

Math
Week of 11/4 - 11/8/19

Markups and Markdowns

1

Introducing Proportions to Solve
Percent Problems

WARM UP

The regular price of a bathing suit is \$89.99. Estimate the sale price of the bathing suit for each of the following sales.

1. 70% off regular price
2. 30% off regular price
3. 50% off regular price
4. 25% off regular price

LEARNING GOALS

- Estimate and calculate the values of percents.
- Use percent models to solve percent problems.
- Use proportional relationships to solve for unknowns in multistep percent problems.
- Solve percent problems using the constant of proportionality.

KEY TERMS

- markdown
- markup

You have used ratio reasoning to solve percent problems. How can you use proportional relationships to solve percent problems involving markdowns and markups?

Getting Started

Need New Kicks?

A marketing department is creating signs for an upcoming shoe sale.

**HOLIDAY
SHOE SALE**
35% OFF
the
Regular Price

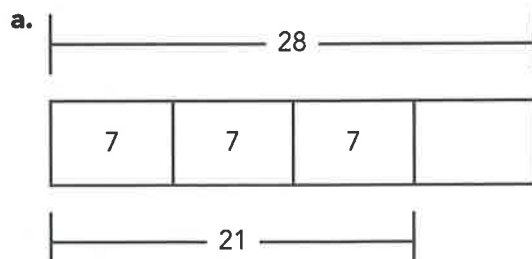
**HOLIDAY
SHOE SALE**
65%
Of
Regular Price

1. Compare the two signs. What do you notice?
2. Which sign should the store use to advertise the shoe sale?
Explain your reasoning.
3. The regular price of a pair of shoes is \$59.99.
Estimate the sale price of the pair of shoes two different ways.

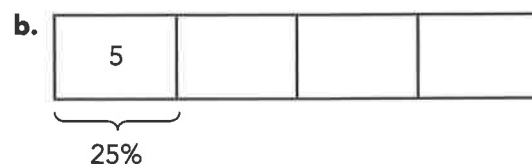


Three percent scenarios are shown. Match each model to the appropriate scenario.

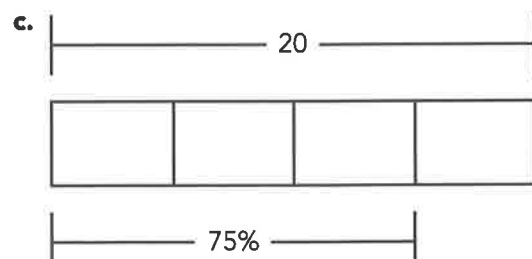
1. A shirt costs \$20. If it was on sale for 75% off, what is the discount?



2. A skirt originally cost \$28. Alicia pays \$21 for the skirt during a sale. What percent does Alicia save with the sale?



3. A ski hat is on sale for 25% off, which is \$5 off. What is the original price of the ski hat?



4. Use the appropriate model to solve each percent problem. Explain how you solved each.



5. Keisha said that she had developed strategies to solve percent problems, depending on what was given.

- Case A: If I want to calculate the percent, I can divide the part by the whole and rewrite the decimal as a percent.
- Case B: If I want to calculate the part, or percent of a number, I can multiply the percent, written in decimal form, by the number.
- Case C: If I want to calculate the whole, I can divide the percent, written in decimal form, by the part.

Is Keisha correct?

Does this always work? Explain your thinking.

Using Proportions to Solve Percent Problems



Corinne, Eduardo, and Adina each set up a proportion to solve four different percent problems.

1. Read each percent problem and analyze the corresponding student's work.

Remember, you can write a percent as a proportion.

$$\frac{\text{part}}{\text{whole}} = \frac{\text{percent number}}{100}$$

A shirt costs \$20. If it is on sale for 75% off, what is the discount?

A skirt originally cost \$28. Alicia pays \$21 for the skirt during a sale. What percent does Alicia save with the sale?

Corinne



$$\frac{75}{100} = \frac{x}{20}$$

$$(75)(20) = 100x$$

$$1500 = 100x$$

$$\frac{1500}{100} = \frac{100x}{100}$$

$$15 = x$$

The discount is \$15.

Eduardo



$$\frac{x}{100} = \frac{21}{28}$$

$$28x = (100)(21)$$

$$28x = 2100$$

$$\frac{28x}{28} = \frac{2100}{28}$$

$$x = 75$$

Alicia paid 75% of the cost, so Alicia saved 25%.

a. How did Corinne know where to place the 20 in her proportion?

b. How did Eduardo decide Alicia saved 25%?

A ski hat is on sale for 25% off, which is \$5 off. What is the original price of the ski hat?

Adina



$$\begin{aligned}\frac{25}{100} &= \frac{x}{5} \\ (25)(5) &= 100x \\ 125 &= 100x \\ \frac{125}{100} &= \frac{100x}{100} \\ 1.25 &= x\end{aligned}$$

- c. Explain what Adina did incorrectly. Then, set up and solve the problem correctly.

