OU Math Day 2023

Geometry test

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1. The area of a rectangle with base 4 and diagonal 5 is

   (A) 5 (B) 7.5 (C) 10 (D) 12 (E) None of the above

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2. The area of a circle with circumference 4π is

   (A) 2 (B) 4 (C) 4π (D) $2\pi^2$ (E) None of the above

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3. Which of these points lies on the line through $(-1, 1)$ and $(2, 0)$:

   (A) $(3, -1)$ (B) $(1/2, 1/2)$ (C) $(-3, 1)$ (D) $(5, -5/2)$ (E) None of the above

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4. Two sides of a triangle have lengths 3 and 5. Which of the following is a possible length of the third side?

   (A) 1 (B) 3/2 (C) $\sqrt{20}$ (D) $\sqrt{80}$ (E) None of the above

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5. The surface area of a cube is 24. What is its volume?

   (A) 2 (B) 4 (C) 8 (D) 16 (E) None of the above

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6. The triangle ABC has side lengths $AB = 2$, $BC = 3$, $AC = 4$. The angle at B is

   (A) smaller than 90° (B) equal to 90° (C) larger than 90°

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7. A right triangle has a hypotenuse of length 4. Which of the following is a possible area?

   (A) 1 (B) 2 (C) 4 (D) All of the above (E) None of the above

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8. Starting with a square piece of paper, the corners are trimmed so as to leave the largest possible circular piece. Now this disk is trimmed so as to leave the largest possible square piece again. How much of the paper was cut off?

   (A) $1/3$ (B) $1/2$ (C) $\pi/6$ (D) $1/\pi$ (E) None of the above

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9. Start with two circles of radii $R_1 = 1$ and $R_2 = 1000$, and then increase these until, for each circle, the circumference has increased by 10. What is the difference $R_2 - R_1$ of the new radii?

   (A) 1000 (B) 1001 (C) 1010 (D) 1100 (E) None of the above

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10. What is the angle between the two hands of a clock at 3:30?

    (A) 60° (B) 75° (C) 80° (D) 90° (E) None of the above

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11. How many square inches are in a square foot?

    (A) 12 (B) 24 (C) 96 (D) 144 (E) None of the above

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12. The square $ABCD$ has side length 4. Let E, F, G be the midpoints of BC, CD, and DA, respectively. What is the area of the quadrilateral $AEFG$?

(A) 2 (B) 4 (C) 6 (D) 10 (E) None of the above

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13. What is the length of the space diagonal of a cube of side length 1?

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

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14. What is the area of an equilateral triangle of perimeter 6?

(A) $\sqrt{1}$ (B) $\sqrt{2}$ (C) $\sqrt{3}$ (D) $\sqrt{4}$ (E) None of the above

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15. Which of the following is not true of a right triangle?

(A) It can not be equilateral; (B) All angles are at most 90°; (C) The longest side is opposite the right angle; (D) The product of the two shorter sides is twice its area; (E) None of the above

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16. A rectangle has an area of 64 and one side is four times longer than another. What is its perimeter?

(A) 18 (B) 20 (C) 36 (D) 40 (E) None of the above

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17. A rhombus has side length 6 and an interior angle of 60°. What is the length of the shorter diagonal?

(A) 4 (B) $2\sqrt{6}$ (C) 6 (D) $\sqrt{8}$ (E) None of the above

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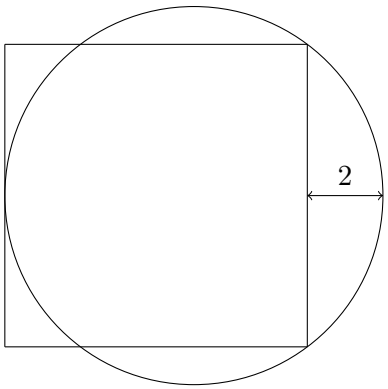
18. The areas of three mutually adjacent faces of a rectangular box are 24, 36, and 54. What is the volume of the box?

(A) 172 (B) 184 (C) 196 (D) 216 (E) None of the above

19. Let R be the region of all those points in a square of side length 2 that are at distance at most 1 from one of the corners. What is the area of R?

(A) 1 (B) 2 (C) π (D) 2π (E) None of the above

20. Given a square and a circle as below, what is the area of the square?



(A) 25 (B) 64 (C) 81 (D) 125 (E) Not enough information given to determine

Answers for the 2023 Geometry Test:

1–5: DCBCC

6–10: CDBEB

11–15: DEDCE

16–20: DCDCB