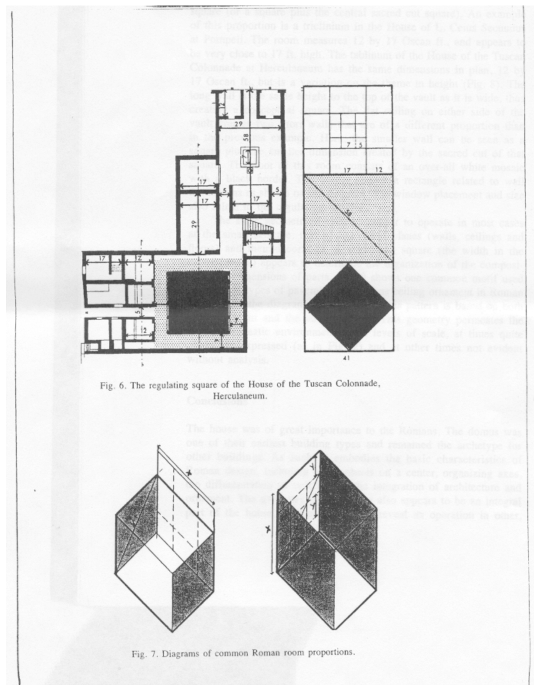
Problem Set 2

1. Consider a single house in Herculaneum, *The House of the Tuscan Colonnade*, also analyzed by the Watts. The floor plan is shown below.



The Watts measure the dimensions in Oscan feet [1] As you can see in the floor plan, the Watts found the following dimensions:

5	12	17	29	41

Find all ratios of these numbers that fall within the acceptance ranges of the Sacred Cut ratios (if any do). The acceptance ranges can be found under 1/31 on the webpage I use for display in class.

[1] The Oscans were an early Italic people who built the original walls and towers of Pompeii, and may have founded Herculaneum.

2. Suppose you are going to be testing several works of art and architecture to see whether your favorite ratio appears. You are assuming that your measurements will be within 1% of the actual lengths, and so, as we found in class, the ratios will be off from the actual ratio of the lengths by no more than 2%. Find the *acceptance range* for your ratio, if your favorite ratio is:

   (a) The Golden Ratio, $(1+\sqrt{5})/2$.

   (b) $(\sqrt{7}-\sqrt{5})/3$.

3. Suppose a Golden Ratio fanatic measures his box of cereal one morning and finds that the height of the box is 12.2" and the width is 7.8".

   (a) Is the ratio of the height to the width within our acceptance range for the Golden Ratio?

   (b) If the fanatic re-measures after having coffee and putting on his glasses, and decides he had been off by 1% in each of his measurements, might he be able to claim his cereal box was designed using the Golden Ratio, using our acceptance range?

4. Suppose you measure the length and width of a rectangle, paying attention to how accurately you are measuring. Your results:

$$\text{width } = 3 \text{ feet } \pm .02\% \qquad \text{length } = 6 \text{ feet } \pm .03\%.$$

   (a) Find the value of the ratio of the measured length to the measured width.

   (b) Find the range of values that the *actual* ratio of length to width could fall in. (That is, take into account the errors your measurements could have had.) *Remember:* the errors are percents, so you'll need to calculate what the actual error range is.

   (c) What's the furthest off from the measured ratio the *actual* ratio could be? Express your answer as a percent: *The actual ratio could be no more than ______% off from the measured ratio."*

5. For each of the following, you'll be drawing a line that is cut in mean and extreme ratio (i.e. the Golden Ratio).

   (a) Suppose we want to draw a line cut in mean and extreme ratio, and we want the short segment to be 3 units long. How long should the long segment be? Draw such a line as carefully as possible.

   (b) Suppose we want to draw a line of length 6 that is cut in mean and extreme ratio. Where should we place the cut? Draw such a line, as carefully as possible.

   Look at the two lines with cuts that you've drawn. Do they look the same or different? (You don't necessarily have to address this in what you turn in, I just want you to pay attention to the big picture!)

6. Suppose we don't happen to agree with Euclid about balance between extremes. So we define our own standard of beauty and all that, beginning with the ideal way to cut a line. Here's ours:

   > *A line is said to be cut in a* **very cool** *ratio when the greater segment is to the lesser segment as twice the whole is to the greater.*

   (a) Set up the proportion described in the definition of the *very cool ratio.*

   (b) What *is* this very cool ratio? (By this I mean, *find* the number it equals!)

   (c) Suppose we want to draw a line cut in a very cool ratio, and we want the short segment to be 3 units long. How long should the long segment be? Draw such a line as carefully as possible.

   (d) Suppose we want to draw a line of length 6 that is cut in a very cool ratio. Where should we place the cut? Draw such a line as carefully as possible.

   (e) How do these cuts compare to those you found in the previous problem?