

### Solve & Discuss It!

Clare subscribes to an online music streaming service for a yearly fee of \$96. Starting next month, there will be a 12% increase in the fee.  
The ad for another music streaming service is shown below. Should Clare switch? Explain.



**DIGITAL STREAMING OF MUSIC**  
\$8.75 per month

#### Lesson 3-5

### Solve Markup and Markdown Problems

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**I can...**  
solve problems involving percent markup and markdown.

**Model with Math**  
You can use the percent equation to determine the percent increase.

**Focus on math practices**  
**Make Sense and Persevere** What is another problem-solving method you could use to check that your solution makes sense?

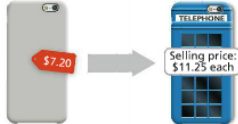
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**Essential Question** How are the concepts of percent markup and percent markdown related to the percent equation?


**EXAMPLE 1** Find the Percent Markup

Marty buys plain cell phone cases and then decorates them to resell online at a higher price. What is the percent markup on each phone case?

**Markup** is the amount of increase from the cost of an item to its selling price. The markup as a percent increase from the original cost is the **percent markup**.



**STEP 1** Draw a bar diagram to represent the problem and to find the markup.



**STEP 2** Use the percent equation to find the percent markup.

markup = percent markup · cost

$$4.05 = P \cdot 7.20$$

$$\frac{4.05}{7.20} = P$$

$$0.5625 = P$$

Remember to express the decimal value as a percent.

The percent markup on each cell phone case is about 56%.

**Try It!**

What is the percent markup on a \$300 phone sold for \$465?

markup = percent markup · cost

= P · 300

= P

The percent markup on the phone is  %.

**Convince Me!** How does the percent equation help solve markup problems?

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**EXAMPLE 2** Find the Selling Price

The local furniture store pays \$110 for a chest of drawers and sells it with a 40% markup. What is the selling price of the chest of drawers?

**STEP 1** Draw a bar diagram to represent the problem.



**STEP 2** Use the percent equation to find the markup and the selling price.

$$\text{markup} = \text{percent markup} \cdot \text{cost}$$

$$m = 0.40 \cdot 110$$

$$m = 44$$

The markup is \$44.  
 $110 + 44 = 154$   
 The selling price of the chest of drawers is \$110 + \$44 or \$154.

**Try It!**

What is the selling price for a \$45 pair of shoes with a 15% markup?

**EXAMPLE 3** Find Markdown and Sales Tax

Edward wants to buy a snowboard that is on sale. If the sales tax in Edward's state is 7.5%, how much will he pay for the snowboard?

**Markdown** is the decrease from the original price of an item to its sale price. The markdown as a percent decrease of the original price is the **percent markdown**.



**STEP 1** Use the percent equation to find the marked down price of the snowboard.

$$\text{markdown} = \text{percent markdown} \cdot \text{original price}$$

$$m = 0.30 \cdot 180$$

$$m = 54$$

The sale price is \$180 - \$54, or \$126.

**STEP 2** Use the percent equation to find the sales tax board.

$$\text{sales tax} = \text{percent} \cdot \text{sale price}$$

$$s = 0.075 \cdot 126$$

$$s = 9.45$$

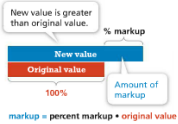
Edward will pay  $126 + 9.45$ , or \$135.45, for the snowboard.

**Try It!**

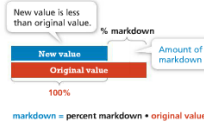
Find the percent markdown for an \$80 jacket that is on sale for \$48.

**KEY CONCEPT**

You can solve markup and markdown problems using the percent equation.



$\% \text{ markup} = \frac{\text{markup/down} - \text{old}}{\text{old}}$



**Do You Understand?**

- 2. Reasoning** How are the concepts of markup and markdown related to the percent equation?
- 2. Reasoning** What does the amount of the markup or markdown represent in the percent equation?
- 3. Generalize** When an item is marked up by a certain percent and then marked down by the same percent, is the sale price equal to the price before the markup and markdown?

**Do You Know How?**

- An item costs \$4 before tax and \$4.32 after sales tax. What is the sales tax rate?



