`Directions: Select the best answer for each multiple choice questions. E answer meaning "none of these."

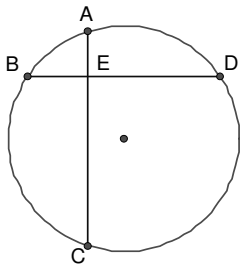
1) The three undefined planar terms in Geometry include all of the following except:
(A) Plane (B) Ray (C) Point (D) Line (E) NOTA

2) An equilateral triangle with side length of 4 units is completely put into a square of side length 8 units. A point is randomly selected inside the square. Find the odds in favor of the point lying inside the triangle.
(A) $\frac{4\sqrt{3}}{64}$ (B) $\frac{\sqrt{3}}{16}$ (C) $\frac{16\sqrt{3}+3}{253}$ (D) $\frac{\sqrt{3}}{8}$ (E) NOTA

3) In triangle ABC, angle bisector $\overline{BD}$ splits $\overline{AC}$ into $\overline{AD}$ and $\overline{DC}$ with lengths of 5 units and 7 units respectively. If AB= 12 units, find the length of $\overline{BC}$.
(A) $2\sqrt{21}$ (B) $\frac{84}{5}$ (C) $12\sqrt{2}$ (D) $\frac{60}{7}$ (E) NOTA

4) How many diagonals are in a convex 103-gon?
(A) 5150 (B) 10300 (C) 10506 (D) 5253 (E) NOTA

5) In the figure below, chords $\overline{AC}$ and $\overline{BD}$ intersect at point E and are perpendicular to each other. If AE =3, EC=6, and, BE=2 find the area of the circle.



(A) 130π (B) $\frac{65}{2}\pi$ (C) 65π (D) 70π (E) NOTA

6) Find the area of a triangle with sides of length 25, 60, and 65.
(A) $50\sqrt{30}$ (B) 750 (C) $65\sqrt{97}$ (D) 823 (E) NOTA

7) The point where the medians of a triangle intersect is called the
(A) incenter (B) centroid (C) circumcenter (D) center (E) NOTA

8) In triangle ABC, the median from vertex A is perpendicular to the other median from vertex B. If the lengths of sides AC and BC are 6 and 7 respectively, then the length of side AB is?

(A) $\sqrt{17}$ (B) 4 (C) 4.5 (D) 4.25 (E) NOTA

9) Given a circle with diameter = x, triangle ABC is within the circle such that point B is at the center of the circle, and points A and C are on the circumference of the circle. Given that $m\angle ABC = 120$, find the area of the circle not occupied by the triangle.

(A) $\left(\frac{x}{2}\right)^2\left(\pi - \frac{\sqrt{3}}{4}\right)$ (B) $\left(\frac{x}{2}\right)\left(\frac{\pi}{3} - \frac{\sqrt{3}}{4}\right)$ (C) $\left(\frac{x}{2}\right)^2\left(\pi - \frac{1}{4}\right)$

(D) $\left(\frac{x^2}{2}\right)^2\left(\pi - \frac{1}{4}\right)$ (E) NOTA

10) Name the following conic: $3x^2 + 4xy + 2y^2 + 8x - 7y + 3 = 0$

(A) Point (B) Ellipse (C) Parabola (D) Hyperbola (E) NOTA

11) Given that the area of triangle ABC, with $m\angle B = 30°$ and sides AB = 5 and BC = 5, is expressed in the form $\frac{a}{b}$. Find the sum of a and b where a and b are relatively prime.

(A) 8 (B) 58 (C) 42 (D) 29 (E) NOTA

12) How many lines of symmetry does a regular octagon have?

(A) 4 (B) 16 (C) 8 (D) 2 (E) NOTA

13) In triangle ABC, point E is on $\overline{AB}$ and point D is on $\overline{AC}$. Given that $AE : EB = 4 : 5$ and $AD : DC = 2 : 3$ and point P is the intersection of $\overline{BD}$ and $\overline{CE}$, find $BP : PD$.

(A) 25:12 (B) 25:3 (C) 3:4 (D) 4:3 (E) NOTA

14) Find the length of the altitude to the 10 unit side of a triangle whose two other sides have lengths of 7 units and 5 units.

(A) 35 (B) 25 (C) $\frac{\sqrt{66}}{5}$ (D) $\frac{2\sqrt{66}}{5}$ (E) NOTA

15) What is the geometric mean between -3 and -12?

(A) 6 (B) 36 (C) 12 (D) 3 (E) NOTA

16) Find the length of the common internal tangent segment of two circles with radii of 4 units and 12 units whose centers are 20 units apart.

