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# Final Exam MTH 211 Fall 2010

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**QUESTION 1. (Each is 4 points, Total = 64)**

(i) The measurement of each interior angle of a regular 10-gon is

a) 36 (b) 144 c) 100 108

(ii) The measurement of each center angle of a regular 15-gon is

a) 156 b) 12 c) 24 d) 225

(iii) One of the following is constructible by unmarked ruler and a compass:

a) regular 21-gon b) regular 22-gon c) regular 34-gon d) regular 50-gon

(iv) Given $C$ is a circle centered at O and with radius 6 cm. Let $A$ be a point such that $| OA |= 3$. Let $Inv(A)$ be the inversion of $A$ with respect to $C$. Then $| OInv(A) |$ =

a) 2 b)12 c) 9 d) 4.5

(v) If a regular $n$-gon is constructible, then the angle (180/n) is constructible.

a) True b) False

(vi) If an angle $\alpha$ is constructible, then the angle $\alpha/16$ is constructible.

a) True b) False

(vii) Let $C$ be a circle centered at O and with radius 3. Given $A$ is a point such that $| OA |= 1$ and $D$ is a circle orthogonal to $C$ and passing through $A$. Then one of the following values is a possibility for the radius of $D$:

a)3 b)5 c) 3.5 d) 2

(viii) Let $H$ be the horizon circle (the model for non-Euclidean) with radius 4 and centered at $O$. Let $A$ be a point in $H$ such that $| OA |= 3$. Then the non-Euclidean distance between $O$ and $A$ is :

a) ln(3) b) ln(7) c) ln(9) = 2ln(3) d) ln(4)

(ix) In non-Euclidean (hyperbolic) geometry, if $a, b$ are two points, then

a) There are infinitely many lines pass through $a$ and $b$ b) There is exactly one circle passes through $a$ and $b$ c) There is exactly one line passes through $a$ but not through $b$ d) There is exactly one line passes through $a$ and $b$.

(x) In non-Euclidean Geometry, the sum of all interior angles of a regular 4-gon is

a) 180 b) less than or equal to 180 c) 360 d) less than 360

(xi) One of the below is a possibility for the inversion of the arc $ab$ with respect to the circle $C$ (the arc ab is a part of a circle not passing through the center of $C$)

(xii) One of the below is a possibility for the inversion of the arc $ab$ with respect to the circle $C$ (the arc ab is a part of a circle passing through the center of $C$)

(xiii) Let $C$ be a circle with radius 4 and centered at O. Let $Q$ be a point on $C$. Draw a circle call it $D$ centered at $Q$ with radius 4 again (note that $D$ passes through O). The two circles intersect in two points, say $A$ and $B$. Now choose a point say $Z$ on D such that the line segment OZ is a diameter of $D$. Now the line segment $AB$ intersects the diameter $OZ$ in a point say $M$ (note that $AB$ is perpendicular to OZ). The inversion of $M$ with respect to the circle $C$ is

a) the point $Z$ b) a point outside the circle $D$ c) a point outside $C$ but inside $D$ and not on D d) is the mid point of the line segment $QZ$.

(xiv) In the previous question, the length of $AZ$ is

a) 4 b) $4\sqrt{3}$ c) 6 d) $2\sqrt{3}$

(xv) The length of $AQ$ in question XIII is

a) 2 b) $\sqrt{2}$ c) $2\sqrt{3}$ d)$4\sqrt{3}$

(xvi) Let $K$ be the mid-point of the line segment $OM$ as in question XIII. The inversion of $K$ with respect to $C$ is

a) a point inside $D$ but outside $C$ b) the mid-point meter $OZ$ c) the mid-point of $QZ$ d) a point outside $D$ but on the line extension of $OZ$

**QUESTION 2. (12 points)** Let $H$ be a horizon circle (a model for non-Euclidean geometry) centered at O and with radius 4. Construct a non-Euclidean triangle inside $H$ call it $OAB$ such that $\mid OA \mid = \mid OB \mid = 2$ and $OA$ is perpendicular to $OB$. (Note that $\mid OA \mid$ indicates the Euclidean distance between $A$ and $O$). OUTLINE THE STEPS BY STATING THE CRUCIAL STEPS IN THE CONSTRUCTION.

Use a marked ruler in order to find the NON-EUCLIDEAN DISTANCE between $A$ and $B$ (You may measure to the nearest decimal)

**QUESTION 3. (12 points)** Draw a horizontal line and call it $L_1$, draw another line and call it $L_2$ such that $L_2$ intersects $L_1$ at an angle 90 degrees. Let $C$ be a point that does not lie on either $L_1$ nor $L_2$. Find two points say $a$ on $L_2$ and $b$ on $L_1$ such that $C$ lies on the line segment $ab$ and $\mid ac \mid = 1.5 \mid cb \mid$. OUTLINE THE STEPS BY STATING THE CRUCIAL STEPS IN THE CONSTRUCTION.

**QUESTION 4. (12 points)** Let $ab$ be a diameter of a semicircle. Find two points say D, F lying on the arc of the semicircle and two points say X, Y lying on the diameter ab such that $DFXY$ is a rectangle with $FX$ as the length, $XY$ as the width, and $\mid FX \mid = 2 \mid XY \mid$. OUTLINE THE STEPS BY STATING THE CRUCIAL STEPS IN THE CONSTRUCTION.

**Faculty information**

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