

### Normal Distribution

- 1) According to CBS Money Watch, the average monthly household cellular phone bill is \$100. Suppose monthly household cell phone bills are normally distributed with a standard deviation of \$11.35.
  - a. What is the probability that a randomly selected monthly cell phone bill is more than \$127?
  - b. What is the probability that a randomly selected monthly cell phone bill is between \$87 and \$110?
  - c. What is the probability that a randomly selected monthly cell phone bill is between \$107 and \$117?
  - d. What is the probability that a randomly selected monthly cell phone bill is no more than \$82?
  
- 2) According to the Internal Revenue Service, income tax returns one year averaged \$1,332 in refunds for taxpayers. One explanation of this figure is that taxpayers would rather have the government keep back too much money during the year than to owe it money at the end of the year. Suppose the average amount of tax at the end of a year is a refund of \$1,332, with a standard deviation of \$725. Assume that amounts owed or due on tax returns are normally distributed.
  - a. What proportion of tax returns show a refund greater than \$2,000?
  - b. What proportion of the tax returns show that the taxpayer owes money to the government?
  - c. What proportion of the tax returns show a refund between \$100 and \$700?
  
- 3) Tool-workers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome. It strikes as many as 23,000 workers per year. The U.S. Labor Department estimates that the average cost of this disorder to employers and insurers is approximately \$30,000 per injured worker. Suppose these costs are normally distributed, with a standard deviation of \$9,000.
  - a. What proportion of the costs are between \$15,000 and \$45,000?
  - b. What proportion of the costs are greater than \$50,000?
  - c. What proportion of the costs are between \$5,000 and \$20,000?
  - d. Suppose the standard deviation is unknown, but the mean is still \$30,000 and 90.82% of the costs are more than \$7,000. What would be the value of the standard deviation?
  - e. Suppose the mean value is unknown, but the standard deviation is still \$9,000. How much would the average cost be if 79.95% of the costs were less than \$33,000?

- 4) Suppose you are working with a data set that is normally distributed, with a mean of 200 and a standard deviation of 47. Determine the value of  $x$  from the following information.
- 60% of the values are greater than  $x$ .
  - $x$  is below 17% of the values.
  - 22% of the values are less than  $x$ .
  - $x$  is greater than 55% of the values.
- 5) Suppose the annual employer 401(k) cost per participant is normally distributed with a standard deviation of \$625, but the mean is unknown.
- If 73.89% of such costs are greater than \$1,700, what is the mean annual employer 401(k) cost per participant?
  - Suppose the mean annual employer 401(k) cost per participant is \$2,258 and the standard deviation is \$625. If such costs are normally distributed, 31.56% of the costs are greater than what value?
- 6) Based on annual driving of 15,000 miles and fuel efficiency of 20 mpg, a car in the United States uses, on average, 750 gallons of gasoline per year. If annual automobile fuel usage is normally distributed, and if 29.12% of cars in the United States use less than 640 gallons of gasoline per year, what is the standard deviation?
- 7) The U.S. national average door-to-doctor wait time for patients to see a doctor is now 21.3 minutes. Suppose such wait times are normally distributed with a standard deviation of 6.7 minutes. Some patients will have to wait much longer than the mean to see the doctor. In fact, based on this information, 3% of patients still have to wait more than how many minutes to see a doctor?
- 8) Suppose commute times in a large city are normally distributed and that 62.5% of commuters in this city take more than 21 minutes to commute one way. If the standard deviation of such commutes is 6.2 minutes, what is the mean commute?
- 9) According to one source, the average cumulated college student loan debt for a graduating senior is \$29,400. Assume that such debt is normally distributed and that the standard deviation is \$5,684. Thirty percent of these graduating seniors owe more than what amount?