Lecture 5 Standardized Proportions and the Number 100

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Percentage Terms and Notation

$$percentage : base :: rate : 100$$

Terms

- Percent is a standardize proportion where a ratio between percentage and base is related to parts of 100. (Literally the same as saying "x out of 100")

- The **percentage** is the part of a number computed by the rate.

- The **base** is the number on which the percentage is computed. (This can often be thought of as the total amount, original amount, or total population in most problems.)

- The **rate**, also referred to as the percent, is the parts out of 100 to be taken from the base.

- **Amount** is the sum obtained by adding the percentage to the base.

- **Difference** is the remainder obtained by subtracting the percentage from the base.

Notation

- A percent may be written as:

    - A ratio $25 : 100$ or $1 : 4$.
    - A fraction $\dfrac{25}{100}$ or $\dfrac{1}{4}$
    - A decimal 0.25
    - Using the % sign 25%

- Frequently, a problem can be searched for keywords. For example: "What **is** 25% **of** 200?".

    - The "is" portion corresponds to the percentage.
    - The "of" portion corresponds to the base.
    - We could rewrite the fraction's proportion as the following mnemonic

    $$is : of :: percent : 100$$

    - Exercise: Rewrite this mnemonic proportion in fraction form.

Percentage Calculations

- To find any part of a percent, simply set up the proportion and solve.

  1. What is 25% of 300?
  2. 120 is 30% of what number?
  3. What percent of 400 is 50?

- In problems dealing with amounts and differences, the base and percentage are used in the sum or difference.

  1. A store sells shirts for $15.00 apiece. If they have a 20% off sale, what is the price of the shirts?
  2. A merchant purchases rugs for $10.00 apiece and sells them for $15.00. What percent markup has the merchant applied?
  3. According to `worldometers.info`, the United States population increases by 0.71% each year. If the present population of the United States is 3.28×10^8 people, what will the population be next year?

Percentage and Proportion Problems

1. A besieged town, containing 22,400 inhabitants, has provisions to last 3 weeks; how many must be sent away that they may be able to hold out 7 weeks? [1]

2. If 8 workers in 24 days working 10 hours a day can reap 48 acres of wheat, how many acres could 12 workers reap in 20 days of 12 hours each?

3. If a staff of 4ft casts a shadow 7ft in length, what is the height of a tower which casts a shadow of 198ft at the same time? [2]

4. A homeowner sells their house at a loss of 20%. If the selling price was $60,000.00, what was the original price of the home?

5. In the erection of a house I paid twice as much for material as for labor. Had I paid 6% more for material, and 9% more for labor, my house would have cost $1284.00; what was its cost?[2].

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[1] Transcribed from: *A Treatise on Arithmetic* by J. H. Smith. 1878
[2] Transcribed from: *The Proressive Higher Arithmetic* edited by Daniel Fish. 1878