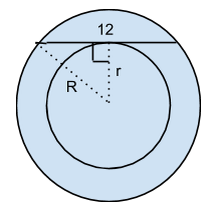
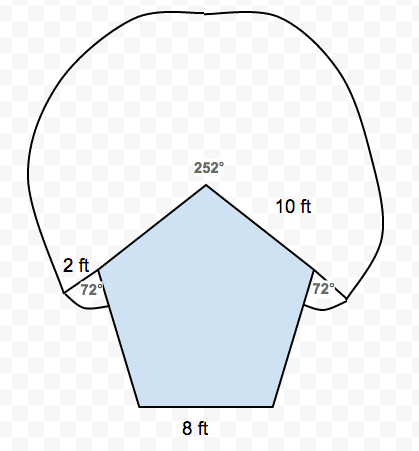
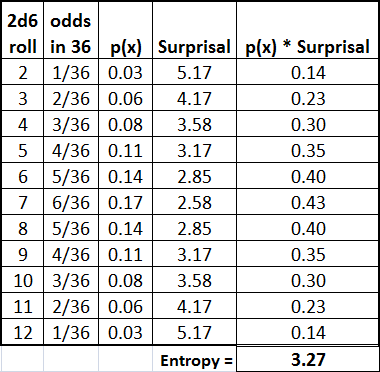
ANSWERS:

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

**SOLUTIONS:**

1. The cube has a side length of 4 ft and the square pyramid has a base length 4 ft with height of 4 ft. **C**

****

1. As shown on the right, you can form a right triangle with half the chord and the radii. According to Pythagorean Theorem, . Rearranging this, we have . Area of the annulus is the area of the larger circle subtracted by the area of the smaller circle. Therefore, the area is . **A**
2. According to Euler’s polyhedron formula, Edges=Vertices+Faces-2. 30=20+Faces-2. There are 12 faces, hence this polyhedron is a dodecahedron. **D**
3. The correct notation for the contrapositive is . The symbol use for answer choice D is the conjunction symbol which means “and”. **E**
4. With so many sides, the 50-gon shares almost-identical characteristics to a circle. The 50-gon has a perimeter of 50 ft and therefore, having a diameter of . The radius is then approximately and the area is approximately . **B**
5. By circumscribing a circle about the 50-gon, one can see the angle is just an inscribed angle of the circle with a corresponding arc length of 3/5th the entire perimeter. According to the inscribed angle theorem, the measure of an inscribed angle is half of the measure of the corresponding arc. The arc has a measure of . The angle is therefore 108 degrees. **D**
6. The number of diagonals in any polygon is determined by . **B**
7. There are 10 strands of straw and each will intersect with all 9 other strands at most once. Saying this will double the number of intersections. For example, strand 1 intersects with strands 2 through 10 once while strand 10 intersect with strands 1 through 9 once. The intersection of strand 1 and 10 is included twice. Therefore the maximum number of intersections is or 10C2=45. **C**
8. That is angle-side-angle. **A**
9. Rumpelstiltskin can weave straw into gold at a rate of 1/4th of a room per hour whereas Nikstlitslepmur can unweave gold to straw at a rate of 1/8th of a room per hour. That means the net change of the room from straw to gold is It will take 8 whole hours for the room to be filled with gold. **D**
10. As shown, the area which the dog can roam is given by three sectors, one with a radius of 10 ft and angle of 252 degrees and two with radius of 2 ft and angle of 72 degrees. The area the dog can roam is therefore . **D**
11. Assume the points (2,5) and (10,11) to be endpoints of the diameter of a circle. According to inscribed angle theorem, all inscribed angles passing both points will be right angles (Corresponding arc of diameter is 180 degrees). When the end of the slingshot is within the circle, it is obtuse and when outside, it is acute. Therefore the area of the space Rumpelstiltskin’s hand can be in is 25as the diameter of the circle is 10. **C**
12. The formula for this height is given by where a and b are the heights of the tower. Notice that the distance between the tower does not affect the height. . **B**
13. There are 60 ticks on a standard clock, each tick representing 1 minute. Therefore, every minute, the minute hand moves . The every hour, the hour hand moves 5 ticks or 30 degrees. Then every minute, the hour hand moves . Since the hour hand and minute hand both turn in the same direction, the angle changes at a rate of per minute. At 11:59, minute hand and hour hand both are 1 minute away from hitting the 12. Thus the minute hand is 6 degrees from 12 and the hour hand from the 12, resulting in a angle. 1 minute after 12, the angle is again at as at 12, it is a 0 *degree* angle. 120 seconds. **C**
14. These numbers are all composite (1ol). The daughter is having quite the bad day. **E**
15. In order for the gown to not have a hole, the specific polygon chosen must tessellate. For a polygon to tessellate, each interior angle must divide into 360. The pentagon is the only polygon of the answer choices that does not tessellate. **C**
16. The surface area of a cone consists of two parts: the lateral area and the base. The area of the base is simply the area of the circle with radius 5. The lateral area is given by . The slant height is just the diagonal of a right triangle with leg lengths of 5 and 12, in other words 13. The total surface area is . **A**
17. The truth value of a conditional statement is always true if the hypothesis is false. **A**
18. From the given information, one can derive the area of a regular dodecagon to be the sum of the area of 6 squares, 6 triangles, and 1 hexagon, all with the same side length as the dodecagon. The derived formula is where s is the side length. Plugging in 3, we have the area of . **C**
19. The sum of the first *n* perfect cubes can be given by the sum of the first *n* natural numbers squared. In other words, . The sum of the first 10 natural numbers is 55. . **D**
20. A rectangular prism has 4 space diagonals. Therefore, 4 swords are needed. **B**
21. Let *a, b,* and *c* be the measure of the length, width, and height respectively. Then the sum of the length, width, and height squared is . We recognize the volume as *abc* and the surface area to be . Thus The space diagonal is given by . **B**
22. A piece of paper folded in this way will result in two right triangles. One with an area of half the rectangle, in other words a 12 by 18 right triangle. The other right triangle is a triangle with one leg length of 12, while the sum of the remaining leg and hypotenuse is 18. This means this triangle is 5 by 12. Adding the area of these two triangles give you 138. **C**
23. Don’t be thrown off by the answer choices. Recognize that a circle is the most efficient shape regarding perimeter-area optimization. **E**
24. Triangle Inequality Theorem states that any side of the triangle is always less than the sum of the other two sides. If one assumes the direct distance from the palace to the mall as one side (*a*), the palace to the detour location as another side (*b*), and the detour location to the mall as the third side (*c*), one can see that according to triangle inequality. **A**
25. Shown below is the probability distribution chart for each sum. The probability of Rumpelstiltskin winning is then . The chances of Nikstlitslepmur winning is then . **A**
26. Using Heron’s formula, one can calculate the area. . 72 gold per square unit, so . **D**
27. Justin traveled a total distance of He travels a net distance of 40 ft west and 9 ft south, in other words . If he took the direct route, he would have walked less. **B**
28. There are twenty-two 3-digit perfect squares (. You must consider two cases. 3 even and 0 odd digits or 1 even and 2 odd digits. The perfect squares that satisfy these conditions are 121, 169, 196, 361, 400, 484, 529, 576, 729, and 961. A total of 10. **C**
29. The dimension that deals with at most length and width is the 2nd dimension. **C**