Name:_____
School:_____

Geometry Individual 2018

St. Paul's Tournament

1. Find the total surface area of a cylinder if the base area is 49π and the height is 7 (in terms of π).

2. Find the absolute value of the difference between the degree measures of the supplement and the complement of an angle with degree measure 35.

3. Simplify: $\sqrt{216} - \sqrt{96} + 2\sqrt{24}$.

4. Find the area of a quadrilateral with vertices located at points $(0,0), (3,0), (0,4)$, and $(3,8)$.

5. The circumference of a circle is 3 inches. Find the exact area of the circle.

6. Find the coordinates of the point obtained by reflecting the point (-2,5) about the y-axis.

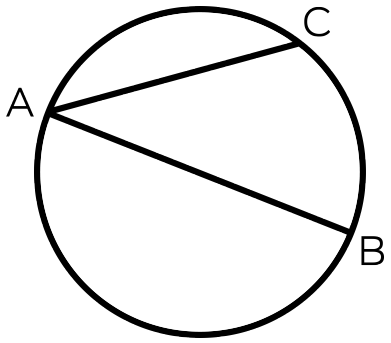
7. Which of the following statements is FALSE:
   (a) Complements of the same angle are congruent.
   (b) A supplement of an acute angle must be an obtuse angle.
   (c) Vertical angles sum to 90°
   (d) Supplements of the same angle are congruent.
   (e) None of the above.

8. A right triangle has legs of lengths 2 inches and 5/6 inches. Find the length of the hypotenuse.

9. The length of a rectangle is 1 inch less than three times its width. Its perimeter is 10 inches. Find the area of this rectangle.

10. What is the sum of the degree measures of the exterior angles in a convex dodecagon?

11. AB is a diameter of the circle and AC is a chord whose length is equal to the length of the radius of the circle. Find the degree measure of arc BC.

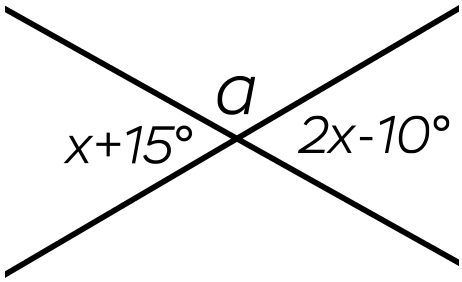


Note: Not drawn to scale.

12. A regular hexagon has an area of $45\sqrt{3}$. What is its perimeter?

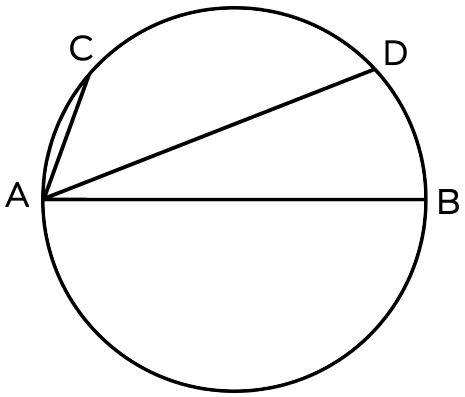
13. Which of the following represents the points in the xy-plane that lie on a line parallel to the line segment connecting (1,2) and (4,6)?
(a) $y = (3/4)x + (11/4)$
(b) $y = (3/4)x - (1/2)$
(c) $4(x - 3) = 3(y - 2)$
(d) $y = (4/3)$
(e) None of the above.

14. What is the angle a in degrees (see the figure below)?



Note: Not drawn to scale.

15. In the circle, $\overline{AB}$ is the diameter. Find $m\angle DAC$ if $AB = 4$, $AC = 2$, and $AD = 2\sqrt{2}$



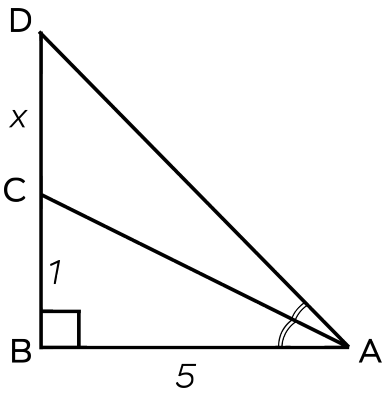
Note: Not drawn to scale.

16. If the diameter of a sphere is doubled, then the volume of the sphere is increased by a factor of what?

17. A triangle has vertices given by R(0,0), S(a,0), and T(0,b). In terms of a, b, and c, what are the coordinates of the centroid of the triangle?

18. A triangle with sides 6 inches, 8 inches, and 10 inches is inscribed in a circle. Find the radius of this circle.

19. For the following problem, find the value of x ($x = |CD|$) in the following figure. Congruent angles and right angles are marked.

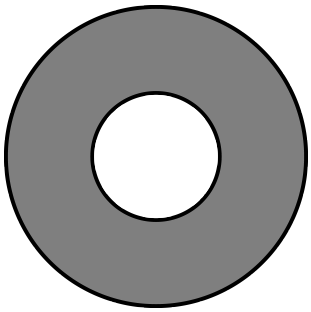


Note: Not drawn to scale.

20. What is the locus of points whose ratio of the distance from a fixed line to the distance from a fixed point is less than 1?

21. In quadrilateral ABCD, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at P. E, F, G, H are the centroids of triangles ABP, BCP, CDP, and ADP, respectively. If the area of quadrilateral ABCD is 18, find the area of the quadrilateral EFGH. The centroid of a triangle is the point of intersection of the medians of the triangle.

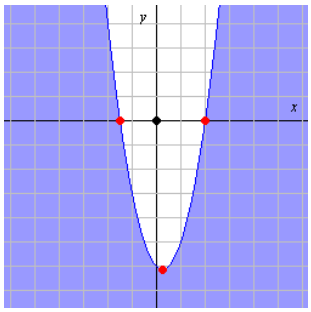
22. An annulus is the region formed between two concentric circles (as shown in the shaded region in the figure below). If the radius of the smaller circle is 2, what should the radius of the larger circle be if the annulus is to have an area half that of the smaller circle?



Note: Not drawn to scale.

Answers

1. 196π
2. 90
3. $6\sqrt{6}$
4. 18
5. $\frac{9}{4\pi}$
6. $(2, 5)$
7. (c) Vertical angles sum to 90°
8. 13/6
9. 21/4
10. 360°
11. 120°
12. $6\sqrt{30}$
13. (c) $4(x-3) = 3(y-2)$
14. 140°
15. 15°
16. 8
17. $(\frac{a}{3}, \frac{b}{3})$
18. 2
19. 13/12
20. The "outside" of a parabola.
    Example of how it looks like:



21. 4
22. $\sqrt{6}$