

Lecture 6 Proportions and Change

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Change According to Proportions

Direct Proportions

- When something increases by a proportion, this is called a direct proportion.
- Suppose we have a proportion $a : b :: c : d$. If an increase in a causes a proportional increase in c , then $a : b :: c : d$ is a direct proportion.
- You must read the nature of a problem to know whether it is increasing and therefore a direct proportion.

Inverse Proportions

- When something decreases by a proportion, this is called an inverse proportion.
- Using the letters a , b , c , and d from the previous problem, if an increase in a causes a decrease in c , then the corresponding inverse proportion is $a : b :: d : c$.
- You must read the nature of a problem to know whether it is decreasing and therefore an inverse proportion.

Change According to Percents

Increasing, Amount, and Markup

- Recall the term amount. $\text{amount} = \text{base} + \text{percentage}$.

Decreasing, Difference, Discount

- Recall the term difference. $\text{difference} = \text{base} - \text{percentage}$.

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?

¹Transcribed from: *A Treatise on Arithmetic* by J. H. Smith. 1878

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.

²Transcribed from: *The Progressive Higher Arithmetic* edited by Daniel Fish. 1878