All of the problems in the previous activity involved a sale or a **markdown**. To make money, businesses often buy products from a wholesaler or distributor for one amount and add to that amount to determine the price they use to sell the product to their customers. This is called a **markup**.

The school store is selling spirit wear. They mark up all of the prices by 20% to sell to the community and students.

2. If the store's cost for a sweatshirt is \$25, what is the customer's cost? Analyze the four student responses shown.

Dean



$$\begin{aligned}\frac{20}{100} &= \frac{x}{25} \\ 5 &= x\end{aligned}$$

The customer's cost is \$5.

Binh



$$\begin{aligned}\frac{20}{100} &= \frac{x}{25} \\ 5 &= x\end{aligned}$$

The customer's cost is
 $\$5 + \$25 = \$30$.

Luke



The new "whole" is the total cost, which is 20% more than the original 100%. I can multiply the store cost by 120%, or 1.20.

$$25(1.20) = 30$$

The customer's cost is \$30.

Lahari



The original cost is now the part.

$$\frac{100}{120} = \frac{25}{x}$$

$$30 = x$$

The customer's cost is \$30.

a. Compare Dean's method to Binh's method.

b. Compare Luke's method to Lahari's method.

3. Use the method(s) of your choice to complete the table of the store's cost and the customer's cost for the spirit wear.

	Store's Cost	Customer's Cost
T-shirt	\$8	
Face Tattoos		\$4.50

Can you see another proportion you can write to solve this problem?





You know that the percent whole is always 100. So as long as you know 2 of the other 3 values, you can solve the proportion.



Solve each percent problem. Show your work.

4. The \$199.99 game console Amy purchased was on sale for 10% off. How much did Amy pay?

5. A computer is normally \$899 but is discounted to \$799. What percent of the original price does Shawn pay?

6. If Fernando paid \$450 for a netbook that was 75% of the original price, what was the original price?

7. Fantasy-N-Fun sells gaming cards for \$9.99 but they pay only \$6.75 per card. What is the percent markup?

8. Dontrelle received 30% off when he purchased a rare book regularly priced at \$96.50. How much did Dontrelle pay?

9. Brittany is selling car magnets. She purchases them for \$7.50 each and marks up the price by 30%. How much is Brittany planning to charge?



Chet is planning his vacation. The flight he selected was \$229.99 but he got 20% off because he booked it online through a new travel website. What did he pay?

1. Explain why Katie's answer is incorrect. Then, determine the correct answer.

Katie



$$\frac{20}{100} = \frac{x}{229.99}$$

$$(20)(229.99) = 100x$$

$$\frac{4599.8}{100} = \frac{100x}{100}$$

$$45.998 = x$$

So, Chet paid about \$46.

2. Explain why Emma's method worked.

Emma



$$\frac{80}{100} = \frac{x}{229.99}$$

$$(80)(229.99) = 100x$$

$$\frac{18399.2}{100} = \frac{100x}{100}$$

$$183.99 = x$$

Chet paid \$183.99 for his flight.

Solve each problem.

3. Anita sold USB thumb drives for \$4.95, which was a 10% markup from what she paid for each. How much did Anita pay for the drives?

4. Games that usually sell for \$36.40 are on sale for \$27.30. What percent off are they?

5. Jimmy's new cell phone cost him \$49.99 when he signed a 2-year plan, which was 75% off the original price. What was the original price?

A rebate is a refund of part of the amount paid for an item. Generally, a customer mails a completed form to the company after a purchase, and a rebate check is mailed to the customer.

6. Liz is shopping for a game system. Two competing stores offer deals on the system that she wants to purchase.

Game Hut
• \$375
• 15% off sale on all game systems

Fun n Games
• \$399
• \$50 rebate after the purchase

Where should Liz shop? Show all of your work and explain your reasoning.

7. Dante has been shopping around for a new mountain bike. He found two bikes that he likes equally—one is sold at Mike's Bikes for \$300, and the other is sold at Cycle Center for \$275.

Dante has a coupon for 25% off any bike at Mike's Bikes. However, the manufacturer of the bike at Cycle Center has included a \$40 rebate after the purchase of the bike.

Where should Dante purchase his mountain bike? Show all of your work and explain your reasoning.

8. Barry is shopping for a new sweater that originally cost \$50.00. The department store has all items marked down by 20%. He also has a coupon for an additional 10% off all purchases.

Barry

Since all items are marked down by 20%, and I have an additional 10% off, that means I get a 30% discount.

$$\frac{30}{100} = \frac{X}{50}$$

$$2X = 30$$

$$X = 15$$

The cost of the sweater is $\$50.00 - \$15.00 = \$35.00$.

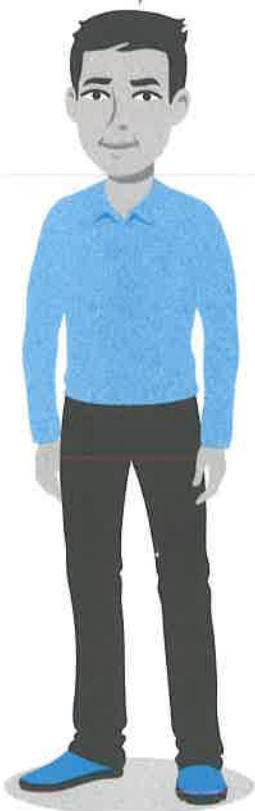
Describe Barry's mistake. Then calculate how much Barry will pay for the sweater.