5. Sheila buys two concert tickets from her friend. She pays \$90 for the two tickets. She looks at the tickets and sees that each ticket has a face value of \$52.50.

a. How much of a markdown did her friend give Sheila? Explain how you know.

Sheila's friend gave \$12.50 her a discount of \$7.50 per ticket.

$$\frac{90}{2} = 45$$

$$45 - 52.50 = -7.50$$

$$\frac{7.50}{52.50} = 0.1428$$

$\approx -14.28\%$   
 $\approx -14\%$   
 The markdown on the tickets for the concert is about 14%.

$\div 100$   
 $\frac{300}{100} = 3$   
 $3 \times \$30 = \$90$

**Practice & Problem Solving**

**Leveled Practice** In 7-8, fill in the boxes to solve.

7. A \$300 suit is marked down by 20%. Find the sale price rounded to the nearest dollar.

markdown = percent markdown  $\cdot$  original price  
 $20\% \cdot 300 = 60$   
 original price - markdown = sale price  
 $300 - 60 = 240$   
 sale price = \$240

8. The selling price of an item is \$650 marked up from the wholesale cost of \$450. Find the percent markup from wholesale cost to selling price.

selling price - markup = wholesale cost  
 $650 - 300 = 450$   
 markup = percent markup  $\cdot$  wholesale cost  
 $200 = d \cdot 450$   
 $450 \cdot d = 200$   
 $d = \frac{200}{450} \approx 44\%$

9. Karen purchased the DVD player shown in the sign on the right. Find the percent markdown rounded to the nearest percent.

$\frac{175.90 - 153.77}{175.90} \approx 0.1256 \approx 12.56\% \approx 13\%$   
 The DVD player price dropped about 13%.

10. A store manager instructs his employees to mark up all items by 30%. A store clerk puts a price tag of \$30 on an item that the store bought for \$27. As an employee, you notice that this selling price is incorrect.

a. Find the correct selling price. Round to the nearest dollar.  
 $27 \cdot 1.3 = 35.1 \approx 35$

b. What was the clerk's likely error?

11. Nate has \$50 to spend at the grocery store. He fills his shopping cart with items totaling \$46. At checkout he will have to pay tax on all items in the cart. Does he have enough money to buy everything in his cart? Explain.

$0.06\%$  of \$46  
 $0.06 \times 46 = 2.76$   
 $46.00 + 2.76 = 48.76$

12. A department store buys 300 shirts at a cost of \$1,800 and sells them for \$10 each. Find the percent markup rounded to the nearest percent.

$\frac{499 - 48.76}{48.76} \approx 9.24$   
 $9.24 \times 100 = 924\%$

Yes, Nate has \$50 and he only pays \$48.76, so he will have \$1.24 leftover.

$\frac{\%}{100} \rightarrow d$   
 $0.7 \cdot 776 = 543.20$   
 $70\% \text{ of } \$776 = \$543.20$

13. **Make Sense and Persevere** A computer store buys a computer system at a cost of \$465.60. The selling price was first at \$776, but then the store advertised a 30% markdown on the system.


a. Find the current sale price. Round to the nearest cent if necessary.

The current sale price of the computer is \$543.20 after the 30% markdown

b. Members of the store's loyalty club get an additional 10% off their computer purchases. How much do club members pay for the computer with their discount?

$90\% \rightarrow 0.9 \times 543.20 = 488.88$

14. **Higher Order Thinking** A sporting goods store manager was selling a ski set for a certain price. The manager offered the markdowns shown on the right, making the one-day sale price of the ski set \$328. Find the original selling price of the ski set.



**Assessment Practice**

15. Eliza cannot decide which of two bicycles to buy. The original price of each is \$380. The first is marked down by 50%. The second is marked down by 30% with an additional 20% off.

**PART A**  
Find the sale price of each bicycle. Show your work.

**PART B**  
Which bicycle should Eliza buy if the bicycles are the same except for the selling price?

16. A shoe store uses a 50% markup for all of the shoes it sells. What would be the selling price of a pair of shoes that has a wholesale cost of \$57?

1st option  
 $50\% \text{ of } \$380$   
 $0.5 \times 380 = 190$

2nd option:  
 $(0.8)(0.7)(\$380)$   
 $= 212.80$

