

Final Exam , MTH 211, Spring 2010

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QUESTION 1. Let L_1 and L_2 be two lines intersect in an angle α such that $\alpha \neq 90$. USED UNMARKED RULER AND A COMPASS TO BISECT THE ANGLE α. STATE CLEARLY THE STEPS OF CONSTRUCTIONS (NO MATH JUSTIFICATION IS NEEDED)

QUESTION 2. Let $abcd$ be a square with ad as the base and cd as the width. Let m be the midpoint of ad. Draw a circle C centered at m with radius cm. Then C intersects the extended line of ad at a point k. Prove that ak/ad = the Golden Ratio.

QUESTION 3. USE UNMARKED RULER AND A COMPASS TO CONSTRUCT A GOLDEN CUTE TRIANGLE with base that has length $4cm$ (you may use a marked ruler to measure 4cm).

QUESTION 4. Let L_1 and L_2 be two perpendicular lines. Choose a point m such that m does not lie on L_1 and m does not lie on L_2. USE UNMARKED RULER AND A COMPASS to find a point, say a, on the line L_1 and a point, say b on L_2 so that the line segment ab passes through m and $\mid am \mid = 2 \mid mb \mid$. STATE THE STEPS OF CONSTRUCTIONS. THEN VERIFY YOUR CONSTRUCTION.

QUESTION 5. Let C be a circle of radius 3 and center O. Let A be a point inside C such that $\mid OA \mid = 1cm$.

a) Is there a circle D of radius $3.5cm$ such that D passes through A and orthogonal to C? if yes, do nothing. If no, then explain why not.

b) USE a marked ruler and a compass to construct a circle F of radius $\sqrt{17}$ such that D passes through A and orthogonal to C.

QUESTION 6. Let C be a circle of radius 2 and center O. Let A be a point such that $\mid OA \mid= 1$. Let D be a circle orthogonal to C and centered at $Inv(A)$. Let m be the intersection point of D with the line segment $OInv(A)$. Find the exact length of the line segment $Inv(A)Inv(D)$.

QUESTION 7. (i) Can we construct an angle of 10 degrees (using unmarked ruler and a compass)? EXPLAIN

(ii) Can we construct a regular 22-gon (using unmarked ruler and compass)? explain

(iii) I claim that we can construct a regular 40-gon. Justify my claim. What will be the measurement of each interior angle?

(iv) Three types of regular gon: Say K, M, N. The K-type is regular 12 gon. We must use at least one piece of each type in order to tile a plane. What are the possibilities for the M-type and the N-type? State all possibilities WITHOUT ANY JUSTIFICATION.

QUESTION 8. (i) Let H be a hyperbolic circle with radius 3cm and center O. Let A be a point inside H such that $d_h(O,A) = \ln(5)$ (the hyperbolic distance is $\ln(5)$). Find $d(O,A)$ (the Euclidean distance between O and A). Show the work

(ii) Let H be a hyperbolic circle with radius 3cm and center O. Let B be a horizon point on H. Now choose two points A, C inside H such that $d(O,A) = d(O,C) = 1cm$. Given A, B do not lie on a diameter of H, and A, C do not lie on a diameter of H, and C, B do not lie on a diameter of H. Construct two lines say, L_1, L_2, such that L_1 passes through A, L_2 passes through C, L_1 is parallel to L_2 but L_1 meets L_2 at B. STATE THE STEPS OF CONSTRUCTIONS WITHOUT ANY MATH JUSTIFICATION.

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