The Shoe Super Store sells name brand shoes at a price much less than most department stores. The chart hanging in the store displays the normal price of the shoes and the Shoe Super Store price.

Regular Department Store Price	Shoe Super Store Price
\$20	\$16
\$25	\$20
\$30	\$24
\$35	\$28
\$40	\$32
\$50	\$40

Remember, proportions are formed by equivalent ratios.



Alfie



The Shoe Super Store prices do not vary directly with the regular department store prices.

A \$20 pair of shoes is only \$4 cheaper at the Shoe Super Store, while a \$50 pair of shoes is \$10 cheaper at Shoe Super Store.

1. Explain what is wrong with Alfie's reasoning.

2. What is the constant of proportionality? Interpret the constant of proportionality for this problem situation.

3. Define the variables and write an equation to represent the relationship between the department store price and Shoe Super Store price.

4. What is the Shoe Super Store price for a pair of shoes that cost \$28 at the department store? Explain your reasoning.

5. What is the department store price for a pair of shoes that cost \$15 at Shoe Super Store? Explain your reasoning.

TALK the TALK **Percent and Proportions**

Demonstrate how to solve any type of percent problem with proportions.

1. Write each proportion, with a variable in the appropriate place, to calculate each specific unknown.

a. Calculate the Percent

b. Calculate the Part

c. Calculate the Whole

Assignment

Write

Explain how to use proportions to solve for the unknown in a percent problem.

Remember

The answer to the percent problem may or may not be the value of the unknown in your proportion. Re-read the problem and ensure that you answer the question being asked.

Practice

- The cable provider's "triple play" package offers a land line, internet service, and cable TV for one fixed price. If you already subscribe to their cell phone service they offer an additional 12% off the price of the triple play package. If the discounted price of the triple play is \$132, what is the price of the package without the discount?
- The O! Natural Company sells a juice in 1 gallon bottles. The current retail price of the juice is \$3.50 for 1 gallon. In order to remain competitive, the company will decrease the price to \$3.20.
 - What percent of the original price are consumers going to pay?
 - Suppose the company's cost per 1 gallon is \$2.70. What is the markup if they sell each gallon at \$3.20? What is the markup if they sell each gallon at \$3.50?
- The O! Natural Company is trying to get schools in the state to sell their juice product.
 - If the sales representative went to 300 schools and convinced 125 to sell their product, what percentage decided to not sell their product? Use two different strategies to calculate the answer.
 - The sales representative made a deal with the schools for a discount on the individual juice bottles. The company usually sells the bottles to the distributors for \$2.25, but they are selling them to the schools for 15% off. For what price will they sell each bottle to the schools?
 - Suppose the schools pay \$2.00 per bottle for the juice and sell it to community members for \$2.50 per bottle. What percent markup are they charging?
- Jillian is shopping for new school supplies. She finds a flyer in the newspaper for her favorite store. They are offering the following coupons.

Office World Sale! All laptops—Buy now and receive a \$100 rebate after purchase! *cannot be used with any other coupons	Office World Sale! Receive 20% off any one item!
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Jillian needs to buy a new laptop for the school year. The list price for the laptop is \$479.99. Is it a better deal to use the coupon for the \$100 rebate or the 20% off one item? Explain your reasoning.

Stretch

While Emma is shopping with her friend Jacob, they notice a sign in the front of the store.

BACK-TO-SCHOOL SALE!

- 20% off all purchases
- \$10.00 student discount

They also notice that the two cashiers are applying the discounts differently. The cashier on their left is taking 20% off the total bill and then subtracting \$10.00. The cashier on their right is subtracting \$10.00 first and then taking 20% off the total.

In order to get a better deal, should Emma and Jacob go to the cashier on the left or the right? Or does it not matter? Show all of your work and explain your reasoning.

Review

1. Millie is cutting out stars to decorate the gym for the school dance. The number of stars (s) she can cut out varies directly with the time (t) in minutes she spends cutting out the stars.
 - a. Write an equation to show the relationship between s and t .
 - b. Complete the table to show the number of stars Millie is able to cut out for various amounts of time.
 - c. Write an equation to represent the relationship between s and t using the value of k you determined from the table.

Time (t) (in minutes)	Number of Stars (s)	$\frac{s}{t} = k$
	0
12	6	
	15	
44		
50		

- d. Graph the data. Label the x - and y -axes and title your graph.
 - e. Did the graph turn out as you expected? Explain.
 - f. Explain how to determine the constant of proportionality using the graph.
2. Determine if there is a proportional relationship between the two quantities. Explain your reasoning.

a.

A	B
35	92
23	80

b.

C	D
20	8
12.5	5

3. Determine two equivalent ratios for each ratio given.
 - a. $\frac{2}{5}$
 - b. 6 yellow : 9 blue