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Instructions: Complete the following exercises in a clear and specific, use Minitab. Value 5pts each part.

1. According to government data, 30% of working women have never been married, choosing a random sample of 11 women workers. What is the probability that

a) Exactly 2 of them have never been married?

$$X \sim B(11, .3)$$

$$P(2) = .1998$$

b) At most 3 of them have never been married?

$$P(X \leq 3) = .5696$$

c) At least 7 of them have been married?

$$P(X \geq 7) = .7897$$

$$= P(X \leq 4) = .7897$$

2. In a clinical study found that 1 in 5 people suffer from mental illness. We randomly selected 30 people:
 a) What is the probability that 7 of these people suffer from mental illness?

$$P = \frac{5}{1} = .2 \quad n = 30 \quad X \sim B(30, .2)$$

$$P(7) = .1538$$

b) What is the probability that at least 8 of these people do not suffer from mental illness?

$$\begin{aligned} &\text{Do not suffer} \\ &X \sim B(30, .2) \\ &P(X \leq 22) = 1 \end{aligned}$$

$$X \sim B(30, \frac{4}{5})$$

$$X \sim B(30, .8)$$

$$P(X \geq 8) = 1 - P(X \leq 7)$$

$$= 1 - 0$$

$$= 1$$

$$P(X \leq 6) = F(6) = .60697$$

c) What is the probability that at most 6 suffer from mental illness?

3. In his doctoral thesis, L. A. Beckel (University of Minnesota, 1982) studied the social behavior of river otters during the mating season. An important role in the bonding process of river otters is very short periods of social grooming. After extensive observations, Dr. Beckel found that one group of river otters under study had a frequency of initiating grooming of approximately 1.7 for each 10 minutes. Suppose that you are observing river otters for 30 minutes. Let $r = 0, 1, 2, \dots$ be a random variable that represents the number of times (in a 30-minute interval) one otter initiates social grooming of another.

(a) What is λ ? (Use 2 decimal places.)

$$\lambda = 1.7 / 10 \text{ min}$$

$$\lambda = (1.7)(3) / 30 \text{ min} = 5.1 / 30 \text{ min}$$

(b) Find the probabilities that in your 30 minutes of observation, one otter will initiate social grooming four times, five times, and six times.

$$P(4) = .1719$$

$$P(5) = .1753$$

$$P(6) = .149$$

(c) Find the probability that one otter will initiate social grooming four or more times during the 30-minute observation period.

$$P(X \geq 4) = 1 - P(X \leq 3) = 1 - F(3) = .7487$$

(d) Find the probability that one otter will initiate social grooming less than four times during the 30-minute observation period.

$$P(X < 4) = P(X \leq 3) = F(3) = .2513$$

4. Richard has just been given a 6-question multiple-choice quiz in his history class. Each question has six answers, of which only one is correct. Since Richard has not attended class recently, he doesn't know any of the answers. Assuming that Richard guesses on all six questions, find the indicated probabilities.

(a) What is the probability that he will answer all questions correctly?

$$n = 6 \quad p = \frac{1}{6} = .1667$$

$$X \sim B(6, .1667)$$

$$P(6) = .0000215$$

(b) What is the probability that he will answer all questions incorrectly?

$$P(0) = .3348$$

(c) What is the probability that he will answer at least one of the questions correctly?

$$P(X \geq 1) = 1 - P(0) = 1 - .3348 = .6652$$

(d) What is the probability that Richard will answer at least half the questions correctly?

$$P(X \geq 3) = 1 - F(2) = 1 - .9377 = .0623$$

5. An teacher assigned 15 exercises of which will choose 7 for the test.

a. What is the probability of make the 7, if Sara just make 10 right?

Examen anterior

b. What is the expected value for Sara?

c. What is the standard deviation?

d. If Sara make 7 out of 7, that is a outlier?

6. Susan is taking Western Civilization this semester on a pass/fail basis. The department teaching the course has a history of passing 69% of the students in Western Civilization each term. Let $n = 1, 2, 3, \dots$ represent the number of times a student takes Western Civilization until the *first* passing grade is received. (Assume the trials are independent.)

$$p = 0.69 \quad p(1) = 0.69 \quad x \sim G(0.69)$$

(b) What is the probability that Susan first passes on the second try ($n = 2$)?

$$P(2) = 0.2139$$

(c) What is the probability that Susan needs three or more tries to pass Western Civilization?

$$P(x > 3) = 1 - F(3) = 1 - 0.9039 = 0.0961$$

(d) What is the expected number of attempts at Western Civilization Susan must make to have her (first) pass? *Hint: Use μ* for the geometric distribution and round.

$$\mu = \frac{1}{p} = \frac{1}{0.69} = 1.449$$

7. *USA Today* reported that approximately 25% of all state prison inmates released on parole become repeat offenders while on parole. Suppose the parole board is examining five prisoners up for parole. Let x = number of prisoners out of five on parole who become repeat offenders.

x	0	1	2	3	4	5
$P(x)$	0.211	0.379	0.220	0.170	0.019	0.001

(a) Find the probability that one or more of the five parolees will be repeat offenders.

$$P(x \geq 1) = 1 - P(0) = 1 - 0.211 = 0.789$$

(b) Find the probability that two or more of the five parolees will be repeat offenders.

$$P(x \geq 2) = 1 - F(1) = 1 - (0.211 + 0.379) = 1 - 0.59 = 0.41$$

(c) Find the probability that four or more of the five parolees will be repeat offenders.

$$P(x \geq 4) = 1 - F(3) = 0 \quad P(x \geq 4) = 0.019 + 0.001 = 0.02$$

(d) Compute μ , the expected number of repeat offenders out of five.

$$\mu = \sum xp(x) = 0(0.211) + 1(0.379) + 2(0.22) + 3(0.17) + 4(0.019) + 5(0.001) = 1.41$$

(e) Compute σ , the standard deviation of the number of repeat offenders out of five.

$$\sigma = \sqrt{\sum (x - \mu)^2 p(x)} = (0 - 1.41)^2(0.211) + (1 - 1.41)^2(0.379) + \dots + (5 - 1.41)^2(0.001) = 1.1299$$

$$X \sim N(85, 20)$$

8. A person's blood glucose level and diabetes are closely related. Let x be a random variable measured in milligrams of glucose per deciliter (1/10 of a liter) of blood. Suppose that after a 12-hour fast, the random variable x will have a distribution that is approximately normal with mean $\mu = 85$ and standard deviation $\sigma = 20$. Note: After 50 years of age, both the mean and standard deviation tend to increase. For an adult (under 50) after a 12-hour fast, find the following probabilities.

(a) x is more than 60

$$P(X > 60) = 1 - F(60) = 1 - 0.1057 = 0.8943$$

(b) x is less than 110

$$F(110) = 0.8944$$

(c) x is between 60 and 110

$$P(60 \leq X \leq 110) = F(110) - F(60) = 0.8944 - 0.1057 = 0.7887$$

(d) x is greater than 140 (borderline diabetes starts at 140)

$$P(X > 140) = 1 - F(140) = 1 - 0.997 = 0.003$$

(e) Find the value that give the 10% of the lower blood glucose level.

$$x = ? \quad P(X \leq z) = 0.10 \quad X = 59.369 \quad \text{Inverse}$$

(f) Find the value that give the 10% of the upper blood glucose level.

$$90\% = 10\% \text{ upper} \quad X = 110.631$$

Bono (5pts)

a) What is the problem with Non random samples?

b) Why they get the expectancy on life wrong?

c) What is the reason about the fall in SAT scores?

d) How they use a Non Random sample to put more armor in the planes? How they check the assumptions?