Business Statistics A First Course (Canadian) 2nd edition Sharpe Test Bank

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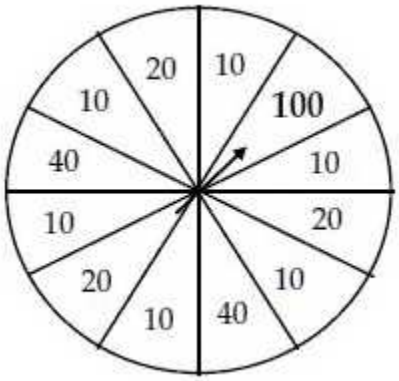
Business Statistics: A First Course, 2nd Cdn. Ed. **(Sharpe)**
Part 2 Modeling With Probability

Part 2 Chapter 5: Randomness and Probability

1 Quiz A

1) During its grand opening week, Stickler's bicycle shop offers a "wheel of discount savings." After customers select the items they wish to purchase, they spin the wheel to determine the discount they will receive. The wheel is divided into 12 slices. Six slices are red and award a 10% discount, three slices are white and award a 20% discount, and two slices are blue and award a 40% discount. The remaining slice is gold and awards a 100% discount!



a. What is the probability that a customer gets at least a 40% discount?
b. What is the probability that a customer does not get at least a 40% discount?
c. What is the probability that a customer gets a 10% or 20% discount?
d. What is the probability that two customers in a row get a 20% discount?
Answer:
a. 0.25 (2/12 + 1/12)since the customer might get a blue or gold slice.
b. 0.75 (1 - 0.25 = 9/12) complement rule
c. 0.75 (6/12 + 3/12 = 9/12) addition rule with mutually exclusive events
d. 0.0625 (3/12 × 3/12) independence rule
Type: ES
Objective: 5

2) Suppose you visit Stickler's bicycle shop in the hopes of getting a 100% discount on your purchase. As you wait your turn in line, there are three gold winners in a row. The two customers in line behind you begin to discuss what's happened. One believes that the streak of three gold winners has killed anyone else's chances of getting a 100% discount, while the other says just the opposite... that the wheel's "hot streak" increases their chances of getting a 100% discount. Comment on these opinions.
Answer: The spins are independent trials, so if the wheel is fair the three gold winners in a row have no effect on the next persons' chances.
Type: ES
Objective: 6

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3) A recent survey of local cell phone retailers showed that of all cell phones sold last month, 64% had a camera, 28% had a music player, and 22% had both.
a. What is the probability that a cell phone sold last month had a camera or a music player?
b. What is the probability that a cell phone sold last month did not have either a camera or a music player?
c. Is a cell phone having a camera and a music player mutually exclusive? Explain.
Answer:
a. 0.70 (0.64 + 0.28 - 0.22) general addition rule
b. 0.30 (1 - 0.70) complement rule (reinforcement)
c. No. The intersection of these two events is not zero.
Type: ES
Objective: 5

4) A small manufacturing company recently instituted Six Sigma training for its employees. Two methods of training were offered: online and traditional classroom. Management was interested in whether the division in which employees worked affected their choice of method. Below is a table summarizing the data.

	Sales	Quality	Operations	Total
Traditional	16	10	8	34
Online	35	23	44	102
Total	51	33	52	136

a. What is the probability that an employee chose online training?
b. What is the probability that an employee is in the quality division and chose online training?
c. What is the probability that an employee chose online training given that he or she is in the sales division?
Answer:
a. 0.75 (102/136)
b. 0.70 (23/33)
c. 0.69 (35/51)
Type: ES
Objective: 1, 3, 5

5) Does it appear that choice of instructional method (traditional or online) and division (sales, quality and operations) are independent? Explain.
Answer: Because the marginal probability of choosing online training (0.75) does not equal the conditional probability of choosing online training given the employee is in the sales division (0.69), the choice of instructional method is not independent of division.
Type: ES
Objective: 6

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6) One explanation put forth for the dearth of women CEOs in the high tech industry is that there is a lack of mentoring opportunities for women. A recent survey of CEOs in that industry found that 80% were men. Moreover, 75% of the CEOs had been mentored while only 15% were women and had been mentored.

a. Construct the contingency table.

b. Are gender and mentoring independent? Explain.

Answer:

a.

	Men	Women	
Mentored	.60	.15	.75
Not Mentored	.20	.05	.25
	.80	.20	1.00

b. The conditional probability P(Mentored/Men) = 0.60/0.80 = 0.75 which equals the marginal probability P(Mentored) = 0.75. Yes, mentoring is independent of gender.

Type: ES

Objective: 2

2 Quiz B

1) As an incentive to get new customers, the local branch of a bank launched "bouncing for bucks." During this week long event, any customer opening a new checking account with the bank would have the opportunity to throw a bouncy rubber ball into a large box divided into squares. Each square was labeled with a dollar amount that would be deposited into his or her new checking account. Here is how the box was labeled:

10	30	10	30	10
20	10	50	10	20

a. What is the probability that a customer gets $20 or more?

b. What is the probability that a customer gets less than $20?

c. What is the probability that a customer gets $20 or $30?

d. What is the probability that two customers in a row get $50?

Answer:

a. 0.50 (5/10)

b. 0.50 (1 - 0.50) complement rule

c. 0.40 (2/10 + 2/10) addition rule with mutually exclusive events

d. 0.01 (1/10 × 1/10) independence rule

Type: ES

Objective: 2, 5

2) As you enter the bank, you watch four persons in front of you all win $50. The local branch manager tells you how lucky you are to be throwing the ball while it is on a hot streak but the friend with you says that you're unlucky because the streak can't continue. Comment on their statements.

Answer: The tosses are independent. So if the box and ball are fair, the four winners of $50 have no effect on the next person's chances of winning $50.

Type: ES

Objective: 6

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3) A major airline keeps track of data on how their passengers redeem frequent flyer miles. They found that in the last year 58% of passengers redeemed them to purchase tickets for domestic travel, 44% redeemed them to purchase tickets for international travel, and 16% redeemed them to purchase tickets for both domestic and international travel.
a. What is the probability that in the last year a passenger redeemed frequent flyer miles to purchase a ticket for domestic or international travel?
b. What is the probability that in the last year a passenger did not redeem frequent flyer miles to purchase a ticket for domestic or international travel?
c. Is redeeming frequent flyer miles to purchase a ticket for domestic and international travel mutually exclusive? Explain.
Answer:
a. 0.86 (0.58 + 0.44 - 0.16) general addition rule
b. 0.14 (1 - 0.86) complement rule
c. No, the intersection of these two events is not zero.
Type: ES
Objective: 2, 5

4) The option to buy extended warranties are commonplace with most electronics purchases. But does the type of purchase affect a consumer's willingness to pay extra for an extended warranty? Data for 420 consumers who purchased digital cameras and laptop computers from a leading electronics retailer are summarized in the table.

	Purchased Warranty?		
	Yes	No	Total
Digital Camera	30	42	72
Laptop Computer	145	203	348
Total	175	245	420

a. What is the probability that a consumer purchases an extended warranty?
b. What is the probability that a consumer purchases a digital camera and an extended warranty?
c. What is the probability that a consumer purchases an extended warranty given that he or she has purchased a digital camera?
Answer:
a. 0.42 (175/420)
b. 0.07 (30/420)
c. 0.42 (30/72)
Type: ES
Objective: 2, 5

5) Does it appear that the decision to purchase an extended warranty and type of electronics (digital camera or laptop computer) purchased are independent? Explain.
Answer: Because the marginal probability of purchasing an extended warranty (0.42) does equal the conditional probability of purchasing an extended warranty given the employee purchased a digital camera (0.42), the decision to purchase an extended warranty is independent of type of electronics (digital camera or laptop computer) purchased.
Type: ES
Objective: 2

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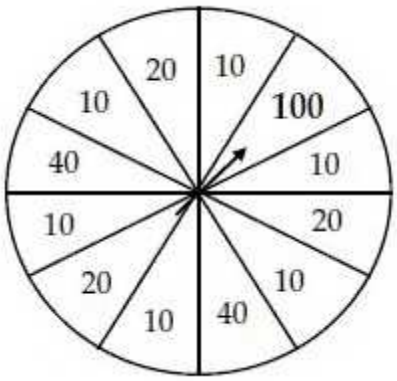
6) In a large metropolitan area, the probability that an individual owns a single-family home is 0.40. The probability that an individual in this same area owns a small business is 0.05.
a. What is the probability that an individual living in this metropolitan area does not own a single-family home?
b. What is the probability that an individual in this metropolitan area does not own a small business?
c. Of the individuals in this area who own a small business, 80% owns a single family home. What is the probability that an individual owns a small business and owns a single family home?
Answer:
a. 0.60 (1 - 0.40) complement rule
b. 0.95 (1 - 0.05) complement rule
c. 0.04 (0.80 × 0.05) general multiplication rule
Type: ES
Objective: 2, 5

3 Quiz C - Multiple Choice

During its grand-opening week, Stickler's bicycle shop offers a "wheel of discount savings." After customers select the items they wish to purchase, they spin the wheel to determine the discount they will receive. The wheel is divided into 12 slices. Six slices are red and award a 10% discount, three slices are white and award a 20% discount, and two slices are blue and award a 40% discount. The remaining slice is gold and awards a 100% discount!



1) The probability that a customer gets at least a 40% discount is
A) 3/12.
B) 2/12.
C) 0.0625.
D) 9/12.
E) 10/12.
Answer: A
Type: MC
Objective: 2, 5

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2) The probability that a customer does not get at least 40% discount is
A) 0.25.
B) 2/12.
C) 0.0625.
D) 9/12.
E) 10/12.
Answer: D
Type: MC
Objective: 2, 5

3) The probability that a customer gets a 10% or 20% discount is
A) 3/12.
B) 2/12.
C) 0.0625.
D) 9/12.
E) 10/12.
Answer: D
Type: MC
Objective: 2, 5

4) The probability that two customers in a row get a 20% discount is
A) 3/12.
B) 2/12.
C) 0.0625.
D) 9/12.
E) 10/12.
Answer: C
Type: MC
Objective: 2, 5

A recent survey of local cell phone retailers showed that of all cell phones sold last month, 64% had a camera, 28% had a music player, and 22% had both.

