CTJan27 Online Year 5 - Percentage Increase and Decrease

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1. Introduction

Overview of Percentage Increase and Decrease:
Percentage increase and decrease are methods to express how much a quantity has grown or shrunk relative to its original value, in percentage terms. These concepts are crucial for comparing changes over time, such as price changes, population growth, or declines in production.

Importance and Applications:
Understanding percentage increase and decrease is essential for many practical situations. For instance, you use it when calculating sales tax, determining the growth of investments, or understanding changes in population size. It also helps in making informed decisions in everyday life, like determining how much money you save during a sale or how much a price has gone up.

2. Prerequisite Knowledge

Understanding Basic Percentages:
Students should have a foundational understanding of what a percentage is—expressing a number as a fraction of 100. For example, 50% means 50 out of 100.

Basic Arithmetic Operations:
Students need to be comfortable with basic arithmetic operations like addition, subtraction, multiplication, and division, as these are integral to calculating percentage increases and decreases.

3. Lesson Content

Definition of Percentage Increase and Decrease:

- **Percentage Increase:** This occurs when the new value of an item is greater than its original value. The percentage increase is calculated by finding the difference between the new and original values, dividing this difference by the original value, and then multiplying the result by 100 to convert it to a percentage.

  Formula:

  $$\text{Percentage Increase} = \left(\frac{\text{New Value} - \text{Original Value}}{\text{Original Value}} \right) \times 100$$

  Example: If the price of a book increased from $20 to $25, the percentage increase is calculated as follows:

  $$\text{Percentage Increase} = \left(\frac{25 - 20}{20} \right) \times 100 = \frac{5}{20} \times 100 = 25\%$$

  So, the price increased by 25%.

- **Percentage Decrease:** This occurs when the new value of an item is less than its original value. The percentage decrease is calculated similarly to the percentage increase, except the new value is less than the original value.

  Formula:

  $$\text{Percentage Decrease} = \left(\frac{\text{Original Value} - \text{New Value}}{\text{Original Value}} \right) \times 100$$

Example: If the price of a shirt decreases from $50 to $40, the percentage decrease is calculated as follows:

$$\text{Percentage Decrease} = (\frac{50 - 40}{50}) \times 100 = \frac{10}{50} \times 100 = 20\%$$

So, the price decreased by 20%.

Calculating Percentage Increase:

- **Step 1:** Determine the original value and the new value.
- **Step 2:** Subtract the original value from the new value to find the increase.
- **Step 3:** Divide the increase by the original value.
- **Step 4:** Multiply the result by 100 to get the percentage increase.

Example: A population of a town grew from 8,000 to 10,000 people.

- Increase = 10,000 - 8,000 = 2,000
- Percentage Increase = $\frac{2,000}{8,000} \times 100 = 25\%$
  So, the population increased by 25%.

Calculating Percentage Decrease:

- **Step 1:** Determine the original value and the new value.
- **Step 2:** Subtract the new value from the original value to find the decrease.
- **Step 3:** Divide the decrease by the original value.
- **Step 4:** Multiply the result by 100 to get the percentage decrease.

Example: A car's value depreciated from $15,000 to $12,000.

- Decrease = 15,000 - 12,000 = 3,000
- Percentage Decrease = $\frac{3,000}{15,000} \times 100 = 20\%$
  So, the car's value decreased by 20%.

Solving Real-Life Problems Involving Percentage Increase and Decrease:

- **Problem 1:** A store sells a jacket for $80. If the store increases the price by 15%, what is the new price?
  - Increase = $80 \times 0.15 = 12$
  - New Price = $80 + $12 = $92
- **Problem 2:** The price of a laptop decreased from $1,200 to $960. What is the percentage decrease?
  - Decrease = $1,200 - 960 = 240$
  - Percentage Decrease = $\frac{240}{1,200} \times 100 = 20\%$
- **Problem 3:** A stock's price went up from $50 to $60. Calculate the percentage increase.
  - Increase = $60 - 50 = 10$

