

2009 Hoover HS Math Tournament: Geometry Written Test

1. What is the greatest number of times a coplanar circle and square can intersect?

- A. 10                      B. 8                      C. 6                      D. 5                      E. NOTA

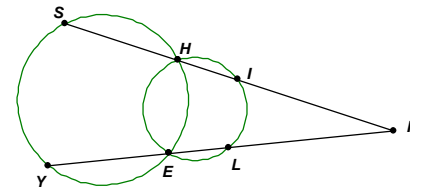
2. Quadrilateral DREW is inscribed in a circle. If  $m\angle D = 4x + 40$ ,  $m\angle E = 5x + 5$ , and  $m\angle W = 3x + 10$ , then  $m\angle R = ?$

- A.  $75^\circ$                       B.  $90^\circ$                       C.  $125^\circ$                       D.  $135^\circ$                       E. NOTA

3. Susmita has two pieces of wire having equal lengths and bends one to form a square, and the other to form an equilateral triangle. If  $A$  is the area of the triangle and  $B$  is the area of the square, how are  $A$  and  $B$  related?

- A.  $A = \frac{\sqrt{3}}{9}B$                       B.  $A = \frac{9\sqrt{3}}{4}B$                       C.  $A = \frac{\sqrt{3}}{4}B$                       D.  $A = \frac{4\sqrt{3}}{9}B$                       E. NOTA

4. Eugene saw the given figure, noticing that  $RI = 9$ ,  $HI = 3$ ,  $SH = 6$ , and  $RL = 8$ . He wondered what  $YE$  equaled. Please find the measurement for him.



- A.  $\frac{5}{2}$                       B.  $\frac{8}{3}$                       C.  $\frac{11}{2}$                       D.  $\frac{16}{3}$                       E. NOTA

5. Todd noticed that a circle is inscribed in a right triangle whose hypotenuse is 10 and a leg is 8. The area of the triangle exceeds the area of the circle by...?

- A.  $24 - 4\pi$                       B.  $16\sqrt{3} - 32\pi$                       C.  $64\sqrt{3} - 32\pi$                       D.  $40 - 32\pi$                       E. NOTA

6. The Washington Monument in Washington, D. C., casts a shadow that is 142 ft. 6 in. long at the same time that Mason, who is 156 cm tall, casts a shadow that is 40 cm long. What is the height of the Washington Monument to the nearest foot?

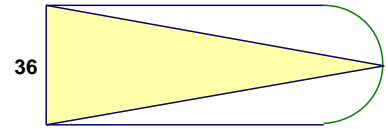
- A. 162                      B. 627                      C. 556                      D. 2916                      E. NOTA

7. Two parallel chords on the same side of the center of a circle are 12 inches and 20 inches long and 2 inches apart. Find the radius of the circle.

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

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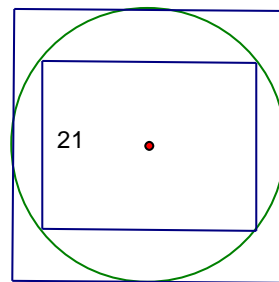
8. Xinke wants to paint a figure like the one to the right one a wall in his playroom but needs to know the area of the shaded region to buy paint. If the figure is a semicircle adjoining a rectangle whose dimensions are 54 m by 36 m, with an isosceles triangle is inscribed what is the area of the shaded region that he wants to paint?



- A. 1944      B. 1296      C. 324      D. 1701      E. NOTA
9. Michael sends a bank container through the vacuum tube at the drive in teller of a bank. If the container is a cylinder capped with a hemisphere on either end with the radius of each hemisphere 2.5 inches and the cylinder portion of the container 8 inches long, what is the outside surface area of the container?
- A.  $325\pi/2$       B.  $200\pi/3$       C.  $140\pi$       D.  $65\pi$       E. NOTA
10. Brent is fencing in a square area of 576 square feet. Fence posts, which are needed every three feet, cost \$32 each. The fencing itself costs \$3.00 per foot. What is the total cost of fencing materials?
- A. \$1440      B. \$ 2880      C. \$1312      D. \$2333      E. NOTA
11. Flora rides her 4-wheeler 1.5 miles north before turning east and traveling 4.5 miles. She then travels south 4.5 miles before turning west and traveling half a mile. How many miles is she from her starting point?
- A. 5      B. 10.5      C.  $4.5\sqrt{2}$       D. 9      E. NOTA
12. Parallelogram JOEL has  $JO = EL = 8\text{cm}$  and diagonal  $OL = 10\text{cm}$ . Point F is on  $\overline{EL}$ , exactly 3 cm from E. Let T be the intersection of  $\overline{JF}$  and  $\overline{OL}$ . Find the length of  $\overline{TO}$ .
- A.  $80/13$       B.  $50/13$       C.  $30/13$       D.  $15/4$       E. NOTA
13. The midpoints of different sets of four sides of a regular hexagon, TAYLOR, can be connected to create a trapezoid, a kite, or a rectangle. Two of these quadrilaterals formed in this manner have equal areas; what fraction of the hexagon's area is one of those quadrilateral's area?
- A.  $2/3$       B.  $3/4$       C.  $1/2$       D.  $1/6$       E. NOTA

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14. Tammy sees a diagram of a rectangle inscribed in a circle and a square circumscribed around the circle. The inscribed rectangle has side length 21. The length of that side is 75 percent of the side length of the circumscribed square. What is the area inside the square but outside the circle?