5) The probability that a cell phone sold last month had a camera or a music player is
A) 0.22.
B) 0.70.
C) 0.92.
D) 0.30.
E) 0.08.
Answer: B
Type: MC
Objective: 2, 5

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6) The probability that a cell phone sold last month did not have either a camera or a music player is
A) 0.22.
B) 0.70.
C) 0.92.
D) 0.30.
E) 0.08.
Answer: D
Type: MC
Objective: 2, 5

7) Which of the following statements about cell phones sold last month is true?
A) Having a camera and having a music player are mutually exclusive events.
B) The intersection of having a camera and having a music player is zero.
C) Having a camera and having a music player are independent events.
D) Having a camera and having a music player are disjoint events.
E) Having a camera and having a music player are not mutually exclusive events.
Answer: E
Type: MC
Objective: 6

The option to buy extended warranties is commonplace with most electronics purchases. But does the type of purchase affect a consumer's willingness to pay extra for an extended warranty? Data for 420 consumers who purchased digital cameras and laptop computers from a leading electronics retailer are summarized in the table.

	Purchased Warranty?		
	Yes	No	Total
Digital Camera	30	42	72
Laptop Computer	145	203	348
Total	175	245	420

8) The probability that a consumer purchases a digital camera and an extended warranty is
A) 0.07.
B) 0.42.
C) 0.58.
D) 0.17.
E) 0.83.
Answer: A
Type: MC
Objective: 1, 3, 5

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9) The probability that a consumer purchases an extended warranty given that he or she has purchased a digital camera is
A) 0.07.
B) 0.42.
C) 0.58.
D) 0.17.
E) 0.83.
Answer: B
Type: MC
Objective: 1, 3, 5

10) The probability that a consumer purchases an extended warranty given that he/she has purchased a digital camera is
A) 0.07.
B) 0.42.
C) 0.58.
D) 0.17.
E) 0.83.
Answer: B
Type: MC
Objective: 1, 3, 5

11) Which of the following statements is true?
A) The decision to purchase an extended warranty and type of electronics (digital camera or laptop computer) purchased are independent.
B) The decision to purchase an extended warranty and type of electronics (digital camera or laptop computer) purchased are mutually exclusive.
C) The decision to purchase an extended warranty and type of electronics (digital camera or laptop computer) purchased are disjoint events.
D) The decision to purchase an extended warranty and type of electronics (digital camera or laptop computer) purchased are not independent.
E) The decision to purchase an extended warranty and type of electronics (digital camera or laptop computer) purchased are related.
Answer: A
Type: MC
Objective: 6

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Consider the following to answer the question(s) below:

	Age 50 or Younger	Over Age 50	Total
Mutual Funds	**30**	**35**	**65**
Stocks	**45**	**45**	**90**
Bonds	**20**	**25**	**45**
Total	**95**	**105**	**200**

12) The probability that a client is over age 50 and is holding bonds is
A) 0.238.
B) 0.15.
C) 0.225.
D) 0.010.
E) 0.175.
Answer: A
Type: MC
Objective: 3, 4

13) The probability that a client is over age 50 and is not holding bonds is
A) 0.762.
B) 0.225.
C) 0.525.
D) 0.175.
E) 0.325.
Answer: A
Type: MC
Objective: 3, 4

14) The probability that a client is holding mutual funds given that he/she is age 50 or younger is
A) 0461.
B) 0.316.
C) 0.857.
D) 0.15.
E) 0.475.
Answer: B
Type: MC
Objective: 3, 4

15) The probability that a client only holds bonds is
A) 0.45.
B) 0.475.
C) 0.225.
D) 0.125.
E) 0.10.
Answer: C
Type: MC
Objective: 3, 4

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16) Which of the following statements is true?
A) The decision to purchase stocks and the age of the client are not independent.
B) The decision to purchase stocks and the age of the client are independent.
C) The decision to purchase stocks and the age of the client are mutually exclusive.
D) The decision to purchase stocks and the age of the client are unrelated.
E) The decision to purchase stocks and the age of the client are disjoint events.
Answer: A
Type: MC
Objective: 6

17) When a customer enters a store there are three outcomes that can occur: buy nothing, buy a small amount, or buy a large amount. It is the case that if a customer buys a large amount, he or she cannot also buy a small amount or buy nothing. We say that these events are
A) independent.
B) all inclusive.
C) related.
D) disjoint.
E) unrelated.
Answer: D
Type: MC
Objective: 6

18) Of the last 100 customers entering a computer shop, 25 have purchased a computer. If the purchases of customers are independent of one another, the probability that the next customer will purchase a computer is
A) 0.50.
B) 1.00.
C) 0.25.
D) 0.0625.
E) 0.75.
Answer: C
Type: MC
Objective: 6

Harrison Water Sports has three retail outlets: Vancouver, Victoria, and Nanaimo. The Vancouver store does 50 percent of the total sales in a year, while the Victoria store does 35 percent of the total sales, and Nanaimo the remainder. Further analysis indicates that of the sales in Vancouver, 20 percent are in boat accessories. The percentage of boat accessories at the Victoria store is 30 and the percentage at the Nanaimo store is 25.

19) If a sale is recorded as a boat accessory, the probability that the sale was made at the Victoria store is
A) 0.433.
B) 0.35.
C) 0.30.
D) 0.2425.
E) 0.105.
Answer: A
Type: MC
Objective: 4, 5

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20) Overall, the probability that a sale by Harrison Water Sports will be for a boat accessory is
A) 0.105.
B) 0.2425.
C) 0.10.
D) 0.375.
E) 0.30.
Answer: B
Type: MC
Objective: 4, 5

21) If a sale is recorded as a boat accessory, the probability that the sale was made at the Nanaimo store is
A) 0.375.
B) 0.2245.
C) 0.155.
D) 0.25.
E) 0.15.
Answer: C
Type: MC
Objective: 4, 5

In a large metropolitan area, the probability that an individual owns a single-family home is 0.40. The probability that an individual in this same area owns a small business is 0.05.

22) The probability that an individual living in this area does not own a single family home is
A) 0.95.
B) 0.03.
C) 0.60.
D) 0.04.
E) 0.10.
Answer: C
Type: MC
Objective: 4, 5

23) Of the individuals in this area who own a small business, 80% owns a single-family home. The probability that an individual owns a small business and owns a single family home is
A) 0.04.
B) 0.03.
C) 0.60.
D) 0.95.
E) 0.10.
Answer: A
Type: MC
Objective: 4, 5

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Part 2 Chapter 6: Random Variables and Probability Models

1 Quiz A

1) A fast food restaurant just leased a new freezer and food fryer for three years. The service contract for the freezer offers unlimited repairs for a fee of $125 a year plus a $35 service charge for each repair needed. The restaurant's research indicates that during a given year 80% of these freezers need no repairs, 11% needed to be serviced once, 5% twice, 4% three times, and none required more than three repairs.
a. Find the expected number of repairs for this freezer per year.
b. Find the standard deviation of the number of repairs per year.
c. What are the mean and standard deviation of the restaurant's annual expense with the service contract for the freezer?
Answer:
a. $E(X) = 0(0.80) + 1(0.11) + 2(0.05) + 3(0.04) = 0.33$ repairs
b. $Var(x) = (0 - 0.33)^2(0.80) + (2 - 0.33)^2(0.05) + (3 - 0.33)^2(0.04) = 0.512$

Standard deviation = $\sqrt{0.512} = 0.72$
c. Let $C = \$125 + \$35X$; $E(C) = \$125 + \$35(0.33) = 136.55$
Standard deviation(C) = $\$35(0.72) = \$25.20$
Type: ES
Objective: 2

2) Internet service providers (ISP) need to resolve customer problems as quickly as possible. For one ISP, past data indicate that the likelihood is 0.80 that customer calls regarding Internet service interruptions are resolved within one hour. Out of the next 10 customer calls about interrupted service,
a. What is the probability that exactly 7 will be resolved within one hour?
b. What is the probability that at least 7 will be resolved within one hour?
c. How many customers would be expected to have their service problems resolved within one hour?
Answer:
a. Use binomial with $n = 10$, $p = 0.80$. Find $P(X = 7) = 0.2013$
b. $P(X >= 7) = 0.8791$
c. $E(X) = np = 10(0.80) = 8$ customers
Type: ES
Objective: 2, 4

3) Suppose that incoming calls per hour to a customer service center of a small credit union are uniformly distributed between 0 and 6 calls.
a. What is the probability that fewer than 3 calls are received per hour?
b. What is the probability that at least 3 calls are received per hour?
c. What is the probability that more than 6 calls are received per hour?
Answer:
a. 3/7
b. 4/7
c. 0
Type: ES
Objective: 4

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4) Suppose that the time for e-mail confirmation of an online purchase is uniformly distributed between 1 and 6 minutes.

a. What is the probability that an e-mail confirmation arrives within 3 minutes?

b. What is the probability that an e-mail confirmation arrives in within 4 minutes?

c. What is the average time for an e-mail confirmation?

Answer:

a. P (X < 3) = (3 - 1)/(6 - 1) = 0.40

b. P (X < 4) = (4 - 1)/(6 - 1) = 0.60

c. μ = (1 + 6)/2 = 3.5 minutes

Type: ES

Objective: 4

5) The owner of a pet store is trying to decide whether to discontinue selling specialty clothes for pets. She suspects that only 4% of the customers buy specialty clothes for their pets and thinks that she might be able to replace the clothes with more profitable items. Before making a final decision, she decides to keep track of the total number of customers for a day and whether they purchase specialty clothes.

a. The owner had 275 customers that day. Assuming this was a typical day for her store, what would be the mean and standard deviation of the number of customers who buy specialty clothes for their pet each day?

b. Surprised by the high number of customers who purchased specialty pet clothing that day, the owner decided that her 4% estimate must have been too low. How many clothing sales would it have taken to convince you? Justify your answer.

Answer:

a. Using the Binomial model, Mean: $\mu = np = (275)(0.04) = 11$

Standard deviation: $\sigma = \sqrt{npq} = \sqrt{(275)(0.04)(0.96)} = 3.25$

b. Since $np = 11$ and $nq = 264$, we expect at least 10 successes and at least 10 failures. The sample size is large enough to apply a Normal model. It would be unusual to see the number of customers who purchased specialty pet clothing more than 2 or 3 standard deviations above the mean. Since the standard deviation = 3.25, it would be unusual to see more than 18 (11 + 2(3.25) = 17.5) customers who purchased specialty clothing.

So, I would conclude that her 4% estimate must have been too low if more than 18 customers purchased specialty clothing for their pet.

Type: ES

Objective: 3, 4

6) A shareholder believes that in one year, there is a 20% chance that his stock will be worth $75, a 50% chance that it will be worth $100, and a 30% chance that it will be worth $140.

a. Find the stock's expected value in one year.

b. Find the standard deviation of the stock's worth in one year.

