Math 5e, Fall 2026 Homework 7

Homework #7 is due November 9

Instructions: Some problems are from class, and some are new. Please try to solve all problems, do your best, and show your work. Write on separate sheets of paper, not between the lines of this handout!

Important: Review the **CW7_math5e_Proportions_Main_Points** file attached on Google Classroom.

1. Find the unknown

   (a) $\frac{3}{x} = \frac{15}{4}$ (b) $\frac{x}{7} = \frac{9}{84}$ (c) $\frac{y}{7} = \frac{65}{91}$

2. Solve the following problems using the properties of proportions

   a) If $\frac{a}{b} = \frac{4}{7}$ find $\frac{b}{a}$ b) If $\frac{a}{b} = \frac{3}{5}$ find $\frac{a+b}{b}$ c) If $\frac{a}{b} = \frac{5}{3}$ find $\frac{a+b}{a-b}$

   d) Given $\frac{x-2}{x+4} = \frac{1}{3}$ find x e) If a:b = 2:3 and b:c = 4:5, find a:b:c

3. One bookshelf has 70 books and a second has 36. How many books should you move from the first to the second shelf to have an equal number of books on each shelf?

4. In a factory with 30 machines, one client's order would take 12 days to fulfill. Before work on the order begins, 20% of the machines broke. How many days will it take to fulfill the order using only the working machines?

5. The ratio of boys to girls in 6th grade is 9 : 11, and in 7th grade the ratio of boys to girls is 29 : 31. There are 100 and 120 students in 6th and 7th grades, respectively. If all students attend a dance, what is the overall ratio of boys to girls?

6. The ratio of the ages of A and B is 7 : 9. After 6 years, their ages will be in the ratio 4 : 5. Find their present ages.

7. A map is drawn to a scale of 1 : 50,000. If two towns are 8 cm apart on the map, what is the real distance between them in kilometers?

8. Optional: Two mixtures of acid and water are in the ratio 2:5 and 3:7. In what ratio should they be mixed so that the resulting mixture has acid and water in the ratio 7:17?

9. Choose and complete one of the exploration projects from the list on the next page.

Exploration Projects: Famous Ratios

Choose one of the following mini-projects (or invent your own)

The Golden Ratio in Art and Architecture. Research the number $\varphi = \frac{1+\sqrt{5}}{2} \approx 1.618$. Find where it appears in art and architecture — for example, in the Parthenon, the Pyramids of Giza, *The Last Supper* or *Mona Lisa* by Leonardo da Vinci, *The Creation of Adam* by Michelangelo, or *The School of Athens* by Raphael. Use photos, reproductions, or building plans to measure proportions and see whether they are close to φ. Explain how artists and architects may have used this ratio intentionally to create harmony and balance.

The Golden Ratio in Nature. Research the number $\varphi = \frac{1+\sqrt{5}}{2} \approx 1.618$. Explore where it appears in nature — for example, in spiral shells, sunflowers, pinecones, flower petals, hurricanes, or galaxies. Take or find photographs of natural objects and measure key proportions (such as spiral growth or segment lengths) to see how close they are to φ. Discuss whether these patterns happen by mathematical necessity, natural efficiency, or coincidence.

Music and Harmony. Investigate how ratios such as 2 : 1, 3 : 2, and 4 : 3 correspond to octaves, fifths, and fourths in music. You can use a keyboard, guitar, or a digital tuner to explore frequency relationships.

Body Ratios. Measure your own height, arm span, or hand length and compare them to classical proportions described by Leonardo da Vinci's *Vitruvian Man*. How close are these ratios to the golden ratio?