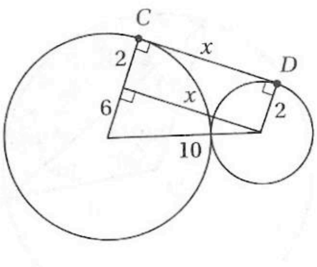
EXERCISE SET 2: GEOMETRY ANSWER KEY

No Calculator

1. **60** If the smaller cylinder has a radius of r and a height of h, its volume is $\pi r^2 h$. The larger cylinder therefore must have a radius of $2r$ and a height of $1.5h$, and a volume of $\pi(2r)^2(1.5h) = 6\pi r^2 h$. Since this is 6 times the volume of the smaller cylinder, it must hold $10 \times 6 =$ 60 ounces of oatmeal.

2. **8** First, let's draw the radii to the points of tangency, the segment joining the centers, and the segment from the center of the smaller circle that is perpendicular to the radius of the larger circle. Since the tangent segment is perpendicular to the radii, these segments form a rectangle and a right triangle.



Since the circumference of the smaller circle is 4π, its radius is 2, and since the circumference of the larger circle is 16π, its radius is 8. The hypotenuse of the right triangle is the sum of the two radii: $2 + 8 = 10$. One of the legs of the right triangle is the difference of the two radii: $8 - 2 = 6$.

Pythagorean Theorem:	$x^2 + 6^2 = 10^2$
Simplify:	$x^2 + 36 = 100$
Subtract 36:	$x^2 = 64$
Take square root:	$x = 8$

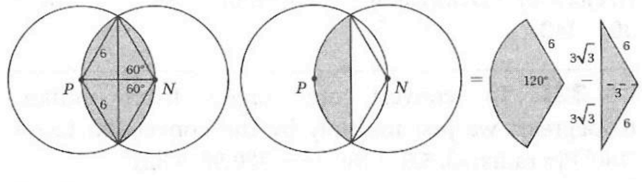
3. **B**

Diameter $= 2r$:	$2r = 6\pi^2$
Divide by 2:	$r = 3\pi^2$
Area formula:	$\pi r^2 = \pi(3\pi^2)^2$
Simplify:	$\pi r^2 = \pi(9\pi^4)$
Simplify:	$\pi r^2 = 9\pi^5$

4. **C** From the 3-D Distance Formula back in Lesson 4, the length of the diagonal is $\sqrt{6^2 + 4^2 + 2^2} = \sqrt{36 + 16 + 4} = \sqrt{56}$

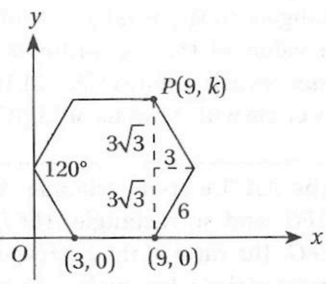
5. **A** All of the equations are clearly equations of circles, so our only task is to verify that one of these equations is satisfied by both point (3, 0) and point (9, 0). Simply by plugging these coordinates into the equations, we can verify that only the equation in (A) is true for both points: $(3 - 6)^2 + (0 - 4)^2 = 25$ and $(9 - 6)^2 + (0 - 4)^2 = 25$.

6. **C** In this problem, we have to take advantage of the Strange Area Rule from Lesson 7. First we should draw the segments from P and N to the points of intersection. Since each of these segments is a radius, they have equal measure (6), and form two equilateral 60°-60°-60° triangles.



The shaded region is composed of two circle "segments," each of which is a sector minus a triangle, as shown in the figure above. The sector, since it has a 120° central angle, has an area 1/3 of the whole circle, or (1/3) $(\pi(6)^2) = 12\pi$ and the triangle has area $3\left(3\sqrt{3}\right) = 9\sqrt{3}$. Therefore, the shaded region has an area of $(2)\left(12\pi - 9\sqrt{3}\right) = 24\pi - 18\sqrt{3}$.