Answer:

a. $E(X) = \Sigma\, xP(x) = \$75(0.20) + \$100(0.50) + \$140(0.30) = \$107$

b. $\sigma = SD(X) = \sqrt{Var(X)}$, $Var(X) = \Sigma\,(x - \mu)^2\, P(x)$

$Var(X) = \Sigma(x - \mu)^2\, P(x) = (75 - 107)^2(0.20) + (100 - 107)^2(0.50) + (140 - 107)^2(0.30) = 556$

$\sigma = SD(X) = \sqrt{Var(X)} = \sqrt{556}$

Type: ES

Objective: 2

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7) The number of plants that are found in a field averages 2 per square metre and follows a Poisson distribution. Based on this,
a. What is the expected value?
b. What is the probability that a 1-square metre section will contain less than 3 plants?
Answer:
a. The expected value of a Poisson distribution = E(X) = $\lambda = 2$
b. $P(X < 3) = P(X = 0) + P(X = 1) + P(X = 2) = 0.6767$
Type: ES
Objective: 2, 4

2 Quiz B

1) A small business just leased a new computer and colour laser printer for three years. The service contract for the computer offers unlimited repairs for a fee of $100 a year plus a $25 service charge for each repair needed. The company's research indicates that during a given year 86% of these computers need no repairs, 9% need to be repaired once, 4% twice, 1% three times, and none required more than three repairs.
a. Find the expected number of repairs for this kind of computer per year.
b. Find the standard deviation of the number of repairs per year.
c. What are the mean and standard deviation of the company's annual expense with the service contract for the computer?
Answer:
a. $E(X) = 0(0.86) + 1(0.09) + 2(0.04) + 3(0.01) = 0.20$ repairs
b. $Var(X) = 0.30$ $SD(X) = 0.55$ repairs
c. Let $C = 100 + 25X$; $E(C) = 100 + 25(0.20) = \$105$; $SD(C) = 25(0.55) = \$13.69$
Type: ES
Objective: 2

2) It is estimated that 20% of luxury cars manufactured in 2008 were silver. A car dealership typically sells 20 luxury cars per month.
a. What is the probability that 8 of the luxury cars sold per month are silver?
b. What is the probability that more than 10 of the luxury cars sold per month are silver?
c. How many silver luxury cars would you expect are sold per month?
Answer:
a. Use binomial with n = 20, p = 0.20. Find P (X = 8) = 0.0222.
b. Find P (X > 10) = .0006
c. E(X) = np = 20(0.20) = 4 silver luxury cars
Type: ES
Objective: 4

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3) Suppose the time it takes for customer representatives to diagnose and fix computer problems is uniformly distributed from 10 to 120 minutes.

a. What is the probability that a problem is diagnosed and fixed within 30 minutes?

b. What is the probability that it takes longer than 90 minutes to diagnose and fix a computer problem?

c. What is the average time for customer representatives to diagnose and fix computer problems?

Answer:

a. $P(X < 30) = (30 - 10)/ (120 - 10) = 0.18$

b. $P(X > 90) = (120 - 90)/ (120 - 10) = 0.27$

c. $\mu = (10 + 120)/2 = 65$ minutes

Type: ES

Objective: 4

4) A company believes that there is a 25% chance of making a daily profit of $500, a 35% chance that it will be $1000 and 40% chance that it will be $1500.

a. Find the expected value.

b. Find the standard deviation.

Answer:

a. $E(X) = \Sigma\, xP(x) = \$500(0.25) + \$1000(0.35) + \$1500(0.40) = \$1075$

b. $\sigma = SD(X) = \sqrt{Var(X)}$, $Var(X) = \Sigma\, (x - \mu)^2\, P(x)$

$Var(X) = \Sigma(x - \mu)^2\, P(x)$

$= (500 - 1075)^2(0.25) + (1000 - 1075)^2(0.35) + (1500 - 1075)^2(0.40)$

$= 156\ 875$

$\sigma = \sqrt{156\ 875} = \$396.07$

Type: ES

Objective: 2

5) The number of calls received by a call centre follows a Poisson distribution with an average of 5 calls per minute. For a 1 minute period,

a. Find the expected value.

b. Find the probability of receiving no more than 2 calls.

Answer:

a. Expected value = $\lambda = 5$

b. $P(X \le 2)\ P(X = 0) + P(X = 1) + P(X = 2) = 0.1247$

Type: ES

Objective: 2, 4

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3 Quiz C - Multiple Choice

A fast food restaurant just leased a new freezer and food fryer for three years. The service contract for the freezer offers unlimited repairs for a fee of $125 a year plus a $35 service charge for each repair needed. The restaurant's research indicates that during a given year 80% of these freezers need no repairs, 11% needed to be serviced once, 5% twice, 4% three times, and none required more than three repairs.

1) The expected number of repairs for this freezer per year is
A) 1 repair.
B) 1.25 repairs.
C) 0.33 repairs.
D) 0.79 repairs.
E) 2.5 repairs.
Answer: C
Type: MC
Objective: 2

2) The standard deviation of the number of repairs for this freezer per year is
A) 0.72 repair.
B) 0.512 repairs^2.
C) 1.25 repairs.
D) 2.5 repairs^2.
E) 0.33 repairs.
Answer: A
Type: MC
Objective: 2

3) The mean restaurant's annual expense with the service contract for this freezer is
A) $25.20.
B) $136.55.
C) $122.45.
D) $89.90.
E) $0.
Answer: B
Type: MC
Objective: 2

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It is estimated that 20% of luxury cars manufactured in 2008 were silver. A car dealership typically sells 20 luxury cars per month.

4) The probability that 8 of the luxury cars sold per month are silver is
A) 0.0006.
B) 0.1276.
C) 0.0222.
D) 0.7779.
E) 0.0978.
Answer: C
Type: MC
Objective: 4

5) The probability that more than 10 of the luxury cars sold per month are silver is
A) 0.0006.
B) 0.1276.
C) 0.0222.
D) 0.7779.
E) 0.9994
Answer: A
Type: MC
Objective: 4

6) Internet service providers (ISP) need to resolve customer problems as quickly as possible. For one ISP, past data indicates that the likelihood is 0.80 that customer calls regarding Internet service interruptions are resolved within one hour. Out of the next 10 customer calls about interrupted service, how many would be expected to have their service problems resolved within one hour?
A) 2
B) 4
C) 6
D) 8
E) 10
Answer: D
Type: MC
Objective: 2

7) Suppose that incoming calls per hour to a customer service center of a small credit union are uniformly distributed between 0 and 6 calls. The probability that fewer than 3 calls are received per hour is
A) 3/6.
B) 4/6.
C) 3/7.
D) 4/7.
E) 1/6.
Answer: C
Type: MC
Objective: 1, 3, 4

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8) Suppose that the time for e-mail confirmation of an online purchase is uniformly distributed between 1 and 6 minutes. The probability that an e-mail confirmation arrives within 3 minutes is
A) 0.40.
B) 0.50.
C) 0.60.
D) 0.80.
E) 0.70.
Answer: A
Type: MC
Objective: 4

A company believes that there will be a 50% chance of making a profit of $1000, a 30% chance of making a profit of $1500 and a 20% chance of making a profit of $2000.

9) What is the expected profit?
A) $1000
B) $300
C) $2000
D) $1350
E) $4500
Answer: D
Type: MC
Objective: 2

10) Find the standard deviation for the company's profit.
A) 390.51
B) 152 498
C) 350
D) 18.71
E) 1350
Answer: A
Type: MC
Objective: 2

The number of clients arriving at a bank machine is Poisson distributed with an average of 2 per minute.

11) For a 5-minute period, find the expected value.
A) 2
B) 1.41
C) 3.16
D) 10
E) The expected value for 5 minutes cannot be determined with the given information.
Answer: D
Type: MC
Objective: 5

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12) What is the probability that no more than 2 customers will arrive in a 5 minute period?
A) 0.0005
B) 0.1246
C) 0.0028
D) 0.6767
E) The answer cannot be determined with the given information.
Answer: C
Type: MC
Objective: 5

An airline has found that its flights between Toronto and Vancouver can take anywhere from 4.5 - 7.5 hours, with any time between this range being equally likely.

13) What is the standard deviation?
A) 0.75 hours
B) 0.87 hours
C) 6 hours
D) 0.33 hours
E) The standard deviation cannot be determined.
Answer: B
Type: MC
Objective: 2

14) What is the probability that the flight will take more than 7 hours?
A) 0.83
B) 0.33
C) 0.67
D) 0.17
E) Anywhere between 0% and 100%.
Answer: D
Type: MC
Objective: 4

A courier service claims that no more than 5% of all of its deliveries arrive late. Assuming deliveries are independent, a sample of 10 deliveries is randomly selected.

15) What is the probability that exactly 2 of the sample deliveries arrive late?
A) 0.0746
B) 0.9884
C) 0.2347
D) 0.0439
E) 0.1125
Answer: A
Type: MC
Objective: 4

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16) Cars arrive randomly and independently at a drive through service centre at a rate of 10 per hour. What is the probability that no cars will arrive in a 15 minute period?
A) 0.0821
B) 0.0067
C) 0.0250
D) 0.00
E) 0.1353
Answer: A
Type: MC
Objective: 5

17) Cars arrive randomly and independently at a drive through service centre at a rate of 10 per hour. What is the probability that 2 or 3 cars will arrive in a 15 minute period?
A) 0.4703
B) 0.0131
C) 0.0099
D) 0.2873
E) 0.0053
Answer: A
Type: MC
Objective: 5

18) The probability model for random variable X is specified as:

$P(X) = X/6$ for $X = 1, 2$ or 3

The expected value of X is
A) 2.00.
B) 0.50.
C) 0.333.
D) 2.333.
E) 0.167.
Answer: D
Type: MC
Objective: 2

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Part 2 Chapter 7: The Normal and Other Continuous Distributions

1 Quiz A

1) At a local manufacturing plant, employees must complete new machine set ups within 30 minutes. New machine set-up times can be described by a normal model with a mean of 22 minutes and a standard deviation of four minutes.
a. What percent of new machine set ups take more than 30 minutes?
b. The typical worker needs five minutes to adjust to their surroundings before beginning their duties. What percent of new machine set ups are completed within 25 minutes to allow for this?
Answer:

a. $P(\text{time} > 30) = z = \frac{30 - 22}{4} = 2.0$

$P(z > 2.00) = 0.0228 \sim 2.28\%$

b. $P(z \le 25) = P\left(z \le \frac{25 - 22}{4}\right) = P(z \le 0.75) = 0.7734$

or about 77.3%
Type: ES
Objective: 1, 4

2) The Graduate Management Admission Test (GMAT) has scores from 200 to 800. Scores are supposed to follow a Normal distribution with a mean of 500 and standard deviation of 100.
a. Suppose you earned a 600 on your GMAT test. From that information and the 68-95-99.7 Rule, where do you stand among all students who took the GMAT?
b. Suppose you earned a 300 on your GMAT test. Where do you stand among all students who took the GMAT?
Answer:

a. $P(\text{score} > 600) = z = \frac{600 - 500}{100} = 1.0$

$P(z > 1.00) = 1 - P(z \le 1) = 1 - 0.8413 = 0.1586 \sim 16\%$. This means that 16% of those who wrote the test got a better score than you.

b. $P(z \le 300) = P\left(z \le \frac{300 - 500}{100}\right) = P(z \le -2) = 0.02275 \sim 2.3\%$. This means that only 2.3% of those who wrote the test did worse than you.
Type: ES
Objective: 1, 2, 4

3) Assuming the GMAT scores are nearly normal with $N(500, 100)$, what proportion of GMAT scores falls between 450 and 650?
Answer: $P(\text{score} > 650) = z = \frac{650 - 500}{100} = 1.5$

$P(z < 1.50) = 0.9332$.

