Grade 6 Meaning of percent

6.N.6	
Demonstrate an understanding of percent (limited to whole numbers) concretely, pictorially, and symbolically.	1. Explain that "percent" means "out of 100." 2. Explain that percent is a ratio of a certain number of units to 100 units. 3. Use concrete materials and pictorial representations to illustrate a percent. 4. Record the percent displayed in a concrete or pictorial representation. 5. Express a percent as a fraction and a decimal. 6. Identify and describe percents from real-life contexts and record them symbolically. 7. Solve a problem involving percents.

Clarification of the outcome:

- The outcome concerns understanding percent and equivalents for it (e.g as a fraction).
- The approach developed for solving percent problems relies on an understanding of ratio and the container model for ratio. It does not involve using the procedural shortcut that involves treating 'of' as a way to say 'multiply' (e.g. 5% of 200 is .05 x 200). The procedural shortcut tends to be magical for students.

Required close-to-at-hand prior knowledge:

- Understand fractions as part of a whole.
- Understand equivalent fractions.
- Understand decimals to hundredths.
- Understand ratio and can solve simple ratio problems, using the container model.

  [Refer to: Meaning of ratio]
- Can convert fractions to decimals and vice versa.

SET SCENE stage

The problem task to present to students:

Have students collect occurrences of percent in newspapers, magazines, and flyers and then make a collage. You will have to tell them to look for the word ‘percent’ and the symbol ‘%’.

Comment:

The purpose is to have student become aware of the existence of percent and its relevance to worldly matters.

DEVELOP stage

Activity 1: Addresses achievement indicators 1 and 6, and revisits SET SCENE.

- Discuss the collage as to how and where percent is used. Ask students why percent was invented. Accept all responses. Do not provide a reason yet. Tell them that a reason should become clear after they play the waste paper basketball game.
- Have students play the waster paper basketball game. You need four waste paper baskets (or cardboard boxes). Make the distance from the throwing line to the "basket" about 4 metres (the same for each group). Organize students into four groups, where one group has 5 students (the group with 5 balls) and the remaining groups consist of five or more students (this assumes there are at least 20 students in the class). Each group has a different, but specific, number of **paper** balls (5 balls, 10 balls, 20 balls, 25 balls) to throw at a waste paper basket. Each group throws its allotted paper balls at the basket by having each student in the group throw 1 or more balls (it depends on how many students in the group and on how many balls the group has to throw). Each group keeps track of how many balls land in the basket. For example, suppose group #1 has 5 students in it and 5 balls to throw. Each student throws 1 ball. Two of the five balls land in the basket.

Note:

The total number of balls thrown by a group must be exactly the number of balls assigned to the group. For example, suppose a group consists of 7 students and has 20 balls allotted to it. Then 6 students would throw 3 balls and one student would throw 2 balls (6 x 3 + 1 x 2 = 20).

- Have the groups display the results of playing the game (how many balls landed in the basket and how many balls were thrown). Discuss which group won the competition. Use the discussion to help them realize that deciding who won is difficult because each group threw a different number of balls.
- Ask them what might be a useful number of balls to use as a common baseline. [Provide hints: How many cents in a dollar? How many years in a century?] Ensure that the number 100 emerges as the common baseline. Have students convert their 'balls landing in the basket' fractions to fractions out of 100 (e. g. For group #1, 2 of 5 balls landed in the basket becomes 40 out of 100). Have them use the results to decide which group won. Now you write their fractions out of 100 in a percent way (e. g. for group #1, 40 out of 100 becomes 40%) and tell students that the percent notation is just another way to write a fraction out of 100. Discuss percent notation as a **different writing style** for a fraction idea. One advantage of the percent notation is that it requires less "ink" to write the same idea (e. g. compare 40% to 40/100).

Activity 2: Addresses achievement indicators 1, 3, 5, and 6.

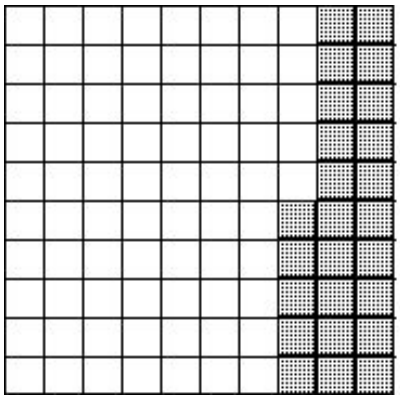
- Present students with computer loading bar pictures and ask them to estimate what percent has been loaded. [See the example.]

About half of tthe loading bar is shaded.
This means about 50% of the loading is done.

- Ask students to draw three different loading bars, estimate the amount loaded as a percent, and change the percent to a fraction.

Activity 3: Addresses achievement indicators 1, 3, 4, 5, and 6.

- Present a picture of a hundred grid and shade some of the small squares. Ask students to tell what fraction of the hundred grid is shaded. [See the example.] Ask students to write the fraction as a percent and as a decimal. Discuss the relationship between the three ways out writing "out of 100". Repeat about three times, using different shadings.
- Reverse the direction of the activity. Provide hundred grids and ask students to show specific percents on them (e. g. shade in 30%). Have them write the percent as a fraction and as a decimal.



