Name _____     Date _____

# Markup and Markdown Problems

A store that sells skis buys them from a manufacturer at a wholesale price of $57.  The store's markup rate is 50%.

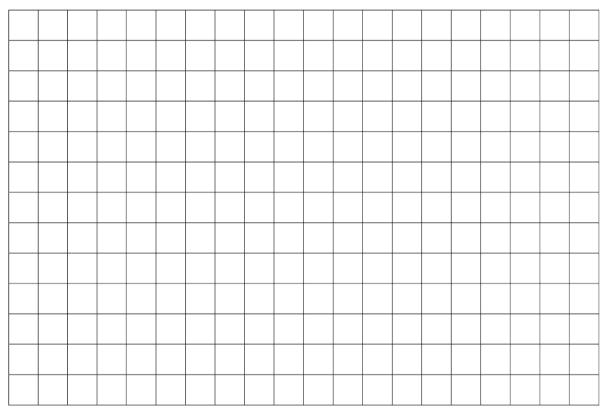    a.    What price does the store charge its customers for the skis?

    b.    What percent of the original price is the final price?  Show your work.

    c.    What is the percent increase from the original price to the final price?

1. You have a coupon for an additional 25% off the price of any sale item at a store.  The store has put a robotics kit on sale for 15% off the original price of $40.  What is the price of the robotics kit after both discounts?

2. A sign says that the price marked on all music equipment is 30% off the original price.  You buy an electric guitar for the sale price of $315.

   a.   What is the original price?

   b.   How much money did you save off the original price of the guitar?

   c.   What percent of the original price is the sale price?

3. The cost of a New York Yankee baseball cap is $24.00.  The local sporting goods store sells it for $30.00.   Find the markup rate.

4. Write an equation to determine the selling price in dollars, $p$, on an item that is originally priced $s$ dollars after a markdown of 15%.

    a.   Create and label a table showing five possible pairs of solutions to the equation.

    b.   Create and label a graph of the equation.

    c.   Interpret the points $(0,0)$ and $(1,r)$.

5. At the amusement park, Laura paid $6.00 for a small cotton candy. Her older brother works at the park, and he told her they mark up the cotton candy by 300%. Laura does not think that is mathematically possible. Is it possible, and if so, what is the price of the cotton candy before the markup?

6. A store advertises that customers can take 25% off the original price and then take an extra 10% off. Is this the same as a 35% off discount? Explain.

7. An item that costs $50.00 is marked 20% off. Sales tax for the item is 8%. What is the final price, including tax?

    a.   Solve the problem with the discount applied before the sales tax.

    b.   Solve the problem with the discount applied after the sales tax.

    c.   Compare your answers in parts (a) and (b). Explain.

8. The sale price for a bicycle is $315. The original price was first discounted by 50% and then discounted an additional 10%. Find the original price of the bicycle.

9. A ski shop has a markup rate of 50%. Find the selling price of skis that cost the storeowner $300.

10. A tennis supply store pays a wholesaler $90 for a tennis racquet and sells it for $144. What is the markup rate?

11. A shoe store is selling a pair of shoes for $60 that has been discounted by 25%. What was the original selling price?

12. A shoe store has a markup rate of 75% and is selling a pair of shoes for $133. Find the price the store paid for the shoes.

13. Write $5\frac{1}{4}\%$ as a simple fraction.

14. Write $\frac{3}{8}$ as a percent.

15. If 20% of the 70 faculty members at John F. Kennedy Middle School are male, what is the number of male faculty members?

16. If a bag contains 400 coins, and $33\frac{1}{2}\%$ are nickels, how many nickels are there? What percent of the coins are not nickels?

17. The temperature outside is 60 degrees Fahrenheit. What would be the temperature if it is increased by 20%?

A store that sells skis buys them from a manufacturer at a wholesale price of $57. The store's markup rate is 50%.

    a.    What price does the store charge its customers for the skis?

          $57 \times (1 + 0.50) = 85.50.$ *The store charges $85.50 for the skis.*

    b.    What percent of the original price is the final price? Show your work.