- Percentage Increase = $\frac{10}{50} \times 100 = 20\%$

- **Problem 4:** A product was originally priced at $100 but is now on sale for $75. What is the percentage decrease?
  - Decrease = $100 - 75 = 25$
  - Percentage Decrease = $\frac{25}{100} \times 100 = 25\%$

4. Vocabulary Words with Definitions

- **Percentage Increase:** The percentage by which a value grows compared to its original amount.
- **Percentage Decrease:** The percentage by which a value reduces compared to its original amount.
- **Original Amount:** The initial value before any changes.
- **New Amount:** The value after an increase or decrease has been applied.
- **Difference:** The amount by which the original value and the new value differ, used to calculate percentage changes.

1. If two products increase in price, one from $40 to $50 and another from $100 to $110, which one has a higher percentage increase? (1 point)

   ○ 1. $40 to $50

   ○ 2. $100 to $110

2. Why might a business choose to advertise a percentage increase in profits rather than the actual dollar amount? (1 point)

   ○ 1. More relatable to customers

   ○ 2. More impressive

   ○ 3. Easy to calculate

3. If two items decrease in price, one from $60 to $45 and another from $120 to $90, which one has a higher percentage decrease? (1 point)

   ○ 1. $60 to $45

   ○ 2. $120 to $90

3. Fill-in-the-Blank

4. If a population increased from 50,000 to 60,000, what is the percentage increase? (1 point)

   _____

5. A car's value drops from $20,000 to $18,000. What is the percentage decrease? (1 point)

   _____

6. Imagine you want to increase the attendance of an event from 150 to 180 people. What is the required percentage increase? (1 point)

7. Suppose you want to decrease your spending from $250 a month to $200. What percentage decrease would this be? (1 point)

Level 1: Remembering

8. What is the formula for calculating percentage increase? (1 point)

   ○ (Original Value − New Value) / Original Value × 100

   ○ (New Value − Original Value) / Original Value × 100

   ○ (Original Value + New Value) / 2

   ○ (New Value × Original Value) / 100

9. What is the formula for calculating percentage decrease? (1 point)

   ○ (New Value − Original Value) / Original Value × 100

   ○ (Original Value − New Value) / Original Value × 100

   ○ (New Value × 100) / Original Value

   ○ (Original Value − New Value) × 100

Level 2: Understanding

10. If the price of a product increased from $50 to $60, what is the percentage increase? (1 point)

    ○ 10%

    ○ 15%

    ○ 20%

    ○ 25%

11. A book's price decreased from $120 to $96. What is the percentage decrease? (1 point)

    ○ 10%

    ○ 15%

    ○ 20%

    ○ 25%

Level 3: Applying

12. A television is priced at $500. During a sale, the price is reduced by 15%. What is the sale price? (1 point)

- ○ $425
- ○ $450
- ○ $475
- ○ $400

13. The population of a city increased from 200,000 to 250,000. What is the percentage increase in (1 point) population?

- ○ 20%
- ○ 25%
- ○ 30%
- ○ 50%

Level 4: Analyzing

14. Two items are priced at $80 and $120. The $80 item is increased by 10%, and the $120 item is (1 point) decreased by 10%. Which item has a greater price change in absolute terms?

- ○ The $80 item
- ○ The $120 item
- ○ Both have the same price change
- ○ Cannot determine from the information given

15. A car's value decreases from $25,000 to $20,000, while another car's value decreases from (1 point) $30,000 to $25,000. Which car had a larger percentage decrease?

- ○ The first car
- ○ The second car
- ○ Both had the same percentage decrease
- ○ Cannot determine from the information given

Level 5: Evaluating

16. If a product's price is increased by 20% and then decreased by 20%, is the final price the same (1 point) as the original price?

- ○ Yes
- ○ No, it is higher
- ○ No, it is lower
- ○ Cannot determine from the information given

17. A company reports a 15% increase in revenue followed by a 10% decrease the next year. Is the (1 point) final revenue greater than, less than, or equal to the original revenue?