$P(z < 450) = P\left(z < \frac{450 - 500}{100}\right) = P(z \le -0.5) = 0.3085$

$P(450 < Score < 650) = 0.9332 - 0.3085 = 0.6247$ About 62% of scores fall between 450 and 650.
Type: ES
Objective: 1, 2, 4

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4) Suppose that an MBA program in a university admits only people with GMAT scores among the top 5%. Assume that scores in the GMAT test follows a *N(500, 100)* distribution. How high your GMAT score has to be to be admitted in this MBA program?
Answer: The top 5% of Normal distribution is associated with $Z = 1.645$.

$$1.645 = \frac{x - 500}{100}$$

164.5 = x - 500
x = 664.5
To be eligible for admission in this university, you need to get a score of 664.5 or higher in the GMAT test.
Type: ES
Objective: 1, 2, 4

5) In the last quarter of a recent year, the return on a group of equity mutual funds followed a Normal distribution with N(6.2%, 1.8%). What percent of the funds would you expect to be in the following regions?
a. Return of 10% or more.
b. Return of 5% or less.
Answer:
a. P(return > 10%) = 1 - P(return < 10%)

$$z = \frac{10 - 6.2}{1.8} = 2.11$$

P(return > 10%) = 1 - P(return < 10%) = 1 - P(z < 2.11) = 1 - 0.9826 = 0.01743
Less than 2% of the funds had a return of more than 10%.

b. P(return < 5%)

$$z = \frac{5 - 6.2}{1.8} = -0.6667$$

P(return < 5%) = P(z <-0.6667) = 0.2525
About 25% of funds had a return of less than 5%.
Type: ES
Objective: 1, 2, 4

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2 Quiz B

1) Suppose the time it takes for customer representatives to diagnose and fix computer problems is uniformly distributed from 10 to 120 minutes.
a. What is the probability that a problem is diagnosed and fixed within 30 minutes?
b. What is the probability that it takes longer than 90 minutes to diagnose and fix a computer problem?
c. What is the average time for customer representatives to diagnose and fix computer problems?
Answer:
a. P (X < 30) = (30 - 10)/ (120 - 10) = 0.18
b. P (X > 90) = (120 - 90)/ (120 - 10) = 0.27
c. μ = (10 + 120)/2 = 65 minutes
Type: ES
Objective: 1, 2, 4

2) According to the Statistics Canada, 68% of Canadians owned their own home in 2003. A local real estate office wants to see if this is the case for its area. The office selects a random sample of 200 people to estimate the percentage who own their own homes.
a. Verify that the normal model can be used to approximate the binomial in this situation.
b. What is the probability that at least 140 people own their own home?
Answer:
a. np = 200(0.68) = 136 > = 10 and nq = 200(0.32) = 64 > = 10; and 200 people is less than 10% of the total in the area.
b. P(X > 140) = P (Z > 0.61) = 0.2709
Type: ES
Objective: 3, 4

3) A company's manufacturing process uses 500 gallons of water at a time. A "scrubbing" machine then removes most of a chemical pollutant before pumping the water into a nearby lake. To meet federal regulations the treated water must not contain more than 80 parts per million (ppm) of the chemical. Because a fine is charged if regulations are not met, the company sets the machine to attain an average of 75 ppm in the treated water. The machine's output can be described by a normal model with standard deviation 4.2 ppm.
a. What percent of the batches of water discharged exceed the 80 ppm standard?
b. The company's lawyers insist that not more than 2% of the treated water should be over the limit. To achieve this, to what mean should the company set the scrubbing machine? Assume the standard deviation does not change.
Answer:
a. $z = \frac{80 - 75}{4.2} = 1.19$

P($z \geq 1.19$) 0.117

b. $z = 2.054$
$\frac{80 - \mu}{4.2} = 2.054$

$\mu \approx 71.374$
Type: ES
Objective: 1, 3, 4

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4) A company's manufacturing process uses 500 litres of water at a time. A "scrubbing" machine then removes most of a chemical pollutant before pumping the water into a nearby lake. To meet federal regulations the treated water must not contain more than 80 parts per million (ppm) of the chemical. Because there is a fine charged if regulations are not met, the company sets the machine to attain an average of 75 ppm in the treated water. The machine's output can be described by a Normal model with a standard deviation 4.2 ppm.

a. What percent of the batches of water discharged exceed the 80 ppm standard?

b. The company's lawyers insist that not more than 2% of the treated water should be over the limit. In order to achieve this, to what mean should the company set the scrubbing machine? Assume the standard deviation does not change.

Answer:

a. $z = 1.19$

$P(z \geq 1.19) \approx 0.117$

b. $z = 2.054$

$\mu \approx 71.373$

Type: ES

Objective: 1, 3, 4

5) The owner of a small convenience store is trying to decide whether to discontinue selling magazines. He suspects that only 5% of the customers buy magazines and thinks that he might be able to sell something more profitable. Before making a final decision, he keeps track of the number of customers who buy magazines on a given day.

a. On one day he had 280 customers. Assuming this day was typical, what would be the mean and standard deviation of the number of customers who buy magazines each day?

b. Surprised by the high number of customers who purchased magazines that day, the owner decided that his 5% estimate must have been too low. How many magazine sales would it have taken to convince you? Justify your answer.

Answer:

a. $\mu = 280(0.05) = 14$, $\sigma = \sqrt{280(0.05)(0.95)} = 3.65$

b. Since $np = 14$ and $nq = 266$, we expect at least 10 successes and at least 10 failures. The sample size is large enough to apply a Normal model. It would be unusual to see sales more than 2 (or 3) standard deviations above the anticipated mean. Since 14 + 2(3.65) = 21.3 (or 14 + 3(3.65) = 24.95), I would conclude the 5% estimate was probably too low if 22 (25) customers or more bought magazines.

Type: ES

Objective: 1, 3, 4

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3 Quiz C - Multiple Choice

1) Suppose that incoming calls per hour to a customer service center of a small credit union are uniformly distributed between 0 and 6 calls. The probability that fewer than 5 calls are received per hour is
A) 3/7.
B) 4/6.
C) 5/6.
D) 4/7.
E) 1/6.
Answer: C
Type: MC
Objective: 4

2) Suppose that the time for e-mail confirmation of an online purchase is uniformly distributed between 1 and 7 minutes. The probability that an e-mail confirmation arrives within 4 minutes is
A) 0.50.
B) 0.40.
C) 0.60.
D) 0.80.
E) 0.70.
Answer: A
Type: MC
Objective: 4

At a local manufacturing plant, employees must complete new machine set ups within 30 minutes. New machine set-up times can be described by a normal model with a mean of 22 minutes and a standard deviation of four minutes.

3) What percent of new machine set ups take more than 30 minutes?
A) 97.72%
B) 49.72%
C) 2.28%
D) 52.28%
E) 47.72%
Answer: C
Type: MC
Objective: 4

4) The typical worker needs five minutes to adjust to his or her surroundings before beginning duties. What percent of new machine set ups are completed within 25 minutes to allow for this?
A) 77.3%
B) 27.3%
C) 22.7%
D) 72.7%
E) 75%
Answer: A
Type: MC
Objective: 4

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A company's manufacturing process uses 500 litres of water at a time. A "scrubbing" machine then removes most of a chemical pollutant before pumping the water into a nearby lake. To meet federal regulations the treated water must not contain more than 80 parts per million (ppm) of the chemical. Because there is a fine charged if regulations are not met, the company sets the machine to attain an average of 75 ppm in the treated water. The machine's output can be described by a Normal model with a standard deviation 4.2 ppm.

5) What percent of the batches of water discharged exceed the 80 ppm standard?
A) 88.3%
B) 11.7%
C) 61.7%
D) 38.3%
E) -11.7%
Answer: B
Type: MC
Objective: 4

6) The company's lawyers insist that not more than 2% of the treated water should be over the limit. In order to achieve this, to what mean should the company set the scrubbing machine? Assume the standard deviation does not change.
A) 75 ppm
B) 78.626 ppm
C) 71.373 ppm
D) 80 ppm
E) 60 ppm
Answer: C
Type: MC
Objective: 4

An airline has found that its flights between Toronto and Vancouver can take anywhere from 4.5 - 7.5 hours, with any time between this range being equally likely.

7) What is the standard deviation?
A) 0.75 hours
B) 0.86 hours
C) 6 hours
D) 0.33 hours
E) The standard deviation cannot be determined.
Answer: B
Type: MC
Objective: 1, 4

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8) What is the probability that the flight will take more than 7 hours?
A) 0.83
B) 0.33
C) 0.67
D) 0.17
E) Anywhere between 0% and 100%.
Answer: D
Type: MC
Objective: 4

9) The manager of a computer help desk operation in Moncton, NB has collected enough data to conclude that the time per call is normally distributed with a mean equal to 8.21 minutes and a standard deviation of 2.14 minutes. Based on this, what is the probability that a call will last longer than 13 minutes?
A) 0.0125
B) 0.4875
C) 0.5125
D) 0.9875
E) 0.0224
Answer: A
Type: MC
Objective: 4

10) The manager of a computer help desk operation in Moncton has collected enough data to conclude that the time per call is normally distributed with a mean equal to 8.21 minutes and a standard deviation of 2.14 minutes. The manager wants to set the time limit at a level such that it will sound on only 8 percent of all calls. The time limit should be
A) about 11.23 minutes.
B) about 5.25 minutes.
C) about 14.58 minutes.
D) about 10.35 minutes.
E) about 20.29 minutes.
Answer: A
Type: MC
Objective: 4

11) The manager of a computer help desk operation in Moncton has collected enough data to conclude that the time per call is normally distributed with a mean equal to 8.21 minutes and a standard deviation of 2.14 minutes. What is the probability that three randomly monitored calls will each be completed in 4 minutes or less?
A) About 0.00001
B) About 0.4756
C) About 0.0244
D) About 0.0732
E) About 0.1076
Answer: A
Type: MC
Objective: 4

