**The Number Strand: Outcome N7.4**

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| **Outcome** | **Indicators** | | |
| N7.4 Expand and demonstrate an understanding of percents to include fractional percents between 1% and 100%.  [C, PS, R]  *In support of the K-12 Mathematics goals of Number Sense and Logical Thinking and Mathematical Attitude.* | 1. Express a percent as a decimal or fraction. 2. Solve a problem that involves finding a percent. 3. Solve problems that involve finding percents of a value. 4. Determine the answer to a percent problem where the answer requires rounding and explain why an approximate answer is needed (e.g., total cost including taxes). 5. Explain the meaning of a percent given in a particular context. 6. Make and justify decisions, or suggest courses of action based upon known percents for the situation. | | |
| **Learning Space:**  [**Top**](#top) | | | |
| In grade 6, students began their formal investigation of percents by looking at representing (concretely, visually, and in a variety of symbolic formats), identifying contexts that involve percents and interpreting whole numbered percents less than 100%. In grade 7, the students continue their exploration of percents by expanding to decimal percents between 1% and 100% and applying percents within problems that involve percents of a given quantity or determining a percent. With the introduction of fractional percents, the students also begin to encounter situations in which rounding and approximate values play a role. Moreover, the students’ learning related to this outcome should directly complement the students learning outcome N7.3 “Demonstrate an understanding of the relationships between positive decimals, positive fractions (including mixed numbers, proper fractions and improper fractions), and whole numbers.”  Although it occurs commonly in a daily lives, percent is an abstract notion that is based in the concept of fractions (out of 100). Students will need to engage in a variety of experiences that expose them to visual and concrete understandings of percent as well as how to represent those understandings in the alternate forms of percent, decimal and fraction (including improper fractions and mixed numbers). Pictorial and concrete approaches should also be used to introduce the students to solving of problems and interpreting situations that involve percents.  At the grade 7 level, problem solving and percents include contexts where students are asked to determine the percent of a non-percent quantity (e.g., 4 ½ % of 20 people, not 4 ½ % of an original 20%) and to express the relationship between two quantities as a percent. Students will need a strong understanding of the mathematics and the reasoning behind these concepts and cannot be dependent upon abstract rules without understanding.  There are many possibilities for the students’ study of percents to be enriched by the integration of this topic into many of the other grade seven subjects. For example, the students’ will encounter many examples of percents in health education when they are analyzing, considering factors, and posing and solving problems related to Canada’s food guide. As well, students could research population increases and decreases in social studies, or statistics involving percents related to their study of career guidance. Connections can also be made between this outcome and other mathematical content that the students encounter in this grade, including their study of probability and circle graphs. | | | |
| **What Students Should…**  [**Top**](#top) | | | |
| **Know**   * The symbol for percent is %. * How to write and read percent statements (e.g., 7 % is read as 7 percent and thirty percent can be written as 30%) * P*ercent* means “out of 100”. | | **Understand**   * The relationships between percents, decimals, and fractions. * Why some situations require percents to be rounded off while others do not. * The meaning of a percent in a particular context. * Why a situation can be described using a percent. * How to read a fractional percent as a value out of 100 (e.g., 23 ½ percent is 23 ½ out of 100). * Why a total of 100% represents all possibilities. * How the ordering of percents relates to the ordering of decimals and fractions. | **Be Able to Do**   * Determine a percent to represent a given situation. * Solve problems that involve finding the percent of a quantity. * Make and justify decisions based upon known percents in the situation and social or financial considerations or restrictions. * Suggest and support a course of action for a particular situation through the analysis of percents. * Change between representations of percents, decimals, and fractions to answer questions and solve problems. * Order a set of percents, fractions, and decimals. |
| **Key Questions**  [**Top**](#top) | | | |
| * In what contexts have you heard “percent” and what did it mean to you? * What does a fractional percent mean and look like? * What is significant about 100%? * What does the fraction of a quantity represent? | | | |

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| **Suggestions for Assessment:**  [**Top**](#top) |
| **Big Idea:**  Meaning and representation of percent.  **Suggestions for assessment tasks:**   1. Have each student find an example of a fractional percent between 1% and 100%. Using that fractional percent, have the students:  * write an explanation of what the percent they selected tells them * create a concrete or pictorial representation of the percent * write the percent in decimal form * write the percent in fractional form * give a whole number approximation of the percent and explain their reasoning for the approximate percent they gave.   **What to look for:**   * See [*Meaning And Representation Of Percent Rubric*](file:///C:\Users\kw426\AppData\Local\Temp\Meaning%20And%20Representation%20Of%20Percent%20Rubric.doc).   **Big Idea:**  Using percent.  **Suggestions for assessment tasks:**   1. Give the students a percent and ask them to create and solve a problem involving that percent. 2. Give the student a context, and ask them to create and solve a problem involving percent related to that context. 3. Give the students two problems, one in which they need to determine a percent, and one in which they need to use a given percent to determine a quantity. Ask the students to solve both problems and explain how the problems are different in terms of the mathematics that they needed to do.   **What to look for:**   * See [*Using Percent Rubric.*](file:///C:\Users\kw426\AppData\Local\Temp\Using%20Percent%20Rubric.doc) |