○ Greater than

○ Less than

○ Equal to

○ Cannot determine from the information given

Level 6: Creating

18. You want to reduce your spending by 30% from $2,000 per month. What should be your new budget?　(1 point)

   ○ $1,400

   ○ $1,500

   ○ $1,600

   ○ $1,800

19. A company's profit increased by 25% last year. If the current profit is $100,000, what was the profit before the increase?　(1 point)

   ○ $80,000

   ○ $90,000

   ○ $95,000

   ○ $75,000

Level 7: Socratic Method

20. Why might a business choose to advertise a percentage increase in profits rather than the actual dollar amount?　(1 point)

   ○ More relatable to customers

   ○ More impressive

   ○ Easy to calculate

21. If an item's price increased by 25% last year and decreased by 25% this year, would the final price be the same, higher, or lower than the original price? Why?　(1 point)

   _____

   _____

   _____

   _____

   _____

22. A product's price was decreased by 15% and then increased by 20%. How does the final price compare to the original price, and why?　(1 point)

   _____

   _____

_____
_____
_____

Mixed Questions

23. If a stock price increases from $40 to $50, what is the percentage increase?　　　(1 point)

_____

24. If a store increases the price of a $60 shirt by 30%. What is the new price?　　　(1 point)

_____

25. After a 20% decrease, the price of a computer is $800. What was the original price?　　　(1 point)

_____

26. If a product's price decreased from $150 to $120, what is the percentage decrease?　　　(1 point)

_____

27. If a car's value increased by 10% from $20,000. What is the new value?　　　(1 point)

_____

28. If a company's revenue decreased by 25% from $200,000. What is the new revenue?　　　(1 point)

_____

29. If the population of a town decreased from 50,000 to 40,000. What is the percentage decrease? (1 point)

_____

Finding the Original Price When Percentage Increase is Known

When you know the final price after a percentage increase and the percentage by which it was increased, you can find the original price using the following steps:

Step-by-Step Process:

1. **Identify the Final Price:** This is the price after the percentage increase has been applied.

2. **Identify the Percentage Increase:** This is the percentage by which the original price has increased.

3. **Set Up the Equation:** Use the formula:

$$\text{Final Price} = \text{Original Price} \times (1 + \frac{\text{Percentage Increase}}{100})$$

4. **Solve for the Original Price:**

$$\text{Original Price} = \frac{\text{Final Price}}{(1 + \frac{\text{Percentage Increase}}{100})}$$

Examples:

1. **Example 1:**

   - **Problem:** A laptop's price increased by 20% to $600. What was the original price?

   - **Solution:**
     The final price is $600, and the percentage increase is 20%.

     Set up the equation:

     $$600 = \text{Original Price} \times (1 + \frac{20}{100})$$

     Simplify the equation:

     $$600 = \text{Original Price} \times 1.20$$

     Solve for the original price:

     $$\text{Original Price} = \frac{600}{1.20} = 500$$

     Answer: The original price was $500.

Example 2:

- **Problem:** A bike's price increased by 15% to $460. What was the original price?
- **Solution:**
  The final price is $460, and the percentage increase is 15%.

  Set up the equation:

  $$460 = \text{Original Price} \times \left(1 + \frac{15}{100}\right)$$

  Simplify the equation:

  $$460 = \text{Original Price} \times 1.15$$

  Solve for the original price:

  $$\text{Original Price} = \frac{460}{1.15} = 400$$

  Answer: The original price was $400.

30. If a bicycle's price is increased by 8% to $540. What was the original price?   (1 point)

_____

31. If the price of a phone increased by 15% to $345. What was the original price?   (1 point)

_____

32. If a jacket is on sale for $48 after a 20% discount. What was the original price?   (1 point)

_____

33. A jacket's price increased by 25% to $75. What was the original price?   (1 point)

_____

34. After a 15% increase, the price of a shirt is $69. What was the original price?   (1 point)

_____

35. A computer's price increased by 30% to $780. What was the original price?   (1 point)

_____

36. The price of a phone increased by 10% to $330. What was the original price?   (1 point)

_____

37. After a 20% increase, the price of a bicycle is $240. What was the original price?   (1 point)

_____