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12) The Graduate Management Admission Test (GMAT) has scores from 200 to 800. Scores are supposed to follow a Normal distribution with a mean of 500 and standard deviation of 100. What percentage of students scored better than you if you earned a GMAT score of 600?
A) 15.86%
B) 12.98%
C) 10%
D) 84.14%
E) 2.25%
Answer: A
Type: MC
Objective: 4

13) Assuming the GMAT scores are nearly normal with $N(500, 100)$, what proportion of GMAT scores falls between 450 and 650?
A) 59.86%
B) 62.47%
C) 32.57%
D) 89.16%
E) 66.67%
Answer: B
Type: MC
Objective: 4

14) Suppose that an MBA program in a university admits only people with GMAT scores among the top 5%. Assume that scores in the GMAT test follows a $N(500, 100)$ distribution. How high your GMAT score has to be to be admitted in this MBA program?
A) 700
B) 600
C) 664.5
D) 465.5
E) 568.5
Answer: C
Type: MC
Objective: 4

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Part 2 Chapter 8: Surveys and Sampling

1 Quiz A

1) The administration of a large Canadian university is interested in learning about the types of wellness programs that would interest its employees. To do this, they plan to survey a random sample of employees. Under consideration are several plans for selecting the sample. Name the sampling strategy for each.
a. There are five categories of employees (administration, faculty, professional staff, clerical and maintenance). Randomly select ten individuals from each category.
b. Each employee has an ID number. Randomly select 50 numbers.
c. Randomly select a school within the university (e.g., Business School) and survey all of the individuals (administration, faculty, professional staff, clerical and maintenance) who work in that school.
d. The HR Department has an alphabetized list of newly hired employees (hired within the last five years). After starting the process by randomly selecting an employee from the list, then every 5th name is chosen to be included in the sample.
Answer:
a. Stratified.
b. Simple random sample.
c. Cluster.
d. Systematic.
Type: ES
Objective: 2

2) Suppose the administration of a large Canadian university decides to learn about the types of wellness programs that would interest its employees. To do this, they plan to survey a random sample of employees. At a Starbucks located on campus, every tenth person who enters on a Monday morning is selected to be surveyed. Explain why this may be biased.
Answer: Depending on the time during which individuals are surveyed, undercoverage may be an issue. For example, different categories of employees have different levels of flexibility (clerical and maintenance workers don't have as much flexibility in their work days as do administration, faculty and professional staff). In addition, persons other than employees would presumably enter Starbucks, although a screening question can be used to make sure those interviewed are employees.
Type: ES
Objective: 1

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3) Suppose the administration of a large Canadian university decides to learn about the types of wellness programs that would interest its employees. To do this, they plan to design a survey to learn about their employees. Two of the questions asked in the survey of employees are shown below.

• *Because exercise is so important to good health, would you be willing to participate in organized walks during lunch hour?*
• *Would you attend a "low-fat cooking" demonstration?*

a. Are these questions valid (appropriately worded)? Explain.
b. Which question is more neutral? Explain.
Answer:
a. The first question is "leading" the respondent to answer yes.
b. The second question is more neutral because it does not lead to a yes response.
Type: ES
Objective: 3

4) A consumer research group is interested in how older drivers view hybrid cars. Specifically, they wish to assess the percentage of drivers in Canada 50 years of age or older who intend to purchase a hybrid in the next two years. They used a list of CARP (Canadian Association of Retired Persons, www.carp.ca) members as the sampling frame. Based on a systematic sample, they estimated the percentage to be 17%.
a. Define the target population.
b. Define the parameter.
c. What is the statistic?
d. How might the results be biased?
Answer:
a. All U.S. drivers 50 or older.
b. % who intend to purchase a hybrid in the next two years.
c. 17% based on the sample.
d. The sampling frame does not include all U.S. drivers 50 or older (not everyone 50 or older is a member of AARP).
Type: ES
Objective: 1

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2 Quiz B

1) GLOBO opened its first store in 1992 and it is Canada's largest family shoe store chain with the widest selection of fashion-right footwear. The company has recently launched an online store. Sales via the Internet have been sluggish compared to their brick and mortar stores, and management suspects that its regular customers have concerns regarding the security of online transactions. To determine if this is the case, they plan to survey a random sample of their regular customers. Under consideration are several plans for selecting the sample. Name the sampling strategy for each of the following.
a. Regular customers belong to a rewards program and have a customer rewards ID number. Randomly select 100 numbers.
b. GLOBO has stores in five different cities in Ontario, Canada. Randomly select one of the stores and survey all regular customers that belong to its rewards program.
c. GLOBO has an alphabetized list of regular customers who belong to their rewards program. After randomly selecting a customer on the list, every 25th customer from that point on is chosen to be in the sample.
d. Customers are grouped into four age categories (under 21, 21 to 35, 36 to 50, and older than 50). Randomly select 10 regular customers in each age category.
Answer:
a. Simple random sample.
b. Cluster.
c. Systematic.
d. Stratified.
Type: ES
Objective: 2

2) In the GLOBO study just described,
a. Define the target population.
b. Define the parameter.
c. What is the sampling frame?
d. How might the results be biased?
Answer:
a. All regular GLOBO customers.
b. % of regular GLOBO customers who have concerns about online security.
c. GLOBO customers who belong to the rewards program.
d. Not all regular customers belong to the rewards program and GLOBO should also consider how others (potential customers) feel.
Type: ES
Objective: 1

3) One member of the management team at GLOBO suggests that their survey could be conducted online. Customers logging on to the online store would be asked to take a few minutes to complete the survey and would be offered a coupon as incentive to participate. Explain how this approach might be biased.
Answer: This is a voluntary response sample. This sample consists of customers already visiting the online store; the bias would probably be toward not having concerns about online security.
Type: ES
Objective: 1

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4) Two of the questions asked in the survey of customers are as follows:

- *Given the prevalence of identity theft, are you reluctant to provide credit card information online?*
- *Are you confident that any information you provide online is secure?*

a. Are these questions valid (appropriately worded)? Explain.
b. Which question is more neutral? Explain.
Answer:
a. The first question is leading by mentioning the prevalence of identity theft.
b. The second question is more neutral because it does not lead the customer to a specific response.
Type: ES
Objective: 3

3 Quiz C - Multiple Choice

The administration of a large Canadian university is interested in learning about the types of wellness programs that would interest its employees. To do this, they plan to survey a sample of their employees.

1) Suppose that there are five categories of employees (administration, faculty, professional staff, clerical and maintenance) and the university decides to randomly select ten individuals from each category. This sampling plan is called
A) simple random sampling.
B) stratified sampling.
C) cluster sampling.
D) systematic sampling.
E) convenience sampling.
Answer: B
Type: MC
Objective: 2

2) Suppose that the university randomly selects a school (e.g., the Business School) and surveys all of the individuals (administration, faculty, professional staff, clerical and maintenance) who work in that school. This sampling plan is called
A) simple random sampling.
B) stratified sampling.
C) cluster sampling.
D) systematic sampling.
E) convenience sampling.
Answer: C
Type: MC
Objective: 2

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GLOBO, a Canadian shoe chain, has recently launched an online store. Sales via the Internet have been been sluggish compared to their brick and mortar stores, and management suspects that its regular customers have concerns regarding the security of online transactions. To determine if this is the case, management plans to survey a sample of regular customers.

3) Suppose that GLOBO's regular customers belong to a rewards program and have a customer rewards ID number. GLOBO decides to randomly select 100 numbers. This sampling plan is called
A) simple random sampling.
B) stratified sampling.
C) cluster sampling.
D) systematic sampling.
E) convenience sampling.
Answer: A
Type: MC
Objective: 2

4) Suppose that GLOBO has an alphabetized list of regular customers who belong to their rewards program. After randomly selecting a customer on the list, every 25th customer from that point on is chosen to be in the sample. This sampling plan is called
A) simple random sampling.
B) stratified sampling.
C) cluster sampling.
D) systematic sampling.
E) convenience sampling.
Answer: D
Type: MC
Objective: 2

5) All regular GLOBO customers is known as the _____ of the study.
A) parameter
B) statistic
C) target population
D) sampling frame
E) sample
Answer: C
Type: MC
Objective: 1

6) Which of the following is the parameter of interest in the GLOBO study?
A) All regular GLOBO costumers
B) Percent of regular GLOBO customers who have concerns about online security
C) GLOBO customers who belong to the rewards program
D) Percent of GLOBO customers who belong to the rewards program that don't shop online
E) Percent of regular non-GLOBO customers who have concerns about online security
Answer: B
Type: MC
Objective: 1

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7) One member of the management team at GLOBO suggests that the survey could be conducted online. Customers logging on to the online store would be asked to take a few minutes to complete the survey and would be offered a coupon as incentive to participate. Which of the following statements is true?

I. This is a voluntary response sample.
II. This would result in an unbiased random sample.
III. This would result in a biased sample.

A) I only
B) II only
C) III only
D) I and II
E) I and III
Answer: E
Type: MC
Objective: 1

A consumer research group is interested in how older drivers view hybrid cars. Specifically, they wish to assess the percentage of drivers in Canada 50 years of age or older who intend to purchase a hybrid in the next two years. They selected a systematic sample from a list of CARP (Canadian Association of Retired Persons, www.carp.ca) members. Based on this sample, they estimated the percentage to be 17%.

8) The sampling frame for this study is
A) all drivers in the U.S. 50 years of age or older.
B) 17%.
C) the list of CARP members.
D) how older drivers view hybrid cars.
E) all non-CARP members.
Answer: C
Type: MC
Objective: 1

9) Which of the following statements about this study is false?

I. 17% of all Canadian drivers 50 years of age or older intend to purchase a hybrid in the next two years.
II. 17% is a parameter.
III. 17% is a statistic.

A) I only
B) II only
C) III only
D) I and II
E) I and III
Answer: D
Type: MC
Objective: 1

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10) Which of the following survey questions is leading?

I. Given the prevalence of identity theft, are you reluctant to provide credit card information online?
II. Are you confident that any information you provide online is secure?
III. Are you concerned about the security of online transactions?

