KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
MATHEMATICS DEPARTMENT

STAT 211 BUSINESS STATISTICS I
Semester 211, Second Exam
Tuesday November 9, 2021
Time allowed 90 minutes

Name: ____ ID #: ___________________________

Section #: ____ Serial #: _________________________

😊Important Note:

- Formula sheet will be provided to you in exam. You are not allowed to bring, with you, formula sheet or any other printed/written paper.
- Mobiles are not allowed in exam. If you have your mobile with you, turn it off and put it under your seat so that it is visible to proctor.
- Make sure you have 7 unique pages of exam paper (including this title page), normal table and formula sheet.

From an inventory of 48 new cars being shipped to local dealerships, corporate reports indicate that 12 have defective radios installed. The sales manager of one dealership wants to predict the probability out of the 8 new cars it just received that, when each is tested, exactly half of the cars have defective radios.

based on the above information, solve the next **2** questions

1. What type of probability distribution will most likely be used to analyze the number of cars with defective radios?

    a. Hypergeometric distribution.
    b. Binomial distribution.
    c. Poisson distribution.
    d. Uniform distribution.
    e. Normal distribution

Since the sample selected from finite population, the distribution is hypergeometric

2. What is the probability out of the 8 new cars it just received that, when each is tested, exactly half of the cars have defective radios?

    a. 0.0772
    b. 0.0802
    c. 0.3407
    d. 0.2655
    e. 0.6062

$$P(X = 4) = \frac{C_4^{12} C_4^{36}}{C_8^{48}} = 0.0772$$

The following table represents the probability distribution for the household size for the owner-occupied housing unit Al-Khobar.

The size	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Probability	0.05	0.06	0.15	0.27	0.23	a	0.1

based on the above information, solve the next **2** questions

3. Find probability that only 5 or 6 people on it?

    a. 0.37
    b. 0.14
    c. 0.13
    d. 0.46
    e. 0.23

$$a = 1 - P(X = 1) - P(X = 2) - P(X = 3) - P(X = 4) - P(X = 5) - P(X = 7) = 0.14$$
$$P(X = 5) + P(X = 6) = 0.23 + 0.14 = 0.37$$

4. What is the mean household size?

    a. 4.39
    b. 4.33
    c. 4.67
    d. 4.81
    e. 4

$$\mu = \sum xP(X = 5) = 4.39$$

The number of power outages at a nuclear power plant has a Poisson distribution with a mean of 6 outages per year.

based on the above information, solve the next **3** questions

5. The probability that there will be exactly 3 power outages in a year is

a. 0.0892
b. 0.0173
c. 0.1487
d. 0.0504
e. 0.2240

X~ Poisson with $\lambda = 6$ & $t = 1\ year \rightarrow \lambda t = 6$

$$P(X = 5) = \frac{6^5 e^{-6}}{5!} = 0.0892$$

6. The probability that there will be no more than 1 power outage in half a year is

a. 0.1991
b. 0.0173
c. 0.1487
d. 0.9826
e. 0.8009

X~ Poisson with $\lambda = 6$ & $t = \frac{1}{2}\ year \rightarrow \lambda t = 3$

$$P(X \leq 1) = P(X = 0) + P(X = 1)$$
$$= \frac{3^0 e^{-3}}{0!} + \frac{3^1 e^{-3}}{1!} = 0.1991$$

7. The expected number of power outage in 3 months is

a. 1.5
b. 6
c. 2
d. 3
e. 4

X~ Poisson with $\lambda = 6$ & $t = \frac{1}{4}\ year$

$$\mu = \lambda t = 6\left(\frac{1}{4}\right) = 1.5$$

8. Data were collected from a sample of 35 college students in response to the question 'Do you currently own share in any stocks?' In response, 16 students said 'No'. Determine the sample proportion of college students who own shares of stock.

a. 0.5429
b. 0.1
c. 0
d. 0.5
e. 0.4671

$$\pi = \frac{x}{n} = \frac{35 - 16}{35} = \frac{19}{35} = 0.5429$$

A company is considering drilling ten oil wells. The probability of success for each well is 0.3, independent of the results for any other well.

