OU Math Day 2009

Geometry Test

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1. If a triangle is acute, which of the following conditions are satisfied?

   I. *All internal angles are less than* $90°$.

   II. *Exactly one internal angle is larger than* $90°$.

   III. *The sum of all three internal angles is* $180°$.

   (A) I only (B) II only (C) I & III only (D) III only (E) None of the above

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2. Three of the interior angles of a quadrilateral have measures $110°$, $120°$ and $130°$. What is the measure of the fourth angle?

   (A) $5°$ (B) $10°$ (C) $20°$ (D) $40°$ (E) None of the above.

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3. 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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4. 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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5. Two rectangles $\mathcal{R}_1$ and $\mathcal{R}_2$ are similar. The larger rectangle $\mathcal{R}_1$ has area 72 and one side of length 6, and the smaller rectangle $\mathcal{R}_2$ has one side of length 10. What is the area of $\mathcal{R}_2$?

   (A) 12 (B) 50 (C) 60 (D) 200 (E) None of the above

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6. 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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7. Two sides of a triangle have lengths 4 and 7. Which of the following is a possible length of the third side?

   (A) 3 (B) 8 (C) 11 (D) 12 (E) All of the above

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8. 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.

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9. 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.

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10. 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.

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11. If a right triangle has legs of length 4 and 5 centimeters then the hypotenuse of the triangle has length

(A) 3 cm (B) 41 cm (C) 9 cm (D) $\sqrt{41}$ cm (E) None of the above.

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12. Let ℓ_1 be the line which passes through the points $(-2, -4)$ and $(4, 14)$. Let ℓ_2 be the line through the point $(1, -1)$ with slope $m = -5$. The lines ℓ_1 and ℓ_2 intersect at the point

(A) $(5/16, 1/16)$ (B) $(35/16, -1/16)$ (C) $(1/16, 35/16)$
(D) $(-1/16, 35/16)$ (E) None of the above

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13. Let S be a square with side length s and let C be a circle with radius r. If S and C have the same area, and the perimeter of S equals the circumference of C then what is the relationship between s and r?

(A) $s/r = 1$ (B) $s/r = \sqrt{\pi}$ (C) $s/r = \pi$ (D) $s/r = \pi^2$ (E) None of the above.

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14. Consider the following statements about a triangle:
I. A longest side of the triangle is opposite a largest angle.
II. The sum of the angles in the triangle is 180°.
III. The triangle contains at least one angle greater or equal to 60°.
Which of the statements are true?

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

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15. The length of one side of an isoceles right triangle is 10 inches. What is the perimeter of the triangle in inches?

(A) $10\sqrt{2}-10$ only (B) $20+10\sqrt{2}$ only (C) either $10+10\sqrt{2}$ or $20+10\sqrt{2}$
(D) either $10+10\sqrt{2}$ or $10\sqrt{2}-10$ (E) None of the above.

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16. A rectangle has an area of 196 square inches and one side is four times longer than another. What is the perimeter of the rectangle?

(A) 14 *in* (B) 8π *in* (C) 70 *in* (D) 35 *in* (E) None of the above.

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17. The number of edges in an hexagon is

(A) 7 (B) 8 (C) 6 (D) 9 (E) None of the above.

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18. 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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19. What is the degree measure of the angle between the two hands of a clock when the time is 3:36 PM?

(A) 90° (B) 108° (C) 116° (D) 126° (E) None of the above.

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20. An isoceles triangle Δ has a base with length 20 and an area of 240. What are the side lengths of Δ?

(A) 20, 26, and 26 (B) 20, 24, and $4\sqrt{61}$ (C) 20, 20 and 28
(D) 20, $4\sqrt{61}$, and $4\sqrt{61}$ (E) None of the above.

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21. An equilateral triangle has one side with length 7 yards. What is the perimeter of the triangle in yards?

(A) 21 (B) 49 (C) $7\sqrt{3}/2$ (D) 49π (E) None of the above.
