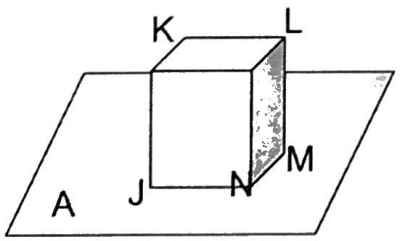
Essex County Math League
May 22, 2019
Geometry

Directions: You may write on this test. Be sure that your name, subject, and school (including town name) are on the answer sheet. Mark the answer sheet with dark, careful marks using a #2 pencil. Your score will be determined by the number of correct answers. Incorrect or blank answers will NOT lower your score. You may use only an SAT I approved calculator on this test. The answer to the tie-breaker should be placed on the answer sheet in the place indicated by the proctors.
The tie-breaker will be scored only in the case of a tie between the top scorers, and will not count as part of the team score.
Some answers are marked as "Not given". This is a viable answer and means that the correct answer is NOT one of the first four listed.

1. Refer to the diagram. Choose the best answer for points J,K, and L :



a. Collinear but not coplanar
b. Noncollinear and noncoplanar
c. Noncollinear but coplanar
d. Collinear and coplanar
e. Noncollinear

2. In the diagram, PR = RS = ST, PQ +RT = 63, and QS = 33. Find PT.

a. 99 b. 72 c. 90 d. 96 e. 76

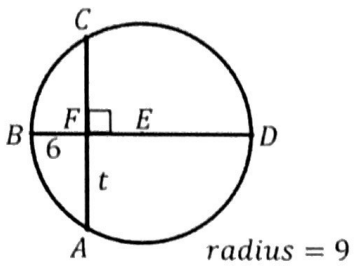
3. The bisector of an angle divides an angle into two angles, each of which has measure 15 degree less than the complement of the angle. What is the measure of the angle?

a. 50° b. 35° c. 30° d. 75° e. 45°

4. A square is inscribed in a circle. The area of the circle is 32π. Find the side of the square.

a. $4\sqrt{2}$ b. $16\sqrt{2}$ c. 8 d. 16 e. 4

5. Find t.

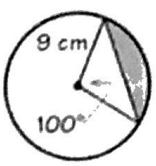


a. $\sqrt{54}$ b. $\sqrt{15}$ c. $6\sqrt{2}$ d. $4\sqrt{2}$ e. $3\sqrt{6}$

6. Right isosceles triangle ABC with the area of 81 sq. units is located in the first quadrant with a base on the x-axis. Vertex A has coordinates (0.0). Vertex C has coordinates (3a, 0). Find coordinates of vertex B.

a. $(6, 6\sqrt{3})$ b. (3, 3) c. $(9, 9\sqrt{2})$ d. (9, 9) e. (6. 6)

7. Find the shaded area.



a. 30.8 cm^2 b. 28.2 cm^2 c. 45.8 cm^2 d. 58.2 cm^2 e. 60.5 cm^2

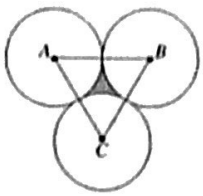
8. A point in the second quadrant with coordinates (-a, b) is reflected over the x-axis. If the reflected point is then reflected over the line y = - x, what are the final coordinates of the image?

a. (a, b) b. (-a, -b) c. (b, -a) d. (-b, -a) e. (b, a)

9. Find the angle formed by the y-axis and the line that goes through the origin and the center of the circle given by the equation $x^2 + y^2 - x + 8y + 4 = 0$

a. 82.87° b. 7.13° c. 7.18° d. 14.48° e. 75.96°

10. Find the shaded area. All circles have the same radius r.

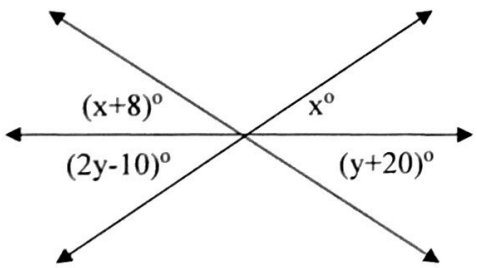


a. $r^2\sqrt{3}-\frac{1}{3}\pi r^2$ b. $r^2\sqrt{3}-\frac{1}{2}\pi r^2$ c. $2\sqrt{3}r^2-\frac{1}{3}\pi r^2$ d. $r^2\sqrt{3}-\frac{1}{2}\pi r^2$ e. not given

11. In $\triangle$ABC, $\angle$B is a right angle and sinA = $\frac{2\sqrt{7}}{7}$. Find cosA.

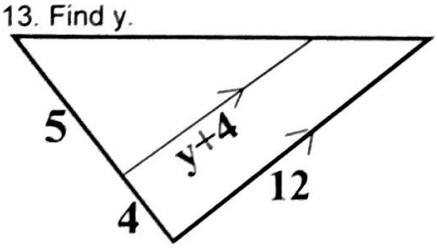
a. $\frac{\sqrt{7}}{14}$ b. $\frac{\sqrt{21}}{3}$ c. $\frac{\sqrt{7}}{7}$ d. $\frac{\sqrt{21}}{7}$ e. not given