25 of the 100
squares are shaded.
This means 25% are shaded.

- Present students with a hundredths decimal less than 1 (e. g. .21). Have them represent the decimal as a fraction and a percent and show it on a hundred grid. Repeat about three times.

Activity 4: Addresses achievement indicators 1, 5, and, 6, and practice.

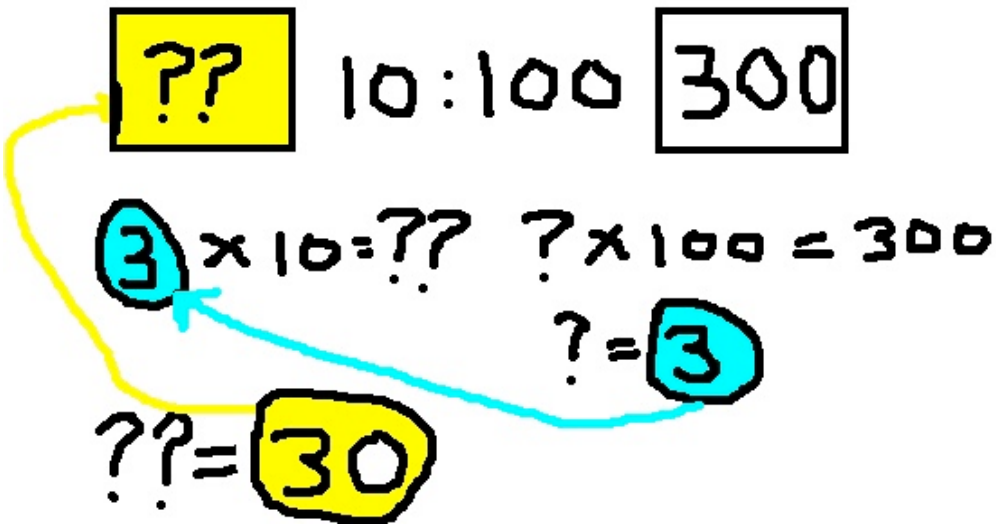
- Provide students with the following 'Favorite Physical Education Activities' data: Basketball 25%, Soccer 15%, Field Hockey 10%, Dancing 10%, Volleyball 30%, Gymnastics 10%. Have them translate the percents into fractions and decimals.

Activity 5: Addresses achievement indicators 1, 5, and, 6, and practice.

- Organize students into groups. Provide each group with print material (e. g. a newspaper). Have each group randomly select a paragraph from the print material. Have each group count off the first 100 letters in the selected paragraph, count the number of vowels and consonants in the sample, and display the results as percent, fraction, and decimal. Have the groups present their findings. Discuss them as to different/same and why.

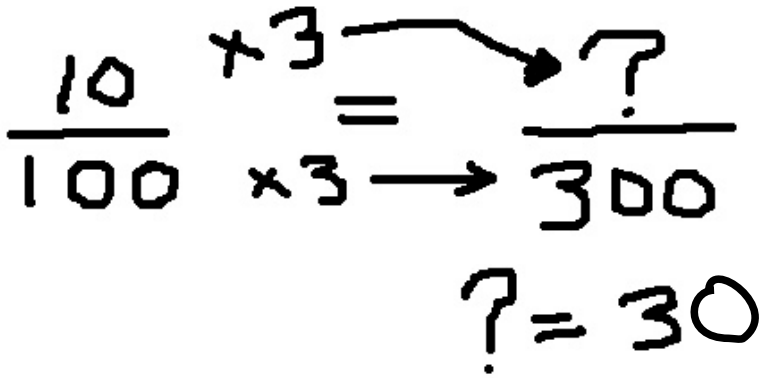
Activity 6: Addresses achievement indicators 1, 2, 6, and, 7, and revisits SET SCENE.

- Revisit the students' collages and discuss the meaning (in terms of 'out of 100') of some of the percent examples found in the collages. Ask students to tell what it means when someone says, "100% of the job is done." Ask students to describe other situations involving 100% (e.g. all of the loading bar is shaded).
- Ask students to describe what it means when someone says, "50% of the job is done." Ask students to describe other situations involving 50%.
- Ask students to express 5% as a ratio. 18% as a ratio. 45% as a ratio. Discuss their responses. Ensure that they realize that percent is also the ratio of a specific number of units to 100 units (e.g.: 5% is 5: 100).
- [If necessary, refresh students on the container model of ratio). [Refer to: Meaning of ratio]
- Select one of the precent situations from a collage (e.g.: 10% off sale on T-shirts). Create a percent problem (where the known number is a multiple of 100) for that situation (e.g.: *A bike normally costs $300. How much does it cost if it is on sale for 10% off?*). Ask students to use ratio to solve the problem. Discuss their strategies. Ensure they can use the container model of ratio to solve the percent problem (see below). Repeat three times (select situation, create problem, etc.).



