least 60 rounds were played; however, any multiple of 60 would also be a possible answer for the number of rounds played.

Have each group display one solution to one wonder on a document camera or have that group work out their solution on the board. After each group shares their solutions, ask if any other groups disagree or if they found the solution a different way. If so, have them display their work as well. Discuss the multiple solutions with the class to determine if they are both valid or if only one is valid. Continue until all groups have presented and all solvable wonders have been addressed.

Explore

Move forward to the **slide 2** of the PowerPoint. Ask students to work in their groups to consider the wonders and think about possible solutions. After several minutes, ask each group to share their thinking.

After each group has shared, click forward to **slide 3**. Explain these directions to the students. Let students work on these problems until all groups have written a process statement in the form provided on the PowerPoint.

Have each group read this statement aloud to the class. Ask the class to determine if they agree with this statement.

Teacher's Note

Most groups will restrict the fractions to those with a denominator of 10 or 100 (or some other power of 10). Be sure that the process they create works for all numerators. For example, some groups may say that, for a fraction with a denominator of 10, you can simply place a decimal point in front of the number in the numerator to make the decimal equivalent, but this does not work for improper fractions like 16/10. Likewise, if students restrict fractions to those with denominators of 100, verify that the process they created works for one-digit, two-digit, and three-digit numerators.

Explain

Click forward to **slide 4** (the first green slide). Give students five minutes to try to create definitions of "per" and "cent." Have several students share their responses before moving forward to **slide 5**. Explain this slide to students and then move forward to **slide 6**.

Allow students to work in pairs to complete the question that appears on slide 6. After a minute, let students volunteer answers. Then click the slide to reveal the visual representation of the whole. Explain this representation. Repeat this process for the remainder of the questions on slide six.

Pass out graph paper. Tell students that they are to use the graph paper to create a visual representation of the percentage for the remainder of the questions. Click to **slide 7**. Give students 5-10 minutes to work through this question and create their visual representations. After they are complete, have several pairs share their representations by holding them up for the class to see or displaying them on a document camera. After several pairs have shared, click through the remainder of slide 7 and discuss the representations shown.

Repeat this process for **slides 8 and 9**.

Move forward to **slide 10**. Have students record their answers to these questions in their notebooks or an Exit Ticket.

After students have recorded their responses (or at the beginning of class the next day, if using an exit ticket), have students pair together to compare and contrast their responses. Discuss some of the differences they found in their answers as a whole group. Finally, move forward to **slide 11**. Have students critique the responses recorded on this slide. Allow students to suggest additions or changes to these responses. Make sure they explain why they feel the change in necessary. Finally, allow students to edit and rewrite their own responses to these questions.

After they have recorded their final responses, click forward to **slide 12**. Have students copy the chart on the slide in their notebooks and fill it in to summarize and refresh their minds about the previous activity.

Teacher's Note

You may need to explain what the chart means when it asks for the "equivalent number" out of 100. If necessary, refer back to slides seven, eight, or nine to illustrate that they are asking for the number of shaded squares out of the total 100 squares shown on the slide.

Move forward to **slide 13**. Ask students to compare the two fractions in each row. Is the first one greater, less than, or equal to the second? Students should recognize that the two fractions in each row are equivalent.

Click forward to **slide 14**. Confirm for students that each row of fractions are equivalent. Ask students to describe how they determined that each pair of fractions were equivalent. Have several students share their methods.

Teacher's Note

Methods may include multiplying the numerator and denominator of the first fraction by the same number to get the second fraction, entering each fraction into a calculator and getting the same result, or cross-multiplying the fractions and getting the same result.

Click to slide 14 so that the numerators on the right side are circled and a new question appears at the bottom of the slide. Use a Think, Pair, Share strategy to elicit student responses. Students should recognize that the numerators are the percents found earlier. Click one last time and have students record this finding in their notebooks.

Forward to **slide 15**. Arrange students into groups of two or three and allow them several minutes to try to work out the problem. After several minutes (or when you start to notice frustration rising) go around the room and have each group share their thinking and what they have done with the problem so far. Tell students that you are going to give them more time to try to solve the problem, they might try another group's method if it seems more promising.

After several more minutes, have them share their progress again. Continue until most groups have reached a solution. Then move forward to repeat the process with **slides 16 and 17**.

After most groups have solved all three problems, move to **slide 18**. Have students record these questions and their responses in their notebooks or math journals.

Extend

Teacher's Note

Be sure to have the nets for the dice in this game prepared!

Tell students that they will be playing a game about percentages. Have students divide into teams of five or six players each. Give each team a whiteboard. Explain the rules of the game are as follows:

Teams will take turns sending one player to the front of the room to roll the dice.

Teacher's Note

It is often helpful to have the students roll the dice on the surface of a document camera, so all students can see the result.

Once the dice have been rolled and students know the results, each team must work together to form a percentage question using the two terms shown on the dice. For example, if the dice show "Boys in this class" and "wearing red," students could either ask the question "What percent of boys in this class are wearing red?" or "What percent of the people wearing red in this class are boys?" The first team to create a percent question *that has not already been asked* earns a point for the team. Once a team has created a proper question, write the question on the board or on the document camera. The team that created the question earns a point, then each team must work together to try to answer the question. When they have found a solution, they record it on their whiteboard. Once all groups have recorded a solution, each group holds up their whiteboard. Call on one team with the correct answer to share their work and solution with the class. Then, any team with the correct answer earns a point. After points are awarded, one person from a different team will roll the dice to start the next round. If no team is able to make a new question from the roll of the dice, then the team who is rolling is awarded a point and gets to roll again.

Teacher's Note

You can continue playing this game until all possible questions (included on the questions handout of this lesson) are asked or until you're satisfied that students understand how to find a percentage.

Evaluate

Students complete the questions on the attached **Evaluation Worksheet**. After students complete the worksheet, have students exchange their worksheet with a partner. Direct students to peer review part one of the worksheet for their partner and write a solution guide to their partner's five questions in part two.

Resources

- K20 Center. (n.d.). Bell Ringers and Exit Tickets. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505d6f2
- K20 Center. (n.d.). I Notice, I Wonder. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f507d1a7
- K20 Center. (n.d.). Think-Pair-Share. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5064b49