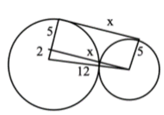
1. A
2. B
3. D
4. D
5. A
6. C
7. C
8. C
9. B
10. B
11. D
12. B
13. E
14. D
15. A
16. C
17. B
18. A
19. A
20. C
21. A
22. C
23. B
24. C
25. A
26. B
27. D
28. D
29. B
30. D

1. A Since the circle circumscribes the hexagon, by drawing a picture we can see that the side length of the hexagon is going to be 6. Using the area of a hexagon is equal to $\frac{3x^2\sqrt{3}}{2}$, the area of the hexagon is equal to $54\sqrt{3}$. The area of the circle is equal to πr^2, so the circle's area is 36π. Subtracting the two, you find the area between the hexagon and the circle to be 36π - $54\sqrt{3}$.
2. B Since the circumference is 24π, the radius of the circle is 12. The angles should sum to 360 so x + 2x + 90 + 90 = 360, making x = 60. To find the shaded area, we have to find the area of the sector then subtract the area of the triangle. For the 2x angle, the area of the shaded region is $\frac{120}{360}(12^2\pi) - \frac{1}{2}(6)(12\sqrt{3})$. For the x angle, the area of the shaded region is $\frac{60}{360}(12^2\pi) - \frac{12^2\sqrt{3}}{4}$. Combining the two areas, we get 72π – $72\sqrt{3}$. So, PQ = 1.
3. D The area of a circle is πr^2. Since the two circles have the same center, all we have to do is subtract the area of the small circle from the big circle. 164π – 92π = 72π
4. D Each minute the minute hand moves 6˚ and the hour hand moves 0.5˚. So, every minute, the angle between the minute hand and the hour hand increases by 5.5˚. At 9:00 the two hands of the clock form a 90˚ angle. 22 minutes later, the angle between the hands increases by 5.5 * 22 degrees, or 121˚. 121˚ + 90˚ = 211˚. Then the obtuse angle is 360˚ – 211˚ or 149˚.
5. A The figure formed is a torus. The surface area of a torus is $4\pi^2 Rr$, where R is the distance from the center of the torus to the middle of the torus figure and r is the radius of the circle being revolved. So, in this case, R = 12 and r = 6. Plugging it into the formula, you get an answer of is $288\pi^2$.
6. C The volume of a torus is $2\pi^2 Rr^2$. Plugging the values from above into the formula, you get $864\pi^2$.
7. C To find the center of the circle, all we need to do is find where the perpendicular bisectors of the two pair of points that lie on the circle. Using (-5, -4) and (6, 9) we get the equation of the perpendicular bisector to be $y - \frac{5}{2} = -\frac{11}{13}\left(x - \frac{1}{2}\right)$. Then using (6, 9) and (12, 13) we get the equation of the perpendicular bisector to be $y - 11 = -\frac{3}{2}(x - 9)$. Then finding where the two lines intersect, we should get an answer of 33.
8. C

$$(x - y)10 = 50$$
$$(x + y)5 = 50$$
$$x = \frac{15}{2}$$

9. B The area of the triangle is 84. Using $R = \frac{abc}{4A}$ we find the circumradius to be $\frac{65}{8}$.
10. B The square has an area of $\left(\frac{16\pi}{4}\right)^2$ or $16\pi^2$. The circle has an area of $\left(\frac{16\pi}{2\pi}\right)^2 \pi$ or 64π. So the ratio of their areas is $\frac{4}{\pi}$.
11. D The area of a regular octagon is $2s^2(1 + \sqrt{2})$

12. B To find the volume, we find the volume of the cylinder and subtract the hole in the middle. The big radius of the cylinder 8 and the radius of the hole is 3. The area of the annulus will be 64π – 9π, or 55π. Then multiplying by the height of 5, we find the volume to be 275π.
13. E Drawing a good picture, we get the equation $5(5) = 12(2r - 12)$. Solving for r, we get $\frac{169}{24}$. The question asked for the diameter, so we have to multiply by 2.
14. D This is a direct application of Stewarts. Using Stewarts, we get an answer of 53/2.
15. A Drawing the picture, it appears that the crease forms a similar triangle with the original. Since the width is half of that of the original triangle, the height, in this case, also the crease, must be in the same ratio.
16. C The first time around, the total area that is shaded is 4. The second time around, when the same thing is done to the middle square, each square that is shaded is 1/9 that of the previous on and there are 4 squares, so the total area shaded is 4/9. This is just a geometric series with first term 4 and common ratio of 1/9. Summing them up, you should get an answer of 9/2.
17. B Using heron's formula, the area of the triangle is $24\sqrt{21}$. The altitude is perpendicular to the side of the triangle, so using $\frac{bh}{2}$ where b is 17, solving for h, you should get an answer of $\frac{48\sqrt{21}}{17}$.
18. A Using heron's formula for quadrilaterals, we should get answer choice A
19. A Connecting the center of the circle to point P, we get that triangle PAO is a 30-60-90 triangle. This means side PO has length 20. Subtracting out the radius, we get 10 as out answer.
20. C EF is the midsegment of the trapezoid, so AB plus CD has length equal to 40. By drawing a good picture, we can see that this is equal to half the perimeter of the trapezoid. Knowing this, we find that the perimeter is 80.
21. A We reflect the point (-4, 9) over the x-axis and then find the distance between (-4, -9) and (5, 3). This is the shortest distance. We notice that this is a 9-12-15 right triangle, making the distance 15.
22. C First, we always draw a good picture. We notice that the two sides of the triangle that lies in each circle has the same length. Setting the radius of the circles to a, b, and c. We get that a + b + c = 21, a + b = 13, b + c = 14, and c + a = 15. Solving we get that c = 7, a = 6, and b = 8. Then finding the sum of the areas, we get 149π.
23. B



$x^2 + 2^2 = 12^2 \quad x = 2\sqrt{35}$

24. C First use Pythagorean theorem to find that $BC = 40$ and $AD = 48$.
Next using Ptolemy's theorem, we have (AC)(BD) + (AD)(CB) = (AB)(CD).
Plugging in the values, we get that CD = $\frac{234}{5}$.
25. A If you pick any 5 points, you have found yourself a convex pentagon. Thus, the answer to the question is just 12 choose 5 or 792.

26. B After 3 seconds, the volume of the cone that is filled is equal to 18π. This figure is also a cone. Notice that the height of the cone is always twice the radius. Using the volume of a cone and solving for the radius, we get 3. So the area of the circle is 9π.
27. D The length of the altitude to the hypotenuse of a right triangle is just the geometric mean of the two segments that it divides the hypotenuse into. So $\sqrt{16 * 25} = 20$.
28. D $F + V = E + 2$ $6 + 8 = E + 2$ $E = 12$
29. B There are 5 Platonic solids
30. D There are 13 Archimedean solids