1. The hypotenuse of a right triangle is 12" long, and one of the acute angles measures 30 degrees. The length of the shorter leg must be:

    (A) 4 $\sqrt{3}$ inches   (B) 6 $\sqrt{3}$ inches
    (C) 5 inches   (D) 6 inches
    (E) 7 inches

2. The sum of the measures of all of the non-overlapping angles formed by 7 rays drawn on the same side of a line from the same point of that line is (?)

    (A) 1260°   (B) 1080°   (C) 900°
    (D) 360°   (E) 180°
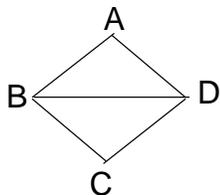
3. How many degrees are there in an angle that measures one-ninth of its complement?

    (A) 810°   (B) 162°   (C) 81°
    (D) 80°   (E) 9°

4. Each interior angle of a regular octagon is:

    (A) 120°   (B) 144°   (C) 135°
    (D) 140°   (E) 108°

5. ABCD is a rhombus with BC = 5, and BD = 6. What is the length of CA?

    (A) 8   (B) 9   (C) 10
    (D) 11   (E) 12

6. Which of the following is true if two given triangles are <u>not</u> similar?

    (A) their areas cannot be equal
    (B) they may be congruent
    (C) they are not congruent
    (D) their corresponding sides may be proportional
    (E) their corresponding angles may be equal

7. The points (1,2), (- 4,3) and (7,- 6) are three vertices of a parallelogram. The fourth vertex is:

    (A) (12,- 2)   (B) (2,- 11)
    (C) (- 11,5)   (D) all of these
    (E) none of these

8. A triangle and a rectangle have equal areas. The base and height of the triangle are 12 and 4, respectively. Find the width of the rectangle if its length is 8.

    (A) 3   (B) 4   (C) 5
    (D) 6   (E) 7

9. A rectangle has length x units and width y units. The rectangle has the same perimeter as an equilateral triangle with a side of m units. Find x in terms of m and y.

    (A) m + y   (B) m - y
    (C) 3m - 2y
    (D) $\frac{1}{2}$ m + y   (E) $\frac{1}{2}$ (3m $-$ 2y)

10. The side of a cube is decreased by 50%. By how much does the volume decrease?

    (A) 12.5%   (B) 25%   (C) 50%
    (D) 75%   (E) 87.5%

11. If the circumference of a circle is 12π feet, what is the number of square feet in its area?

    (A) 6π (B) 9π (C) 36π
    (D) 81π (E) 144π

12. What is the area of a circle inscribed in a square that has a side length of 8 cm?

    (A) 8π cm² (B) 16π cm² (C) 32π cm²
    (D) 64π cm²   (E) 48π cm²

13. In circle C, minor arc XK is 1 / 3 of the circumference of the circle. If F is not on minor arc XK, what is the measure of inscribed angle XFK ?

    (A) 60°   (B) 30°   (C) 15°
    (D) 120°   (E) 300°

14. Find the area of the shaded part of the figure:

    5 cm

    5 cm   5 cm
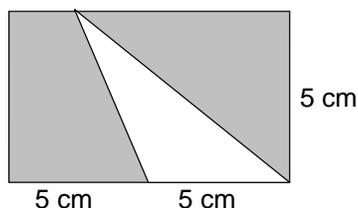
    (A) 25cm²   (B) 50cm²   (C) 35cm²
    (D) 37.5 cm²   (E) 12.5 cm²

15. If a quadrilateral is inscribed in a circle, the opposite angles are:

    (A) congruent   (B) obtuse
    (C) complementary   (D) acute
    (E) supplementary

16. A circle can be inscribed in:

    (A) any triangle   (B) any octagon
    (C) any trapezoid   (D) any polygon
    (E) any parallelogram

17. The area of a trapezoid is 160 square units, one base is 26 units, and the height is 8 units. What is the length of the other base?

    (A) 7   (B) 14   (C) 56
    (D) 6   (E) 80 / 17

18. A square piece of paper, with one side equal to 12 units, is folded so that the four corners of the square meet in the center of the square. This forms a new square. What is the side measure of the new square?

    (A) 5   (B) $5\sqrt{3}$ (C) $6\sqrt{2}$
    (D) 6   (E) 8

19. The diameter of the front wheel of a tricycle is 8" and the diameter of each rear wheel is 3". How many revolutions has each back wheel made while the front wheel has turned 1440 degrees?

    (A) $10\frac{2}{3}$ (B) 4   (C) $2\frac{2}{3}$
    (D) 24   (E) 96

20. A circular track has a radius of 210 feet. Approximately how many times must a jogger circle the track in order to jog one mile?

(A) 20   (B) 4   (C) 35
(D) 39   (E) 34

21. The value of B is:

(A) 3.14   (B) 3.1415
(C) 3.141592   (D) 3.1415926535
(E) none of these

22. The area of a circle inscribed in an equilateral triangle is 4π. What is the height of the triangle?

(A) 2   (B) 4   (C) 6
(D) 8   (E) 10

23. The sum of the exterior angles of any polygon will always be what measure?

(A) 180°
(B) 360°
(C) (n – 2) 180°
(D) (n + 2) 180°
(E) none of these

24. The area of a square 18 ft. on a side is equal to the area of a rectangle with a length of 3 yards. The width of this rectangle is:

(A) 2 ft.   (B) 9 ft.   (C) 18 ft.
(D) 36 ft.   (E) 27 ft.

