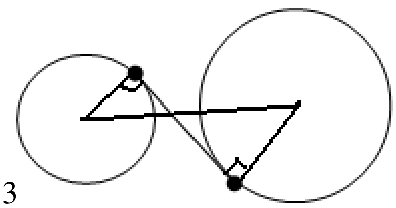
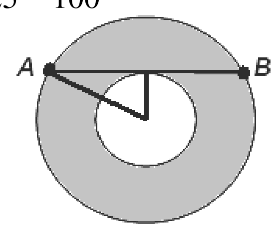
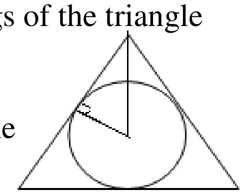
1. **[C]** The radius of the sphere is 6, and the volume is $\frac{4}{3}\pi r^3 = 288\pi$.
2. **[C]** The dials rotate once every 20 minutes, 12 minutes, and 10 minutes, respectively. Finding the LCM of 20, 12, and 10, it is 60. They will align again after 60 minutes, at 2:00.
3. **[A]** $m\overset{\frown}{BC} = 180°$, because $\overline{BC}$ is a diameter, so the last arc measures $80°$. $m\angle ACB = \frac{100-80}{2} = 10°$.
4. **[B]** The center of the circle is at $(-2,1)$, in Quadrant II. Its radius is $\sqrt{3}$. Because $\sqrt{3} < \sqrt{5}$, the circle does not reach across the origin into Quadrant IV. Since $1 < \sqrt{3} < 2$, the circle crosses the *x*-axis into Quadrant III, but does not reach into Quadrant I.
5. **[C]** Drawing radii to the tangent points and connecting the centers, find similar triangles. Let *x* be the distance from the center of the larger circle to the intersection point. Solving $\frac{14}{45-x} = \frac{22}{x}$, find that $x = \frac{55}{2}$.



By Pythagorean triples, the larger part of the internal tangent measures $\frac{33}{2}$.
Substituting and using the Pythagorean Theorem again, the smaller part of the internal tangent measures $\frac{21}{2}$, so the entire tangent segment measures $\frac{54}{2} = 27$.
6. **[B]** When the circumference increases by 20%, that is the same as multiplying the circumference by $\frac{6}{5}$.
The area factor will be the square of that, so the area is multiplied by a factor of $\frac{36}{25} = \frac{144}{100}$, which is a 44% increase.
7. **[B]** Let the radius of the large circle be R, and the radius of the small circle be r. The area of the annulus is $\pi\left(R^2 - r^2\right)$. Drawing the triangle shown and noting that *r* will perpendicularly bisect the chord, $r^2 + 36 = R^2 \rightarrow 36 = R^2 - r^2$.



8. **[C]** Opposite angles of a cyclic quadrilateral are supplementary.
9. **[A]** The shaded central angle measures $45°$, $CX = 6$, and by 45-45-90 triangles, the legs of the triangle measure $3\sqrt{2}$, and its area is 9.
10. **[A]** Solving $\frac{x^2\sqrt{3}}{4} = 108\sqrt{3}$, find that a side of the triangle measures $12\sqrt{3}$. Drawing the radius of the circle to the side of the triangle, the radius of the triangle is the short leg. Since the long leg measures $6\sqrt{3}$, the short leg measures 6.

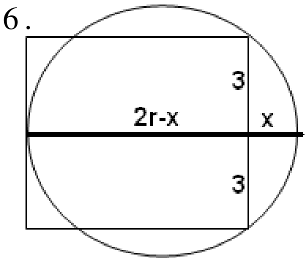


11. **[C]** The radii of the circles are 2 and 4. The shaded area is $16\pi - 4\pi = 12\pi$
12. **[D]** The common difference is $\frac{35-5}{6-1} = 6$, so the radii of the circles are $\{5,11,17,23,29,35\}$. The area of the annulus is $23^2\pi - 17^2\pi = 240\pi$.
13. **[D]** Solving $12^2 = 8(8+x)$, find that $x = 10$.
14. **[C]** On the left, half of a circle with radius 20 = 200π. On the top and bottom each, ¼ of a circle with radius 16 = $2(64\pi)$. On the right, two quarter circles with 6-foot radius = $2(9\pi)$. The sum is 346π and the sum of the digits is 13.

