OU Math Day 2013
Geometry Test
(with answers on the last page)

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1. A rectangle has an area of 360 square meters and one side is ten times longer than another. What is the perimeter of the rectangle?

   (A) 132 m (B) 36π m (C) 66 m (D) 64 m (E) None of the above.

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2. Which of the following statements are true?

   I. *For any two lines in space there is a plane containing both lines.*

   II. *For any two parallel lines in space there is a plane containing both lines.*

   III. *For any two intersecting lines in space there is a plane containing both lines.*

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

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3. The number of edges in an octagon is

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

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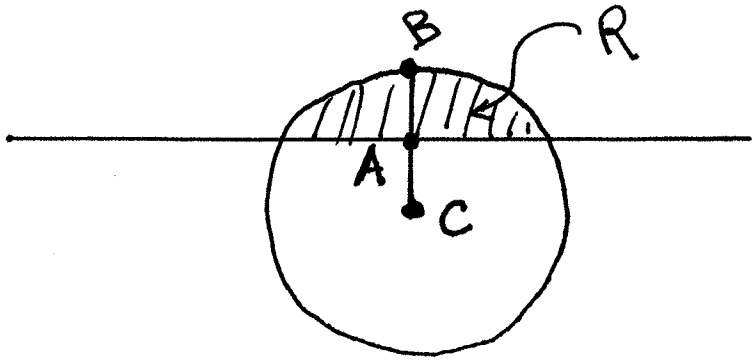
4. Let $\mathcal{R}$ be the region inside a circle of radius 2 which is cut off by a straight line whose distance from the center C of the circle is 1 as shown below. (So, in the picture, $CA = AB = 1$) What is the area of $\mathcal{R}$?

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



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5. A circular pizza is cut 4 times in straight lines. What is the smallest possible number of pieces which do not contain any of the outer crust?

(A) 0 (B) 1 (C) 2 (D) 3 (E) None of the above.

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6. A circular pizza is cut 4 times in straight lines. What is the largest possible number of pieces which do not contain any of the outer crust?

(A) 0 (B) 1 (C) 2 (D) 3 (E) None of the above.

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7. A square with side length s is inscribed in a circle with radius r. What is the ratio r/s ?

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

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8. A triangle has vertices at $(-1,0)$, $(7,0)$, and $(2,5)$. What is its area?

(A) 20 (B) 8 (C) 15 (D) 40 (E) None of the above

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9. What is the distance between a pair of diametrically opposite vertices in a cube whose side length is 5?

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

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10. All of the side lengths of a quadrilateral Q are equal. Which of the following statements are true?

I. *Q is a square.*
II. *Q is a parallelogram.*
III. *Q is a rectangle.*

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

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11. Two rectangles $\mathcal{R}_1$ and $\mathcal{R}_2$ are similar. The larger rectangle $\mathcal{R}_1$ has sides of length 6 and 12, 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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12. Two sides of a triangle have lengths 4 and 3. Which of the following is a possible length of the third side?

(A) 6 (B) 2 (C) $\sqrt{5}$ (D) Any of 6, 3 or $\sqrt{5}$ (E) None of the above

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

(A) 6 (B) 2 (C) $\sqrt{5}$ (D) Any of 6, 3 or $\sqrt{5}$ (E) None of the above

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14. A right triangle ΔABC has sides of length $AB = 3$, $BC = 4$ and $AC = 5$. A square inside the triangle has one vertex at B and its opposite vertex on the hypotenuse $\overline{AC}$. What is the area of the square.

(A) $\frac{144}{49}$ (B) $\frac{7}{2}$ (C) 3 (D) 1 (E) None of the above

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15. Let $\mathcal{P}$ be a parallelogram and let A and B be distinct points on $\mathcal{P}$. How many points on $\mathcal{P}$ are equidistant from A and B?

(A) 0 (B) 1 (C) 2 (D) 4 (E) None of the above.

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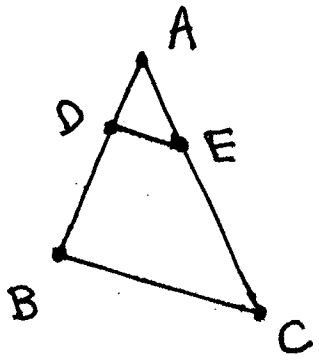
16. In the figure below, the line segments $\overline{BC}$ and $\overline{DE}$ are parallel, $EC = 8cm$, $AE = 4cm$ and $AB = 8cm$. What is AD?

(A) 4 cm (B) 3 cm (C) 8/3 cm (D) 2 cm (E) None of the above.



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17. In the figure above, if triangle ΔADE has area $10cm^2$ then what is the area of ΔABC?

(A) 20 cm^2 (B) 30 cm^2 (C) $10\sqrt{3}$ cm^2 (D) 90 cm^2 (E) None of the above.

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18. Which of the following conditions on a quadrilateral T guarantee that T is a trapezoid?

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

II. *There is a pair of opposite sides of the same length.*

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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19. A square piece of paper whose diagonal has length 10 cm is folded along its diagonal. What is the perimeter of the resulting triangle in cm?

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

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20. 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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21. A circle has an area of $81/\pi$ square inches. What is its circumference?

(A) $9/\pi$ *in* (B) $9/\sqrt{\pi}$ *in* (C) 9 *in* (D) 18 *in* (E) None of the above.

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22. If the point (a, a) is equidistant from $(1, 8)$ and $(5, -2)$ what is a?

(A) $a = 2$ (B) $a = 5$ (C) $a = 3$ (D) $a = 0$ (E) None of the above

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ANSWERS:

1. A
2. C
3. C
4. D
5. A
6. D
7. A
8. A
9. C
10. B
11. B
12. D
13. E
14. A
15. C
16. C
17. D
18. C
19. C
20. E
21. D
22. C