



## Markup & Markdown

### MARKUP

Businesses buy products at a **cost** price and then markup the products to cover the **expenses (overhead)** of running the business and the desired **profits**. The sum of cost plus markup gives the **selling price**, as shown below. **Markup** is also referred to as **margin** or **gross profit**.

$$\begin{aligned}\text{Selling Price} &= \text{Cost} + \text{Markup} \\ S &= C + M\end{aligned}$$

Markup (since it includes expenses and profits) can be rewritten as follows:

$$\begin{aligned}\text{Markup} &= \text{Expenses} + \text{Profits} \\ M &= E + P\end{aligned}$$

Substituting the expression for markup into the selling price equation gives us:

$$\begin{aligned}\text{Selling Price} &= \text{Cost} + \text{Expenses} + \text{Profit} \\ S &= C + E + P\end{aligned}$$

*Example:* Audiophile Records purchases CDs at a cost of \$12 each. Operating expenses of the business are 25% of the cost and the owner requires a profit of 15% of cost. How much is the markup on the CDs? What is the selling price?

*Solution:*

(i) To find the markup, we use the information given about expenses and profit:

$$\begin{aligned}M &= E + P = (0.25 \times C) + (0.15 \times C) \\ M &= (0.25 \times \$12) + (0.15 \times \$12) \\ M &= 3 + 1.80 = \$4.80\end{aligned}$$

(ii) To find the selling price, we now add the markup of \$4.80 to the cost:

$$S = C + M = \$12 + \$4.80 = \$16.80 \text{ per CD}$$

*Example:* Meteor Lights purchases disco balls for \$67.00 each. Operating expenses are 25% of the selling price and the owner requires a profit of 10% of the selling price. How much should the disco balls be sold for?

*Solution:*

Operating expenses are 25% of the selling price, so  $E = 0.25 \times S$ . Profits are 10% of the selling price, so  $P = 0.10 \times S$ .

$$\begin{aligned}S &= C + 0.25S + 0.10S \\ S &= 67 + 0.35S \\ 0.65S &= 67 \\ S &= \$103.08\end{aligned}$$

Meteor Lights must sell the disco balls for \$103.08 each.



## RATE OF MARKUP

The markup can be expressed as a percentage of the (1) cost or (2) selling price. This is known as the rate of markup.

(1) Rate of markup based on cost is denoted by  $m_c$   
 $m_c = \text{Markup/Cost} = M/C$  (multiply by 100 to get the percentage)

(2) Rate of markup based on selling price is denoted by  $m_s$   
 $m_s = \text{Markup/Selling price} = M/S$  (multiply by 100 to get the percentage)

*Example:* The cost of a new hoodie is \$30. The selling price is \$45. Find the rate of markup based on cost.

*Solution:*

$$S = C + M$$

$$M = S - C = 45 - 30 = \$15$$

Now we can solve for the rate of markup based on cost,

$$m_c = M/C = 15/30 = 0.50 = 50\%$$

*Example:* A skateboard is bought at cost for \$45. The rate of markup based on cost was 25%. Find the selling price and markup.

*Solution:* First we find the markup since we are given the rate and cost,

$$m_c = M/C$$

$$M = m_c \times C$$

$$M = (0.25) \times 45 = \$11.25$$

Now we plug into the selling price equation and find  $S = 45 + 11.25 = \$56.25$

*Example:* The cost of a new pair of headphones is \$94. The rate of markup based on selling price is 40%. Find the selling price and markup.

*Solution:*

$$S = C + M$$

$$S = 94 + 0.4S \quad \leftarrow \quad m_s = M/S = 0.4 ; \text{ so } M = 0.4 \times S$$

$$0.6S = 94$$

$$S = \$156.67$$

Now we can easily determine the markup:

$$M = S - C = 156.67 - 94 = \$62.67$$



## MARKDOWN

A markdown is a reduction in the regular selling price of a product. The Sale Price is the reduced price as shown below.

$$\text{Sale price} = \text{Regular selling price} - \text{Markdown}$$

The rate of markdown ( $m_d$ ) is ALWAYS BASED ON THE REGULAR SELLING PRICE.

$$m_d = \text{MD}/S$$

Markdown on selling prices occurs in response to market conditions (e.g. competitor pricing) and often leads to less-than-desired profit levels. While a business might be willing to have zero profit, they don't want to lose money handling the product. The **total cost** of the product includes the cost of buying the product and the expenses involved.

$$\text{Total Cost} = \text{Cost} + \text{Expenses}$$

$$TC = C + E$$

If the product is sold at a price that equals the total cost (**break-even point**), the business does not make any profit nor does it suffer a loss. We can rewrite the selling price equation in terms of profit and total cost.

$$S = C + E + P$$

$$S = TC + P$$

$$P = S - TC$$

The difference between selling price and total cost is the **operating profit** (or **loss**). If the selling price does not even cover the cost of buying the item, the business suffers an absolute loss.