A) I only
B) II only
C) III only
D) I and II
E) II and III
Answer: A
Type: MC
Objective: 1

11) In developing and conducting a survey, what is the purpose of the pilot test phase?
A) To demonstrate flaws in the survey
B) To generate initial data to analyze
C) To determine the cost of the survey
D) To make sure that the respondents like the questions
E) To determine if the results can be predicted
Answer: A
Type: MC
Objective: 3

12) In conducting a personal interview, the interviewer is allowed to arbitrarily decide who should be interviewed. Which of the following statements is true?
A) This is a voluntary response sample.
B) This is a simple random sample.
C) This is a biased sample.
D) This is an unbiased sample.
E) This is a representative sample.
Answer: C
Type: MC
Objective: 3

13) When a tax auditor randomly selects 20 accounts from all the accounts of a business to check for accuracy, she has selected
A) a census.
B) a simple random sample from a population.
C) a convenience sample.
D) a biased sample.
E) a stratified sample.
Answer: B
Type: MC
Objective: 1

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14) An Internet service provider has the capability of tracking the time that each of its customers spends connected to the Internet during a month. These data would constitute
A) a convenience sample.
B) a simple random sample.
C) a cluster sample.
D) a multistage sample.
E) a population.
Answer: E
Type: MC
Objective: 1

15) A professor hands out survey forms to the students in her own classes. If the population is all students attending the university, this is an example of
A) a convenience sample.
B) a random sample.
C) a stratified sample.
D) a census.
E) an unbiased sample.
Answer: A
Type: MC
Objective: 2

16) An attribute of a population is called
A) a parameter.
B) a statistic.
C) a census.
D) a real number.
E) an integer.
Answer: B
Type: MC
Objective: 1

17) The National Capital Commission recently did a quality check on the length of fence posts being installed in a new park area. To do this, each of the 400 posts in inventory was numbered. Twenty numbers between 1 and 400 were randomly selected. These 20 poles were the ones selected for the study. This type of sampling is called
A) convenience sampling.
B) cluster sampling.
C) simple random sampling.
D) stratified sampling.
E) non-statistical sampling.
Answer: C
Type: MC
Objective: 2

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18) In order to estimate a parameter (such as the mean) of a population you would need which of the following?
A) Population
B) Census
C) Cluster
D) Sample
E) Pilot test
Answer: D
Type: MC
Objective: 1

19) An attribute of a sample is called a
A) parameter.
B) statistic.
C) real number.
D) integer.
E) census.
Answer: B
Type: MC
Objective: 1

20) A simple random sample experiment is repeated four times choosing the same sample size each time. Which of the following statements can be made about the different outcomes?
A) The samples will usually be different from one another.
B) The samples will always be the same.
C) Measurements calculated from the samples will always be different.
D) The samples will always be different from one another.
E) Measurements calculated from the samples will always be the same.
Answer: A
Type: MC
Objective: 1

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Part 2 Chapter 9: Sampling Distributions and Confidence Intervals for Proportions

1 Quiz A

1) The owner of a small convenience store is trying to decide whether to discontinue selling magazines. He suspects that only 5% of the customers buy magazines and thinks that he might be able to sell something more profitable. Before making a final decision, he keeps track of the number of customers who buy magazines on a given day.

a. On one day he had 280 customers. Assuming this day was typical, what would be the mean and standard deviation of the number of customers who buy magazines each day?
b. Surprised by the high number of customers who purchased magazines that day, the owner decided that his 5% estimate must have been too low. How many magazine sales would it have taken to convince you? Justify your answer.
Answer:
a. $\mu = 280(0.05) = 14$, $\sigma = \sqrt{280(0.05)(0.95)} = 3.65$
b. Because $np = 14$ and $nq = 266$, we expect at least 10 successes and at least 10 failures. The sample size is large enough to apply a Normal model. It would be unusual to see sales more than 2 (or 3) standard deviations above the anticipated mean.
Because $14 + 2(3.65) = 21.3$ (or $14 + 3(3.65) = 24.95$), I would conclude the 5% estimate was probably too low if 22 (25) customers or more bought magazines.
Type: ES
Objective: 7

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2) According to a recent survey, about 33% of Canadians polled said that they would likely purchase reusable cloth bags for groceries to reduce plastic waste. Suppose 45 shoppers are interviewed a local supermarket.
a. Describe the sampling distribution for the sample proportion by naming the model and telling its mean and standard deviation.
b. What is the probability that no more than 12 shoppers will say that they are likely to purchase reusable cloth bags for groceries?
Answer:
a.
1. 10% condition: 45 shoppers is less than 10% of all shoppers
2. Success/failure condition: $n\hat{p} = 45 \times 0.33 = 14.85$ and $n\hat{q} = 45 \times 0.67 = 30.15$, which both exceed 10
We can use the Normal model with mean 0.33 and standard deviation $\sqrt{\frac{0.33 \times 0.67}{45}} = 0.070$ to model the sampling distribution.
b. We want to find the probability that no more than 12 shoppers will say that they are likely to purchase reusable cloth bags for groceries. This is the same as asking the probability of finding less than 26.7% of 45 shoppers.

We need to standardize the 26.7% and the find the probability of getting a z-score less than or equal to the one we find:

$$z = \frac{0.267 - 0.33}{0.070} = -0.90$$

$P(Z < -0.90) = 0.1841$, so the probability is about 18.4% that no more than 12 shoppers will say that they are likely to purchase reusable cloth bags for groceries.
Type: ES
Objective: 1, 2

EU (European Union) countries report that 46% of their labour force is female. The United Nations wants to determine if the percentage of women in the Canadian labour force is the same. Representatives from Statistics Canada plan to check a random sample of more than 10 000 employment records on file to estimate the percentage of women in the Canadian labour force.

3) Statistics Canada wants to estimate the percentage of women in the Canadian labour force to within ±5%, with 90% confidence. How many employment records should be sampled?
Answer: $n = (1.645)^2(0.46)(0.54)/(0.05)^2 = 286.86 = 269$ records
Type: ES
Objective: 7

4) Managers actually select a random sample of 525 employment records, and find that 229 of the people are females. Construct the 90% confidence interval.
Answer: Confidence interval: (0.3998, 0.4722)
Type: ES
Objective: 5, 6

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5) Interpret the confidence interval in this context.
Answer: We are 90% confident that between 39.98% and 47.22% of the employment records from the Canadian labour force are female.
Type: ES
Objective: 6

6) Explain what 90% confidence means in this context.
Answer: If many random samples were taken, 90% of the confidence intervals produced would contain the actual percentage of all female employment records in the Canadian labour force.
Type: ES
Objective: 5

7) Should representatives from Statistics Canada conclude that the percentage of women in the Canadian labour force is lower than Europe's rate of 46%? Explain.
Answer: No. Because 46% lies in the confidence interval, (0.3998, 0.4722), it is possible that the percentage of women in the labour force matches Europe's rate of 46% women in the labour force.
Type: ES
Objective: 5

8) Are the assumptions and conditions for constructing a confidence interval met?
Answer: We have a random sample of less than 10% of the employment records, with 229 successes (females) and 296 failures (males), so the normal model applies.
Type: ES
Objective: 4

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2 Quiz B

1) The owner of a pet store is trying to decide whether to discontinue selling specialty clothes for pets. She suspects that only 4% of the customers buy specialty clothes for their pets and thinks that she might be able to replace the clothes with more profitable items. Before making a final decision, she decides to keep track of the total number of customers for a day and whether they purchase specialty clothes.

a. The owner had 275 customers that day. Assuming this was a typical day for her store, what would be the mean and standard deviation of the number of customers who buy specialty clothes for their pet each day?
b. Surprised by the high number of customers who purchased specialty pet clothing that day, the owner decided that her 4% estimate must have been too low. How many clothing sales would it have taken to convince you? Justify your answer.
Answer:
a. Using the Binomial model, mean: $\mu = np = (275)(0.04) = 11$
Standard deviation: $\sigma = \sqrt{npq} = \sqrt{(275)(0.04)(0.96)} = 3.25$
b. Because $np = 11$ and $nq = 264$, we expect at least 10 successes and at least 10 failures. The sample size is large enough to apply a Normal model. It would be unusual to see the number of customers who purchased specialty pet clothing more than 2 or 3 standard deviations above the mean. Because the standard deviation = 3.25, it would be unusual to see more than 18 (11 + 2(3.25) = 17.5) customers who purchased specialty clothing. So, I would conclude that her 4% estimate must have been too low if more than 18 customers purchased specialty clothing for their pets.
Type: ES
Objective: 8

2) It is generally believed that electrical problems affect about 14% of new cars. An automobile mechanic conducts diagnostic tests on 128 new cars on the lot.

a. Describe the sampling distribution for the sample proportion by naming the model and telling its mean and standard deviation.
b. What is the probability that in this group more than 18% of the new cars will be found to have electrical problems?
Answer:
a. We can assume these cars are a representative sample of all new cars, and certainly less than 10% of them. We expect 14% × 128 = 17.92 successes (electrical problems) and 86% × 128 = 110.08 failures (no problems) so the sample is large enough to use the sampling model N(0.14, 0.031).

$$SD(\hat{p}) = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(0.14)(0.86)}{128}} = 0.031$$

b. $z = \dfrac{\hat{p} - p}{SD(\hat{p})}$ $\qquad P(\hat{p} > 0.18) = P\left(z > \dfrac{0.18 - 0.14}{0.031}\right) = P(z > 1.30) = 0.096$, about 10%

Type: ES
Objective: 2

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One division of a large defense contractor manufactures telecommunication equipment for the military. This division reports that 12% of non-electrical components are reworked. Management wants to determine if this percentage is the same as the percentage rework for electrical components manufactured by the entire company. The Quality Control Department plans to check a random sample of the over 10 000 electrical components manufactured across all divisions.

3) The Quality Control Department wants to estimate the true percentage of rework for electrical components to within ±4%, with 99% confidence. How many components should managers sample?
Answer: $n = (2.575)^2 (0.12) (0.88) / (0.04)^2 = 437.62 = 438$ electrical components
Type: ES
Objective: 7

4) They actually select a random sample of 450 electrical components and find that 46 of those had to be reworked. Create the confidence interval.
Answer: Confidence interval: (0.0652, 0.1388)
Type: ES
Objective: 5, 6

5) Interpret the confidence interval in this context.
Answer: We are 99% confident that between 6.5% and 13.9% of electrical components are reworked.
Type: ES
Objective: 5, 6

6) Explain what 99% confidence means in this context.
Answer: If many random samples were taken, 99% of the confidence intervals produced would contain the actual percentage of electrical components that are reworked.
Type: ES
Objective: 5

7) Should the Quality Control Department conclude that the percentage of rework for the electrical components is lower than the rate of 12% for non-electrical components? Explain.
Answer: No. Because 12% lies in the confidence interval it's possible that the percentage of electrical components that are reworked matches the percentage of non-electrical components that are reworked.
Type: ES
Objective: 5, 6

8) Are the assumptions and conditions for constructing a confidence interval met? Explain.
Answer: We have a random sample of less than 10% of all electrical components, with 46 successes (reworked) and 404 failures (not reworked), so the normal model applies.
Type: ES
Objective: 4

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3 Quiz C - Multiple Choice

The owner of a small convenience store is trying to decide whether to discontinue selling magazines. He suspects that only 5% of the customers buy magazines and thinks that he might be able to sell something more profitable. Before making a final decision, he keeps track of the number of customers who buy magazines each day. On a typical day he has 280 customers in his store.