based on the above information, solve the next **4** questions

9. What type of probability distribution will most likely be used to analyze the number of successful wells?

a. Binomial distribution.
b. Hypergeometric distribution.
c. Poisson distribution.
d. Uniform distribution.
e. Normal distribution

Since we select fixed number of wells with two possible outcomes and the wells independent with probability success equally likely in all locations, the distribution is binomial

10. What is the probability that exactly five wells will be successful?

a. 0.1029
b. 0.2001
c. 0.0367
d. 0.0009
e. 0.2401

$$P(X=5) = C_5^{10}(0.3)^5(0.7)^5 = 0.1029$$

11. What is the probability that one or more wells will be successful?

a. 0.9717
b. 0.0282
c. 0.8506
d. 0.9596
e. 0.8789

$$P(X \geq 1) = 1 = P(X=0) = 1 - 0.7^{10} = 0.9717$$

12. Each well that is successful will be worth $700000. What is the expected return?

a. $2100000
b. $100000
c. $210000
d. $7000000
e. - $100000

$$return = n\pi(700000)$$

$$= 10(0.3)(700000) = \$2100000$$

The time (in years) **after** reaching age 60 that it takes an individual to retire is approximately exponentially distributed with a mean of about five years. Suppose we randomly pick one retired individual. We are interested in the time after age 60 to retirement.

based on the above information, solve the next **3** questions

13. Find the probability that the person retired before age 70.

a. 0.8646
b. 0
c. 0.1353
d. 0.0183
e. 0.3678

X~ Exponential with $\mu = 5$

$$P(X < 10) = 1 - e^{-\frac{10}{5}}$$
$$= 0.8646$$

14. In a room of 1,000 people over age 70, how many do you expect will NOT have retired yet?

a. 135.3
b. 981.7
c. 18.3
d. 864.6
e. 20.3

$$number\ of\ not\ retired = n\pi$$
$$= 1000(1 - 0.8646)$$
$$= 135.3$$

15. What is the median lifetime of retirement?

a. 63.46 years
b. 3.46 years
c. 60.14 years
d. 0.14 years
e. 60 years

$$0.5 = P(X < a) = 1 - e^{-\frac{1}{5}a} \quad \rightarrow \quad e^{-\frac{1}{5}a}$$
$$= 0.5 \quad \rightarrow \quad -\frac{1}{5}a$$
$$= \ln 0.5 \quad \rightarrow \quad a$$
$$= -5 \ln 0.5 = 3.46$$

Since the retirement after 60, the median lifetime of retirement

$$= 60 + 3.46 = 63.46\ years$$

16. 46 percent of the population favor to shop from Hyper Panda. A random sample of 500 is taken from Al Khobar. Using the continuity correction factor, approximate the probability that at least 250 favor to shop from Hyper Panda.

a. 0.0401
b. 0.9599
c. 0.0329
d. 0.9671
e. 0.0367

$$P(X \geq 250) = P(X \geq 249.5)$$
$$= P\left(Z \geq \frac{249.5 - 500(0.46)}{\sqrt{500(0.46)(1 - 0.46)}}\right)$$
$$= P(Z \geq 1.75) = P(Z \leq -1.75)$$
$$= 0.0401$$

The weights of cans of soup produced by a company are normally distributed with a mean of 15 ounces and a standard deviation of 0.5 ounces.

based on the above information, solve the next **3** questions

17. What is the probability that a can of soup selected randomly from the entire production will weigh at least 15.75 ounces?

a. 0.0668
b. 0.10
c. 0.50
d. 0.9332
e. 0.90

X~ normal with $\mu = 15$ & $\sigma = 0.5$

$$P(X \geq 15.75) = P\left(Z \geq \frac{15.75 - 15}{0.5}\right) = P(Z \geq 1.5)$$
$$= P(Z \leq -1.5) = 0.0668$$

18. If 28,390 of the cans of soup of the entire production weigh at least 15.75 ounces, how many cans of soup have been produced?