15. **[B]** Draw in the radii from C and the diagonals of the resultant kite. Let $AB = 2x$, and then by 30-60-90 triangles, $BC = \frac{4\sqrt{3}}{3}x = 4$, so $x = \sqrt{3}$, and the radius of the circle is 2.
16. **[C]** $36\pi \cdot \frac{40}{360} = 4\pi$
17. **[C]** Let the diameter of the circle be d. By the chord crossing theorem, $12^2 = 4(d-4)$, so the diameter is 40, and the radius is 20.
18. **[A]** Draw radii to the endpoints of the chord, and draw the height of the resultant triangle from the center. By 30-60-90 triangles, the radius of the circle is $4\sqrt{3}$, and the height of the triangle is $2\sqrt{3}$. The area of the segment is $\frac{1}{3}\pi\left(4\sqrt{3}\right)^2 - \frac{1}{2}(12)\left(2\sqrt{3}\right) = 16\pi - 12\sqrt{3}$.
19. **[B]** $\frac{6!}{2!4!} = 15$.
20. **[A]** Draw the radii to the tangent line. By similarity, $\frac{6}{r} = \frac{r}{10}$, so $r^2 = 60$, and the area is 60π and the sum of the digits is 6.
21. **[A]** The mean of the x-intercepts is 4, and the sum is twice the mean.
22. **[C]** The hypotenuse of the triangle is the diameter of the circle, because of the inscribed right angle. So the area of the circle is 25π, and the area of the triangle is 24. $\frac{24}{25\pi} = \frac{96}{100\pi} = \frac{0.96}{\pi}$.
23. **[C]** The sum of the data members is 72, and solving $\frac{16}{72} = \frac{x}{360}$, find that $x = 80°$.
24. **[D]** $\pi r^2 = 30\pi + \frac{2\pi r}{2} \rightarrow r^2 - r - 30 = 0$. Factoring, $(r-6)(r+5) = 0$, and $r = 6$ (since -5 is an impossibility.) The area is 36π.
25. **[A]** The path is 120 inches long. Using $\pi \approx \frac{22}{7}$, the circumference of the wheel is $14 \cdot \frac{22}{7} = 44$ inches. $\frac{120}{44} = 2\frac{32}{44}$.
26. **[B]** $m\overset{\frown}{AC} = 140°$ because of the inscribed angle, and $m\angle BXC = 80°$. By chord crossing, $m\overset{\frown}{BC} = 2(80) - 50 = 110°$. And then $m\overset{\frown}{AB} = 140 - 110 = 30°$.
27. **[D]** Solving $\frac{3}{2}x^2\sqrt{3} = 36\sqrt{3}$, find that a side of the hexagon, which is also its radius, is $2\sqrt{6}$. So a side of the square is $4\sqrt{6}$, and the square's diagonal, which is the diameter of the larger circle, is $\left(4\sqrt{6}\right)\left(\sqrt{2}\right) = 8\sqrt{3}$. The radius is then $4\sqrt{3}$, and the area is 48π.
28. **[D]** The circumcenter of the triangle is at the intersection of its perpendicular bisectors. The lower side of the triangle has slope $\frac{1}{4}$ and midpoint $(4,1)$. Writing the equation of the perpendicular bisector, $y - 1 = -4(x-4) \rightarrow y = -4x + 17$. Looking at the side opposite the origin, the slope is -1 and the midpoint is $(6,4)$. Writing the equation of the perpendicular bisector, $y - 4 = 1(x-6) \rightarrow y = x - 2$. Setting the equations equal, $-4x + 17 = x - 2 \rightarrow x = \frac{19}{5}$, so $m = 3.8$.

29. [C]

30. **[A]** Draw the diameter of the circle through the tangent point. Label the diagram as shown. Note that $(3)(3)=(x)(2r-x)$ by the chord crossing theorem. But also notice that $2r-x=6$.



Substituting, $9=6x$, and $x=\frac{3}{2}$. Substituting again, $2r-\frac{3}{2}=6 \rightarrow r=\frac{15}{4}$.

So the area of the circle is $\frac{225\pi}{16}$. $A+B=241$, and the units digit is 1.