2007 Hoover HS Math Tournament
Geometry Written Test

1. A circle of radius 6 has half of its area removed by cutting away a border of uniform width. Find the width of the border.

A. $3\sqrt{2}$ B. $6-3\sqrt{2}$ C. $6-\sqrt{13}$ D. $13\sqrt{2}$ E. NOTA

2. A circle has radius 4.2 inches, by what amount is its circumference increased when its radius is increased by 1 inch? (Use $\pi = 3.14$)

A. 3.14 B. 6.28 C. 9.42 D. 1.57 E. NOTA

3. The mid-segments of a triangle are 30, 30, and 48. The area of the triangle is

A. 432 B. 554 C. 1108 D. 1728 E. NOTA

4. The equation $x^2 + y^2 - 2x + 4y - 4 = 0$ represents

A. a circle B. a point C. a straight line D. a ellipse E. NOTA

5. Three circles, each with an 8 inch radius, are all tangent to each other. Find the area of the region between the circles.

A. $16\sqrt{3} - 8\pi$ B. $16\sqrt{3} - 32\pi$ C. $64\sqrt{3} - 32\pi$ C. $64\sqrt{3} - 32\pi$ E. NOTA

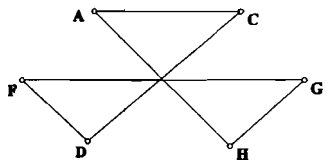
6. How many bricks 8 inches by 4 inches by 2 inches are necessary to build a wall 20 feet by 6 feet by 1 foot, if 10% of the wall is mortar?

A. 162 B. 2 C. 3294 D. 2916 E. NOTA

7. A cylinder that used to contain three tennis balls is now filled with water. The diameter of the cylinder is 3 inches and the height is 8 inches. A gallon is defined as a unit of liquid capacity equal to 231 cubic inches or 128 ounces. How many ounces of water does the cylinder hold? Use $22/7$ as pi, and since the cylinder can't hold more than its volume, round your answer down to the previous whole number of ounces.

A. 18 B. 36 C. 31 D. 16 E. NOTA

8. The sum of angles A, C, F, G, D, & H is



A. 180° B. 360° C. 540° D. 1080° E. NOTA

9. Points P and Q are the midpoints of diagonals AC and BD, respectively, of the trapezoid ABCD. If the longer base AB = 100 and PQ = 30, then DC is

A. 30 B. 35 C. 40 D. 45 E. NOTA

10. From a given point, two tangent segments to a circle with a 6 inch radius intercept a 120 degree arc. Find the perimeter of the region bounded by the two tangents and the minor arc.

A. $12\sqrt{3} + 4\pi$ B. $12\sqrt{3} + 12\pi$ C. $16 + 4\pi$ D. $16 + 12\pi$ E. NOTA

11. In a right triangle with hypotenuse c and legs a & b, $c^2 = 2ab$, one acute angle contains

A. 30° B. 75 C. 60° D. 45 E. NOTA

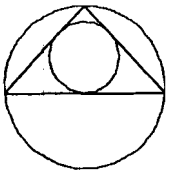
12. In an equilateral triangle with side 6 inches, a segment is drawn inside the triangle and parallel to one side of the triangle so that a trapezoid with 4 inch legs is formed. Find the area of that trapezoid.

A. $5\sqrt{15}$ B. $4\sqrt{3}$ C. $5\sqrt{3}$ D. $6\sqrt{3}$ E. NOTA

13. In ΔABC, $AC >$ AB. Point D is chosen on AC making AD = AB. If $m\angle CBA - m\angle C = 20^\circ$, then $m\angle CBD =$

A. 10° B. 15° C. 20° D. 25° E. NOTA

14. The sides of the triangle are 5, 5, and 6 inches long. Find the ratio of the area of the inscribed to the area of the circumscribed circle.



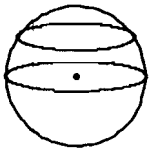
A. $12/25$ B. $1/9$ C. $25/36$ D. $144/625$ E. NOTA

15. In isosceles triangle ABC, AB = AC and the altitude to BC is 20. If the perimeter of the triangle is 80, the triangle area is
A. 400 B. 300 C. 200 D. 100 E. NOTA

16. What is the ratio of the area of a square inscribed in a semicircle with radius r to the area of a square inscribed in a circle with radius r?
A. $2/5$ B. $5/2$ C. $1/2$ D. $1/4$ E. NOTA

17. The diagonals of a rhombus have lengths of 18 and 24. Find the radius of a circle inscribed in this rhombus.
A. 8 B. $8/5$ C. $27/5$ D. $36/5$ E. NOTA

18. Find the area of a small circle on a sphere of radius 5" if the plane of the circle is 4" from the center of the sphere. Use $\pi = 3.14$ and round answer to the nearest tenth.

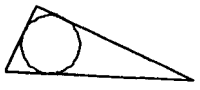


A. 26 B. 28.3 C. 29.6 D. 30.1 E. NOTA

19. The arc of a sector has degree measure 60. The radius of the sector is 12 inches. Find the area of the circle that can be inscribed in the sector.
A. 24π B. 16π C. 36π D. 4π E. NOTA

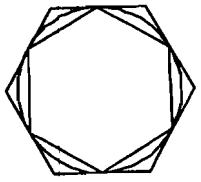
20. Find the circumference of a circle inscribed in an isosceles trapezoid with bases 8 and 18 inches long.
A. 12π B. $7\pi\sqrt{2}$ C. 10π D. 13π E. NOTA

21. A circle is inscribed in the right triangle with hypotenuse 10 and one leg of 8. The area of the triangle exceeds the area of the circle by



A. $24-2\pi$ B. $24-\pi/2$ C. $30-\pi$ D. $24-4\pi$ E. NOTA

22. A regular hexagon is inscribed in a circle, and a second regular hexagon is circumscribed about the same circle. If the sum of the areas of the two hexagons is $56\sqrt{3}$. Find the radius of the circle.



A. $2\sqrt{105}/5$ B. 8 C. $4\sqrt{2}$ D. 16 E. NOTA 4

23. A right rectangular prism of total surface area 270 square inches has an altitude of 6 inches. The width of the base is 2 inches less than the length. Find the volume of the prism.
A. $35-32\sqrt{43}$ B. $53-72\sqrt{43}$ C. $210-192\sqrt{3}$ D. $35-32\sqrt{3}$ E. NOTA $1242-144\sqrt{43}$

24. Given a triangle with an altitude 10 inches long. How far above a side should a parallel line be drawn to divide the triangle into a new triangle and a trapezoid so that the ratio of the new triangle area to the trapezoid area is 2:3?
A. $2\sqrt{10}$ B. $10-2\sqrt{10}$ C. $10-8\sqrt{10}$ D. $8\sqrt{10}$ E. NOTA

25. The altitude of a hexagonal based right pyramid is twice as long as the edge of the base. If the pyramid has a volume of $192\sqrt{3}$ cubic inches, find a base edge
A. $8\sqrt[3]{3}$ B. 6 C. $4\sqrt[3]{3}$ D. $10\sqrt[3]{3}$ E. NOTA

TB 1 An isosceles trapezoid with bases of lengths 12 and 16 is inscribed in a circle of radius 10. The center of the circle lies in the interior of the trapezoid. Find the area of that trapezoid.

TB2 A right rectangular tank with a 12 by 8 inch base is filled with water to a depth of 5 inches. If the water rises 2/3 of an inch when a solid cube is completely submerged in the tank, find the length of an edge of the cube.

TB3 Two dimensions of a right rectangular prism are 6 and 8. If the length of the diagonal of the prism is 12, find the third dimension.