

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.

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 $n \geq 2$. 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 .

QUESTION 4. a) Can we construct a regular 18-gon? Explain.

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.

QUESTION 7. You are given a line segment of length 1cm. Draw a line segments AB . Now construct two line segments, say CD and EF such that $|CD| > |AB|$ and $|AB| = |CD||EF|$. STATE the steps CLEARLY and try to be BRIEF to the point. Illustrate the steps by diagrams.

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

Faculty information

Ayman Badawi, Department of Mathematics & Statistics, American University of Sharjah, P.O. Box 26666, Sharjah, United Arab Emirates.

E-mail: abadawi@aus.edu, www.ayman-badawi.com