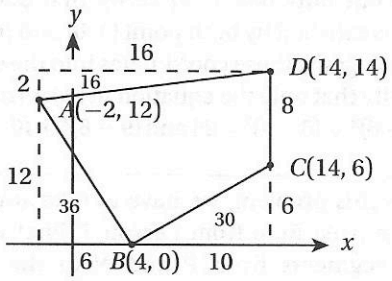
7. **B** Each side of the hexagon has length $9 - 3 = 6$. Each interior angle of a regular hexagon has measure $(6 - 2)(180°)/6 = 120°$, so the segments shown form two 30°-60°-90° triangles with lengths shown below.



Therefore, $k = 3\sqrt{3} + 3\sqrt{3} = 6\sqrt{3}$.

Calculator

8. **142** First, let's draw a rectangle around the figure as shown.



This shows that the area we want is the area of the rectangle minus the areas of the three triangles: (16)(14) − (1/2)(2)(16) − (1/2)(12)(6) − (1/2)(10)(6) = 224 − 16 − 36 − 30 = 142.

9. **321** To convert any angle from radians to degrees, we just multiply by the conversion factor (180°)/(π radians). 5.6 × 180°/π = 320.86 ≈ 321°.

10. **66** In a circle with radius 10, and arc of length 11.5 has a radian measure of 11.5/10 = 1.15 radians. In degrees, this equals 1.15 × 180°/π = 65.89° ≈ 66°.

11. **7.58** If two similar solids have sides in ratio *of a*:*b*, then their volumes are in a ratio of a^3:b^3. The ratio of the heights is 140:2 = 70:1, so the ratio of volumes is 70^3:1^3 = 343,000:1. This means that the volume of the model is 2,600,000 ÷ 343,000 ≈ 7.58 cubic meters.

12. **C** As a quick sketch will verify, in order for a circle to be tangent to the *y*-axis, its radius must equal the absolute value of the *x*-coordinate of its center. Since the center of each square is (2, −3), the radius must be 2. The only circle with a radius of 2 is (C).

13. **D** By the AA Theorem, triangle *ACD* is similar to triangle *AFG*, and so rectangle *ABCD* is similar to rectangle *AEFG*. The ratio of the corresponding sides is equal to the ratio of their diagonals, which is 15:24 = 5:8. Therefore, the ratio of their areas is 5^2:8^2 = 25:64

14. **A** If *CD* = 9, we can find *AD* by the Pythagorean Theorem. $(AD)^2 + (CD)^2 = (AC)^2$

Substitute:	$(AD)^2 + 9^2 = 15^2$
Simplify:	$(AD)^2 + 81 = 225$
Subtract 81:	$(AD)^2 = 144$
Take square root:	$AD = 12$

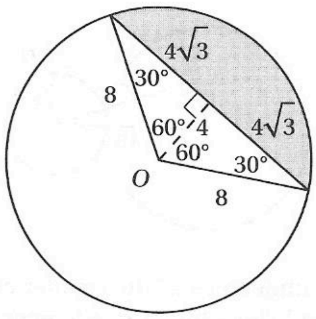
This means that the perimeter of *ABCD* is 12 + 9 + 12 + 9 = 42. Since the ratio of the perimeters of similar figures equals the ratio of corresponding sides, $\frac{42}{p} = \frac{5}{8}$

Cross multiply:	$5p = 336$
Divide by 5:	$p = 67.2$

15. **A** The two radii and the chord form an isosceles triangle. $x + x + 4x = 180$

Simplify:	$6x = 180$
Divide by 6:	$x = 30$

Therefore, the diagram should look like this:



As we saw in question 6, this portion of the circle is called a "segment," and we find its area by taking the area of the sector minus the area of the triangle. The sector has area $(120/360)(\pi 8^2) = 64\pi/3$, and the triangle has area $(1/2)(8\sqrt{3})(4) = 16\sqrt{3}$, so the segment has an area of $64\pi/3 - 16\sqrt{3}$.