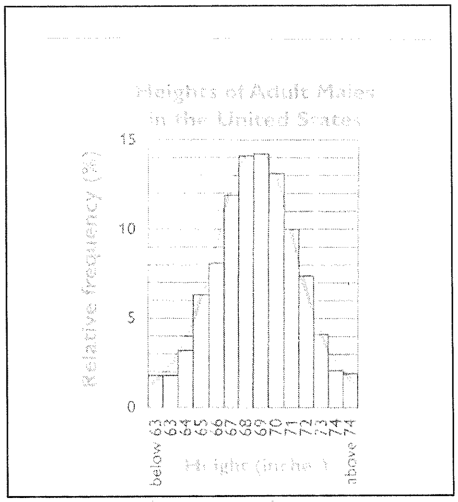
Key

Notes 12.4 Day 1: Normal Distributions

A **normal distribution** is a symmetric, bell-shaped distribution with its highest point over the mean. Most of the data values are clustered near the mean giving the distribution a well-defined peak. The data values are spread evenly around the mean, making the distribution symmetric. Larger deviations from the mean become increasingly rare, producing the tapering tails of the distribution.



symmetric → normal distribution
bell shaped

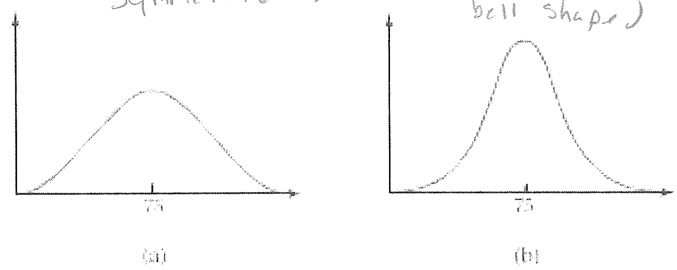
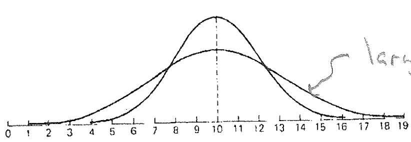


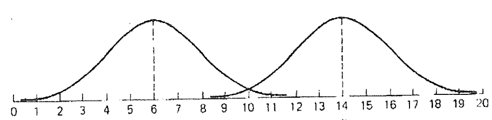
FIGURE 6.13 Both distributions are normal and have the same mean of 75, but distribution (a) has a lower peak and greater variation (a larger standard deviation).

1) Compare the mean and standard deviation of these graphs.



larger s

means equal



s equal

$\bar{x}$ different

2) Which distribution appears to be normally distributed?

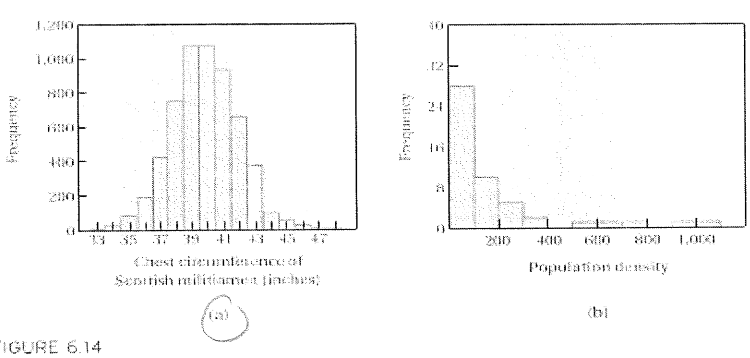


FIGURE 6.14

3) Which of the following would you expect to have a normal or nearly normal distribution?

a) The age of a person on vacation in Las Vegas. prob 731

b) The shoe size of an adult woman.

4) Female adult heights in North America are approximately normally distributed with a mean of 65 inches and a standard deviation of 3.5 inches. Find the height that is

a) 3 standard deviations above the mean. $65 + 3(3.5) = 65 + 10.5 = 75.5$

b) 2 standard deviations below the mean. $65 - 2(3.5) = 65 - 7 = 58$

c) 2½ standard deviations above the mean. $65 + 2.5(3.5) = 65 + 8.75 = 73.75$

THE 68-95-99.7 RULE FOR THE NORMAL DISTRIBUTION

1. Approximately 68% of the data items fall within 1 standard deviation of the mean (in both directions).
2. Approximately 95% of the data items fall within 2 standard deviations of the mean.
3. Approximately 99.7% of the data items fall within 3 standard deviations of the mean.

