Week Five Homework Solutions

Chapter 6 Homework Problems: Problems: 73, 74, 76, 80 (sketch, show technology output; TI users, show keystrokes)

Chapter 7 Homework Problems: Problems: 62, 64, 96

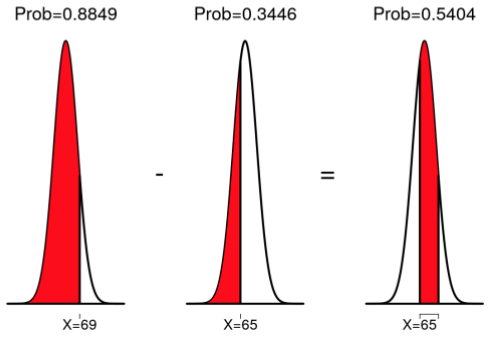
73.

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.

a. $X \sim N(66, 2.5)$
b. Find the probability that the person is between 65 and 69 inches. Include a sketch of the graph, and write a probability statement. **ANSWER: The probability is .5404.**

$$P(65 \le X \le 69) = P(X \le 69) - P(X \le 65)$$
$$P(65 \le X \le 69) = 0.8849 - 0.3446$$
$$P(65 \le X \le 69) = 0.5404$$

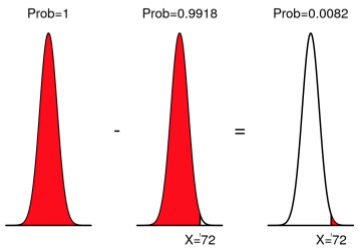
We can visualize this with the curves below:



c. Would you expect to meet many Asian adult males over 72 inches? Explain why or why not, and justify your answer numerically. **ANSWER: The probability is .0082. This can be interpreted as .82% likelihood. This is a very small probability and indicates that we would NOT expect to meet many Asian adult males over 72 inches.**

$$P(X \ge 72) = 1 - P(X \le 72)$$
$$P(X \ge 72) = 1 - 0.9918$$
$$P(X \ge 72) = 0.0082$$

We can visualize this with the curves below:



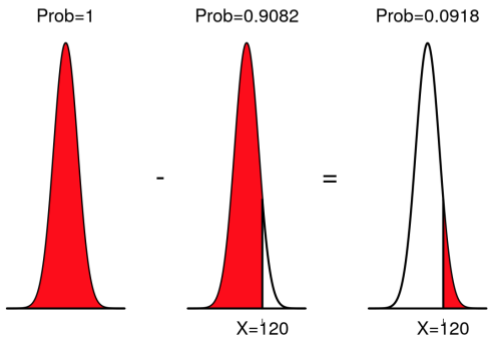
74.

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.

a. $X \sim N(100, 15)$
b. Find the probability that the person has an IQ greater than 120. Include a sketch of the graph, and write a probability statement. **ANSWER: The probability is .0918.**

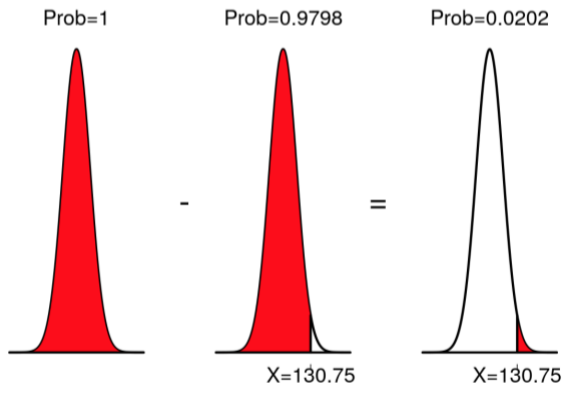
$$P(X \geq 120) = 1 - P(X \leq 120)$$
$$P(X \geq 120) = 1 - 0.9082$$
$$P(X \geq 120) = 0.0918$$

We can visualize this with the curves below:



c. 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. **ANSWER: The minimum IQ is 130.75**

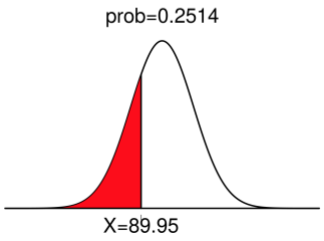
We can visualize this with the curve below:



d. The middle 50% of IQs fall between what two values? Sketch the graph and write the probability statement.
ANSWER: The middle 50% of IQs fall between 89.95 and 110.05.

