OU Math Day 2018
Geometry Test
(edited with answers on the last page)

1. Two similar triangles have perimeters in ratio $5 : 3$. What is the ratio of their areas?

   (A) $5 : 3$ (B) $3 : 5$ (C) $25 : 9$ (D) $125 : 27$ (E) None of the above.

2. Which statement is true?

   (A) All quadrilaterals are rectangles.
   (B) All quadrilaterals are squares.
   (C) All rectangles are quadrilaterals.
   (D) All parallelograms are rectangles
   (E) None of the above.

3. A triangle has sides of length 24, 56 and n, where n is an integer. Find the difference between the largest possible perimeter of the triangle and the smallest possible perimeter of the triangle.

   (A) 80   (B) 46   (C) 79   (D) 31   (E) None of the above.
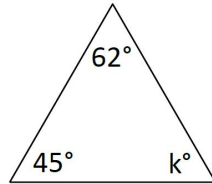
4. Circles of radius 3 and 5 are lying on a horizontal line so that they touch (see the figure below). A line is extended through the centers of the circles. What is the distance from the point A to the point B?

   (A) 10   (B) $\sqrt{120}$ (C) $\sqrt{129}$ (D) $\sqrt{135}$ (E) None of the above.
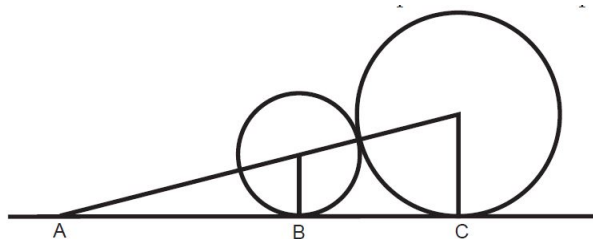
5. Find the value of k corresponding to the missing angle in the triangle below.

   (A) 93   (B) 83   (C) 73   (D) 63   (E) None of the above.

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6. The area of the largest triangle that can be inscribed in a semi-circle of radius r is

   (A) r^2 (B) $2r^2$ (C) $2r^3$ (D) $r^2/2$ (E) None of the above.

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7. A box has six rectangular faces. The areas of three of the faces are 6 square units, 15 square units and 49 square units. What is the volume of the box?

   (A) $3\sqrt{10}/7\ cm^3$ (B) $4410\ cm^3$ (C) $70\ cm^3$ (D) $21\sqrt{10}\ cm^3$ (E) None of the above.

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8. If all of the side lengths of a quadrilateral Q are equal which of the following statements must be true?

   I. Q is a square.
   II. Q is a rhombus.
   III. Q is a parallelogram.

   (A) I only   (B) II and III only   (C) I and III only
        (D) None of I, II, or III   (E) All of I, II, or III

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9. 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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10. Let P and Q be two points in the plane which are 5 units apart. The collection of points that are equidistant from P and Q forms which of the following?

(A) a line   (B) a parabola   (C) a ray   (D) an ellipse   (E) None of the above.

11. A trapezoid $ABCD$ has parallel sides BC and AD with respective lengths of 10 and 14 centimeters, and diagonals AC and BD each of which has length 13 centimeters. What is the area of this trapezoid?

(A) 156 cm^2 (B) 48 cm^2 (C) 24 cm^2 (D) 60 cm^2 (E) None of the above.

12. In the illustration below, two parallel lines cross a third line with the indicated angles of intersection. Which of the following statements is true?

(A) the sum of the angles at 6, 4, 7 and 2 equals 360°
(B) angles 8 and 3 are complementary
(C) the sum of the angles at 6 and 2 equals 180°
(D) angles 5 and 7 are equal
(E) None of the above.
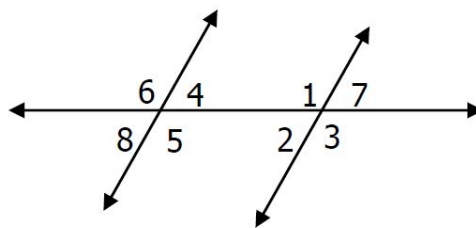
13. The volume of a cube is 216 cubic centimeters. If the length of the sides are increased by a factor of 3 what is the volume of the new cube.

(A) 729 cm^3 (B) 1944 cm^3 (C) 5832 cm^3 (D) 27 cm^3 (E) None of the above.

14. A circle is inscribed inside a square whose side length equals 14 inches. Which of the following is closest to the area of the region inside the square but outside the circle?

    (A) $42\ in^2$ (B) $127\ in^2$ (C) $196\ in^2$ (D) $256\ in^2$ (E) $500\ in^2$

15. A rectangle R has a length of 24 centimeters and a width of 7 centimeters. 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.

16. The sum of the degree measures of the interior angles of a 21-gon is:
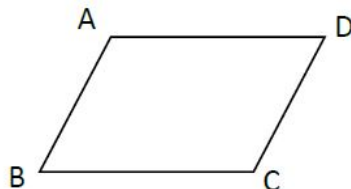
    (A) 4140   (B) 3780   (C) 3420   (D) 360   (E) None of the above.

17. If a right triangle has legs of length 4 and 8 centimeters then its hypotenuse has length

    (A) $4\sqrt{3}$ cm   (B) 12 cm   (C) $4\sqrt{5}$ cm   (D) 4 cm   (E) None of the above.

18. Let $ABCD$ be a parallelogram as shown in the diagram below. If the angle at D has degree measure 66° what is the degree measure of the angle at A?

(A) 66°   (B) 114°   (C) 24°   (D) 228°   (E) None of the above.

19. Let $ABCD$ be a parallelogram as shown in the diagram above. If AB has length 3 and AD has length 5 what is the largest possible area that the parallelogram can have?

(A) 15   (B) $8\sqrt{2}$ (C) it could be arbitrarily large   (D) 16   (E) None of the above.

20. Let $ABCD$ be a parallelogram as pictured above. Suppose that AB has length 3, AD has length 5, and the area of the parallelogram is 10. What is the sum of the squares of the lengths of the two diagonals AC and BD?

(A) 58   (B) 68   (C) 16   (D) 40   (E) None of the above.

21. In the quadrilateral $DEFG$, the diagonals DF and EG are perpendicular, and DE has length 12. Which of the following is true?

(A) $EF = 12$ (B) $DF = 24$ (C) $DG = 12$
(D) no other side length can be determined from this   (E) None of the above.

Answers for the 2018 Geometry Test:

1-4: CCED

5-9: CADBA

10-13: ADCC

14-17: AACC

18-21: BABD