OU Math Day 2005

Geometry Test

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1. The hypotenuse of an isoceles right triangle has length 20 inches. What is the length in inches of one of the other sides of the triangle?

   (A) 10 (B) $10\sqrt{2}$ (C) $20\sqrt{\pi}$ (D) $5\sqrt{2}$ (E) None of the above.

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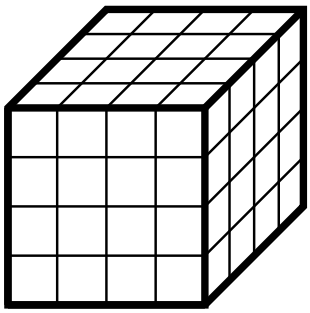
2. A large cube is formed by glueing together 64 small cubes as pictured below. How many of the 64 small cubes are invisible to an observer holding the large cube in their hands?

   (A) 0 (B) 1 (C) 8 (D) 27 (E) None of the above.



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3. What is the distance between a pair of diametrically opposite vertices in a cube whose side length is 4?

   (A) $2\sqrt{3}$ (B) $4\sqrt{2}$ (C) $4\sqrt{3}$ (D) $2\sqrt{2}$ (E) None of the above.

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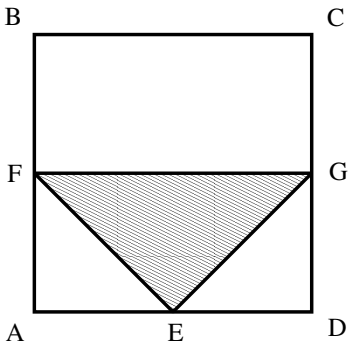
4. The number of edges in an hexagon is

   (A) 5 (B) 6 (C) 8 (D) 9 (E) None of the above.

5. Let ABCD be a square as pictured below. Let E, F and G be the midpoints of edges AD, AB and CD respectively. Determine the area of the triangle EFG if the length of AB is 8.

   (A) 16 (B) 8 (C) 36 (D) 32 (E) None of the above.



6. A quadrilateral has three internal angles of 45°, 120° and 90°. What is the degree measure of the fourth internal angle?

   (A) 75 (B) 90 (C) 100 (D) 105 (E) None of the above.

7. The length of one side of a rectangle is 5 cm and the length of one of its diagonals is 13 cm. What is the perimeter of the rectangle?

   (A) 34 cm (B) 17 cm (C) 50 cm (D) 24 cm (E) None of the above.

8. If circle C_1 has an area that is 3 times larger than the area of another circle C_2 then how many times larger is the diameter of C_1 compared to the diameter of C_2?

(A) $\sqrt{3}$ (B) $2\sqrt{3}$ (C) 9 (D) 18 (E) None of the above.

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9. Which of the following conditions on a quadrilateral Q guarantee that Q is a parallelogram?

I. *Both pairs of opposite sides have the same length.*

II. *There is a pair of opposite sides of the same length, and also a pair of opposite sides that are parallel.*

III. *Both pairs of opposite angles are congruent.*

(A) I and III only (B) I only (C) I, II, and III (D) I and II only (E) None of the above.

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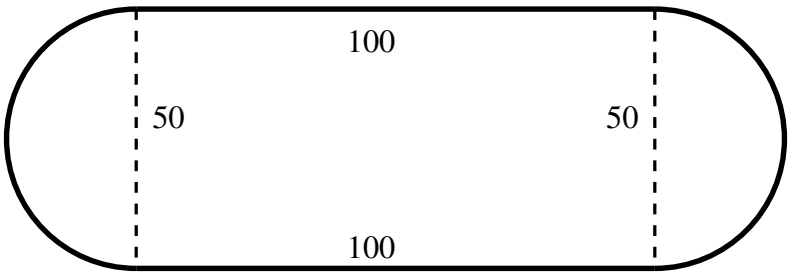
10. Sue and Mike run around a track oval made up of a 100 $yd \times 50$ yd rectangle and two semicircles as pictured below. If Sue runs on the inside lane and Mike runs on a lane 3 yards farther out then how much longer will Mike have to run on each lap?

(A) 24π yd (B) 3π yd (C) 6π yd (D) 12π yd (E) None of the above.



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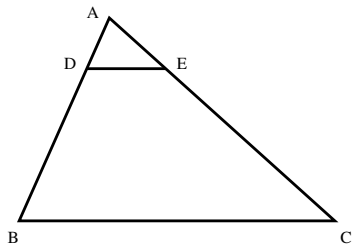
11. A rectangular box has length 1 foot, width 10 inches and height 6 inches. What is its volume?

(A) 60 in^3 (B) 60 ft^3 (C) 620 in^3 (D) 720 in^3 (E) None of the above.

12. In the figure below, the length of DB is three times the length of AD. If DE has length 5 cm what is the length of BC?

(A) 10 cm (B) 15 cm (C) 20 cm (D) 30 cm (E) None of the above.



13. In the figure above, if the angle measure of angle ABC is 81° and the angle measure of angle BAC is 65° what is the angle measure of DEC?

(A) 122° (B) 146° (C) 99° (D) 34° (E) None of the above.

14. A rectangle R has a length of 24 cm and a width of 7 cm. What is the length of the longest line segment which fits inside R?

(A) 25 cm (B) $7\sqrt{2}$ cm (C) $24\sqrt{2}$ cm (D) $\sqrt{527}$ cm (E) None of the above.

15. A circle has an area of 144 square inches. What is its circumference?

(A) $12\sqrt{\pi}\ in$ (B) $12\pi\ in$ (C) $24\sqrt{\pi}\ in$ (D) $48\pi\ in$ (E) None of the above.

16. Let S be a square with side length 7 inches. Let R be the region made up of all points inside S for which the distance to S is no more than 3 inches. What is the area of R?

(A) $33\ in^2$ (B) $48\ in^2$ (C) $49 - \pi\ in^2$ (D) $9\pi/4\ in^2$ (E) None of the above.

17. What is the area of an equilateral triangle whose perimeter is 12?

(A) $4\sqrt{3}$ (B) $36\sqrt{3}$ (C) $6\sqrt{3}$ (D) $12\sqrt{3}$ (E) None of the above.

18. A circle is inscribed in a right triangle as pictured. If the radius of the circle is 4 and the length of the hypotenuse of the triangle is 30, find the perimeter of the triangle.

(A) 34 (B) $30 + 30\sqrt{2}$ (C) 68 (D) $30\sqrt{2} - 30$ (E) None of the above.