12. Find the value of the expression *x-y* using the diagram below:



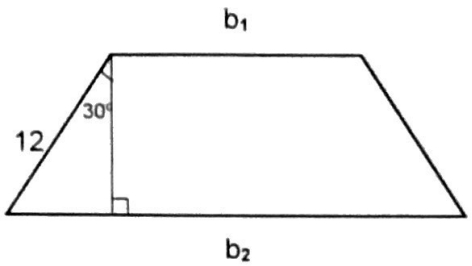
a. 12 b. 22 c. 34 d. 56 e. not given

13. Find y.



a. 12 b. 11 c. 8/3 d. 34/9 e. 28/5

14. The area of an isosceles trapezoid is $46\sqrt{3}$ sq. units. Find b_1 (shorter base).



a. 5/3 b. 10/3 c. 28/3 d. 14/3 e. 16/3

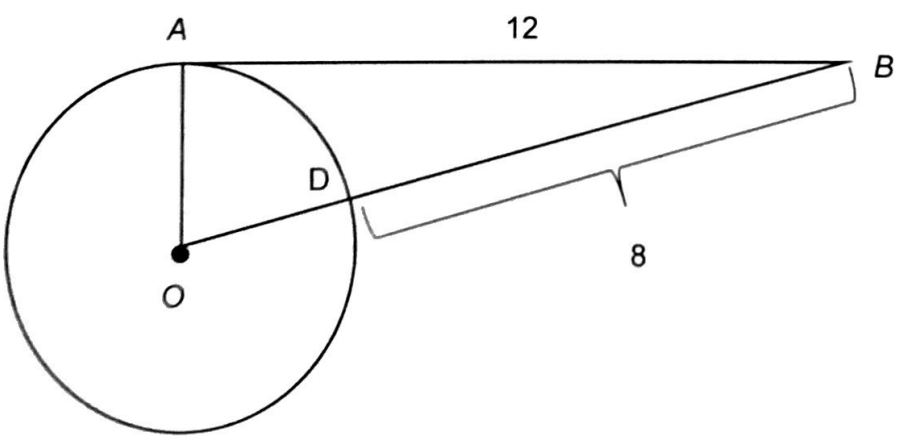
15. Find k so that the lines with equations $2x + 3ky = 5$ and $-x + (k - \frac{1}{3})y = 8$ will be parallel.

a. 2/3 b. - 1/6 c. 2/15 d. - 2/3 e. 2

16. The ratio of the sides in a pentagon is 3:4:4:5:7. The length of the shorter side is 6. Find the perimeter of the pentagon.

a. 23 b. 138 c. 42 d. 69 e. not given

17. $\overline{AB}$ is tangent to circle O. Find the m of $\overset{\frown}{AD}$.

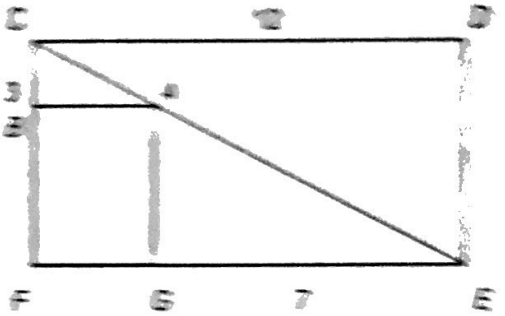


a. 66° b. 67.4° c. 56.3° d. 71.6° e. not given

[illegible] One corner of a cube with the side of [illegible] was cut off to a cross section. The cross section is an equilateral triangle with the length of the side of [illegible]. The height [illegible] the solid that was cut off by the cross section is [illegible]. Find the volume of the new solid cube without the corner.

a) [illegible] b) [illegible] c) [illegible] d) [illegible] e) [illegible]

[illegible] In the diagram, quadrilaterals [illegible] and [illegible] are rectangles. [illegible] and [illegible] How long is [illegible] rounded to the nearest tenth?



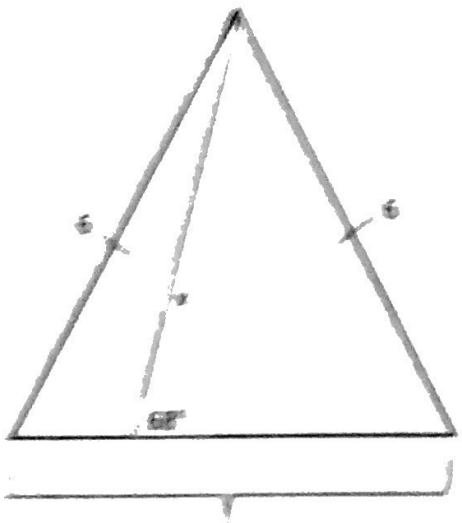
a) 13.5 b) 14.0 c) 15.6 d) 12.7 e) 14.4

[illegible] The dimensions of a rectangle are y and $y^2 + 1$ and the perimeter of the rectangle is 14 units. Find the longer side of the rectangle.

a) 2 b) 10 c) 8 d) 5 e) not given

TIE-BREAKER

Find x. Round your answer to the tenth.



ECML 2019 Geometry – Answer Key

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

Tie Breaker: 5.7