**Lines, Angles, and Squares, Oh MY! Mu Alpha Theta 2012 National Convention**

1. What is the sum of seven of a regular nonagon’s interior angles?

A. 280 B. 98 C. 195 D. 980 E. NOTA



1. A square is inscribed in a circle of radius 4. Another circle is inscribed inside the square and a second square is inscribed in this circle. If this pattern continues, what is the sum of the areas of the 13th square and the 9th circle?

A.  B.  C.  D.  E. NOTA

1. The segment joining (0,0) and (4,3) is rotated about the x-axis forming the lateral surface of a cone. Find the lateral surface area of this cone.  
     
   A) 15π B) 12π C) 16π D) 9π E) NOTA
2. Find the smallest positive integer n such that 2n is a perfect square, 3n is a perfect cube, and 5n is a perfect fifth power.

A)  B)  C)  D)  E) NOTA

1. The line through A (4, 2) and B (-1, *y*) is perpendicular to a line with slope -5. Find *y*.

A. 3 B. 1 C. 0.27 D. -1 E. NOTA

1. Find the area of a regular hexagon, which is inscribed in a circle that has a radius of 6π.

A.  B.  C.  D.  E. NOTA

1. Given triangle PQR with measure ∠P = 90º, PQ = 20 inches and PR = 15 inches, find the sum of the area of the triangle, the length of the hypotenuse and the length of the altitude to the hypotenuse, disregarding units of measure.

A. 331 B. 337 C. 787 D. 187 E. NOTA

1. What is the measure of the acute angle formed by the hands of a clock at 12:20 pm ?

A. 120˚ B. 110˚ C. 107 5/11˚ D. 105˚ E. NOTA

1. The area of a square equals the area of a circle with diameter 12 cm. What is the length of a diagonal of the square in centimeters?

A)  B)  C)  D)  E) NOTA

1. Which of the following is an asymptote of the graph of  ?

A) *x* = 5/2 B) *x* = 1 C) *y* = 1 D) *y* = 5/2 E) NOTA

1. Two circles have radii 5 and 13, and a common external tangent segment of length 12. What is the distance between their centers?

A) 12 B)  C) 13 D) 15 E) NOTA

1. If the line containing the points (-3, *k* ) and ( -9, 8 ) is perpendicular to the line containing the points (-13, *k* +5) and (-11, 2 ) which of the following could be a value of *k*?

A) - ¼ B) -2 C) -4 D)  E) NOTA

1. Find the difference between the smallest perfect square greater than one million and the largest perfect square less than one million.

A. 2000 B. 2001 C. 2012 D. 4000 E. NOTA

1. Which of the following does not lie on the slant asymptote of the function  ?

A) (-4, -11) B) (2, 1) C) (0, -13) D) (4, 5) E) NOTA

1. A ball of putty is rolled into a perfect sphere, and then sliced into two equal hemispheres, each of which has surface area measuring *A* square units, and volume measuring *A* cubic units. Find the radius of the original ball.

A) 1.5 B) 3 C) 4 D) 4.5 E) NOTA

1. The points (0, 8) and (−8, 4) lie on a circle.. If the center of the circle is the point (*m*, *n*) , then find the value of the expression 2*m*+*n*.

A) 1 B) 2 C) 3 D) 4 E) NOTA

1. Which of the following is the *x*-intercept of one of the asymptotes of the hyperbola with vertices at the points (4, 1) and (4, 9) and foci at the points (4, 0) and (4, 10).

A) ¼ B) ¾ C) 4/3  D) 31/3 E) NOTA

1. The circle with equation  is inscribed in a square with four points of tangency. What is the area of the space inside the square but outside the circle?

A)  B)  C)  D)  E) NOTA

1. Find the point in the fourth quadrant that has a distance of 10 from the points (-2, 0) and (10, 0).

A)  B)  C)  D)  E) NOTA

1. The point *A*, (5, -3), divides , where *M* is (-4, -15) and *T* is(8,1), into two segments. What is the ratio of the length of the shorter segment to the length of the longer segment (not ) ?

A) 2:5 B) 2:3 C) 1:3 D) 3:7 E) NOTA

1. A ***Scrabble***™ board consists of 225 congruent squares, each of which has side length one inch. How many squares with integral side length and area greater than 40 square inches can be composed using the squares that make up the ***Scrabble***™ board?

A) 285 B) 225 C) 105 D) 9 E) NOTA

1. What is the sum of the coordinates of the point of intersection of the directrix and axis of symmetry of the parabola ?

A) ½ B) 2½ C) 6½ D) -2½ E) NOTA

1. While hovering in mid-air 48 meters above the ground during a game of Quadratitch, Harry Plotter observed a Hewlett-Packard Calculator on the ground, at an angle of depression of 60°. What is the exact distance in meters between Harry Plotter and the HP calculator?

A)  B) 24 C)  D)  E) NOTA

1. What is the *x*-intercept of the line that is tangent to  at the point (10,12).

A) 19 B) -1 C) -6½ D) 6 E) NOTA

1. For the expressiondefined over the set of Real numbers, and *ab* ≠ 0, which of the following is not a factor of its simplified form?

A) *a* B) |*a*| C) *b* D)  E) NOTA

1. Solve for *k*, given points (1, *k*) and (5, | *k* |) lie on a line that has a slope of 3/5 .

A) -3/10 B) -6/5 C) -3/20 D) Ø E) NOTA

1. Sam and Lisa are riding on the Ferris wheel at the Mu Alpha Theta State Fair. There are 24 cars evenly spaced around the Ferris wheel, and the distance from the center hub to each car is 36 feet. Moving at a uniform speed, it takes 2 minutes for a car to go one complete revolution. How many degrees do Sam and Lisa travel in 1⅔ minutes?

A) 120 B) 150 C) 225 D) 285 E) NOTA

1. Using the same premise as in question # 27, above, what linear distance do Lisa and Sam travel in 50 seconds?

A) 30π ft B) 50π ft C) 60π ft D) 45π ft E) NOTA

1. A Boston Cream Pie is a actually a cake invented in Boston, consisting of 2 layers of yellow sponge cake separated by a layer of vanilla custard, and frosted with a thin chocolate glaze. Suzy Baker has just made a fresh one: it is in the shape of a right circular cylinder with a height of 8 inches and a diameter of 10 inches. What is the volume of one slice of cake cut at a central angle of 27°?
2. 7π cu in B) 10π cu in C) 12π cu in D) 15π cu in E) NOTA
3. Consider the graph of the function *xy* = 6. Which of the following is true regarding this function being symmetric with respect to the lines *y* = *x* or *y* = -*x*?
4. The function is only symmetric with respect to *y* = *x.*
5. The function is only symmetric with respect to *y* = -*x.*
6. The function is symmetric to both.
7. The function is symmetric to neither.
8. NOTA