1) On a typical day, what would be the mean number of customers who buy magazines?
A) 280
B) 0
C) 266
D) 14
E) 25
Answer: D
Type: MC
Objective: 1, 2

2) One a typical day, what would be the standard deviation in the number of customers who buy magazines?
A) 3.65
B) 14
C) 13.32
D) 25
E) 5
Answer: A
Type: MC
Objective: 2

According to a recent survey, about 33% of Canadians polled said that they would likely purchase reusable cloth bags for groceries to reduce plastic waste. Suppose 45 shoppers are interviewed at a local supermarket.

3) Which of the following statements is (are) true about the sampling distribution of the sample proportion?
A) The sampling distribution can be described by the normal model with mean of 0.33 and standard deviation of 0.07.
B) The mean of the sampling distribution is 0.23.
C) The standard deviation of the sampling distribution is 0.27.
D) The sampling distribution cannot be described by a Normal distribution.
E) More information is needed to describe the sampling distribution.
Answer: A
Type: MC
Objective: 2

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4) What is the probability that at most 12 shoppers will say that they are likely to purchase reusable bags for groceries?
A) -0.90
B) 0.90
C) 0.267
D) 0.816
E) 0.184
Answer: E
Type: MC
Objective: 1

EU (European Union) countries report that 46% of their labour force is female. The United Nations wants to determine if the percentage of women in the Canadian labour force is the same. Representatives from Statistics Canada plan to check a random sample of more than 10 000 employment records on file to estimate the percentage of women in the Canadian labour force.

5) Statistics Canada wants to estimate the percentage of women in the Canadian labour force to within ±5% with 90% confidence. How many employment records should be sampled?
A) 121
B) 269
C) 451
D) 382
E) 1000
Answer: B
Type: MC
Objective: 7

6) Suppose Statistics Canada wants to be 90% confident of estimating the percentage of women in the labour force to within ±2% of the true percentage. To do this they would have to
A) decrease the sample size.
B) select the same number of employment records.
C) increase the sample size.
D) decrease the precision.
E) increase the sampling error.
Answer: C
Type: MC
Objective: 7

7) They actually select a random sample of 525 employment records, and find that 229 of the people are females. The 90% confidence interval is
A) 0.4006 to 0.4718.
B) 0.2747 to 0.5973.
C) 0.1776 to 0.6944.
D) 0.4235 to 0.4579.
E) 0.1243 to 0.7100.
Answer: A
Type: MC
Objective: 6

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8) If Statistics Canada wishes to tighten the interval, they should

I. increase the confidence level.
II. increase the sample size.
III. decrease the sample size.

A) I only
B) II only
C) III only
D) I and II
E) I and III
Answer: B
Type: MC
Objective: 6, 7

9) All else being equal, increasing the level of confidence desired will
A) tighten the confidence interval.
B) decrease the margin of error.
C) increase precision.
D) increase the margin of error.
E) tighten the confidence interval and increase the margin of error.
Answer: D
Type: MC
Objective: 3, 6, 7

10) Which of the following is not an assumption / condition required for constructing a confidence interval for the proportion?
A) Randomization condition
B) Linearity condition
C) Success/Failure condition
D) 10% condition
E) Normality assumption
Answer: B
Type: MC
Objective: 4

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One division of a large defense contractor manufactures telecommunication equipment for the military. This division reports that 12% of non-electrical components are reworked. Management wants to determine if this percentage is the same as the percentage rework for electrical components manufactured by the entire company. The Quality Control Department plans to check a random sample of the over 10 000 electrical components manufactured across all divisions.

11) The Quality Control Department wants to estimate the true percentage of rework for electrical components to within ±4%, with 99% confidence. How many components should they sample?
A) 651
B) 1000
C) 344
D) 438
E) 579
Answer: D
Type: MC
Objective: 7

12) They actually select a random sample of 450 electrical components and find that 46 of those had to be reworked. The 99% confidence interval is
A) 0.0654 to 0.1390.
B) 0.0432 to 0.1608.
C) 0.0763 to 0.1277.
D) 0.0541 to 0.1499.
E) Cannot be determined with the given information.
Answer: A
Type: MC
Objective: 6

13) The 95% confidence interval based on this data is 0.0742 to 0.1302. Which of the following is the correct interpretation?
A) The percentage of electronic components that are reworked is between 7.4% and 13.0%.
B) We are 95% confident that between 7.4% and 13.0% of electrical components are reworked.
C) The margin of error for the true percentage of electrical components that are reworked is between 7.4% and 13.0%.
D) All samples of size 450 will yield a percentage of reworked electrical components that falls within 7.4% and 13.0%.
E) The probability of 95% that the true number of electrical parts that have to be reworked is between 7.4% and 13.0% is 0.95.
Answer: B
Type: MC
Objective: 6

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14) Based on the 95% confidence interval, should the Quality Control Department conclude that the percentage of rework for the electrical components is lower than the rate of 12% for non-electrical components?
A) Yes, because the lower limit of the confidence interval is 7.4%.
B) Yes, because 12% is contained with the 95% confidence interval.
C) No, because 12% is contained with the 95% confidence interval.
D) No, because the upper limit of the confidence interval is 13.0%.
E) We cannot say since the sample size is not large enough.
Answer: C
Type: MC
Objective: 5

15) All else being equal, increasing the level of confidence desired will
A) tighten the confidence interval.
B) decrease the margin of error.
C) increase precision.
D) increase the margin of error.
E) increase the margin of error and tighten the confidence interval.
Answer: D
Type: MC
Objective: 3, 6, 7

16) Which of the following is not an assumption / condition required for constructing a confidence interval for the proportion?
A) Randomization condition
B) Linearity condition
C) Success/Failure condition
D) 10% condition
E) Independence assumption
Answer: B
Type: MC
Objective: 4

17) City officials want to estimate the proportion of visitors who are repeat visitors to the Rideau Canal Skateway. Suppose they find they need a sample size of 15 000 people to achieve a margin of error of ±0.01 percentage points with 99 percent confidence. This sample is too large to be practical. How can they reduce the sample size?
A) Use a lower confidence level.
B) Use a smaller margin of error.
C) Use a higher level of confidence.
D) Conduct a census.
E) Use a higher confidence level and a smaller margin of error.
Answer: A
Type: MC
Objective: 3, 6, 7

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18) A sample of 250 people resulted in a confidence interval estimate of between 0.14 and 0.20 for the proportion of people who believe that the federal government's proposed tax increase is justified. Based on this information, what was the confidence level used in this estimation?
A) Approximately 79%
B) 95%
C) Approximately 36.9%
D) Approximately 1.26%
E) It cannot be determined with the information given.
Answer: A
Type: MC
Objective: 8

19) A human resources manager wishes to estimate the proportion of employees in her large company who have supplemental health insurance. What is the sample size she should select if she wants 95 percent confidence and a margin of error of ± 0.01?
A) 9604
B) 3458
C) 6765
D) 381
E) 4096
Answer: A
Type: MC
Objective: 7, 8

20) A financial analyst is interested in estimating the proportion of publicly traded companies on the Toronto Stock Exchange that have cash balances of more than 10 percent of the total assets of the company. A random sample of 100 companies shows that 13 had cash balances of more than 10 percent of assets. The 90 percent confidence interval estimate is
A) 0.0641 to 0.1959.
B) -0.0870 to 0.1730.
C) -0.0507 to 0.1494.
D) 0.0747 to 0.1853.
E) -0.0412 to 0.1588.
Answer: D
Type: MC
Objective: 6

21) City officials want to estimate the proportion of visitors who are repeat visitors to the Rideau Canal Skateway. From previous experience they believe the proportion is not larger than 20 percent. They want to estimate the proportion to within ± 0.04 percentage points with 95 percent confidence. The sample size they should use is
A) 385.
B) 601.
C) 97.
D) 10.
E) 248.
Answer: A
Type: MC
Objective: 7

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22) City officials want to estimate the proportion of visitors who are repeat visitors to the Rideau Canal Skateway. They take a sample of 400 visitors and find that 100 are on a second visit. The 95% confidence interval is
A) 0.1942 to 0.3058.
B) 0.2144 to 0.2856.
C) 0.2076 to 0.2924.
D) 0.1996 to 0.3004.
E) 0.2222 to 0.2777.
Answer: C
Type: MC
Objective: 6

23) The produce manager for a local Sobey's store is interested in estimating the percentage of apples that arrive on a shipment with bruises. A random sample of 150 apples showed 14 with bruises. Based on this information, what is the margin of error for a 95 percent confidence interval estimate?
A) 0.0466
B) 0.0933
C) 0.0006
D) 0.0238
E) 0.0392
Answer: A
Type: MC
Objective: 3

24) A study was recently conducted at a major university to estimate the difference in the proportion of business school and non-business school graduates who go on to a higher degree programme within five years of graduation A random sample of 400 business school graduates showed that 75 had gone to graduate school, while in a random sample of 500 non-business graduates, 137 had done so. The standard error for the difference in the proportions of the two groups is
A) 0.
B) 0.0279.
C) 0.0008.
D) 0.0865.
E) 0.1875.
Answer: B
Type: MC
Objective: 2

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25) A study was recently conducted at a major university to estimate the difference in the proportion of business school and non-business school graduates who go on to a higher degree programme within five years of graduation A random sample of 400 business school graduates showed that 75 had gone to graduate school, while in a random sample of 500 non-business graduates, 137 had done so. The 95% confidence interval is
A) -0.1412 to -0.0318.
B) -2.0465 to 1.8375.
C) -0.0880 to -0.0850.
D) -0.1144 to -0.0586.
E) -0.0873 to -0.0857.
Answer: A
Type: MC
Objective: 6

26) City officials want to estimate the proportion of visitors who are repeat visitors to the Rideau Canal Skateway. They take a sample of 400 visitors and find that 100 are on a second visit. The 99% confidence interval is 0.1942 to 0.3058. What is the correct interpretation of the interval?
A) The proportion of repeat visitors is between 19.42% and 30.58%.
B) The probability is 95% that between 19.42% and 30.58% of visitors are on a second visit.
C) We are 99% confident that between 19.42% and 30.58% of visitors are on a second visit.
D) The margin of error is between 19.42% and 30.58%.
E) All samples of 400 will have between 19.42% and 30.58% of visitors on a second visit.
Answer: C
Type: MC
Objective: 5, 6

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Part 2 Tests

1 Test A

A survey of investors finds that 60% use a full service brokerage firm to invest in stocks, 30% trade stocks online, and 24% do both.