          $\text{Quantity} = \text{Percent} \times \text{Whole}$ *Let P represent the unknown percent.*

$$85.50 = P(57)$$
$$85.50\left(\frac{1}{57}\right) = P(57)\left(\frac{1}{57}\right)$$
$$1.50 = P$$

          $1.50 = \dfrac{150}{100} = 150\%.$ *The final price is 150% of the original price.*

    c.    What is the percent increase from the original price to the final price?

          *The percent increase is 50% because $150\% - 100\% = 50\%$.*

In the following problems, students solve markup problems by multiplying the whole by $(1 + m)$, where $m$ is the markup rate, and work backward to find the whole by dividing the markup price by $(1 + m)$. They also solve markdown problems by multiplying the whole by $(1 - m)$, where $m$ is the markdown rate, and work backward to find the whole by dividing the markdown price by $(1 - m)$. Students also solve percent problems learned so far in the module.

1.    You have a coupon for an additional 25% off the price of any sale item at a store. The store has put a robotics kit on sale for 15% off the original price of $40. What is the price of the robotics kit after both discounts?

    $(0.75)(0.85)(40) = 25.50.$ *The price of the robotics kit after both discounts is $25.50.*

2.    A sign says that the price marked on all music equipment is 30% off the original price. You buy an electric guitar for the sale price of $315.

    a.    What is the original price?

          $\dfrac{315}{1 - 0.30} = \dfrac{315}{0.70} = 450.$ *The original price is $450.*

    b.    How much money did you save off the original price of the guitar?

          $450 - 315 = 135.$ *I saved $135 off the original price of the guitar.*

    c.    What percent of the original price is the sale price?

          $\dfrac{315}{450} = \dfrac{70}{100} = 70\%.$ *The sale price is 70% of the original price.*

3. The cost of a New York Yankee baseball cap is $24.00. The local sporting goods store sells it for $30.00. Find the markup rate.

*Let P represent the unknown percent.*

$30 = P(24)$

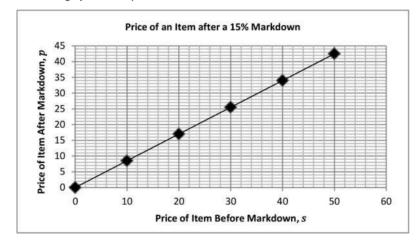$P = \dfrac{30}{24} = 1.25 = (100\% + 25\%)$. *The markup rate is* $25\%$.

4. Write an equation to determine the selling price in dollars, $p$, on an item that is originally priced $s$ dollars after a markdown of $15\%$.

$p = 0.85s$ *or* $p = (1 - 0.15)s$

    a. Create and label a table showing five possible pairs of solutions to the equation.

| Price of Item Before Markdown, $s$ (in dollars) | Price of Item After Markdown, $p$ (in dollars) |
|:---:|:---:|
| 10 | 8.50 |
| 20 | 17.00 |
| 30 | 25.50 |
| 40 | 34.00 |
| 50 | 42.50 |

    b. Create and label a graph of the equation.



    c. Interpret the points $(0, 0)$ and $(1, r)$.

*The point* $(0, 0)$ *means that a* $0$ *(free) item will cost* $0$ *because the* $15\%$ *markdown is also* $0$. *The point* $(1, r)$ *is* $(1, 0.85)$, *which represents the unit rate. It means that a* $1.00$ *item will cost* $0.85$ *after it is marked down by* $15\%$.

5. At the amusement park, Laura paid $6.00 for a small cotton candy. Her older brother works at the park, and he told her they mark up the cotton candy by $300\%$. Laura does not think that is mathematically possible. Is it possible, and if so, what is the price of the cotton candy before the markup?

*Yes, it is possible.* $\dfrac{6.00}{1+3} = \dfrac{6}{4} = 1.50$. *The price of the cotton candy before the markup is* $1.50$.

