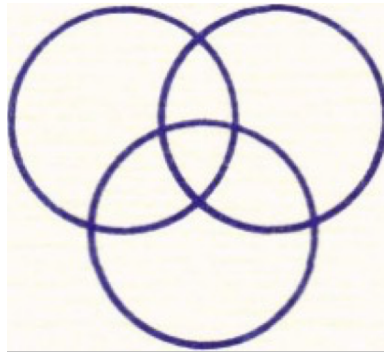


Broward County Council of Teachers of Mathematics



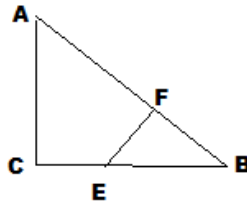
Annual Contest
2016

Geometry

6) Give the name of the regular polygon such that the ratio of an interior angle to an exterior angle is 3:1.

- (A) Square (B) Hexagon (C) Octagon (D) Decagon (E) NOTA

7) $\triangle ABC$ is an isosceles right triangle with right angle at C. $AF = EB = 2$, $\overline{EF} \perp \overline{AB}$. Find the length of \overline{EF} .



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

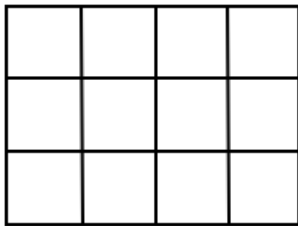
8) The apothem of a regular hexagon has length x . Find the perimeter of the hexagon in terms of x .

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

9) $\triangle ABC$ is an isosceles triangle with $AB = 2AC$. If the perimeter is 40, find the length of \overline{BC} .

- (A) 8 (B) 16 (C) 20 (D) 30 (E) NOTA

10) The rectangle shown has been divided into 12 congruent squares. The length of a diagonal of one of the squares is 4. Find the length of a diagonal of the original rectangle.



- (A) 12 (B) 16 (C) $10\sqrt{2}$ (D) $12\sqrt{2}$ (E) NOTA

- 11) In $\triangle VBH$, $m\angle H = 105^\circ$, $m\angle V = 45^\circ$, $VH = 8$. Find the perimeter of the triangle.
 (A) $8 + 12\sqrt{3} + 6\sqrt{2}$ (B) $8 + 12\sqrt{2} + 4\sqrt{6}$ (C) $18\sqrt{3}$ (D) $18 + 6\sqrt{3}$ (E) NOTA

12) A 75-foot tall palm tree trunk (which is perpendicular to the ground) is broken but not severed by a tropical storm. If its top touches the ground 25 feet from the base of the trunk, how high is the still erect portion of the trunk?

- (A) $33\frac{1}{3}$ (B) $34\frac{1}{3}$ (C) 35 (D) $41\frac{2}{3}$ (E) NOTA

13) Which of the following shapes cannot be formed by drawing a line through a square?

- (A) right isosceles triangle (B) right scalene triangle (C) pentagon (D) isosceles trapezoid (E) NOTA

14) In a regular hexagon with a perimeter of 24, the apothems are drawn and the midpoints of the apothems are connected to form another regular hexagon. Find the perimeter of this new hexagon.

- (A) $4\sqrt{3}$ (B) $6\sqrt{3}$ (C) $9\sqrt{3}$ (D) $12\sqrt{3}$ (E) NOTA

15) The sides of a triangle are $2x, x + 6, 12 - 3x$, where x is a non-zero real number. Find all possible values of x .

- (A) $0 < x < 3$ (B) $x < 1$ (C) $1 < x < 3$ (D) $1 < x < 6$ (E) NOTA

16) In kite ABCD with right angles at B and D, the point of intersection of the diagonals is E. $DE = 24, DC = 30, AC = 28$. Find the length of \overline{AB} .

- (A) 18 (B) 26 (C) 30 (D) 48 (E) NOTA

17) The converse of which of the following statements is true.

- (A) If two angles are congruent, they are right angles. (B) If two angles form a linear pair, then they are supplementary. (C) If two triangles are congruent, then their corresponding angles are congruent. (D) If I am a fish, then I swim. (E) NOTA

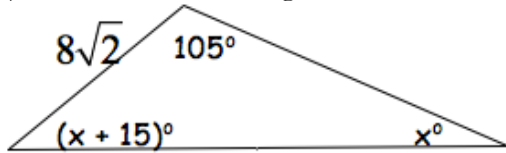
18) In $\triangle ABC$, $AB = 6$, $BC = 8$, $AC = 10$, D and E are points on \overline{AC} such that \overline{BD} is a median and \overline{BE} is an altitude. Find the length of \overline{DE} .