Activity 7: Addresses achievement indicators 1, 5, 6, and, 7, and revisits SET SCENE.

- Refresh students on equivalent fractions for which the denominators are provided and where the denominators eventually become multiples of 100 (e.g. 1/2 is equivalent to ?/10 to ?/20, to ?/50, to ?/100, to ?/200, to ?/300, . . .).
- Revisit the students' collages. Select one of the precent situations from a collage (e.g.: 10% off sale on T-shirts). Create a percent problem (where the known number is a multiple of 100) for that situation (e.g.: *A bike normally costs $300. How much does it cost if it is on sale for 10% off?*). Ask students to use equivalent fractions to solve the problem. Discuss their solutions. Ensure they can use equivalent fractions to solve the percent problem (see below). Repeat three times (select situation, create problem, etc.).



- Discuss the similarity between using the container model and using equivalent fractions methods. Ensure they realize that the methods are similar in that the multiplier x 100 needs to be found for each method and that multiplier is used to calculate the answer.

Activity 8: Addresses achievement indicators 1, 2, 5, 6, 7, practice, revisits SET SCENE.

- Organize students into at least 5 groups. Each group creates a percent problem, based on a collage situation. Ensure that the known number for the problem is a multiple of 100 and that the 'percent of' number is a whole number between 1 and 100 (e.g: '18% of 500' type of numbers).
- Each group solves its problem using the container model of ratio and the equivalent fractions method.
- Each group makes sufficient copies of the problem to share with the other groups (the copies do not include the solution methods). Each groups shares its problem with all of the other groups.
- Each group solves its given problems using either the container model of ratio or the equivalent fraction method. The solutions are presented and discussed.

Activity 9: Assessment of teaching.

- Present students with five questions:

(1) Show 34% on a hundred grid.

(2) Describe what it might mean when someone says, "10% of the job is done."

(3) Write 67% as a fraction.

(4) Change .45 to a percent.

(5) Solve the problem: *A skateboard normally costs $400. It is on sale for 15% off. What does it cost on sale?*

If all is well with the assessment of teaching, engage students in PRACTICE (the conclusion to the lesson plan).

An example of a partial well-designed worksheet follows.

The worksheet contains a sampling of question types. More questions of each type are needed.

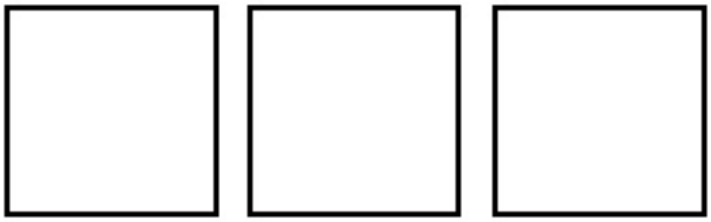
The MAINTAIN stage follows the sample worksheet.

Question 1.

Shade 25% of the square.

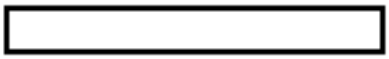
Shade 40% of the square.

Shade 85% of the square.



Question 2.

Show 30% on the computer loading bar.



Question 3.

Write 7% as a fraction and as a decimal.

Write 82% as a fraction and as a decimal.

Question 4.

Write 17/100 as a percent.

Write .64 as a percent.

Question 5.

Write 4/5 as a percent.

Write 3/4 as a percent.

Write 3/5 as a percent.

Write 7/10 as a percent.

Write 4/25 as a percent.

Write 9/50 as a percent.

Question 6.

What is 8% of 500?

What is 2% of 300?

What is 45% of 200?

What is 60% of 1000?

What is 32% of 600?

MAINTAIN stage

Mini-task example

Every so often:

- Provide students with a percent conversion task (e.g. Write 7% as a fraction and as a decimal).
- Provide students with a simple percent problem (e.g. What is 4% of 600?) Ask them to solve it using the container model of ratio and the equivalent fractions method.

Rich-task example #1

Have students survey 25 students to find the number of siblings they have. Have students organize the data into five categories: 0, 1, 2, 3, 4 or more and label and have them represent the results in a hundred grid, drawing and writing the percent. [Note that this requires them to chnage a fraction out of 25 to a fraction out of 100.] Students complete a second hundred grid using second-hand data from Stats Canada to show National trends. Students make bar graphs of both sets of results. Students compare the two sets of bar graphs and consider what conclusions can/cannot be drawn from them.

Comments

This is a rich-task because it integrates statistics with percent, and is a complex project.

Note that you can register with Statistics Canada (Census) and get access to Census information.

Rich-task example #2

Provide students with a store purchase list where the numbers are all multiples of 100 (e.g. bought $200, $700, $100 worth of stuff). Ask students to calculate the Manitoba sales tax (PST) and the goods and services tax (GST) on the purchases and then figure out the final cost to the person who bought the stuff. [NOTE: This problem can be dressed up in many ways - do so.]