Lesson 29: Solving Percent Problems

Student Outcomes

- Students find the percent of a quantity.
- Given a part and the percent, students solve problems involving finding the whole.

Classwork

Exploratory Challenges (25 minutes): Group/Partner

Students explore what it means to have 10%. Students recognize the equivalence between 10%, $\frac{10}{100}$, and $\frac{1}{10}$ and use this relationship to quickly calculate 10% of different quantities. Being able to calculate 10% of a quantity can be an efficient tool or strategy when calculating other percents.

Exploratory Challenge 1

Claim: To find 10% of a number, all you need to do is move the decimal to the left once.

Use at least one model to solve each problem (e.g., tape diagram, table, double number line diagram, 10×10 grid).

a. **Make a prediction. Do you think the claim is true or false? _____ Explain why.**

Answers will vary. One could think the claim is true because 10% as a fraction is $\frac{1}{10}$. The same thing happens when one divides by 10 or multiplies by $\frac{1}{10}$. A student may think the claim is false because it depends on what whole amount represents the number from which the percentage is taken.

b. **Determine 10% of 300.** 30

$300 \times \frac{1}{10} = \frac{300}{10} = 30$

c. **Find 10% of 80.** 8

$80 \times \frac{1}{10} = \frac{80}{10} = 8$

d. **Determine 10% of 64.** 6.4

$64 \times \frac{1}{10} = 6.4$

e. **Find 10% of 5.** $\frac{1}{2}$

$5 \times \frac{1}{10} = \frac{5}{10} = \frac{1}{2}$

f. **10% of** 480 **is 48.**

48	48	48	48	48	48	48	48	48	48

$48 \times 10 = 480$

g. **10% of** 60 **is 6.**

$6 \times 10 = 60$

h. Gary read 34 pages of a 340 pages book. What percent did he read?

$$\frac{34 \div 34}{340 \div 34} = \frac{1}{10} = \frac{10}{100} = 10\%$$

i. Micah read 16 pages of his book. If this is 10% of the book, how many pages are in the book?

$$\frac{10}{100} = \frac{1 \times 16}{10 \times 16} = \frac{16}{160}$$

There are 160 pages in the book.

j. Using the solutions to the problems above, what conclusions can you make about the claim?

The claim is true. When I find 10% of a number, I am really finding $\frac{1}{10}$ of the amount or dividing by 10, which is the same as what occurred when I moved the decimal point in the number one place to the left.

- Using the solutions to the problems above, what conclusions can you make about the claim?
  - *Answers will vary. However, students are required to share what is mathematically happening when the decimal is moved over once to help make connections to why it works. Students may relate back to using place value and regrouping with the concept of decimals.*

Students will read a claim that two separate discounts will give the same results as the sum of the two discounts taken off the original price at the same time. Students need to come to the conclusion that they are not the same because the second discount is being taken off a new amount not the original price.

Exploratory Challenge 2

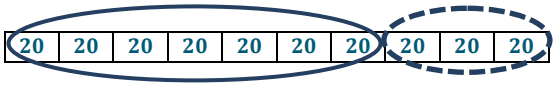
Claim: If an item is already on sale and then there is another discount taken off the sale price, this is the same as taking the sum of the two discounts off the original price.

Use at least one model to solve each problem (e.g., tape diagram, table, double number line diagram, 10×10 grid).

a. Make a prediction. Do you think the claim is true or false? _____ Explain.

The answer is false. They will be different because when two discounts are taken off, the second discount is taken off a new amount.

b. Sam purchased 3 games for $\$140$ after a discount of 30%. What was the original price?



Sale price $= \$140$ *Discount: $\$60$*

$\$200$ is the original price.

c. If Sam had used a 20% off coupon and opened a frequent shopper discount membership to save 10%, would the games still have a total of $\$140$?

$20\% = \frac{20}{100} = \frac{2}{10}$ $\$200 \times \frac{2}{10} = \frac{400}{10} = \$40$ *saved. The price after the coupon is $\$160$.*

$10\% = \frac{10}{100} = \frac{1}{10}$ $\$160 \times \frac{1}{10} = \frac{160}{10} = \$16$ *saved. The price after the coupon and discount membership is $\$144$.*

No, the games would now total $\$144$.

d. Do you agree with the claim? *NO* Explain why or why not. Create a new example to help support your claim.

When two discounts are taken off, the shopper pays more than if both were added together and taken off.

Example:

$\$100$ *original price*

20%*:*

$100 \times \frac{2}{10} = \frac{200}{10} = \$20$ *saved*

$\$100 - \$20 = \$80$ *sale price*

Two 10% *off discounts:*

$100 \times \frac{1}{10} = \frac{100}{10} = \$10$

$90 \times \frac{1}{10} = \frac{90}{10} = \$9$

$\$100 - \$10 - \$9 = \$81$ *sale price*

Closing (15 minutes)

Give time for students to share samples of how they solved the problem. Take time to point out similarities in the different models. Ask students to reflect on which models they like to use most and why.

Lesson Summary

Percent problems have three parts: whole, part, percent.

Percentage problems can be solved using models such as ratio tables, tape diagrams, double number line diagrams, and 10×10 grids.

Exit Ticket (5 minutes)

Name _____ Date_____

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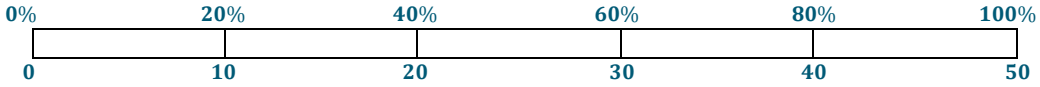
Exit Ticket

Angelina received two discounts on a $50 pair of shoes. The discounts were taken off one after the other. If she paid $30 for the shoes, what was the percent discount for each coupon? Is there only one answer to this question?

Exit Ticket Sample Solutions

Angelina received two discounts on a $\$50$ pair of shoes. The discounts were taken off one after the other. If she paid $\$30$ for the shoes, what was the percent discount for each coupon? Is there only one answer to this question?

Original Price $\$50$



20% *off* $\$50 = \$10$ *discount. After a* 20% *off discount, the new price would be* $\$40$.

25% *off* $\$40 = \$10$ *discount. After a* 25% *off discount, the new price would be* $\$30$.

Therefore, the two discounts could be 20% *off and then* 25%.

This is not the only answer. She could have also saved 25% *and then* 20%.

Problem Set Sample Solutions

1. **Henry has 15 lawns mowed out of a total of 60 lawns. What percent of the lawns does Henry still have to mow?**

   75% *of the lawns still need to be mowed.*

2. **Marissa got an 85% on her math quiz. She had 34 questions correct. How many questions were on the quiz?**

   There were 40 *questions on the quiz.*

3. **Lucas read 30% of his book containing 480 pages. What page is he going to read next?**

   30% *is* 144 *pages, so he will read page* 145 *next.*