Markup and markdown

Key definitions

Cost (C): The amount a business pays to acquire or produce an item.
Markup (M): The amount added to cost to determine the selling price.
Selling Price (S): The regular price at which an item is offered for sale.
Discount: A reduction from the selling price, often expressed as a percentage.
Sale Price: The price after a discount has been applied.
Markdown: A permanent reduction in selling price (different from a temporary discount).

The fundamental relationship in retail pricing is,

$$\text{Cost} + \text{Markup} = \text{Selling Price}$$

Markup calculations

Markup can be expressed as a percentage of cost or as a percentage of selling price. The same dollar markup gives different rates depending on the base used.

Markup Based on Cost	Markup Based on Selling Price
$M = C \times \textbf{Rate}$	$M = S \times \textbf{Rate}$
$S = C \times (1 + \textbf{Rate})$	$S = C \div (1 - \textbf{Rate})$
$\textbf{Rate} = M \div C$	$\textbf{Rate} = M \div S$

Example: A retailer buys a product for \$60 and wants a 40% markup on cost. Find the selling price.

$$S = C \times (1 + \textbf{Rate}) = \$60 \times 1.40 = \$84$$

Example: A store wants to sell an item for \$75 with a 25% markup on selling price. What is the maximum cost?

$$C = S \times (1 - \textbf{Rate}) = \$75 \times 0.75 = \$56.25$$

Caution: A 40% markup on cost is not the same as a 40% markup on selling price. Always identify which base is being used.

Discount calculations

A discount reduces the selling price. The sale price can be calculate two ways:

$$\text{Sale Price} = \text{Selling Price} - \text{Discount Amount}$$

$$\text{Sale Price} = \text{Selling Price} \times (1 - \text{Discount Rate})$$

Example: A $120 jacket is on sale for 35% off. What is the sale price?

$$\text{Sale Price} = \text{Selling Price} \times (1 - \text{Discount Rate}) = \$120 \times 0.65 = \$78$$

Finding the original price from a sale price

To find the original selling price when you know the sale price and discount rate:

$$\text{Selling Price} = \text{Sale Price} \div (1 - \text{Discount Rate})$$

Example: An item is on sale for $63 after a 30% discount. What was the original price?

$$\text{Selling Price} = \$63 \div (1 - 0.30) = \$63 \div 0.70 = \$90$$

Chain discounts

When multiple discounts are applied in sequence, multiply the complement of each discount rate:

$$\text{Sale Price} = \text{Selling Price} \times (1 - d_1) \times (1 - d_2) \times (1 - d_3) \times \cdots$$

Example: A $200 item has discounts of 20% and then 15%. What is the final price?

$$\text{Sale Price} = \$200 \times (1 - 0.20) \times (1 - 0.15) = \$200 \times 0.80 \times 0.85 = \$136$$

The single equivalent discount rate for chain discounts:

$$\text{Single Rate} = 1 - [(1 - d_1) \times (1 - d_2) \times (1 - d_3) \times \cdots]$$

For the example above, $1 - (0.80 \times 0.85) = 1 - 0.68 = 0.32 = 32\%$

Caution: Chain discounts of 20% and 15% do not equal a 35% discount! the order does not matter, but you cannot simply add the percentages.

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