Table Arrangements
Janine is planning on creating a water-based centerpiece for each of the 30 tables at her wedding reception. She has already purchased a cylindrical vase for each table. The radius of the vases is 6 cm and the height is 28 cm. She intends to fill them half way with water and then add a variety of colored marbles until the waterline is approximately three-quarters of the way up the cylinder. She can buy 100 marbles in 2 different sizes with radii of 9 mm or 12 mm. A bag of 9 mm marbles cost $3 and a bag of 12 mm marbles costs $4.

Part One: Cost of Small vs Large Marbles

a) What is the volume of each cylinder?   Record your answer in cubic millimeters and leave in terms of pi.

b) What fraction of the volume of each cylinder should be taken up by marbles?

c) What is the volume of marbles needed for each vase? What is the total volume of marbles needed for all 30 tables? Leave your answers in terms of pi.

d) What is the volume of one bag of 9 mm marbles? Leave your answer in terms of pi.

d) How many bags would you need to fill all of the vases with the 9mm marbles? How much would it cost?

e) What is the volume of one bag of 12 mm marbles? Leave your answer in terms of pi.

f) How many bags would you need to fill all of the vases with the 12mm marbles? How much would it cost?

Part Two: Cost of Combinations

a) Janine's parents, who are paying for the wedding, have told her she can spend at most 180 dollars on marbles. Using x to represent the number of bags of small marbles and y to represent the number of bags of large marbles, write an inequality to show the combinations of marbles she can order for fewer than or equal to 180 dollars.

b) Using x to represent the number of bags of small marbles and y to represent the number of bags of large marbles, write an inequality to show the combinations of marbles she can order to fill at least all of her centerpieces.

c) Graph your inequalities from part a and b in your calculator. Give a combination of marbles that Janine could purchase where she would meet both her money and volume constraint.

d) Janine finds the small marbles more aesthetically appealing. Using your inequalities from part a and b, give a combination of marbles that Janine could purchase where she would meet both her money and volume constraint and use as many small marbles as possible. Be careful about rounding your final answer. Does your result still meet both constraints?
Aluminum Can:

A cylindrical soda can is made of aluminum. It is approximately $4\frac{3}{4}$ inches high and the top and bottom have a radius of approximately $1\frac{3}{16}$ inches:
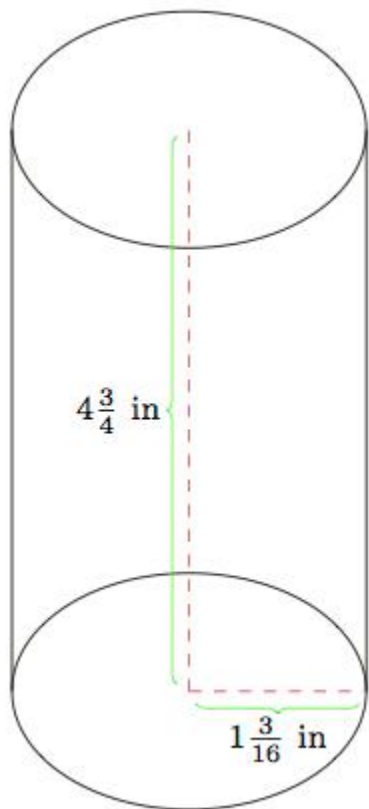
a. Find the approximate surface area of the soda can. What assumptions do you use in your estimate?

b. The density of aluminum is approximately 2.70 grams per cubic centimeter. If the mass of the soda can is approximately 15 grams, how many cubic centimeters of aluminum does it contain?

c. Using the answers to (a) and (b) estimate how thick the aluminum can is.