- A.  $28-14\pi$       B.  $784-196\pi$       C.  $441-169\pi$       D.  $676-144\pi$       E. NOTA

15. A regular hexagon is inscribed inside a circle. The circle is inscribed inside a larger regular hexagon. Compute the ratio of the area of the larger hexagon to the area of the smaller hexagon.

- A.  $\frac{6}{5}$       B.  $\frac{4}{3}$       C.  $\frac{6}{1}$       D.  $\frac{3}{1}$       E. NOTA

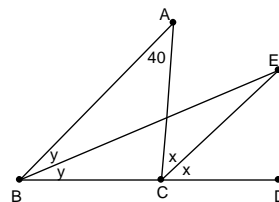
16. Let ABC be an equilateral triangle and P be the point of intersection of the three angle bisectors. Find the length of  $\overline{AP}$  in terms of the length of a side (x) of the triangle.

- A.  $x\sqrt{3}/2$       B.  $x/2$       C.  $x\sqrt{3}/4$       D.  $x\sqrt{3}/3$       E. NOTA

17. The area of a  $30^\circ$  sector of a circle is 100 square units. What is the area of an equilateral triangle inscribed in this circle?

- A.  $300\sqrt{3}/\pi$       B.  $900\sqrt{3}/\pi$       C.  $450\sqrt{3}/\pi$       D.  $150\sqrt{3}/\pi$       E. NOTA

18. What is the measure of angle E in the given diagram?



- A.  $40^\circ$       B.  $30^\circ$       C.  $20^\circ$       D.  $10^\circ$       E. NOTA

19. What is the area of a regular hexagon whose side length is  $5\sqrt{3}$ ?

- A.  $225\sqrt{3}/2$       B.  $75\sqrt{3}/4$       C.  $75/4$       D.  $30\sqrt{3}$       E. NOTA

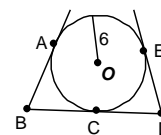
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20. Find the area of a circle inscribed in a regular octagon whose side is 8 units in length.

- A.  $64\pi$       B.  $48\pi + 32\pi\sqrt{2}$       C.  $64\pi + 32\pi\sqrt{2}$       D.  $80\pi + 32\pi\sqrt{2}$       E. NOTA

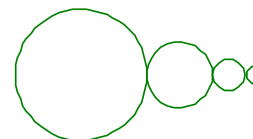
21.  $\overline{BA}$ ,  $\overline{BD}$ ,  $\overline{ED}$  are tangents to  $\odot O$ .  $BD = 8 + 6\sqrt{3}$  and  $m\angle B = 60^\circ$ .

How far would  $\overline{CE}$  be from the center of  $\odot O$ ?



- A.  $4\sqrt{2}$       B.  $\frac{24}{5}$       C.  $2\sqrt{2}$       D.  $\frac{18}{5}$       E. NOTA

22. Tara begins with a circle whose diameter is 16 cm, then adds an externally tangent circle whose diameter is 8 cm. She continued to construct additional circles with diameters that are half the length of the previous circle until there are four circles. What is the sum of the areas of all the circles?



- A.  $340\pi$       B.  $85\pi$       C.  $86\pi$       D.  $341\pi$       E. NOTA

23. Find the area of a circle inscribed in a square whose sides are 10 inches in length.

- A.  $25\pi$       B.  $50\pi$       C.  $75\pi$       D.  $100\pi$       E. NOTA

24. Two circles of radii 7 and 5 are externally tangent. How long is their common external tangent?

- A.  $8\sqrt{3}$       B.  $8\sqrt{3} - 12$       C.  $2\sqrt{35}$       D.  $2\sqrt{26} - 12$       E. NOTA

25. A frustum has regular hexagonal bases with sides 5 and 6 with a slant height of seven. What is the height of the frustum?

- A.  $\frac{\sqrt{193}}{2}$       B.  $\frac{\sqrt{3}}{2}$       C.  $\frac{\sqrt{133}}{2}$       D.  $\frac{5\sqrt{3}}{2}$       E. NOTA

TB 1 Rowlaundush has an icosahedron-shaped muffin with side 2 that she wants to split evenly with her sister, Laundushrow. What is the volume of the part of the cookie Laundushrow will receive?

TB 2 Wesley and Logan are working on their science project. Logan is holding a pole with height "x", Wesley standing some distance away, is holding another pole with height 5 ft. A wire from the top of Wesley's pole is tied to the bottom of Logan's pole and another wire from the top of Logan's pole goes to the bottom of Wesley's pole. The wires cross 36 inches above the ground. How tall is Logan's pole (in feet)?

TB 3 Fattys (Ana, Tara, and Taylor) were eating pizza and pie. If they want to each eat the same amount of both, how much will each eat if the pizza has a diameter of 18 and the pie is  $\frac{1}{4}$  the area of the pizza.