| **Suggestions for Instruction:**  [**Top**](#top) |
| **Big Idea:**  Meaning and representation of percent.  **Suggestions for instructional activities**   1. Give the students a whole numbered percent and ask them to represent it using grid paper and write the quantity represented as a percent, decimal, and fraction. (The students may need prompting to remember that percent means “out of 100” so that they can write the fraction). 2. Ask the students to add ½ of one more square on their diagram of their representation of the whole numbered percent and ask the students to write the new quantity shown as a percent, decimal, and fraction. Have the students share their results and discuss how to represent a fraction of a percent symbolically by having the students reflect on the conventions of writing numbers that they already know. 3. Give the students additional fractional percents and have them create either a concrete or pictorial representation and ask them to write the percent as a decimal and a fraction (mixed number or improper fraction). Include at least three fractional percents with repeating decimals as well as fractional percents that have a terminating decimal. Have the students share their results and resolve conflicts in the writing of decimals and fractions for the percent by having the students justify their answers according to their concrete or pictorial representations. Have the students write in their journal about strategies they use to represent fractional percents concretely, pictorially, and symbolically in different forms. 4. Provide the students with examples of situations in which fractional percents occur. Include examples in which different forms of representing the percent are present. Have the students explore the percents by representing them concretely or pictorially, as well as in alternate symbolic forms. Have the students discuss with a partner what the percent tells them about the situation. 5. Ask the students to each write three different fractional percents – one in fractional form, one as a percent and one as a decimal. Have the students go together in pairs and order the percents from least to greatest. Have the students present their ordered list to the class and explain the strategies they used to order the numbers.   **Big Idea:**  Using percent.  **Suggestions for instructional activities**   1. Give the students a problem for which the percent sought will be a whole number (e.g., 36 of the 75 students chose orange juice. What percent of the students chose orange juice?). Challenge the students to come up with as many strategies as they can for solving the problem. Have the students share and compare their strategies. Ask the students to explain their reasoning behind the strategies. For example, if the students solve the problem symbolically by writing an equivalent fraction out of 100, ask the students why they chose a denominator of 100. If the students chose instead to divide 36 by 75, ask them why they are dividing and why in that order. It is very important that the students can have the understandings that percent means out of 100, fractions represent division (numerator divided by denominator), and in percent the denominator represents the whole and the numerator represents the part of the whole being considered. This should connect strongly with the students’ development of the concept of fractions from grade four. 2. Next, give the students a problem for which the percent sought will not be a whole number (e.g., using 34 rather than 36 in the above example). Ask the students to find the percent using any strategies they used in the last problem or a new strategy. Have the students discuss their strategies with a partner before sharing them as a class. 3. Provide the students with additional problems involving the calculation of a percent and have the students create problems to share with a partner using contexts that are important to them. 4. Give the students a series of problems that require the calculation of a percent of a number. These problems should be easily solved using equivalent fractions or using concrete or pictorial models because the students do not solve problems using proportional reasoning until grade 8 (e.g., An ad said that during a sale the price of an electronic device would be 48% of its original cost. If the device normally costs $200, what is its sale price?). The majority of students will develop the strategy of writing the percent as a fraction out of 100 and then writing an equivalent fraction, although some may need to create concrete or pictorial models to see that pattern.      1. If the students have not done so, have them write the percent from a problem as a decimal and ask them to explore operations between the decimal and the number representing the size of the whole to see if there is a pattern that develops throughout the problems. Discuss the pattern and ask the students to apply it to two or three more problems. Discuss the word “of” in the problem (as in 48% of 200) and how it is interpreted in mathematics. 2. Give the students new problems, this time incorporating wholes for which fractional equivalent to the percent are not easily found. For example, a whole of 66. Also include some percents that are fractional percents. Have the students solve the problems and share their strategies. Some students will also develop the idea of multiplying by the numerator of the percent and then dividing by the denominator (100). Have the students explain why this method works as well. 3. Have the students reflect on the problems they have solved and ask if an exact answer was needed for each of them or if there were questions where an estimate would have been appropriate. Have the students explain their choices and then have them explain how they would determine such an estimate. |