(A) 12 (B) $4\sqrt{6}$ (C) 24 (D) $8\sqrt{6}$ (E) NOTA

17) What is the product of the ordinate of the center of the circle and the square of the radius of the circle defined by: $x^2 + y^2 - 12x + 9y + 10 = 0$.

(A) $-3\sqrt{35}$ (B) 105 (C) 210 (D) $6\sqrt{35}$ (E) NOTA

18) A 25 foot ladder is placed against a vertical wall of a building. The foot of the ladder is 7 feet from the base of the building. If the top of the ladder slips 4 feet, then the foot of the ladder will slide how many feet?

(A) 15 (B) 8 (C) 4 (D) 2 (E) NOTA

19) Given that a circle is inscribed in a triangle with sides of lengths 24, 10, and 26, find the area of the inscribed circle.

(A) 6π (B) 36π (C) 16π (D) 64π (E) NOTA

20) An equilateral triangle of side length 8 is drawn. A new equilateral triangle is formed by joining the midpoints of the sides of the first one. Then a third equilateral triangle is formed by joining the midpoints of the sides of the second one. This process is continued forever. Find the limit of the sum of the areas of all the triangles drawn.

(A) $\frac{64\sqrt{3}}{3}$ (B) $32\sqrt{3}$ (C) $24\sqrt{3}$ (D) 12 (E) NOTA

21) Nine lines parallel to the base of a triangle divide the other sides each into 10 equal segments and the area into 10 distinct parts. If the area of the largest of these parts is 38, then the area of the original triangle is?

(A) 180 (B) 190 (C) 200 (D) 210 (E) NOTA

22) Given that two sides of a triangle are 5 and 10, which of the following could be the length of the third side?

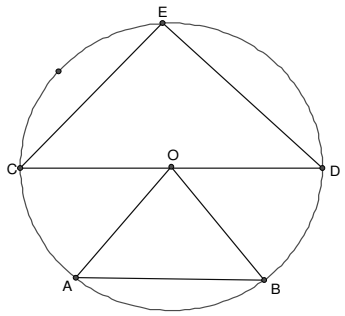
I. 14 II. 5 III. 6 IV. 15

(A) II only (B) I,II,III, and IV (C) I and III (D) I, II, and III (E) NOTA

23) Find the area of a hexagon with vertices at the following coordinates: (2,5), (-1,-2), (0,4), (-3,4), (3,-2), and (5,2).

(A) 86 (B) 44 (C) $\frac{75}{2}$ (D) 54 (E) NOTA

24) Given the figure below and chords $\overline{CE}$ and $\overline{DE}$ are equal chords of a circle with center O. Arc AB is 60°. Find the ratio of the area of triangle CED to the area of triangle AOB:



(A) $\frac{\sqrt{3}}{4}$ (B) $\frac{3\sqrt{3}}{2}$ (C) $\frac{4\sqrt{3}}{3}$ (D) $\frac{\sqrt{3}}{3}$ (E) NOTA

25) The medians of a right triangle which are drawn from the vertices of the acute angles are 5 and $\sqrt{40}$. What is the length of the hypotenuse?

(A) 10 (B) $4\sqrt{10}$ (C) $\sqrt{13}$ (D) $2\sqrt{13}$ (E) NOTA

26) The line perpendicular to the line connecting the points (-2, 37) and (-5,5) goes through the points $(q, 2q)$ and (0,7). What is the value of q rounded to the nearest tenth?

(A) 3.3 (B) 2.2 (C) -7.7 (D) -3.8 (E) NOTA

27) What is the radius of the smallest circle which could contain a symmetrical figure composed of three congruent squares of side length one?

(A) $\sqrt{2}$ (B) $\frac{\sqrt{5}}{2}$ (C) $\frac{5}{4}$ (D) $\frac{5\sqrt{17}}{16}$ (E) NOTA

28) What is the slope of the line tangent to the graph $x^2 + y^2 = 169$ at the point (-12,-5)?

(A) $-\frac{12}{5}$ (B) $-\frac{5}{12}$ (C) $\frac{5}{12}$ (D) $\frac{12}{5}$ (E) NOTA

29) In the coordinate plane, points A(-2,-1), B(0,5) and C(4,3) are vertices of parallelogram ABCD. What are the coordinates of vertex D?

(A) (-2, 3) (B) (6,-1) (C) (0,-5) (D) (2,5) (E) NOTA

30) Given right triangle ABC with legs BC = 3, AC = 4, find the length of the shorter angle trisector from C to the hypotenuse.

(A) $\frac{32\sqrt{3}-24}{13}$ (B) $\frac{12\sqrt{3}-9}{13}$ (C) $6\sqrt{3}-8$ (D) $\frac{25}{12}$ (E) NOTA