6.9: Homework

Use the following information to answer the next two exercises: The patient recovery time from a particular surgical procedure is normally distributed with a mean of 5.3 days and a standard deviation of 2.1 days.

60.

What is the median recovery time?

1. 2.7
2. 5.3
3. 7.4
4. 2.1

61.

What is the *z*-score for a patient who takes ten days to recover?

1. 1.5
2. 0.2
3. 2.2
4. 7.3

62.

The length of time to find a parking space at 9 A.M. follows a normal distribution with a mean of five minutes and a standard deviation of two minutes. If the mean is significantly greater than the standard deviation, which of the following statements is true?

1. The data cannot follow the uniform distribution.
2. The data cannot follow the exponential distribution..
3. The data cannot follow the normal distribution.

1. I only
2. II only
3. III only
4. I, II, and III

63.

The heights of the 430 National Basketball Association players were listed on team rosters at the start of a recent season. The heights of basketball players have an approximate normal distribution with mean, $\mu = 79$ inches and a standard deviation, $\sigma = 3.89$ inches. For each of the following heights, calculate the *z*-score and interpret it using complete sentences.

1. 77 inches
2. 85 inches
3. If an NBA player reported his height had a *z*-score of 3.5, would you believe him? Explain your answer.

64.

The systolic blood pressure (given in millimeters) of males has an approximately normal distribution with mean $\mu = 125$ and standard deviation $\sigma = 14$. Systolic blood pressure for males follows a normal distribution.

1. Calculate the *z*-scores for the male systolic blood pressures 100 and 150 millimeters.
2. If a male friend of yours said he thought his systolic blood pressure was 2.5 standard deviations below the mean, but that he believed his blood pressure was between 100 and 150 millimeters, what would you say to him?

65.

Kyle's doctor told him that the *z*-score for his systolic blood pressure is 1.75. Which of the following is the best interpretation of this standardized score? The systolic blood pressure (given in millimeters) of males has an approximately normal distribution with mean $\mu = 125$ and standard deviation $\sigma = 14$. If X = a systolic blood pressure score then $X \sim N(125, 14)$.

1. Which answer(s) **is/are** correct?
   1. Kyle's systolic blood pressure is 175.

2. Kyle's systolic blood pressure is 1.75 times the average blood pressure of men his age.
3. Kyle's systolic blood pressure is 1.75 above the average systolic blood pressure of men his age.
4. Kyles's systolic blood pressure is 1.75 standard deviations above the average systolic blood pressure for men.

2. Calculate Kyle's blood pressure.

66.

Height and weight are two measurements used to track a child's development. The World Health Organization measures child development by comparing the weights of children who are the same height and the same gender. In 2009, weights for all 80 cm girls in the reference population had a mean μ = 10.2 kg and standard deviation σ = 0.8 kg. Weights are normally distributed. $X \sim N(10.2, 0.8)$. Calculate the *z*-scores that correspond to the following weights and interpret them.

1. 11 kg
2. 7.9 kg
3. 12.2 kg

67.

During a certain year, 1,475,623 students heading to college took the SAT. The distribution of scores in the math section of the SAT follows a normal distribution with mean μ = 520 and standard deviation σ = 115.

1. Calculate the *z*-score for an SAT score of 720. Interpret it using a complete sentence.
2. What math SAT score is 1.5 standard deviations above the mean? What can you say about this SAT score?
3. During a different year, the SAT math test had a mean of 514 and standard deviation 117. The ACT math test is an alternate to the SAT and is approximately normally distributed with mean 21 and standard deviation 5.3. If one person took the SAT math test and scored 700 and a second person took the ACT math test and scored 30, who did better with respect to the test they took?

Use the following information to answer the next two exercises: The patient recovery time from a particular surgical procedure is normally distributed with a mean of 5.3 days and a standard deviation of 2.1 days.

68.

What is the probability of spending more than two days in recovery?

1. 0.0580
2. 0.8447
3. 0.0553
4. 0.9420

69.

The 90th percentile for recovery times is?

1. 8.89
2. 7.07
3. 7.99
4. 4.32

Use the following information to answer the next three exercises: The length of time it takes to find a parking space at 9 A.M. follows a normal distribution with a mean of five minutes and a standard deviation of two minutes.

70.

Based upon the given information and numerically justified, would you be surprised if it took less than one minute to find a parking space?

1. Yes
2. No
3. Unable to determine

71.

Find the probability that it takes at least eight minutes to find a parking space.

1. 0.0001
2. 0.9270
3. 0.1862
4. 0.0668

72.

Seventy percent of the time, it takes more than how many minutes to find a parking space?

1. 1.24
2. 2.41
3. 3.95
4. 6.05

73.

According to a study done by De Anza students, the height for Asian adult males is normally distributed with an average of 66 inches and a standard deviation of 2.5 inches. Suppose one Asian adult male is randomly chosen. Let X = height of the individual.

