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MTH 211 Geometry for Art and Architecture Spring 2014, 1-7

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## MTH 211, Math for Architects, Exam I, Spring 2014

Ayman Badawi

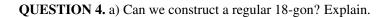
Each question 10 points, total points = 90

**QUESTION 1.** Draw a reasonable line segment and call it AB. Find the mid-point of AB and call it M. Draw a semi-circle centered at M with radius |MB| (To construct your semi-circle, just take the upper-half of the circle centered at M with radius |MB|). Now construct a rectangle ELFD where E, L are points on AB (call EL the width of the rectangle), F, D are points on the semi-circle you constructed (Call LF the length of the rectangle) such that |LF| = 1.5|EL| + |MK|/3, where MK is perpendicular to AB at M and intersects the semi-circle at the point K. STATE the steps CLEARLY and try to be BRIEF to the point. Illustrate the steps by diagrams.

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QUESTION 2. Draw a reasonable line segment and call it AB. Construct a point C on the line segment AB such that  $\frac{|AC|+|CB|}{|AC|}=0.5\frac{|AC|}{|CB|}$ . What is the numerical value of this ratio? STATE the steps CLEARLY and try to be BRIEF to the point. Illustrate the steps by diagrams.

**QUESTION 3.** Given  $a_0 = 1$ ,  $a_1 = 1$ , and  $a_n = 4a_{n-1} + 5a_{n-2}$  for each  $n \ge 2$ . First calculate  $a_2, a_3$ . Find a general formula for  $a_n$ . Now use the formula to find  $a_2, a_3$ , and  $a_7$ .



b) Can we construct a 54-degrees angle? EXPLAIN

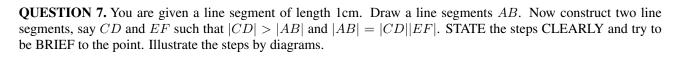
c)Can we construct a regular 34-gon? EXPLAIN

d) Can we construct an 80-degree angle? Explain

**QUESTION 5.** Draw a line segment AB. Now divide AB into 3 segments, say  $S_1, S_2, S_3$  such that  $|S_1| = |S_2|$  and  $|S_3| = \sqrt{2}|S_1|$ .

**QUESTION 6.** Construct a pentagon inside a circle. Now use the constructed pentagon in order to construct a regular 15-gon. STATE the steps CLEARLY and try to be BRIEF to the point. Illustrate the steps by diagrams.

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**QUESTION 8.** You are given a line segments, say AB. YOU ARE NOT ALLOWED to use a marked ruler. Construct a line segment of length  $\frac{|AB|}{\sqrt{3}}$ . STATE the steps CLEARLY and try to be BRIEF to the point. Illustrate the steps by diagrams.

**QUESTION 9.** You are given a line segment of length x > 1 and a line segment of length 1cm. Construct a line segment of length  $\sqrt{\sqrt{5}x^3 - 0.5x^3}$ . STATE the steps CLEARLY and try to be BRIEF to the point. Illustrate the steps by diagrams.

## **Faculty information**

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