*Example:* The Beermaker sells kits for \$24.50. The store's overhead expenses are 50% of cost and the owners require a profit of 25% of cost. (i) What is the cost of the kits? (ii) What is the price needed to cover all of the costs and expenses? (iii) What is the highest rate of markdown at which the store will break even? (iv) What is the highest rate of discount that can be advertised without incurring an absolute loss?

*Solution:*

(i)  $S = C + E + P$

$$S = C + 50\% \text{ of } C + 25\% \text{ of } C = C + 0.5C + 0.25C$$

$$S = 1.75C$$

$$24.50 = 1.75C$$

$$C = (24.50/1.75) = \$14.00$$

(ii)  $TC = C + E = C + 0.5C$

$$TC = 1.5C = 1.5(\$14.00)$$

$$TC = \$21.00$$

(iii) To break even, the maximum markdown is  $\$24.50 - 21.00 = \$3.50$

$$\text{Rate of markdown} = \text{MD}/S = 3.50/24.50 = 0.143 = 14.3\%$$



- (iv) To avoid incurring an absolute loss, the lowest price at which the kit can be sold is the cost at which it was purchased (\$14.00).

In this case, the maximum amount of discount is  $24.50 - 14.00 = \$10.50$

Rate of discount =  $MD/S = 10.50/24.50 = 0.429 = 42.9\%$

### **Practice Problems**

---

1. A store priced a textbook at \$126.75 using a markup of 34% of cost.
  - a. What was the cost of the book?
  - b. What is the markup as a percent of selling price?
2. The TeaSpot sells stovetop kettles at a markup of 15% of the selling price. The store's margin on a particular model is \$6.87.
  - a. What is the selling price of the kettles?
  - b. What is the cost of buying the kettles?
  - c. What is the rate of markup based on cost?
3. An eyewear shop sells wraparound sunglasses for \$86. If they wanted to lower the price to \$75, what rate of markdown would they have to offer?
4. The Music Box paid \$13.95 for a DVD. Expenses are 17% of the selling price and the required profit is 14% of selling price. During a weekend sale, the DVD was marked down 10%.
  - a. What was the regular selling price?
  - b. What was the sale price?
  - c. What was the operating profit or loss?
5. Harry's Hardware realizes a markup of \$34.50 if it sells an article at a markup of 40% of the selling price.
  - a. What is the regular selling price?
  - b. What is the cost?
  - c. What is the rate of markup based on cost?
  - d. If overhead expenses are 27% of cost, what is the break-even price?
  - e. What is the operating profit or loss, if the article is sold for \$75?
6. Autobots purchases car stereos for \$225 less  $33 \frac{1}{3} \%$ . The store operates at a normal markup of 35% of regular selling price. The owner marks all merchandise with new regular selling prices so that the store can offer a  $18 \frac{2}{3}\%$  discount while keeping the same gross profit.
  - a) What is the original regular selling price?
  - b) What is the new selling price?



7. A patio table set that cost a dealer \$330 less 45%, 25% is marked up 160% of cost. For quick sale, the table set was reduced 35%.
  - a. What is the regular selling price?
  - b. What is the sale price?
  - c. What is the rate of markup based on cost realized during the sale?
8. Grin & Bare It buys briefs for \$15 less 15%, 10%. The briefs are priced at a regular selling price to cover expenses of 22% of regular selling price and a profit of 15% of regular selling price. For a special weekend sale, briefs were marked down 20%.
  - a. What was the operating profit or loss on briefs sold during the weekend sale?
  - b. What rate of markup was realized based on cost?
9. Ming Wu bought knife sets for \$170 less 40%, 16 2/3%, 10%. The store's overhead is 45% of regular selling price and the profit required is 21.25% of regular selling price
  - a. What is the break-even price?
  - b. What is the maximum rate of markdown the store can offer to break even?
  - c. What is the realized rate of markup based on cost if the knife sets are sold at the break-even price?
10. A shoe store bought 225 pairs of shoes for \$15750. Twenty-five pairs were sold at a markup of 150% of cost and 175 pairs at a markup of 75% of cost; 10 pairs were sold during a clearance sale for \$80 each and the remaining shoes were disposed of at 20% below cost. Assume all pairs of shoes had the same cost.
  - a. What was the cost of shoes?
  - b. What was the amount of markup realized on the purchase?
  - c. What was the percent markup based on selling price?

## Solutions

---

1. a. \$94.59    b. 25.4%
2. a. \$45.80    b. \$38.93    c. 17.7%
3. 12.8 %
4. a. \$20.22    b. \$18.20    c. \$0.81 profit
5. a. \$86.25    b. \$51.75    c. 66.7%    d. \$65.72    e. \$9.28
6. a. \$230.77    b. \$283.73
7. a. \$353.93    b. \$230.05    c.  $m_c = 69.0\%$
8. a. (\$0.92) loss    b. 26.9%
9. a. \$178.50    b. 21.3%    c. 133.3%
10. a. \$70 per pair    b. \$11,702.50    c. 42.6%

