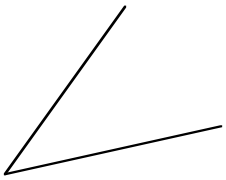
Practice midterm exam

Math in Arts, Fall 2003

1. (a) Construct (using an unmarked ruler and a compass) an angle three times larger than the given angle.



(b) Subdivide (using an unmarked ruler and a compass) the given line segment into two parts such that one of them is twice longer than the other.

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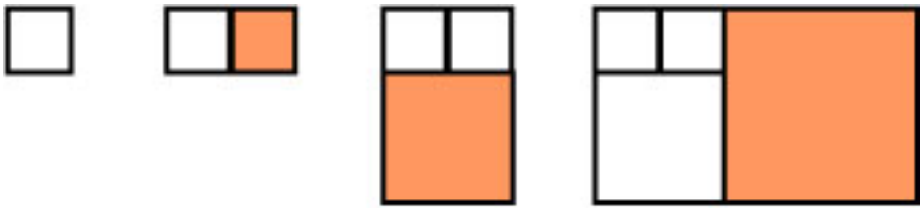
2. (a) Construct an obtuse golden triangle over the above line segment.

(b) Construct a line starting at the top of the golden triangle you have constructed in part (a) and ending at the base of that triangle such that it subdivides the obtuse golden triangle into two golden triangles.

3. We construct a sequence of rectangles by adding squares over the larger sides of the rectangles (see the picture; assume that the length of the side of the initial square is 1 unit). Draw the next rectangle in this sequence and explain (in not more than 2 sentences) how are the shorter sides of the rectangles in this sequence related to the Fibonacci numbers. Explain in not more than two sentences why the rectangle we get after applying the indicated procedure infinitely many times is a golden rectangle.



4. Find the groups of symmetries (= all symmetries) of the objects below.

(a)

(b) ...

...

5. Find the center of a central similarity that sends the smaller mask onto the larger.