a. 425000
b. 30422
c. 28390
d. 141950
e. 1000000

$$P(X \geq 15.75) = 0.0668 = \frac{f}{n} = \frac{28390}{n}$$

$$n = 28390(0.0668) = 425000$$

19. Determine minimum weight of the heaviest 4% of all cans of soup produced.

a. 15.875
b. 14.125
c. 15.8225
d. 14.1775
e. 15.98

$$0.04 = P(X \geq a) = P\left(Z \geq \frac{a - 15}{0.5}\right)$$
$$0.96 = P\left(Z < \frac{a - 15}{0.5}\right)$$
$$\frac{a - 15}{0.5} = 1.75$$
$$a = 1.75(0.5) + 15 = 15.875$$

20. In a recent report, it was stated that the proportion of employees who carpool to their work is 0.22. If a sample of 124 employees is selected, what is the standard error of sample proportion?

a. 0.0372
b. 0.22
c. 21.2784
d. 4.6129
e. 0.0014

Since $n\pi = 27.28 > 5$ & $n(1 - \pi) = 59.72 > 5$

$\hat{p} \overset{approx}{\sim} normal$ with $\mu_{\hat{p}} = n\pi = 27.28$ and

$$\sigma_{\hat{p}} = \sqrt{\frac{0.22(1 - 0.22)}{124}} = 0.0372$$

Suppose that the value of a stock varies each day from $16 to $25 with a uniform distribution,

based on the above information, solve the next **3** questions

21. The probability to find that the value of the stock is $19.6 is

a. 0
b. 0.4
c. 0.6
d. 0.7
e. 0.8571

X~ uniform over the interval $(16, 25)$

$$P(X = 19.6) = 0$$

22. The probability to find that the value of stock is more than $19.6 is

a. 0.6
b. 0.4
c. 0
d. 0.7
e. 0.8571

$$P(X > 19.6) = \frac{25 - 19.6}{25 - 16} = 0.6$$

23. Given that the stock is grater $18.7, then the probability to find that the stock is more than $19.6 is

a. 0.8571
b. 0.4
c. 0
d. 0.7
e. 0.6

$$P(X > 19.6 | X > 18.7) = \frac{P(X > 19.6 \cap X > 18.7)}{P(X > 18.7)} = \frac{P(X > 19.6)}{P(X > 18.7)} = \frac{25 - 19.6}{25 - 18.7} = 0.8571$$

24. Suppose the life of a particular brand of calculator battery is approximately normally distributed with a mean of 79 hours and a standard deviation of 10 hours. What is the probability that 25 randomly sampled batteries from the population will have a sample mean life of less than 83 hours?

a. 0.9772
b. 0.5319
c. 0.0228
d. 0.3446
e. 0.6556

X~ normal with $\mu = 15$ & $\sigma = 0.5$
$\bar{X}$~ normal with $\mu_{\bar{x}} = 15$ & $\sigma_{\bar{x}} = \frac{10}{\sqrt{25}} = 2$

$$P(\bar{X} < 83) = P\left(Z < \frac{(83 - 79)\sqrt{25}}{10}\right) = P(Z < 2) = 0.9772$$

25. In a popular Grocery store in Dhahran, one of the notable complaints by older people is of the waiting time to check out after shopping. This waiting time is known to have a left skewed distribution with a mean of 21.6 minutes and a standard deviation of 7 minutes. Suppose 64 older people have been randomly sampled. Describe the sampling distribution of the mean waiting time for these 64 older people.

a. approximately normal with mean 21.6 minutes and standard error 0.875 minutes.
b. heavily skewed with mean 21.6 minutes and standard error 0.875 minutes.
c. approximately normal with mean 21.6 minutes and standard error 7 minutes.
d. heavily skewed with mean 21.6 minutes and standard error 7 minutes.
e. exponential with mean 21.6 minutes and standard error 21.6 minutes.

Since the sample selected from skewed population, by C.L.T, the sample mean approximately normal with mean $\sigma_{\bar{x}} = 21.6$ and standard error $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{7}{\sqrt{64}} = \frac{7}{8} = 0.875$