Text Exercise Set 16

16-1 Suppose the IQ (Intelligence Quotient) of airline pilots is normally distributed with mean 114 and standard deviation 12.5.

(a) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is under 120, and find this probability.

(b) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is under 100, and find this probability.

(c) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is over 105, and find this probability.

(d) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is over 125, and find this probability.

(e) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is between 110 and 120, and find this probability.

(f) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is between 115 and 120, and find this probability.

(g) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is between 90 and 110, and find this probability.

(h) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is under 70, and find this probability.
16-1 - continued

(i) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is over 165, and find this probability.

(j) Draw a sketch illustrating the probability that one randomly selected airline pilot has an IQ which is over 70, and find this probability.

(k) Draw a sketch illustrating the 90th percentile of the IQs of airline pilots, and find this percentile.

(l) Draw a sketch illustrating the IQ score below which 45% of the IQ scores of airline pilots lie, and find this IQ score.

16-2 The playing times for cassette tapes manufactured by the Econo corporation are normally distributed with mean 46.4 minutes and standard deviation 2.5 minutes.

(a) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is over 47 minutes, and find this probability.

(b) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is over 42.5 minutes, and find this probability.

(c) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is under 50 minutes, and find this probability.

(d) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is under 43 minutes, and find this probability.
16-2 - continued

(e) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is between 45 and 47 minutes, and find this probability.

(f) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is between 47 and 49 minutes, and find this probability.

(g) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is between 43.5 and 45.5 minutes, and find this probability.

(h) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is under 60 minutes, and find this probability.

(i) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is under 35 minutes, and find this probability.

(j) Draw a sketch illustrating the probability that one randomly selected Econo cassette tape has a playing time which is over 60 minutes, and find this probability.

(k) Draw a sketch illustrating the 95th percentile of the playing times, and find this percentile.

(l) Draw a sketch illustrating the playing time below which 20% of the playing times of the cassettes manufactured lie, and find this playing time.
16-3 The weight loss resulting from a one week diet is normally distributed with a mean of 2.9 lbs. and a standard deviation of 1.25 lbs.
(a) Draw a sketch illustrating the probability that a person on this diet will lose less than 1 lb., and find this probability.

(b) Draw a sketch illustrating the probability that a person on this diet will lose more than 2 lbs., and find this probability.

(c) Draw a sketch illustrating the probability that a person on this diet will gain weight, and find this probability.

16-4 For a particular airline, the number of minutes a flight arrives after its scheduled arrival time is normally distributed with a mean of 14.7 minutes and a standard deviation of 8.75 minutes.
(a) Draw a sketch illustrating the probability that a flight on this airline will arrive less than 7 minutes after its scheduled arrival time, and find this probability.

(b) Draw a sketch illustrating the probability that a flight on this airline will arrive more than 10.5 minutes after its scheduled arrival time, and find this probability.

(c) Draw a sketch illustrating the probability that a flight on this airline will arrive before its scheduled arrival time, and find this probability.

16-5 The amount of cereal per box from the assembly line at the Uptown Factory is normally distributed with mean 18.5 ounces and standard deviation 0.75 ounces.
(a) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is more than 19.1 ounces, and find this probability.
16-5 - continued

(b) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is more than 17.6 ounces, and find this probability.

c) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is less than 17.0 ounces, and find this probability.

(d) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is less than 19.73 ounces, and find this probability.

e) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is between 18.32 and 19.22 ounces, and find this probability.

(f) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is between 17.08 and 18.17 ounces, and find this probability.

(g) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is between 18.98 and 19.58 ounces, and find this probability.

(h) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is less than 30 ounces, and find this probability.

(i) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is less than 15 ounces, and find this probability.
16-5 - *continued*

(j) Draw a sketch illustrating the probability that the amount of cereal in one randomly selected box from the Uptown Factory is more than 25 ounces, and find this probability.

(k) Draw a sketch illustrating the 65th percentile of the amount of cereal per box from the assembly line at the Uptown Factory, and find this percentile.

(l) Draw a sketch illustrating the 10th percentile of the amount of cereal per box from the assembly line at the Uptown Factory, and find this percentile.

The amount of cereal per box from the assembly line at the Downtown Factory is normally distributed with mean 18.25 ounces and standard deviation 0.50 ounces.

(m) Decide which of the two factories (Uptown or Downtown) produces a higher proportion of cereal boxes containing less than 17.9 ounces.

(n) Decide which of the two factories (Uptown or Downtown) produces a higher proportion of cereal boxes containing less than 17.6 ounces.