1. X ~ _____(_____,_____)
2. Find the probability that the person is between 65 and 69 inches. Include a sketch of the graph, and write a probability statement.
3. Would you expect to meet many Asian adult males over 72 inches? Explain why or why not, and justify your answer numerically.

74.

IQ is normally distributed with a mean of 100 and a standard deviation of 15. Suppose one individual is randomly chosen. Let X = IQ of an individual.

1. X ~ _____(_____,_____)
2. Find the probability that the person has an IQ greater than 120. Include a sketch of the graph, and write a probability statement.
3. MENSA is an organization whose members have the top 2% of all IQs. Find the minimum IQ needed to qualify for the MENSA organization. Sketch the graph, and write the probability statement.
4. The middle 50% of IQs fall between what two values? Sketch the graph and write the probability statement.

75.

The percent of fat calories that a person in America consumes each day is normally distributed with a mean of about 36 and a standard deviation of 10. Suppose that one individual is randomly chosen. Let X = percent of fat calories.

1. X ~ _____(_____,_____)
2. Find the probability that the percent of fat calories a person consumes is more than 40. Graph the situation. Shade in the area to be determined.
3. Find the maximum number for the lower quarter of percent of fat calories. Sketch the graph and write the probability statement.

76.

Suppose that the distance of fly balls hit to the outfield (in baseball) is normally distributed with a mean of 250 feet and a standard deviation of 50 feet.

1. If X = distance in feet for a fly ball, then X ~ _____(_____,_____)
2. If one fly ball is randomly chosen from this distribution, what is the probability that this ball traveled fewer than 220 feet? Sketch the graph. Scale the horizontal axis X. Shade the region corresponding to the probability. Find the probability.
3. Find the 80^{th} percentile of the distribution of fly balls. Sketch the graph, and write the probability statement.

77.

In China, four-year-olds average three hours a day unsupervised. Most of the unsupervised children live in rural areas, considered safe. Suppose that the standard deviation is 1.5 hours and the amount of time spent alone is normally distributed. We randomly select one Chinese four-year-old living in a rural area. We are interested in the amount of time the child spends alone per day.

1. In words, define the random variable X.
2. X ~ _____(_____,_____)

3. Find the probability that the child spends less than one hour per day unsupervised. Sketch the graph, and write the probability statement.
4. What percent of the children spend over ten hours per day unsupervised?
5. Seventy percent of the children spend at least how long per day unsupervised?

78.

In a certain presidential election, Alaska’s 40 election districts averaged 1,956.8 votes per district for Candidate A. The standard deviation was 572.3. (There are only 40 election districts in Alaska.) The distribution of the votes per district for Candidate A was bell-shaped. Let X = number of votes for Candidate A for an election district.

1. State the approximate distribution of X.
2. Is 1,956.8 a population mean or a sample mean? How do you know?
3. Find the probability that a randomly selected district had fewer than 1,600 votes for Candidate A. Sketch the graph and write the probability statement.
4. Find the probability that a randomly selected district had between 1,800 and 2,000 votes for Candidate A.
5. Find the third quartile for votes for Candidate A.

79.

Suppose that the duration of a particular type of criminal trial is known to be normally distributed with a mean of 21 days and a standard deviation of seven days.

1. In words, define the random variable X.
2. X ~ _____(_____,_____)
3. If one of the trials is randomly chosen, find the probability that it lasted at least 24 days. Sketch the graph and write the probability statement.
4. Sixty percent of all trials of this type are completed within how many days?

80.

A motorcycle racer averages 129.71 seconds per 2.5 mile lap (in a seven-lap race) with a standard deviation of 2.28 seconds. The distribution of their race times is normally distributed. We are interested in one of their randomly selected laps.

1. In words, define the random variable X.
2. X ~ _____(_____,_____)
3. Find the percent of the racer's laps that are completed in less than 130 seconds.
4. The fastest 3% of the racer's laps are under _____.
5. The middle 80% of the racer's laps are from _______ seconds to _______ seconds.

81.

Thuy Dau, Ngoc Bui, Sam Su, and Lan Voung conducted a survey as to how long customers at Lucky claimed to wait in the checkout line until their turn. Let X = time in line. Table 6.3 displays the ordered real data (in minutes):

0.50	4.25	5	6	7.25
1.75	4.25	5.25	6	7.25
2	4.25	5.25	6.25	7.25
2.25	4.25	5.5	6.25	7.75
2.25	4.5	5.5	6.5	8
2.5	4.75	5.5	6.5	8.25
2.75	4.75	5.75	6.5	9.5
3.25	4.75	5.75	6.75	9.5
3.75	5	6	6.75	9.75
3.75	5	6	6.75	10.75