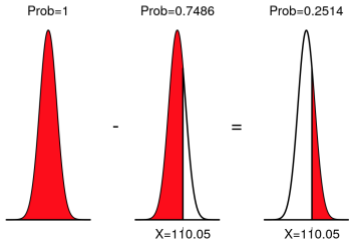
Now the value that 25 percent of the data fall below is 89.95

We can visualize this with the curve below:



Now the value that 25 percent of the data fall below is 110.05

We can visualize this with the curve below:



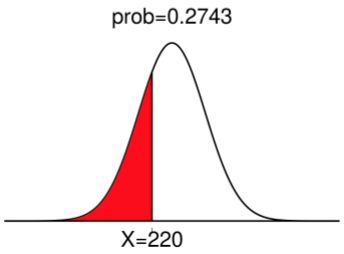
76.

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.

a. If X = distance in feet for a fly ball, then $X \sim N(250, 50)$
b. 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. **ANSWER: The probability is.2743.**

$P(X \leq 220) = 0.2743$

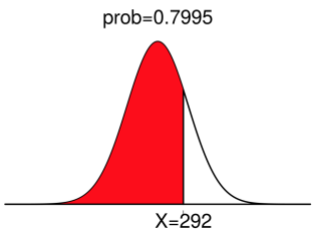
We can visualize this with the curves below:



c. Find the 80th percentile of the distribution of fly balls. Sketch the graph, and write the probability statement.
ANSWER: The distance such that 80% of all distances will be less than is 292 feet.

Now the value that 80 percent of the data fall below is 292

We can visualize this with the curve below:



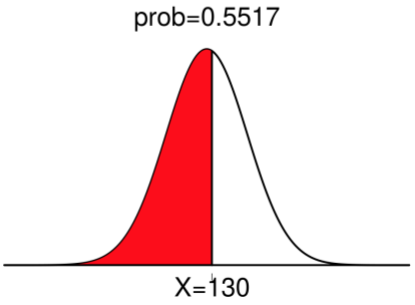
80.

Terri Vogel, an amateur 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 her race times is normally distributed. We are interested in one of her randomly selected laps.

a. In words, define the random variable *X*. represents the distribution of the times to complete a 2.5-mile lap.
b. *X* ~N(129.71, 2.28)
c. Find the percent of her laps that are completed in less than 130 seconds. **ANSWER: The percent is 55.17%.**

$P(X \leq 130) = 0.5517$

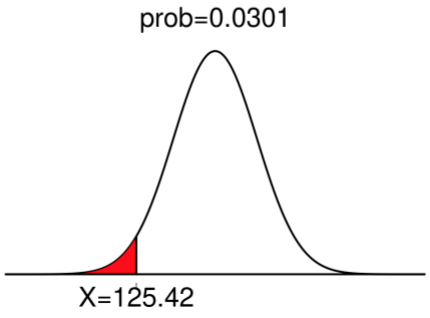
We can visualize this with the curves below:



d. The fastest 3% of her laps are under _____. **ANSWER: …under 125.42 seconds.**

Now the value that 3 percent of the data fall below is 125.42

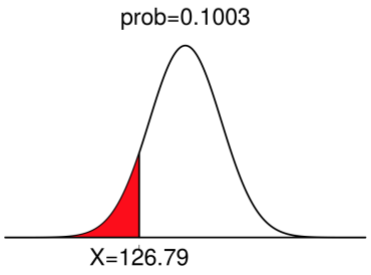
We can visualize this with the curve below:



e. The middle 80% of her laps are from _____ seconds to _____ seconds. **ANSWER: The middle 80% are between 126.79 seconds and 132.63 seconds.**

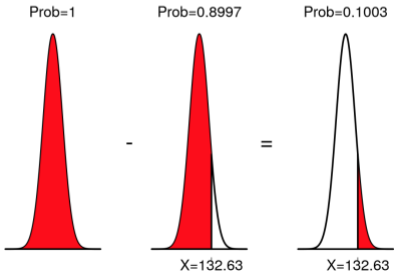
Now the value that 10 percent of the data fall below is 126.79

We can visualize this with the curve below:



Now the value that 10 percent of the data fall below is 132.63

We can visualize this with the curve below:



Chapter 7 Homework Problems:

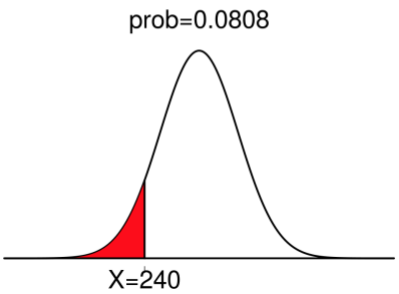
62.