25. The set of points in a plane at a fixed distance from a given point in that plane is:

(A) a line   (B) a circle   (C) an angle
(D) two lines   (E) a point

26. The radii of two circles are 3 cm and 5 cm, respectively. Find the radius of the circle whose area is equal to the sum of the areas of the two given circles.

(A) 8   (B) 34   (C) $\sqrt{34}$
(D) 34π (E) none of these

27. Three lines lie in one plane. Line m intersects line n which is parallel to line p. How many points are equidistant from all three lines at the same time?

(A) 2   (B) 1   (C) 0
(D) 4   (E) 8

28. A sector of a circle has the same area as an equilateral triangle whose base is 12. What is the area of the sector?

(A) 6 $\sqrt{3}$ (B) 36 $\sqrt{3}$ (C) 12
(D) 144   (E) none of these

29. The number of points on a circle that are equidistant from the endpoints of a given diameter is:

(A) 1   (B) 2   (C) 3
(D) 4   (E) 5

30. The radius of a circle is increased by 50%. By how much does the area increase?
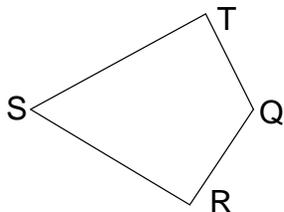
(A) 25%   (B) 50%   (C) 100%
(D) 125%   (E) 250%

31. In the figure, AB = AC, DB = DC, πABC = ½ πDBC, and πD = 70°. How many degrees are there in πA?
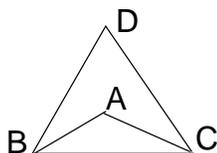
(A) 55   (B) 70   (C) 105
(D) 110   (E) 125

32. QRST is a quadrilateral with TQ $\perp$ TS and QR $\perp$ RS as shown in the figure below. If QT = 70m, SR = 200m, and TS = 240 m, how many square meters are there in quadrilateral QRST?

(A) 2340   (B) 16800   (C) 22400
(D) 23400   (E) 46800

33. Given line QT which goes through the center of a circle with center C, whose radius is 4 and P lies on the circle. If PT = 4 and CQ =4 find the measure of the angle x = πPQC.

(A) x < 20°   (B) 20° # x < 30°
(C) 30° # x < 40°   (D) 40° # x < 50°
(E) x ∃ 50°

34. Two sides of a triangle are 12 cm and 8 cm, respectively. The altitude to the 12 cm side is 4 cm. Find the altitude to the 8 cm side.

(A) 3 cm   (B) 24 cm   (C) 12 cm
(D) 6 cm   (E) 8 / 3 cm

35. Given quadrilateral PQRS inscribed in a circle with side PQ extended beyond Q to point T. How many degrees are in πTQR if πQPS = 110 degrees, & πPSR = 40 degrees?

(A) 30   (B) 70   (C) 140
(D) 40   (E) 110

36. In the figure below, AB $\perp$ BC, BC $\perp$ CD, AB = 8, BC = 5, CD = 4. What is the shortest distance from A to D?
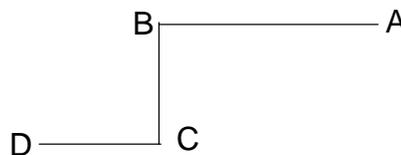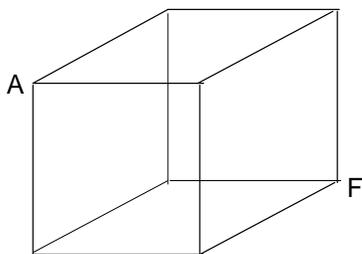

(A) 12   (B) 13   (C) 15
(D) 16   (E) 17

37. What is the effect on the volume of a cylinder if the diameter is doubled and the height is cut in half?

(A) the volume remains the same
(B) the volume is doubled
(C) the volume is cut in half
(D) the volume increases by a factor of four
(E) none of these

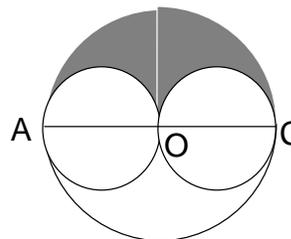38. What is the length of AF in this cube that has edges 1 cm long?

(A) $\sqrt{3}$ (B) $\dfrac{\sqrt{3}}{2}$ (C) $\sqrt{2}$

(D) 1   (E) none of these

39. A point P is selected at random on a semicircle with diameter RS. T is the foot of the perpendicular from P to RS. If RS = 6 and RT = x, then the length of PT in terms of x is:
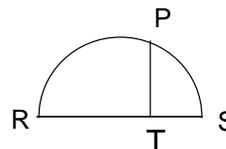
(A) $\sqrt{6x - x^2}$ (B) $\sqrt{6x - 2x^2}$

(C) $\sqrt{3 - x^2}$ (D) $\sqrt{3 - 2x^2}$

(E) $\sqrt{2x - x^2}$

40. In the figure below, the large circle has diameter AC. The two small circles have their centers on AC and are tangent to each other at the center of the large circle. Find the area of the shaded region, given that AC = 4.

(A) 16π   (B) 4π   (C) 2π
(D) 1π   (E) none of these