

MA 111 Review for Exam 1

Exam 1 (given in class on Tuesday, February 9) will cover Using Numbers and Quantities, and Percent and Percent Change, discussed in Sections 1 and 2 of the text.

Can you work each homework, worksheet, and quiz problem *correctly* and *quickly*, providing explanations and justifications, without looking at the text or your notes?

Have you carefully studied the material in the text?

You should be familiar with the following key ideas:

- Understand the difference between number and quantity.
- Know how to convert units (e.g., miles/hour to feet/sec).
- Know how to compare quantities with ratios and with percents.
- Know how to understand, or make better sense, of very large or very small quantities.
- Understand the importance of correct units.
- Understand what percent means.
- Know what the base of a percent is, and be able to identify the base of a percent in context.
- Be able to find different variables in a percentage calculation (e.g., use the base and the result to find the percent).
- Understand how changes in numbers can be measured by percents (percent change).
- Know how to increase or decrease a number by a percentage, and how to reverse this process.
- Understand the difference between (1) change, (2) percent change, (3) change in percent (percentage points), and (4) percent change of percent.
- Be able to interpret a short passage and analyze the given information about numbers, quantities, percents, and percent change.

Practice Problems

1. I enjoy riding my recumbent bicycle at 12 miles per hour. What is my speed in yards per minute?

$$\frac{12 \text{ miles}}{1 \text{ hour}} \times \frac{5280 \text{ feet}}{1 \text{ mile}} \times \frac{1 \text{ yard}}{3 \text{ feet}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} = \frac{352 \text{ feet}}{1 \text{ minute}}$$

2. If light can travel 186,000 miles per second, how many miles can it travel in one year? (Assume one year has 365.25 days.)

$$\frac{186,000 \text{ miles}}{1 \text{ second}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{365.25 \text{ days}}{1 \text{ year}} \approx \frac{3.87 \text{ trillion miles}}{1 \text{ year}}$$

3. Compare the numbers \$23.9 billion and \$4.57 trillion as a ratio and as a percent. (Your answer should be in the form of complete sentences.)

\$4.57 trillion is about 191 times as large as \$23.9 billion, or \$4.57 trillion is about 19100% of \$23.9 billion. \$23.9 billion is about $\frac{1}{191}$ of \$4.57 trillion, or \$23.9 billion is about 0.52% of \$4.57 trillion.

4. Find an effective way to make sense of the size of Obama's proposed \$3.8 trillion federal budget.

Examples: Using the estimate that the world's population is about 6.67 billion, with \$3.8 trillion you could give each person on earth about \$570. Using the estimate that the U.S. population is about 312 million, each person's share of the debt in this country is about \$12,000.

5. Find an effective way to make sense of the size of a water molecule, 0.2 nanometers, which equals 0.0000000002 meters.

Example: Using the estimate of a human hair being 0.00002 meters wide, it would take about 100,000 water molecules to achieve the width of one hair.

6. Express each of the following percentages as a decimal.

(a) 43%

0.43

(b) 1.5%

.015

(c) 250%

2.5

(d) 0.13%

.0013

7. If your score on a test was 62 points out of 70, express the score as a percentage.

$$\frac{62}{70} = \frac{P}{100}, \text{ so } P = \frac{62}{70} \times 100 \approx 89\%.$$

8. What is 37% of 56?

$$\frac{A}{56} = \frac{37}{100}, \text{ so } A = \frac{37}{100} \times 56 = 20.72.$$

9. 78 is what percent of 52?

$$\frac{78}{52} = \frac{P}{100}, \text{ so } P = \frac{78}{52} \times 100 = 150\%.$$

10. 123 is 17% of what?

$$\frac{123}{N} = \frac{17}{100}, \text{ so } N = \frac{123 \times 100}{17} \approx 723.5.$$

11. Out of a class of 35 students, 28 students passed the midterm exam. What percentage of the class failed the midterm?

If 28 students passed, then 7 students failed. $\frac{7}{35} = \frac{P}{100}$, so $P = \frac{7}{35} \times 100 = 20\%$.

12. If your income in one year is \$65000 and you pay \$10000 in income tax, what is the tax rate?

$$\frac{10000}{65000} = \frac{P}{100}, \text{ so } P = \frac{10000}{65000} \times 100 \approx 15.4\%.$$

13. If you buy a book that costs \$19.95, and the sales tax is 6%, what amount do you owe?

$$\frac{A}{\$19.95} = \frac{6}{100}, \text{ so } A = \frac{6}{100} \times \$19.95 \approx \$1.20.$$

14. If you read that the income tax is \$230 per \$1000 in income, what is the tax rate as a percent?

$$\frac{230}{1000} = \frac{P}{100}, \text{ so } P = \frac{230}{1000} \times 100 = 23\%.$$

15. Refer to the previous problem. At that tax rate, if you owed \$34500 in income tax, how much was your income?

$$\frac{\$34500}{N} = \frac{23}{100}, \text{ so } N = \frac{\$34500 \times 100}{23} = \$150,000.$$