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. We randomly sample 49 fly balls.

a. If X^- = average distance in feet for 49 fly balls, then $\bar{x} \sim N\left(250, \frac{50}{\sqrt{49}}\right)$
b. What is the probability that the 49 balls traveled an average of less than 240 feet? Sketch the graph. Scale the horizontal axis for X^-. Shade the region corresponding to the probability. Find the probability. **ANSWER: The probability is .0808.**

$P(X \leq 240) = 0.0808$

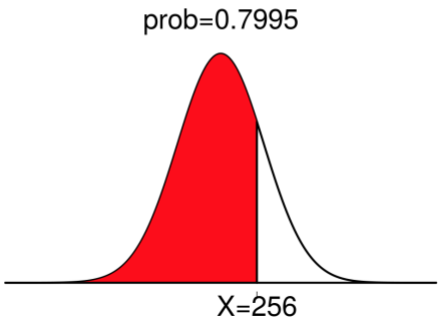
We can visualize this with the curves below:



c. Find the 80th percentile of the distribution of the average of 49 fly balls. **ANSWER: 80% of flyball sample mean distances in the distribution fall below 256 feet.**

Now the value that 80 percent of the data fall below is 256

We can visualize this with the curve below:



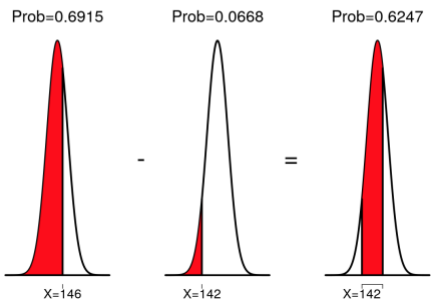
64.

Suppose that a category of world-class runners are known to run a marathon (26 miles) in an average of 145 minutes with a standard deviation of 14 minutes. Consider 49 of the races. Let $\bar{X}$ the average of the 49 races.

a. $\bar{x} \sim N\left(145, \frac{14}{\sqrt{49}}\right)$
b. Find the probability that the runner will average between 142 and 146 minutes in these 49 marathons. **ANSWER: The probability is.6247.**

$$P(142 \leq X \leq 146) = P(X \leq 146) - P(X \leq 142)$$
$$P(142 \leq X \leq 146) = 0.6915 - 0.0668$$
$$P(142 \leq X \leq 146) = 0.6247$$

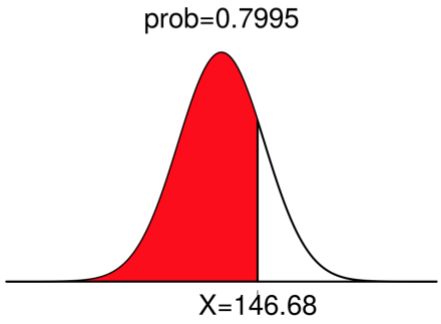
We can visualize this with the curves below:



c. Find the 80th percentile for the average of these 49 marathons. **ANSWER: 80% of the sample mean marathon times for this distribution are less than 146.68 minutes.**

Now the value that 80 percent of the data fall below is 146.68

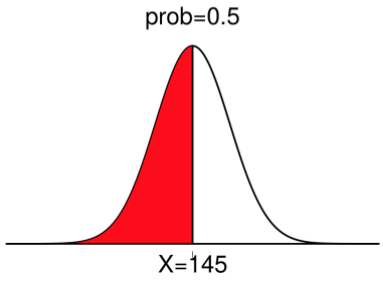
We can visualize this with the curve below:



d. Find the median of the average running times. **(NOTE: This is the 50th percentile)** **ANSWER: The median, or 50th percentile is 145 minutes.**

Now the value that 50 percent of the data fall below is 145

We can visualize this with the curve below:



96.

A typical adult has an average IQ score of 105 with a standard deviation of 20. If 20 randomly selected adults are given an IQ test, what is the probability that the sample mean scores will be between 85 and 125 points? **ANSWER: The probability is .999999, approximately 1. This is almost certain to happen for a sample of 20 with this distribution.**

$P(85 \le X \le 125) = P(X \le 125) - P(X \le 85)$
$P(85 \le X \le 125) = 0.9999961 - 0.0000039$
$P(85 \le X \le 125) = 0.9999922$

We can visualize this with the curves below: