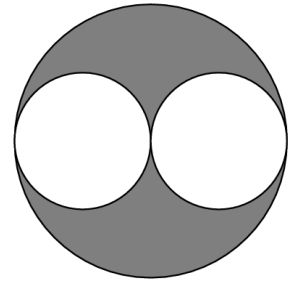


Geometry Round

30 minutes | 15 problems

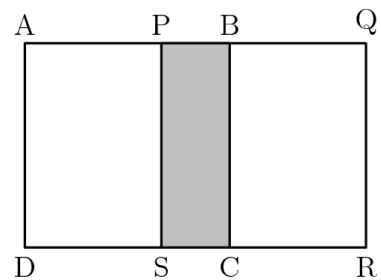
1. An enchanted square pyramid has a square base with a side length of 8 meters and a height of 12 meters. What is the volume of the pyramid?
2. A sorcerer creates a triangular shield in the shape of an equilateral triangle. Each side of the triangle is 12 cm. The altitude of the shield, when simplified, can be expressed as $n\sqrt{m}$. What is $n + m$?
3. Rapunzel has commissioned you to create a pan for her. She wants it as a regular icosagon (a polygon with 20 sides). To make the pan, you find the angle for each of the icosagon's sides. What is the measure of these angles?
4. A cylindrical container holds the invisibility cloak Harry uses to sneak out at night. Harry wants to know if it will fit in his pocket but lacks a measuring tool. He knows that it has a height of 20 MagicMeters and a volume of 320π MagicMeters³. What is the radius of his container in MagicMeters?

5. A genie tells you that you are granted three wishes if you can solve his one problem: My lamp has a circle engraved on it. On the circle is an arc AB with a measure of 156° and a vertex C on the opposite side of the circle. What is angle ACB ?



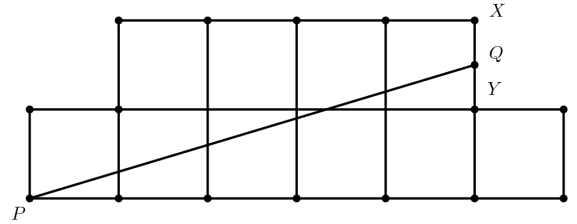
6. The Mad Hatter was making a hat for Alice when he ran out of cloth. He needs enough to finish the design pictured and asks you to run to the market. The two smaller circles are equal in size. If the areas of the two smaller circles add up to 1, what is the area of the shaded part?

7. Harry and a baby basilisk are at the two furthest corners (vertices) of a cube room with side length 1 MagicMeter. If the basilisk can only slither along the outer surface of the cube, what is the shortest distance it can travel to reach Harry?



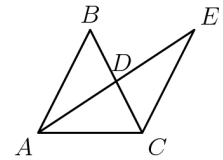
8. Shrek insists that ogres are like onions (as both have many layers) but Donkey insists that ogres are like an overlapping square math problem instead (as both are hard to figure out). As an example, Donkey draws two overlapping squares $ABCD$ and $PQRS$ in the sand. Each square has a perimeter of 60, and the perimeter of the rectangle $AQRD$ is equal to 80. What is the area of the shaded region?

9. To get to the tower that Fiona is held in, Shrek, Donkey and you need to get from point P to point Q. The map is made of 10 unit squares, and the path divides the map equally so that each half has an area of five square units. Donkey wants to know the proportion of XQ to QY. What is XQ/QY?

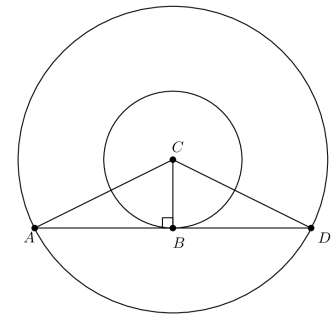


10. Arthur the Wizard finds a leftover slice of cheese lying on the ground. When he takes a closer look at it, he realizes that it is in the shape of a right triangle, with a hypotenuse 4 and an altitude from the hypotenuse to the opposite vertex $\sqrt{3}$. Find the measure of the second-largest angle in the triangle.

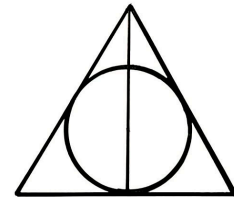
11. The Queen of Hearts is going for a new hairstyle. Her barber asks you to help figure out the dimensions of her new cut (shown to the right). Triangle ABC is an isosceles triangle with $\overline{AB} = \overline{BC}$. Point D is the midpoint of both \overline{BC} and \overline{AE} , and \overline{CE} is 11 units long. Triangle ABD is congruent to triangle ECD . Help the barber find length \overline{BD} before his head is chopped off!



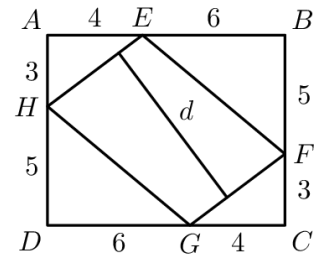
12. Robin Hood wants to set up a new target to shoot arrows into. He makes one, with the centers of both circles being C . Chord AD of length 16 is tangent to the inner circle at B , and $AC = 10$. The area in between the circles can be expressed as $n\pi$. What is the sum of the digits of n ?



13. The symbol for the Deathly Hallows is as shown to the right. If the triangle is equilateral, with a side length of 6, the area of the triangle EXCLUDING the circle can be expressed as $\frac{m\sqrt{n}-\pi}{p}$ when simplified to the greatest degree possible. What is $m + n + p$? (Figure not drawn to scale.)



14. When you stumble into the lair of a famous alchemist, you discover a strange-looking tile pattern drawn on paper strewn all around her desk. Looking closer, you notice that the length of the line d has yet to be found. If $ABCD$ is a rectangle, $EFGH$ is a parallelogram, and the line d is perpendicular to HE and GF , what is d ? Express your answer as a fraction. (Diagram not drawn to scale)



15. In *The Three Broomsticks*, Ron goes to use the bathroom but sees a pentagram inscribed in a circle on the floor. Clearly the wizard making it had one too many butterbeers, as they drew 6 equidistant points on a circle instead of 5, as shown to the right. Given that the radius of the circle is 5, the area of the pentagram can be described as $\frac{a\sqrt{b}}{c}$, where a and c have no common factors, and b is not divisible by a square of any prime. Find $a + b + c$.

