Oklahoma Math Day

November 7, 2019

Geometry

INSTRUCTIONS:

1. Do not begin the test until told to do so.
2. Calculators are not permitted.
3. Be sure to enter your name and high school code on the answer sheet.
4. Use a number 2 pencil to fill out your answer sheet.
5. Please remain in your seat until time is called

OU Math Day 2019

Geometry Test

(with answers on the last page)

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1. Points A, B and C are collinear. If $AB = 10$ and $BC = 3$ which of the following is a possible value for AC?

   (A) 7 (B) 9 (C) 11 (D) 15 (E) None of the above

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2. Three of the interior angles of a quadrilateral have degree measures $100°$, $120°$ 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 set of points that are equidistant from two distinct points in a plane forms which of the following?

   (A) line (B) equilateral triangle (C) ray (D) ellipse (E) None of the above

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4. Suppose that a right triangle has a hypotenuse of 17 cm, and the lengths of the other two sides sum to 23 cm. What is the area of the triangle?

   (A) 120 cm^2 (B) 66 cm^2 (C) 60 cm^2 (D) 68 cm^2 (E) None of the above

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5. A cylindrical can has a radius of 3 inches and a height of 8 inches. How many square inches of metal are needed to construct the can (top and bottom are included)?

   (A) 66π (B) 57π (C) 48π (D) 24π (E) None of the above

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6. You are told that the area of a circle is equal to its circumference. What is the area of that circle? (Assume that the circle is not a point.)

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

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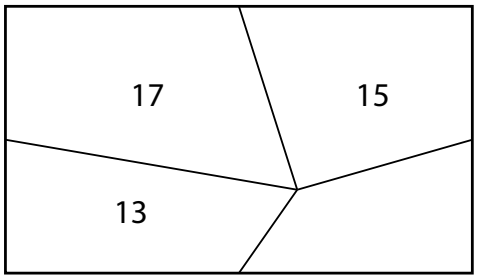
7. A point is chosen in the interior of a rectangle, and a line segment is drawn from the point to the midpoint of each of the four sides of the rectangle. This subdivides the rectangle into four quadrilaterals. If the areas of three of the quadrilaterals are 13, 15 and 17 as shown in the diagram below then what is the area of the rectangle?

(A) 56 (B) 64 (C) 28 (D) 60 (E) None of the above



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8. An equilateral triangle has perimeter L. Determine its area.

(A) $\dfrac{L^2}{12\sqrt{3}}$ (B) $\dfrac{L^2}{9}$ (C) $\dfrac{L^2}{2\sqrt{3}}$ (D) $\dfrac{L}{2\sqrt{3}}$ (E) None of the above

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9. A square piece of paper is folded along its diagonal. If the resulting triangle has a perimeter of 8 inches then how long was each side of the square piece of paper in inches?

(A) $8-4\sqrt{2}$ (B) 2 (C) 8/3 (D) $8-2\sqrt{2}$ (E) None of the above

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10. What is the area of the largest rectangle which fits inside a circle whose diameter is 10 cm given that the length of the rectangle is five times its width ?

(A) 50 cm^2 (B) 25/3 cm^2 (C) 10 cm^2 (D) 250/13 cm^2 (E) None of the above

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11. In a triangle ΔPQR the angle at P is $59°$, and the angle at R is $60°$. Which side of the triangle is longest?

(A) both $\overline{QR}$ and $\overline{PQ}$ (B) $\overline{PR}$ (C) $\overline{QR}$ (D) $\overline{PQ}$ (E) None of the above

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12. If the two diagonals of a quadrilateral are perpendicular bisectors of each other, and one has twice the length of the other, then the quadrilateral is which of the following?

(A) rhombus (B) rectangle (C) square (D) pentagon (E) None of the above

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13. A point P is chosen inside a square $ABCD$ such that the triangle ΔAPB is equilateral. What is the degree measure of the angle $\angle DPC$?

(A) $120°$ (B) $135°$ (C) $140°$ (D) $150°$ (E) $160°$

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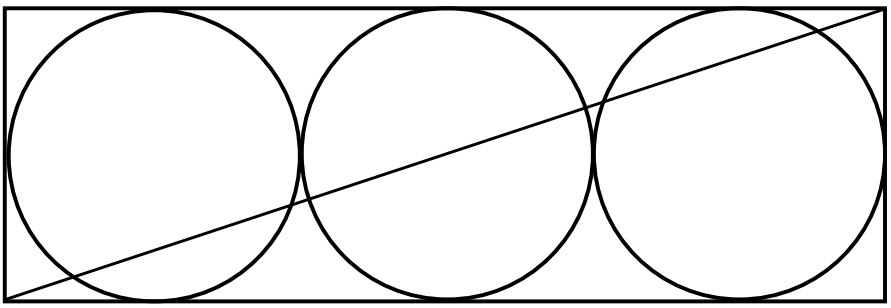
14. Three non-overlapping circles of radius 2 are contained in a 4×12 rectangle as shown in the diagram. Find the area of the region which is below a diagonal of the rectangle and outside of the circles.

(A) 6π (B) $48 - 12\pi$ (C) 24 (D) $24 - 6\pi$ (E) None of the above



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15. The length of two sides of a triangle are 18 and 24. If the third side of the triangle has length n and is also an integer, how many different values for n are possible?

(A) 19 (B) 23 (C) 12 (D) 35 (E) None of the above

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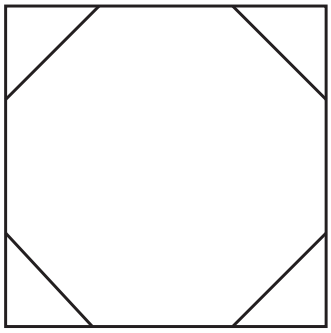
16. Which of the following do not necessarily determine a unique plane in space?

(A) two distinct parallel lines
(B) three distinct points
(C) a line and a point not on the line
(D) two lines which intersect in one point
(E) None of the above

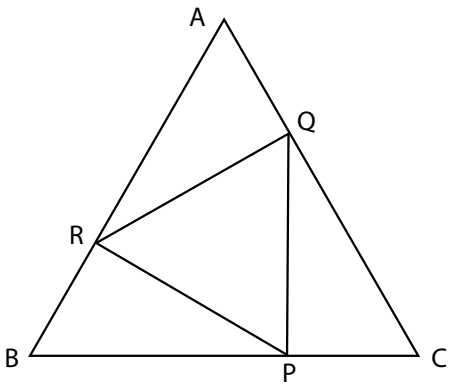
17. Suppose a regular octagon is constructed from a 3×3 square by removing four triangular corners, as shown below. What is the length of each edge of the octagon?

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



18. Triangle ΔABC is equilateral and has an equilateral triangle ΔPQR inscribed in it. If $\overline{PQ}$ is perpendicular to $\overline{BC}$, what is the ratio of the area of ΔPQR to the area of ΔABC?

(A) $1/\sqrt{3}$ (B) $3/5$ (C) $1/2$ (D) $1/3$ (E) None of the above



Answers for the 2019 Geometry Test:

1-5: ABACA

6-10: BAAAD

11-15: BADDD

16-20: BED