OU Math Day 2010

# Geometry Test

## (with answers on the last page)

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1. Which of the following must be true?

   I. *All squares are rectangles.*

   II. *All rhombi are rectangles.*

   III. *Some rhombi are equiangular.*

   IV. *Some parallelograms are squares.*

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

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2. 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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3. The length of the sides of a non-degenerate triangle are 6, 8 and $x$ where $x$ is a positive integer. How many values of $x$ exist?

   (A) 5      (B) 7      (C) 9      (D) 11      (E) None of the above.

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4. A triangle has vertices at $(-1, -1)$, $(-1, 8)$, and $(3, 2)$. What is its area?

   (A) 13.5      (B) 9      (C) 4.5      (D) 27      (E) None of the above

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5. If the area of a circle is doubled then what is the ratio of the new circumference to the new diameter?

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

6. In a triangle $\Delta PQR$ the angle at $P$ is $x°$, the angle at $Q$ is $(x+1)°$ 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.

7. Corresponding sides of two similar triangles measure 4 cm and 6 cm. If the smaller triangle has an area of 32 square cm, find the area of the larger triangle in square cm.
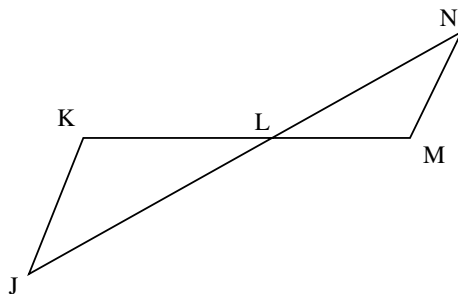
    (A) 48     (B) 72     (C) 84     (D) 96     (E) None of the above.

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

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

9. In the figure below the angles at $J$ and $N$ are equal, $LK = 3$, $LM = 2$ and $MN = 3$. Find the length of $\overline{JK}$.

    (A) 6     (B) 5.5     (C) 5     (D) 4.5     (E) None of the above

10. Which of the following is not true?

    (A) a trapezoid is a quadrilateral
    (B) at least two interior angles of a triangle are acute
    (C) a pentagon has five sides
    (D) an isoceles triangle has two sides with the same length
    (E) the diagonals of a rectangle are perpendicular

11. If the height of a cylinder is doubled and the diameter is cut in half, what is the ratio of the new volume to the original volume?

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

12. Find the number of sides of a regular $n$-gon given that the number of diagonals is equal to $n^2 - 4n - 7$.

    (A) 2    (B) 5    (C) 7    (D) 12    (E) None of the above.

13. In the Cartesian plane the points that are equidistant from two distinct fixed points forms which of the following figures?

    (A) line    (B) segment    (C) ray    (D) ellipse    (E) None of the above.

14. Consider figures in a plane. If points $A$ and $B$ are endpoints of a segment of length 10, find the locus of points that would form a right triangle with $A$ and $B$ such that $\overline{AB}$ is not the hypotenuse of the triangle.

    (A) a semicircle   (B) a circle   (C) a line   (D) two parallel lines   (E) None of the above.

15. In a triangle $\triangle VWX$ let $Y$ be a point on $\overline{VX}$. Find the length of $\overline{WY}$ if $VY = 3$, $VW = 3$, $VX = 4$ and $WX = 5$.

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

16. The area of the annular region between two concentric circles is $825\pi$ and the radius of the smaller circle is 4. Find the diameter of the larger circle.

(A) 56     (B) 58     (C) 62     (D) 72     (E) None of the above

17. 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

18. A piece of cardboard is shaped like a right triangle with legs of 12 and 24 inches. A square is cut out of the cardboard such that one right angle coincides with the right angle of the triangle and the opposite vertex lies on the hypotenuse. Find the area in square inches of the square.

(A) 16     (B) 32     (C) 56     (D) 64     (E) None of the above

19. What is the radian measure of the interior angle of a regular heptagon?

(A) $3\pi/5$     (B) $2\pi/3$     (C) $\pi/6$     (D) $9\pi/7$     (E) None of the above

20. The side lengths of a triangle are 24, 30 and 36. What is the area of the triangle?

(A) $15\sqrt{7}/4$      (B) 180      (C) 360      (D) $135\sqrt{7}$      (E) None of the above

21. Which of the following can be the intersection of two planes in space?

   I. *Point*

  II. *Line*

 III. *Plane*

(A) I, II, III             (B) I, II only             (C) II, III only

        (D) I, III only                   (E) None of the above

22. In the figure below, $\overline{FC}$, $\overline{DA}$ and $\overline{EB}$ are perpendicular to $\overline{AC}$. Also $AD = 10$ and $FC = 5$. Find the length of $\overline{EB}$.

(A) 5/2      (B) 10/3      (C) 7/2      (D) 4      (E) None of the above
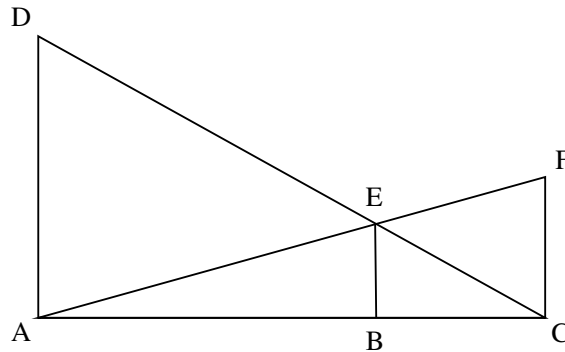
**ANSWERS**:

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