c. If 64 women are randomly selected, what is the probability that their mean head circumference is between 22.00 in. and 23.00 in.? If this probability is high, does it suggest that an order for 64 hats will very likely fit each of 64 randomly selected women? Why or why not?

14. Designing Manholes According to the web site www.torchmate.com, "manhole covers must be a minimum of 22 in. in diameter, but can be as much as 60 in. in diameter." Assume that a manhole is constructed to have a circular opening with a diameter of 22 in. Men have shoulder breadths that are normally distributed with a mean of 18.2 in. and a standard deviation of 1.0 in. (based on data from the National Health and Nutrition Examination Survey).

a. What percentage of men will fit into the manhole?

b. Assume that the Connecticut Light and Power company employs 36 men who work in manholes. If 36 men are randomly selected, what is the probability that their mean shoulder breadth is less than 18.5 in.? Does this result suggest that money can be saved by making smaller manholes with a diameter of 18.5 in.? Why or why not?

15. Water Taxi Safety Passengers died when a water taxi sank in Baltimore's Inner Harbor. Men are typically heavier than women and children, so when loading a water taxi, assume a worst-case scenario in which all passengers are men. Assume that weights of men are normally distributed with a mean of 182.9 lb and a standard deviation of 40.8 lb (based on Data Set 1 in Appendix B). The water taxi that sank had a stated capacity of 25 passengers, and the boat was rated for a load limit of 3500 lb.

a. Given that the water taxi that sank was rated for a load limit of 3500 lb, what is the mean weight of the passengers if the boat is filled to the stated capacity of 25 passengers?

b. If the water taxi is filled with 25 randomly selected men, what is the probability that their mean weight exceeds the value from part (a)?

c. After the water taxi sank, the weight assumptions were revised so that the new capacity became 20 passengers. If the water taxi is filled with 20 randomly selected men, what is the probability that their mean weight exceeds 175 lb, which is the maximum mean weight that does not cause the total load to exceed 3500 lb?

d. Is the new capacity of 20 passengers safe?

16. Loading M&M Packages M&M plain candies have a mean weight of 0.8565 g and a standard deviation of 0.0518 g (based on Data Set 20 in Appendix B). The M&M candies used in Data Set 20 came from a package containing 465 candies, and the package label stated that the net weight is 396.9 g. (If every package has 465 candies, the mean weight of the candies must exceed $396.9/465 = 0.8535$ g for the net contents to weigh at least 396.9 g.)

a. If 1 M&M plain candy is randomly selected, find the probability that it weighs more than 0.8535 g.

b. If 465 M&M plain candies are randomly selected, find the probability that their mean weight is at least 0.8535 g.

c. Given these results, does it seem that the Mars Company is providing M&M consumers with the amount claimed on the label?

17. Gondola Safety A ski gondola in Vail, Colorado, carries skiers to the top of a mountain. It bears a plaque stating that the maximum capacity is 12 people or 2004 lb. That capacity will be exceeded if 12 people have weights with a mean greater than $2004/12 = 167$ lb. Because men tend to weigh more than women, a worst-case scenario involves 12 passengers who are all men. Assume that weights of men are normally distributed with a mean of 182.9 lb and a standard deviation of 40.8 lb (based on Data Set 1 in Appendix B).

a. Find the probability that if an individual man is randomly selected, his weight will be greater than 167 lb.