6. **A store advertises that customers can take 25% off the original price and then take an extra 10% off. Is this the same as a 35% off discount? Explain.**

*No, because the 25% is taken first off the original price to get a new whole. Then, the extra 10% off is multiplied to the new whole. For example, $(1 - 0.25)(1 - 0.10) = 0.675$ or $(0.75)(0.90) = 0.675$. This is multiplied to the whole, which is the original price of the item. This is not the same as adding 25% and 10% to get 35% and then multiplying by $(1 - 0.35)$, or 0.65.*

7. **An item that costs $50.00 is marked 20% off. Sales tax for the item is 8%. What is the final price, including tax?**

    a. **Solve the problem with the discount applied before the sales tax.**

        *$(1.08)(0.80)(50) = 43.20$. The final price is $43.20.*

    b. **Solve the problem with the discount applied after the sales tax.**

        *$(0.80)(1.08)(50) = 43.20$. The final price is $43.20.*

    c. **Compare your answers in parts (a) and (b). Explain.**

        *My answers are the same. The final price is $43.20. This is because multiplication is commutative.*

8. **The sale price for a bicycle is $315. The original price was first discounted by 50% and then discounted an additional 10%. Find the original price of the bicycle.**

*$(315 \div 0.9) \div 0.5 = 700$. The original price was $700.*

9. **A ski shop has a markup rate of 50%. Find the selling price of skis that cost the storeowner $300.**

*Solution 1: Use the original price of $300 as the whole. The markup rate is 50% of $300 = $150.*

*The selling price is $300 + $150 = $450.*

*Solution 2: Multiply $300 by 1 plus the markup rate (i.e., the selling price is $(1.5)(\$300) = \$450)$.*

10. **A tennis supply store pays a wholesaler $90 for a tennis racquet and sells it for $144. What is the markup rate?**

*Solution 1: Let the original price of $90 be the whole. $\text{Quantity} = \text{Percent} \times \text{Whole}$.*

$144 = \text{Percent}(90)$

$\dfrac{144}{90} = \text{Percent} = 0.6 = 160\%$. *This is a 60% increase. The markup rate is 60%.*

*Solution 2:*

$$\text{Selling Price} = (1 + m)(\text{Whole})$$
$$144 = (1 + m)90$$
$$1 + m = \frac{144}{90}$$
$$m = 1.6 - 1 = 0.6 = 60\%$$

11. **A shoe store is selling a pair of shoes for $60 that has been discounted by 25%. What was the original selling price?**

   *Solution 1: $60 represents 75% of the original price. If I divide both the percent and the amount by 3, I find that $20 represents 25% of the cost. Next, I will multiply both the percent and amount by 4 to determine that $80 represents 100%.*

   *The original price was $80.*

   *Solution 2: Let $x$ be the original cost in dollars.*

$$(1 - 0.25)x = 60$$
$$\frac{3}{4}x = 60$$
$$\left(\frac{4}{3}\right)\left(\frac{3}{4}x\right) = \frac{4}{3}(60)$$
$$x = 80$$

   *The original price was $80.*

12. **A shoe store has a markup rate of 75% and is selling a pair of shoes for $133. Find the price the store paid for the shoes.**

   *Solution 1: $133 represents 175% of the original price. If I divide both the percent and the amount by 7, I get $19, which represents 25% of the cost. Next, I can multiply each number by 4 to determine that $76 is 100% of the cost.*

   *The store paid $76.*

   *Solution 2: Divide the selling price by 1.75.*

$$\frac{133}{1.75} = 76$$

   *The store paid $76.*

13. **Write $5\frac{1}{4}\%$ as a simple fraction.**

   $$\frac{21}{400}$$

14. **Write $\frac{3}{8}$ as a percent.**

   $37.5\%$

15. **If 20% of the 70 faculty members at John F. Kennedy Middle School are male, what is the number of male faculty members?**

   $(0.20)(70) = 14.$ *Therefore, 14 faculty members are male.*

16. **If a bag contains 400 coins, and $33\frac{1}{2}\%$ are nickels, how many nickels are there? What percent of the coins are not nickels?**

   $(400)(0.335) = 134.$ *Therefore, 134 of the coins are nickels. The percent of coins that are not nickels is $66\frac{1}{2}\%$.*

17. **The temperature outside is 60 degrees Fahrenheit. What would be the temperature if it is increased by 20%?**

   $(60)(1.2) = 72.$ *Therefore, the temperature would be 72 degrees Fahrenheit.*