1) The probability that an investor selected at random uses a full service brokerage firm to invest in stocks or trades stocks online is
A) 90%.
B) 66%.
C) 34%.
D) 54%.
E) 60%.
Answer: B
Type: MC
Objective: 5.4, 5.5

2) The probability that an investor selected at random neither uses a full service brokerage firm to invest in stocks nor trades online is
A) 90%.
B) 66%.
C) 34%.
D) 10%.
E) 60%.
Answer: C
Type: MC
Objective: 5.4, 5.5

3) A researcher is conducting a study on eating disorders. Using a list of recent participants in the online Weight Watchers program, she randomly selects a name from the alphabetized list. She then chooses every tenth person from that point on to include in her study. This sampling strategy is called
A) Systematic.
B) Cluster.
C) Random.
D) Stratified.
E) Judgmental.
Answer: A
Type: MC
Objective: 7.2

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4) Suppose a sample of 60 business majors revealed that the average time spent studying per week is 22 hours with a standard deviation of 4 hours. For one student reporting that he studies 16 hours per week, the corresponding z score is
A) -1.5.
B) 1.5.
C) 2.2.
D) -2.2.
E) -3.0.
Answer: A
Type: MC
Objective: 7.1

An advocacy group is investigating whether gender has an effect on job category in large investment firms. She surveyed a sample of firms with the following results:

Job Category	*Male*	*Female*
Clerical / Technical	85	215
Professional Staff	720	480
Executive / Managerial	400	100

5) What is the probability that a randomly selected employee's job category is executive/managerial?
A) 0.20
B) 0.80
C) 0.13
D) 0.45
E) 0.25
Answer: E
Type: MC
Objective: 5.3, 5.5

6) What is the probability that a randomly selected employee's job category is executive/managerial given that she is female?
A) 0.13
B) 0.20
C) 0.80
D) 0.05
E) 0.45
Answer: A
Type: MC
Objective: 5.3, 5.5

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7) Which of the following statements is true about gender and job category?
A) Gender and job category are independent.
B) Gender and job category are not independent.
C) Gender and job category are mutually exclusive.
D) Gender and job category are independent and mutually exclusive.
E) There is not sufficient information to determine whether gender and job category are independent or mutually exclusive.
Answer: B
Type: MC
Objective: 5.6

A men's clothing store has determined the following probability distribution for the number of special size orders placed per month. The distribution is as follows:

Number Ordered	Probability
0	**0.10**
5	**0.10**
10	**0.12**
15	**0.30**
20	**0.38**

8) The number of special size orders this men's clothing store can expect per month is
A) 13.8.
B) 20.
C) 15.
D) 14.2.
E) 12.5.
Answer: A
Type: MC
Objective: 6.2

9) The standard deviation in the number of special size orders placed per month is
A) 24.516.
B) 4.95.
C) 15.345.
D) 6.55.
E) 3.88.
Answer: D
Type: MC
Objective: 6.2

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10) The number of claims for lost luggage in a small city airport averages nine per day. Assuming the Poisson distribution, what is the probability that there will be fewer than 3 claims on any given day?
A) 0.0150
B) 0.0212
C) 0.0062
D) 0.0337
E) 0.5000
Answer: C
Type: MC
Objective: 6.5

11) In a particular production process, drying times for newly painted parts are uniformly distributed between 2 and 8 minutes. The probability that a part dries in less than 6 minutes is
A) 2/6.
B) 2/8.
C) 3/6.
D) 4/6.
E) 4/8.
Answer: D
Type: MC
Objective: 7.7

Insurance company records indicate that 10% of its policyholders file claims involving theft or robbery of personal property from their homes. Suppose a random sample of 400 policyholders is selected.

12) The standard deviation of the sampling distribution of the sample proportion of policyholders filing claims involving theft or robbery from their homes is
A) 0.000225.
B) 0.25.
C) 0.0455.
D) 0.1667.
E) 0.015.
Answer: E
Type: MC
Objective: 9.2

13) The probability that the sample proportion of policyholders filing claims involving theft or robbery from their homes is less than 8% is
A) 0.0918.
B) 0.1333.
C) 0.4082.
D) 0.0517.
E) 0.7892.
Answer: A
Type: MC
Objective: 9.1

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In economic downturns companies attempt to downsize their workforces by offering early retirement incentives to older employees. A survey of 723 companies found that 195 engage in such downsizing practices.

14) The estimated proportion of companies that downsize their workforces by offering early retirement incentives is
A) 0.50.
B) 0.73.
C) 195.
D) 0.27.
E) 0.67.
Answer: D
Type: MC
Objective: 9.1

15) The 99% confidence interval for the proportion of companies that downsize their workforces by offering early retirement incentives is
A) 0.19 to 0.35.
B) 0.65 to 0.81.
C) 0.19 to 0.47.
D) 0.69 to 0.77.
E) 0.23 to 0.31.
Answer: E
Type: MC
Objective: 9.6

2 Test B

A publishing company conducted a survey of its readership and found that 60% subscribed to *Food & Wine*, 30% subscribed to *Wine Spectator*, and 25% subscribed to both.

1) The probability that a reader subscribes to *Food & Wine* or *Wine Spectator* is
A) 0.90.
B) 0.65.
C) 0.25.
D) 0.50.
E) 0.85.
Answer: B
Type: MC
Objective: 5.3, 5.5

2) The probability that a reader does not subscribe to either is
A) 0.10.
B) 0.65.
C) 0.50.
D) 0.45.
E) 0.35.
Answer: E
Type: MC
Objective: 5.3, 5.5

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A government agency has 6000 employees. As an alternative to the traditional five-day work week, employees were asked whether they preferred a four-day work week (10 hours per day) or flexible hours. The table below shows the results by age category.

Age Category	*Prefers 4-Day Week*	*Prefers Flex Hours*
Under 30	600	300
30 - 45	1200	1500
Over 45	2100	300

3) What is the probability that an employee at this government agency prefers a four-day work week?
A) 0.54
B) 0.15
C) 0.50
D) 0.35
E) 0.65
Answer: E
Type: MC
Objective: 5.3, 5.5

4) What is the probability that an employee prefers flex hours given that he/she is in the 30-45 age group?
A) 0.90
B) 0.56
C) 0.31
D) 0.80
E) 0.67
Answer: B
Type: MC
Objective: 5.3, 5.5

5) Which of the following statements is true about work week preferences and age category?
A) Work-week preferences are independent of age category.
B) Work-week preferences are mutually exclusive.
C) Work-week preferences are not independent of age category.
D) Work-week preferences are independent and mutually exclusive.
E) There is insufficient information to determine whether work-week preferences and age category are independent or mutually exclusive.
Answer: C
Type: MC
Objective: 5.6

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IT staff for a large corporation has developed the following probability distribution for the number of calls requiring troubleshooting problems per day.

Number of Calls	Probability
0	**0.32**
1	**0.35**
2	**0.18**
3	**0.10**
4	**0.05**

6) The expected number of calls per day is
A) 2.77.
B) 1.56.
C) 1.21.
D) 1.31.
E) 1.
Answer: C
Type: MC
Objective: 6.2

7) The standard deviation in the number of calls per day is
A) 1.31.
B) 1.14.
C) 2.77.
D) 1.56.
E) 1.21.
Answer: B
Type: MC
Objective: 6.2

8) A researcher is conducting a study on Internet use. He decides to first categorize the population by education level (high school, college graduate, advanced degree, etc.) and then survey a select number from each category. This sampling strategy is called
A) Systematic.
B) Cluster.
C) Random.
D) Judgmental.
E) Stratified.
Answer: E
Type: MC
Objective: 8.2

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9) Suppose a sample of 60 cans of soda has a mean of 12.1 ounces and a standard deviation of 0.05 ounces. If a can of soda has 12 ounces, what is its corresponding *z* score?
A) 2.0
B) -2.0
C) 1.8
D) -3.0
E) -1.8
Answer: B
Type: MC
Objective: 7.1

10) As a result of the financial crisis on Wall Street in September 2008 that required federal government intervention, a survey showed that 40% of Americans reallocated their investments to reduce exposure to the stock market. What is the probability that of 5 randomly selected Americans, none will have reallocated their investments in this way?
A) 0.2592
B) 0.8154
C) 0.1699
D) 0.0778
E) 0.1234
Answer: D
Type: MC
Objective: 9.1

11) One of the machines used to press plastic into sheets results in a thickness that varies uniformly between 150 to 200 millimeters. The probability that the thickness of a randomly selected sheet is less than 185 millimeters is
A) 0.70.
B) 0.30.
C) 0.50.
D) 0.65.
E) 0.35.
Answer: A
Type: MC
Objective: 7.7

12) If a population is normally distributed with $\mu = 500$ and $\sigma = 50$, and a sample of size 20 is selected, the probability that the sample mean falls between 450 ad 550 will be _____ the probability that an individual value falls between 450 and 550.
A) the same as
B) less than
C) greater than
D) less than or the same as
E) not enough information given
Answer: C
Type: MC
Objective: 7.4

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Suppose the time it takes for a purchasing agent to complete an online ordering process is normally distributed with a mean of 8 minutes and a standard deviation of 2 minutes. Suppose a random sample of 25 ordering processes is selected.

13) The standard deviation of the sampling distribution of mean times is
A) 0.4 minutes.
B) 2 minutes.
C) 0.08 minutes.
D) 1.6 minutes.
E) 0.12 minutes.
Answer: A
Type: MC
Objective: 6.2

14) What is the probability that the sample mean will be less than 7.5 minutes?
A) 0.3944
B) 0.1056
C) 0.2114
D) 0.4013
E) 0.8944
Answer: B
Type: MC
Objective: 7.4

15) Which is true about a 99% confidence interval based on a given sample?

I. The interval contains 99% of the population.
II. Results from 99% of all samples will lie in this interval.
III. The interval is wider than a 95% confidence interval would be.

A) I only
B) II only
C) III only
D) I and III
E) None
Answer: C
Type: MC
Objective: 9.6

16) After computing a confidence interval, the investigator believes that the results are meaningless because the width of the interval is too large. In reconstructing the interval, the investigator should
A) decrease the sample size.
B) increase the level of confidence.
C) increase the sample size.
D) reduce the population variance.
E) none of the above
Answer: C
Type: MC
Objective: 9.7

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17) A human resources manager at a large company wants to estimate the proportion of employees that would be interested in reimbursement for college courses. If she wishes to be 95% confident that her estimate is within 5% of the true proportion, how many employees would need to be sampled?
A) 271
B) 385
C) 543
D) 646
E) 1234
Answer: B
Type: MC
Objective: 9.7

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