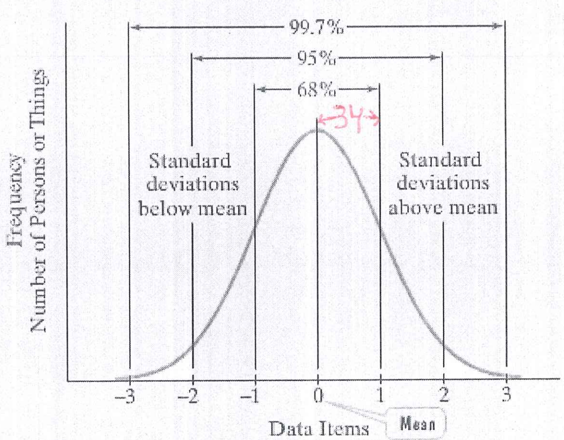
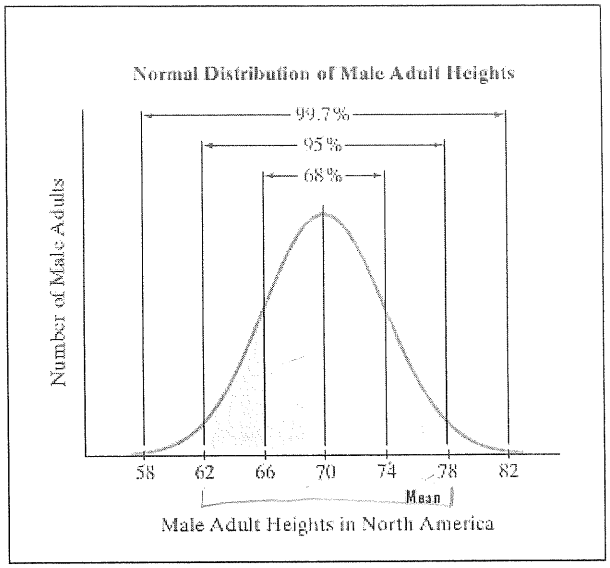


FIGURE 12.11



5) Use the distribution of male adult heights in the figure above to find the percentage of men with heights

a. between 62 inches and 78 inches. 2 \$ 95%

b. between 70 inches and 78 inches. $\frac{95}{2} =$ 47.5%

c. above 74 inches. $\frac{100-68}{2} = \frac{32}{2} = 16\%$

d. below 58 inches

$\frac{100-99.7}{2} = \frac{.3}{2} = .15\%$

6) A survey finds that the prices paid for two-year-old Ford Fusion cars are normally distributed with a mean of \$10,500 and a standard deviation of \$500. What percent of two year old Fusions are sold at a price

10,500

10,000 ← 1s → 11,000

9,500 ← 2s → 11,500

9,000 ← 3s → 12,000

a) between \$10,000 and \$11,000? 68%

b) for less than \$9,500? $\frac{5\%}{2} = 2.5\%$

100 - 95 = 5

c) Between \$10,500 and \$12,000? $\frac{99.7}{2} =$ 49.85%

Normal → mean = median since symmetric

68 / 95 / 99.7

7) IQ scores are normally distributed with a mean of 100 and a standard deviation of 15. Make a normal distribution curve showing this information.

100

85 ← 1s → 115

70 ← 2s → 130

55 ← 3s → 145

a) What % of IQ scores are between 100 and 115?

$\frac{68}{2} = \boxed{34\%}$

b) What % of IQ scores are above 100?

$\boxed{50\%}$ (median is 100)

c) What % of IQ scores are above 115?

$100 - 68 = \frac{32}{2} = \boxed{16\%}$

d) What % of IQ scores are below 70?

$100 - 95 = \frac{5}{2} = \boxed{2.5\%}$

e) What % of IQ scores are between 70 and 115?

70 → 100 2s $\frac{95}{2} = 47.5$

100 - 115 1s $\frac{68}{2} = 34$

$47.5 + 34 = \boxed{81.5}$

f) What percent of IQ scores are greater than 130?

$\frac{100 - 95}{2} = \frac{5}{2} = \boxed{2.5\%}$

g) What % of IQ scores are less than 85?

$\frac{100 - 68}{2} = \frac{32}{2} = \boxed{16\%}$

h) What percent of IQ scores are above 145?

$\frac{100 - 99.7}{2} = \frac{.3}{2} = \boxed{.15\%}$

8) Vending machines can be adjusted to reject coins above and below certain weights. The weights of legal U.S. quarters are normally distributed with a mean of 5.67 grams and a standard deviation of .07 grams. If a vending machine is adjusted to reject quarters that weigh more than 5.81 grams and less than 5.53 grams, what percentage of legal quarters will be rejected by the machine?

2s 95% accepted

5.67

5.60 — 1s — 5.74

← 5.53 — 2s — 5.81 →

5.46 — 3s — 5.88

$100 - 95 = \boxed{5\%}$