Math 107: Quantitative Reasoning

Tuan N. Pham *
Fall 2025

September 5, 2025

Contents

Lecture 1: introduction; percentage, convert percentage to decimal numbers and fractions **3**

Lecture 2: usage of percentage **3**

Lecture 3: scientific notation **4**

Lecture 4: significant digits **4**

Lecture 5: error of measurement-source and representation **4**

Lecture 6: cash flow, interest rate **4**

Lecture 7: compound interest, accumulated balance **4**

Lecture 8: continuous compounding **4**

Lecture 9: two methods of saving—lump sum and annuity **4**

Practice on annuity **4**

Lecture 10: present/future value of a payment stream; loans **4**

Practice on amortization **4**

Review for Midterm I **4**

Lecture 11: logics, some common types of fallacy **4**

Lecture 12: propositions, connectors, truth table **4**

Lecture 13: set notation and Venn diagram **4**

Lecture 14: inductive and deductive arguments **4**

*Faculty of Math and Computing, Brigham Young University-Hawaii

Lecture 15: statistical study 4

Lecture 16: evaluating a statistical study 4

Lecture 17: data representation as tables and graphs 4

Lecture 18: correlation and causality 4

Lecture 19: mean, median, mode, histogram 4

Lecture 20: measure of variations, boxplot 4

Review for Midterm II 4

Lecture 21: practice on the last worksheet 4

Lecture 22: normal distribution, 68-95-97.5 rule 4

Lecture 23: z-score, percentile; practice on the last worksheet 4

Lecture 24: further practice on normal distribution 4

Lecture 25: Central Limit Theorem and sampling distribution 4

Lecture 26: interval of confidence, margin of error, hypothesis testing 4

Lecture 28: independent events, find probability of AND/OR events 4

Lecture 29: practice on the worksheet last time 4

Lecture 30: Law of Large Numbers and expected values 4

Lecture 31: counting permutations and combinations 4

Lecture 32: practice on the worksheet last time 4

Review for Final Exam 4

Lecture 1 (Sep 3)

We will cover the following chapters of the book in order below:

- Chapter 3: representing numbers
- Chapter 4: Math in Finance
- Chapter 1: logic
- Chapter 5 and 6: statistics
- Chapter 7: probability

There are 3 common ways to represent a number: decimal, percentage, fraction. For some cases, rounding is necessary. Percentage and fraction are often used to describe the ratio of a set of things to another set.

Example 1: 6 out of 10 students in an elementary school are male. The ratio of male and female is $6:4$. The percentage of male students in the school is $\frac{6}{10} = \frac{6}{10} \times 100\% = 60\%$.

Example 2: In the academic year 2018-2019, the tuition per student of BYUH was \$2780 per semester. In the academic year 2023-2024, the tuition per student is \$3219 per semester. Over the 5 years from 2018 to 2023, the tuition has increased by $\frac{3219-2780}{2780} = \frac{439}{2780} = \frac{439}{2780} \times 100\% \approx 15.8\%$.

Lecture 2 (Sep 5)

Goals:

- Conversion of decimal (with rounding as needed), fraction, percentage
- Use of percentage
- Absolute change and relative change

You can convert the three forms of representing a number.

Example 1:

$$1.7 = 1.7 \times 100\% = 170\% = \frac{170}{100} = \frac{17}{10}$$

Example 2:

$$\frac{6}{13} = 0.4615384615... \approx 0.462 \quad \text{(rounded to three decimal places)}$$
$$\frac{6}{13} \approx 46.15\% \quad \text{(rounded to two decimal places)}$$

Example 3: There are decimal numbers that never "ends" when you write the digits, but has a repeated pattern. For example, 1.426262626... In other to convert this number into decimal form, let us give it a name, say $x = 1.426262626...$ Now notice that $10x = 14.262626...$ and $1000x = 1426.262626...$ Then

$$1000x - 10x = 1426 - 14 = 1412.$$

In other words, $990x = 1412$. Therefore, $x = \frac{1412}{990} = \frac{706}{495}$.

You can use percentage to compare quantities and to describe the change.

Example 4: The highest SAT score is 1600. Earlier this year, you got 1150. So, you got

$$\frac{1150}{1600} \approx 71.88\%$$

of the total score. Last year, you got 1050. So, you got

$$\frac{1050}{1600} \approx 65.63\%$$

Compared to last year, your score has improved by 100 points (absolute change). You gained $71.88 - 65.63 = 6.25$ percentage points (absolute change). Your score last year was

$$\frac{1050}{1150} \approx 91.30\%$$

of your score this year. Your score this year is

$$\frac{1150}{1050} \approx 109.52\%$$

of your score this year. Your score has increased by

$$\frac{1150 - 1050}{1050} \approx 9.52\% \quad \text{(relative change)}$$

Your score last year was

$$\frac{1150 - 1050}{1150} \approx 8.70\% \quad \text{(relative change)}$$

lower than your score this year.