(o) Decide which of the two factories (Uptown or Downtown) produces a higher proportion of cereal boxes containing less than 17.75 ounces.

(p) Which of the two factories (Uptown or Downtown) shows more consistency in the amount of cereal per box, and why?
16-6 The time it takes Jane Doe to get from home to work in the morning is normally distributed with mean 14.5 minutes and standard deviation 2.0 minutes if she takes Market Street.

(a) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in more than 15 minutes, and find this probability.

(b) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in more than 10 minutes, and find this probability.

(c) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in less than 12.5 minutes, and find this probability.

(d) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday before 8:00 am if she leaves at 7:44 am, and find this probability.

(e) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in between 14 and 16 minutes, and find this probability.

(f) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in between 15 and 20 minutes, and find this probability.

(g) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in between 12 and 13 minutes, and find this probability.

(h) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in more than 25 minutes, and find this probability.
16-6 - continued

(i) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in more than 5 minutes, and find this probability.

(j) Draw a sketch illustrating the probability that Jane Doe arrives at work using Market Street on a random workday in less than 1/2 hour, and find this probability.

(k) Draw a sketch illustrating the 90th percentile of the time it takes Jane to arrive at work using Market Street, and find this percentile.

(l) Draw a sketch illustrating the 35th percentile of the time it takes Jane to arrive at work using Market Street, and find this percentile.

If Jane Doe takes a newly built expressway, the time it takes her to get from home to work in the morning is normally distributed with mean 16 minutes and standard deviation 0.5 minutes.

(m) Decide whether it is better for Jane Doe to take Market Street or the expressway if she has to get to work in less than 17 minutes.

(n) Decide whether it is better for Jane Doe to take Market Street or the expressway if she has to get to work in less than 16 minutes.

(o) Decide whether it is better for Jane Doe to take Market Street or the expressway if she has to get to work in less than 16.5 minutes.
16-6 - continued

(p) Which of the two routes Jane Doe can take (Market street or the expressway) shows more consistency in the time it takes her to get from home to work in the morning, and why?

16-7 An ordinary, fair, six-sided die has a number of spots ranging from 1 to 6 painted on each of its sides. Suppose these six integers represent the parent population from which a simple random sample is to be selected by rolling the die \( n \) times.

(a) Find the mean (\( \mu \)) in the parent population.

(b) Describe the shape of the distribution in the parent population.

(c) Without actually doing it, just suppose we were to obtain the sample mean for each possible sample of \( n = 15 \), and construct a histogram for these sample means; then, this histogram would display the sampling distribution of \( \bar{x} \) with simple random samples if size \( n = 15 \). What would we find the value of the mean (\( \mu_\bar{x} \)) of this sampling distribution be equal to?

(d) How would the dispersion in the sampling distribution of \( \bar{x} \) with \( n = 15 \) compare with the dispersion in the distribution of the parent population?

(e) How would the shape of the sampling distribution of \( \bar{x} \) with \( n = 2 \) compare with the shape of the distribution of the parent population?

16-8 The circumference of a circle is divided into ten equal parts and labeled with the integers 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. A pointer is then mounted at the center of the circle so that each time the pointer is spun, each of the ten integers is equally likely to be selected. Suppose these ten integers represent the parent population from which a simple random sample is to be selected by spinning the pointer \( n \) times.

(a) Find the mean (\( \mu \)) in the parent population.

(b) Describe the shape of the distribution in the parent population.
16-8 - continued
(c) Without actually doing it, just suppose we were to obtain the sample mean for each possible sample of \( n = 15 \), and construct a histogram for these sample means; then, this histogram would display the sampling distribution of \( \bar{x} \) with simple random samples if size \( n = 15 \). What would we find the value of the mean (\( \mu_{\bar{x}} \)) of this sampling distribution be equal to?

(d) How would the dispersion in the sampling distribution of \( \bar{x} \) with \( n = 15 \) compare with the dispersion in the distribution of the parent population?

(e) How would the shape of the sampling distribution of \( \bar{x} \) with \( n = 2 \) compare with the shape of the distribution of the parent population?

16-9 Data on the sale of fruit in a chain of grocery stores is collected. The dollar value of sales in the last week is recorded for each of apples, bananas, grapes, oranges, peaches, pears, plums, and other fruits. The week’s sales is to be compared only for apples, oranges, and pears. Explain why a bar chart would be much more appropriate than a pie chart.

16-10 Explain why in the construction of a histogram it is important for the axis on which frequencies are labeled to begin at zero.