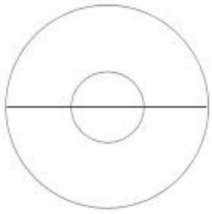
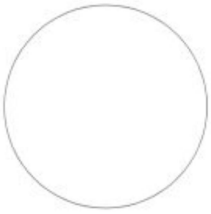
7th/8th Grade Geometry

# Pi's Doughnut Shop

Pi's doughnut shop sells perfectly round doughnuts 4 1/4" in diameter. The unfrosted and frosted doughnuts have perfectly round holes of 1" in diameter. The jelly doughnuts do not have holes.

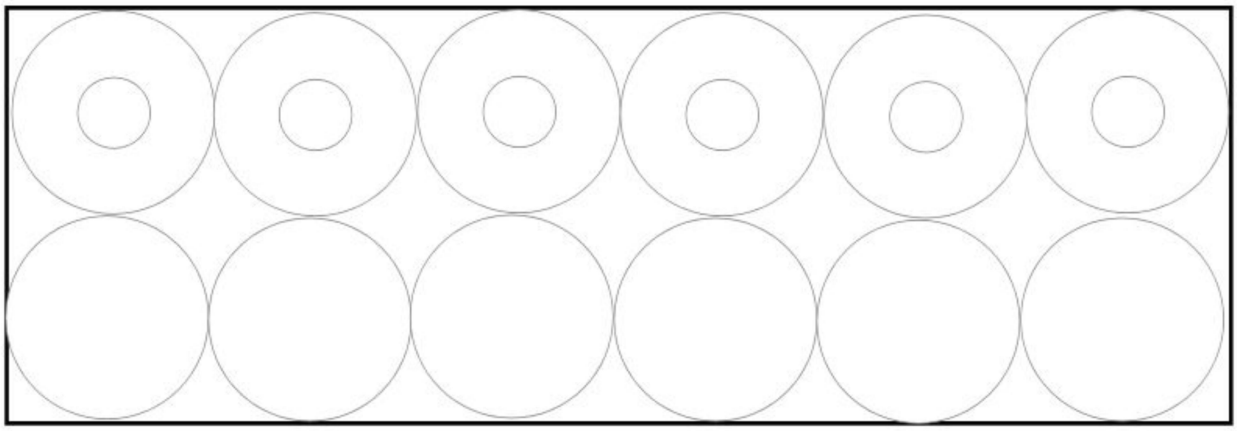


Unfrosted Doughnut:
4 1/4" Diameter Outside
1" Diameter Inside Hole
1 3/4" Height



Jelly Doughnut:
4 1/4" Diameter Outside
1 3/4" Height

Chocolate Frosted Doughnut
Same as Unfrosted Except:
Frosting 1/4" From Edge & Inside
Frosting 1/8" High



Use 3.14 as approximation for pi.

Round everything to 3 digits (thousandths).

1) What is the circumference of a doughnut?
   Answer: 4.25 x pi = 13.345"

2) To help customers stay clean, the chocolate frosted doughnuts only have frosting up to 1/4" from the edge. Of course, the frosting is also perfectly round. What is the circumference of the frosted part?

Hint: Look at the picture. The diameter is smaller since the frosting doesn't go all the way to the edge.

Answer: (4.25 - .5) x pi = 11.775"

3) The perfectly round jelly doughnuts of course have no holes. What is their surface area?

Answer: pi * (4.25/2)^2 = 14.179 sq in

4) The perfectly round holes in the doughnuts are one inch in diameter. What is the surface area of an unfrosted doughnut?

Hint: Subtract out area of the hole.

Answer: Hole = pi * .5^2 = .785
14.179 - .785 = 13.394 sq in

5) What is the surface area covered by the frosting on the frosted doughnuts?

Hint: Look at the picture. This one is tricky. Find the diameter to the edge of the frosting, then calculate that area. Then find the diameter of the hole plus the inside unfrosted part, and calculate that area. Subtract.

Answer: Outside radius = (4.25 - .5)/2 = 1.875
Inside hole + unfrosted par radius: (1+.5)/2 = .75
3.14*(1.875)^2 - 3.14*(.75)^2 =
11.039 - 1.766 = 9.273 sq in

6) If you bought a dozen doughnuts, half unfrosted and half jelly, what is the total surface area of the doughnuts?

Hint: Just add up surface area of doughnuts.

Answer: (6*13.394) + (6*14.179) = 165.438 sq in

7) What is the minimum length and width of the box to hold a dozen doughnuts, if Pi wants to have 2 rows of 6 doughnuts per box? What is the surface area of the bottom of the box?

Hint: Look at the picture. Use the diameters.

Answer: length = 6 * diameter = 6 * 4.25 = 25.5"
width = 2 * diameter = 2 * 4.25 = 8.5"
area = 25.5 * 8.5 = 216.75 sq in

8) If the height of the doughnuts is 1 3/4", and any frosting adds another 1/8", what is the minimum height of the boxes Pi would need to sell a dozen doughnuts in?

Answer: 1.75 + .125 = 1.875"

9) What is the minimum volume of the boxes Pi would need to sell a dozen doughnuts in?

Hint: Volume = Length * Width * Height

Answer: 25.5 * 8.5 * 1.875 = 406.41 cubic inches

10) With a box filled with a dozen doughnuts, 6 unfrosted and 6 jelly, what area of the bottom of the box is not touching a doughnut?

Hint: Start with total area of bottom of box. Subtract out area of doughnuts.

Answer: Total area: 216.75
Area of 6 unfrosted doughnuts: (6*14.179)
Area of 6 jelly doughnuts: (6*13.394)
216.75- (6 * 14.179) - (6 * 13.394) = 51.312 sq in

11) When the baker removed a batch of doughnuts from the oven, one fell off the tray, rolled 4 times on the table, fell 4 feet to the floor, and rolled another 6 feet before it hit the wall. How far did the doughnut travel in feet?

Hint: Add the distance it rolled to distance it fell. Remember to convert inches to feet!

Answer: Rolled in inches: (4 * 13.345) + (6 * 13.345) = 133.45 inches

Fell in inches: 48 inches
Total in inches: 181.45
Convert to feet: 181.45/12 = 15.120