Table 6.3

1. Calculate the sample mean and the sample standard deviation.
2. Construct a histogram.
3. Draw a smooth curve through the midpoints of the tops of the bars.
4. In words, describe the shape of your histogram and smooth curve.
5. Let the sample mean approximate μ and the sample standard deviation approximate σ. The distribution of X can then be approximated by X ~ _____(_____,_____)
6. Use the distribution in part e to calculate the probability that a person will wait fewer than 6.1 minutes.
7. Determine the cumulative relative frequency for waiting less than 6.1 minutes.
8. Why aren't the answers to part f and part g exactly the same?
9. Why are the answers to part f and part g as close as they are?
10. If only ten customers has been surveyed rather than 50, do you think the answers to part f and part g would have been closer together or farther apart? Explain your conclusion.

82.

Suppose that Ric and Anita attend different colleges. Ric's GPA is the same as the average GPA at their school. Anita's GPA is 0.70 standard deviations above her school average. In complete sentences, explain why each of the following statements may be false.

1. Ric's actual GPA is lower than Anita's actual GPA.
2. Ric is not passing because their z-score is zero.
3. Anita is in the 70th percentile of students at her college.

83.

Table 6.4 shows a sample of the maximum capacity (maximum number of spectators) of sports stadiums. The table does not include horse-racing or motor-racing stadiums.

40,000	40,000	45,050	45,500	46,249	48,134
49,133	50,071	50,096	50,466	50,832	51,100
51,500	51,900	52,000	52,132	52,200	52,530
52,692	53,864	54,000	55,000	55,000	55,000
55,000	55,000	55,000	55,082	57,000	58,008
59,680	60,000	60,000	60,492	60,580	62,380
62,872	64,035	65,000	65,050	65,647	66,000
66,161	67,428	68,349	68,976	69,372	70,107
70,585	71,594	72,000	72,922	73,379	74,500
75,025	76,212	78,000	80,000	80,000	82,300

Table 6.4

1. Calculate the sample mean and the sample standard deviation for the maximum capacity of sports stadiums (the data).
2. Construct a histogram.
3. Draw a smooth curve through the midpoints of the tops of the bars of the histogram.
4. In words, describe the shape of your histogram and smooth curve.
5. Let the sample mean approximate μ and the sample standard deviation approximate σ. The distribution of X can then be approximated by X ~ _____(_____,_____).
6. Use the distribution in part e to calculate the probability that the maximum capacity of sports stadiums is less than 67,000 spectators.
7. Determine the cumulative relative frequency that the maximum capacity of sports stadiums is less than 67,000 spectators. Hint: Order the data and count the sports stadiums that have a maximum capacity less than 67,000. Divide by the total number of sports stadiums in the sample.

8. Why aren't the answers to part f and part g exactly the same?

84.

An expert witness for a paternity lawsuit testifies that the length of a pregnancy is normally distributed with a mean of 280 days and a standard deviation of 13 days. The person who is being sued for lack of child support was out of the country from 240 to 306 days before the birth of the child, so the pregnancy would have been less than 240 days or more than 306 days long if he was the biological parent. The birth was uncomplicated, and the child needed no medical intervention. What is the probability that he was NOT the parent? What is the probability that he could be the parent? Calculate the *z*-scores first, and then use those to calculate the probability.

85.

An automotive factory can build an average of 6,000 cars and trucks a week. Generally, 10% of the cars were defective coming off the assembly line. Suppose we draw a random sample of $n = 100$ cars. Let X represent the number of defective cars in the sample. What can we say about X in regard to the 68-95-99.7 empirical rule (one standard deviation, two standard deviations and three standard deviations from the mean are being referred to)? Assume a normal distribution for the defective cars in the sample.

86.

We flip a coin 100 times ($n = 100$) and note that it only comes up heads 20% ($p = 0.20$) of the time. The mean and standard deviation for the number of times the coin lands on heads is $\mu = 20$ and $\sigma = 4$ (verify the mean and standard deviation). Solve the following:

1. There is about a 68% chance that the number of heads will be somewhere between ___ and ___.
2. There is about a ____chance that the number of heads will be somewhere between 12 and 28.
3. There is about a ____ chance that the number of heads will be somewhere between eight and 32.

87.

A $1 scratch off lotto ticket will be a winner one out of five times. Out of a shipment of $n = 190$ lotto tickets, find the probability for the lotto tickets that there are

1. somewhere between 34 and 54 prizes.
2. somewhere between 54 and 64 prizes.
3. more than 64 prizes.

88.

On average, 28% of 18 to 34 year olds check social media before getting out of bed in the morning. Suppose this percentage follows a normal distribution with a standard deviation of 5%.

1. Find the probability that the percent of 18 to 34-year-olds who check social media before getting out of bed in the morning is at least 30.
2. Find the 95^{th} percentile, and express it in a sentence.