- (A) $\frac{7}{5}$ (B) 2 (C) $2\frac{1}{5}$ (D) 5 (E) NOTA

19) M is the midpoint of \overline{AB} and N is the midpoint of \overline{AM} . Find the coordinate of N if A has coordinate c and B has coordinate d , where $d > c$.

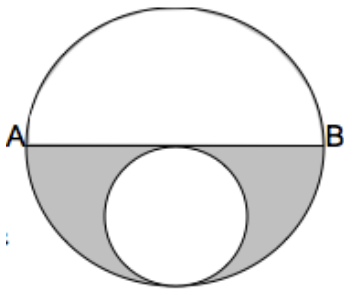
- (A) $\frac{1}{2}(d - c)$ (B) $\frac{3c + d}{2}$ (C) $3c - d$ (D) $\frac{3c + d}{4}$ (E) NOTA

20) The area of the triangle below is $A + A\sqrt{3}$. Give the value of A .



- (A) 8 (B) 16 (C) 32 (D) 40 (E) NOTA

21) \overline{AB} is a diameter of the larger circle and is tangent to the smaller circle. The smaller circle is internally tangent to the larger circle. If $AB = 12$ then give the area of the shaded region.



- (A) 36π (B) 18π (C) 12π (D) 9π (E) NOTA

22) In regular hexagon ABDFEC, what is the ratio of the area of $\triangle ABC$ to the area of $\triangle BCF$?

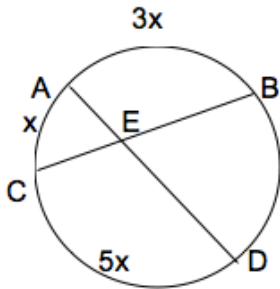
- (A) 1:1 (B) $1:\sqrt{3}$ (C) 1:2 (D) 1:3 (E) NOTA

23) The five-pointed star shown has equal length sides (10 sides of the non-convex polygon that make the star). What is the degree measure of obtuse angle BAC shown (x)?



- (A) 120 (B) 112.5 (C) 108 (D) 100 (E) NOTA

24) Two chords \overline{AD} and \overline{BC} intersect at E. $m\widehat{AC} = x^\circ$, $m\widehat{AB} = 3x^\circ$, $m\widehat{CD} = 5x^\circ$. If $m\angle AEB = 120^\circ$ then find $m\widehat{BD}$.



- (A) 80° (B) 90° (C) 100° (D) 120° (E) NOTA

25) The radius of a circle is $\frac{1}{2}a$ cm and its circumference is a^2 cm for some positive value of a . Give the value of a in cm.

- (A) π (B) 2π (C) 0 (D) 1 (E) NOTA

26) A circle is inscribed in an equilateral triangle and the triangle is inscribed in a larger circle. What is the ratio of the areas of the smaller circle to the larger circle?

- (A) 1:2 (B) 1:3 (C) 1:4 (D) 1:9 (E) NOTA

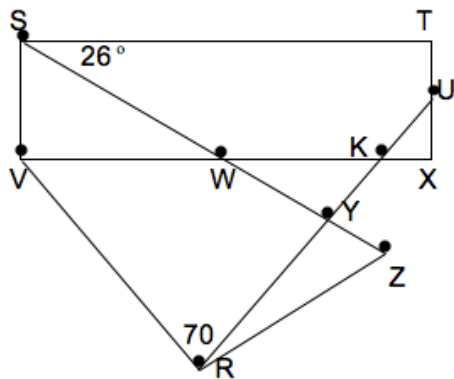
27) The perimeters of a square and an equilateral triangle are equal. If the square has side length 8 cm then what is the height of the triangle in cm?

- (A) $\frac{9\sqrt{3}}{16}$ (B) $\frac{8}{3}$ (C) $\frac{8\sqrt{3}}{3}$ (D) $\frac{16\sqrt{3}}{3}$ (E) NOTA

28) The lateral area of a right circular cylinder is half the total surface area of the cylinder. If the height of the cylinder is 10 then find the volume of the cylinder.

- (A) 1000π (B) 1250π (C) 2500π (D) 4000π (E) NOTA

29) STXV is a rectangle and S, W, Y and Z are collinear. U, Y, K and R are collinear. $VR = RK$. If $m\angle Z = 42^\circ$, find the sum $m\angle YRZ + m\angle KUX$.



- (A) 73° (B) 74° (C) 75° (D) 81° (E) NOTA

30) Find the volume of a rectangular prism with three faces having the areas 8, 9, and 12.

- (A) 30 (B) $12\sqrt{6}$ (C) $18\sqrt{3}$ (D) $15\sqrt{2}$ (E) NOTA