1. Solution: D. Circumference= cm.
2. Solution: A. Volume of screw is equal to the sum of the volumes of the 2 cylinders and the cone. The cylinders have volumes of and , respectively, and the cone has volume . The sum of these is cm3.
3. Solution: B. is approximately equal to 4.87. Thus, DaBaby can make 4 whole screws.
4. Solution: A.
5. Solution: B. Using the distance formula gives us .
6. Solution: E. In order to solve this, we reflect (6, 9) across the line y=-1. This gives us a new point of (6, -11). Now use distance formula on (1,2) and (6,-11) to get
7. Solution: E. Circles maximize the area within given a set perimeter/circumference. Circles have 0 sides.
8. Solution: C. Diagonal formula is .
9. Solution: A. Sum of interior angles is
10. Solution: B. Given n lines, the formula for finding the maximum intersections is
11. Solution: B. The point (0,2) is on the first line. Now use distance from point to line to get the distance is .
12. Solution: C. That’s what it is called.
13. Solution: D.
14. Solution: C. All squares are rectangles and parallelograms.
15. Solution: D.
16. Solution: A. Using Ceva’s theorem we know that Solving for gives us 5.
17. Solution: C. Using Stewart’s theorem we get 34\*34\*20+13\*13\*5-5\*20\*25=d2\*25. d2=4392/5. Sqrt of this.
18. Solution: B. Angle bisector theorem gives 8\*6=12x, so x=4.
19. Solution: D. Formula is a\*b/(a+b). Thus, 4\*3/(4+3)=12/7. This is miles, not meters, so d.
20. Solution: B. 3/2\*s^2\*
21. Solution: B. 32^2-(18-12)^2=x^2. X^2=988, so x=sqrt(988).
22. Solution: C. 32^2-(18+12)^2=x^2. X^2=123, so x=sqrt(124).
23. Solution: D. We can represent the three friends with the variables x,y, and z. Using this, we can create a cube with dimensions of 3x3x3 modeling the squares of the real numbers with a corner on the origin. Now, we can create another sphere modeled by the expression x^2+y^2+z^2<=8. This sphere is centered at the origin with radius of 2sqrt2. Because the real numbers are between 0-3, they are positive, leading to only 1/8 of the sphere being in the cube (half of x,y,z values are positive on the sphere so (1/2)^3 = 1/8). Now to find the probability of the sums of the squares being less than 8, we can find the volume of the sphere that is in the cube divided by the volume of the cube. This is (1/8 x 4pi/3 x (2(sqrt2))^3)/ 3^3 or (8pi(sqrt2))/81. To find the probability of the sums of the squares being over 18 instead of under it, we can just subtract this found probability from 1 giving us (81-8pi(sqrt2))/81.
24. Solution: B. Create a square. One axis is x, the time after midnight that the bus arrives and the other is y, the time after midnight that Lily arrives. Both have length 60 representing the minutes after midnight. Now we can focus of areas of failure to find the remaining area of success. Since the bus waits 3 minutes, we can’t arrive more than 3 minutes after it, creating the expression y>x+3. Since we wait 15 minutes, the bus can’t arrive more than 15 minutes after us creating the expression x>y+15 or y<x-15. This equation and the one above it models the regions of failure. To find the region of success we can subtract 3600( the area of the square 60x60) by the areas of the triangles bounded by the expressions and the x and y axis. This gives us the areas of (45x45)/2 and (57x57)/2. 3600-1012.5-1624.5=963. The probability of success is aea of success divided by total area or just 963/3600 or 107/400.
25. Solution: C. Create a line from 0-120 modeling the minutes after 8 AM. Nelson arrives at 90 minutes afterward and only stays for 30 minutes. Since the bus arrives randomly, the probability of Nelson catching the bus is just 30 minutes(the time he is there)/120 minutes (total time).
26. Solution: D. We can split the dodecagon into 12 isosceles triangles of equal area from the center as one point and the adjacent vertices being 2. Thus, we have 12 isosceles triangles with legs of length 2 and angle between them of 30 degrees. Thus, the area of each triangle is 2\*2\*1/2\*sin(30 deg)=1. 12\*1=12.
27. Solution: E. All are possible cross sections.
28. Solution: B. 14\*2.54=35.56>32. Thus, The Top Grandmaster of the Galaxy is longer by 3.56 cm.
29. Solution: A. Volume of ellipsoid is 4/3\* \*r1\*r2\*r3=4/3\* \*12\*13\*17=3536
30. Solution: B. DaBaby never apologizes, so he did not make a song named “Sorry.” That was Justin Bieber.
31. Solution: B. r=3.45 and h=10. 1/3\*pi\*r^2\*h🡪1/3\*10\*3.45^2\*pi=39.675pi.
32. Solution: C. Area of full circle is 16pi. 6pi/16pi=0.375. 0.375\*360=135 degrees.
33. Solution: A. Look at the octagon below. We know that the side length is 5. Furthermore, the apothem is made up of half the side added to the leg of a 45-45-90 triangle with hypotenuse 5. Thus, the leg it 5sqrt2/2. This means that the apothem is of length 5/2+5sqrt2/2.

5/2

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