

## Solving Percent Problems Using Proportional Reasoning

**STRAND: Computation and Estimation**

**STRAND CONCEPT: Practical Applications-Rational Number and Proportional Reasoning**

**SOL 7.3**

### **Remediation Plan Summary**

Students apply proportions to solve problems that involve percents.

### **Common Misconceptions**

- Students will incorrectly set up the proportions by always putting the variable as the numerator in the second ratio or over 100.
- Students may multiply numerators and then multiply denominators instead of using cross products to solve the proportion.

### **Materials**

- Percents as Ratios handout

### **Introductory Activity**

Begin a class discussion to find out what kind of number sense the students have about percents.

Ask them:

*Where have you seen or used percents?*

*What does 50 percent mean?*

*What is the definition of percent?*

*What does 50 percent look like as a ratio?*

*What would a picture of 50 percent look like?*

An example of what 50 percent looks like is a grid of 100 squares with 50 (or half) of the squares shaded or a circle with one half shaded.

### **Plan for Instruction**

1. Discuss percent as a ratio, reminding students that a ratio is a comparison of two numbers and that with percents, one of the numbers is always 100. Therefore, the ratio for 25% is 25 to 100, or 25:100, or  $\frac{25}{100}$ . Have the students write 30% as a ratio. (30 to 100, 30:100,  $\frac{30}{100}$ ) Have them write 80% as a ratio. Tell students that they will be using the fraction form of the ratio for solving percent problems.
2. Distribute the “Percents as Ratios” handout. Have students do problems 1 through 5, and check their answers. It is not important for students to simplify the ratios.
3. Have the students apply the concept of percent to solve some simple problems. Ask them what the grade for a test means, reminding them that 100% is the basis for most test grades. Show students that a grade of 90% that means that  $\frac{90}{100}$  points were scored.
4. Give students the following problem: “Your friend tells you that he made a 90% on a test that had 20 questions. How many questions did your friend answer correctly?” Tell students that we know that if he had answered all 20 questions correctly, he would have made 100 percent. Have them use that information to set up a proportion, keeping in mind that a proportion

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means that two ratios are equal. Hence, 90% is  $\frac{90}{100}$ , and all 20 correct is 100%. Since the 20 corresponds to 100 and we do not know how many questions were correct, the proportion will be  $\frac{90}{100} = \frac{n}{20}$ . Make sure students understand that the total number on the test always corresponds to the 100 and that the number of correct answers always corresponds to the grade. Have students solve the proportion:

Original problem:  $\frac{90}{100} = \frac{n}{20}$

Step 1:  $90 \bullet 20 = 100 \bullet n$

Step 2:  $1800 = 100n$

Step 3:  $1800 \div 100 = 100n \div 100$

Solution:  $18 = n$

5. Ask students to determine how many questions a student got correct if the test had 25 questions and the students got a grade of 76%. Help them set up the proportion, if necessary:

$$\frac{76}{100} = \frac{n}{25}$$

6. Have students do problems 6 through 9 on the worksheet. Review the answers with the class.
7. Ask students how a teacher uses proportions to determine grades on the test. For example, Mrs. Jones gives a test with 25 questions. If Sarah answers 20 questions correctly, what grade does she earn on the test? Help students set up the proportion, if necessary:

$$\frac{n}{100} = \frac{20}{25} \quad \text{Sarah's grade is 80\%.$$

8. Point out that the only difference from the proportion in step 5 is the location of the missing number ( $n$ ) in the ratio.
9. Ask students to solve this problem: "Mrs. Jones gave a test with 20 problems, and Marcie got 15 correct. What is Marcie's grade?"

$$\frac{n}{100} = \frac{15}{20} \quad \text{Marcie's grade is 75\%.$$

10. Assign problems 10 through 12 on the worksheet. Review the answers with the class.

***Pulling It All Together***

Exit Ticket: Explain what the 100 in the ratio for a percent corresponds to on a test. Write how you can use this information to solve problems about test grades, using proportions

**Note: The following pages are intended for classroom use for students as a visual aid to learning.**

Virginia Department of Education 2018

## Percents as Ratios

Write each percent as a ratio in fraction form. Remember the definition of percent. If you need a picture, use the grids provided.

1. 40% \_\_\_\_\_
2. 75% \_\_\_\_\_
3. 15% \_\_\_\_\_
4. 33% \_\_\_\_\_
5. 20% \_\_\_\_\_

Set up a proportion for each problem below, and determine the number of test questions each student got correct for each test.

6. Sue receives a score of 75% on a test with 20 questions. How many did she get correct?

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7. John received a score of 68% on a test with 50 questions. How many did he get correct?

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8. Anne received a score of 84% on a test with 25 questions. How many did she get correct?

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9. Adam received a score of 90% on a test with 40 questions. How many did he get correct?

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Set up a proportion for each problem below, and determine the score earned by the student on each test.

10. Ms. Smith gave a test with 25 questions, and John got 22 correct. What is John's score?

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11. Ms. Smith gave a test with 30 questions, and Jim got 21 correct. What is Jim's score?

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12. Ms. Smith gave a test with 40 questions, and Mark got 32 correct. What is Mark's score?

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