10 questions 50min
7 MC
3 FR

Math 2311
Test 1 Review

Know all definitions!

1. State whether each situation is categorical or quantitative. If quantitative, state whether it's discrete or continuous.

a. The amount a person grew (in height) in a year.
categorical, quantitative discrete or quantitative continuous

b. The number of classes a student missed.
categorical, quantitative discrete or quantitative continuous

c. Letter Grades.
categorical, quantitative discrete or quantitative continuous

2. Six people were asked how many movies they saw last month. The results were:

2 6 1 3 4 2

a. Find the mean and median.
Commands:

movies=c(2,6,1,3,4,2)
mean(movies) =3
median(movies) = 2.5

b. Find the variance and the standard deviation.
Commands:

var(movies)=3.2
sd(movies)=1.79

c. Find the five-number summary, IQR and range.
Commands:

fivenum(movies)

Min	Q1	Q2	Q3	MAX
1	2	2.5	4	6
		median		

$IQR = Q3 - Q1 = 4 - 2 = \boxed{2}$

$Range = MAX - MIN = 6 - 1 = \boxed{5}$

3. An organization needs to make up a social committee. If the organization has 25 members, in how many ways can a 10 person social committee be made? C(25,10)

Command: choose (25,10) Answer: 3,268,760

4. An organization has 30 members. In how many ways can the positions of president, vice-president, secretary, treasurer, and historian be filled if not one person can fill more than one position? P(30,5) = 30!/(30-5)!

Command: factorial(30)/factorial(30-5) Answer: 17,100,720

5. Suppose that from a group of 9 men and 8 women, a committee of 5 people is to be chosen.

a. In how many ways can the committee be chosen so that there are exactly 3 men? Then find the probability of this event.

17

9M 8W

3M 2W

Commands: Answers:

C(9,3)*C(8,2) choose(9,3)*choose(8,2)

$\frac{C(9,3)*C(8,2)}{C(17,5)}$ $\boxed{2352}$

2353/choose(17,5) $\boxed{0.3801}$

b. In how many ways can the committee be chosen so that there are no men? Then find the probability of this event.

17

9M 8W

0M 5W

Commands: Answers:

C(8,5) * ~~C(9,0)~~ 1

choose (8,5) $\boxed{56}$

choose(8,5)/choose (17,5) $\boxed{0.0090}$

1 or 2 or 3 or 4 or 5

c. What is the probability that the committee contains at least one man?

Command: Answer:

17 be smart, Use complement!

9M 8W

0M 5W

1-0.009 0.991

6. Find $A \cap (B^c \cup C)$ using $= \{3,4,6,8\} = A$

$U = \{1,2,3,4,5,6,7,8,9,10\}$

$A = \{3,4,6,8\}$

$B = \{1,2,5,9\}$ $B^c = \{3,4,6,7,8,10\}$

$C = \{2,4,6,8,10\}$

$B^c \cup C = \{2,3,4,6,7,8,10\}$

FR

7. Suppose that 58% of all customers of a large insurance agency have automobile policies with the agency, 42% have homeowner's policies, and 23% have both. What proportion of the groups will:

a. none of the polices?

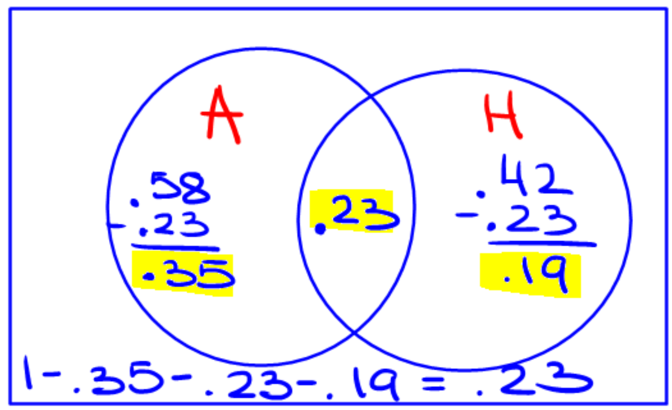
.23 or 23%

b. have auto or homeowners' or both?

$1 - .23 = .77$ or 77%

c. have only homeowners'?

.19 or 19%



FR

8. Suppose $P(A) = 0.72$, $P(B) = 0.46$ and $P(A \cup B) = 0.86$.

ME if NO! $P(A \cap B) = 0$

a. Find $P(A \cap B)$. Are A and B mutually exclusive (disjoint)?

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$.86 = .72 + .46 - P(A \cap B)$

$P(A \cap B) = -.86 + .72 + .46 = \boxed{.32}$

b. Find $P(A | B)$.

$$P(A | B) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{.32}{.46} = \boxed{.6957}$$

c. Are A and B independent?

Check if: $P(A \cap B) = P(A) \cdot P(B)$

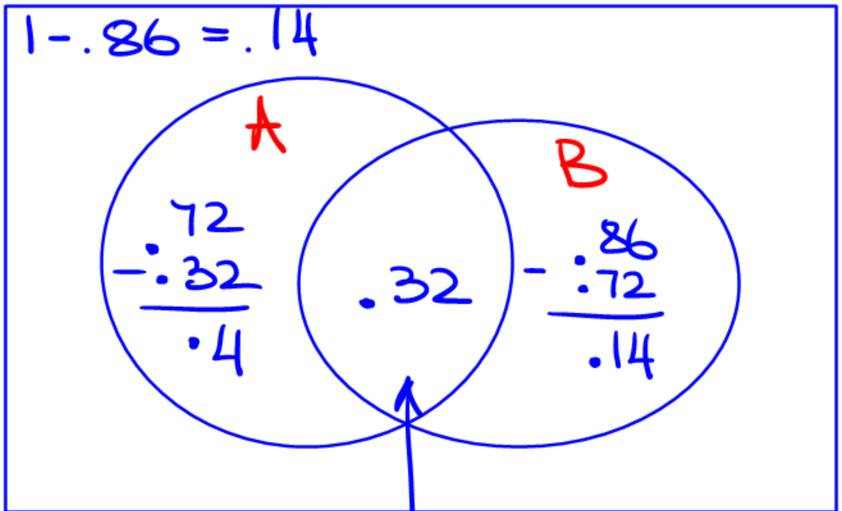
$.32 \overset{?}{\neq} .72 * .46$ NO

$P(A) = .72 \quad P(B) = .46 \quad P(A \cup B) = .86$

M.E.

$A \cap B = \emptyset$

$P(A \cap B) = 0$



$.46 - .14 = .32$

FR

9. Gabelli Partners is planning a major investment. The amount of profit X is uncertain but a probabilistic estimate gives the following distribution (in millions of dollars):

Profit	1	1.5	2	4	10
Probability	0.1	0.2	0.4	??	0.1

0.2

$P(X=4) = 1-(.1+.2+.4+.1)$

$= .2$

a. Find $P(1.5 \le X < 4)$

$= P(X=1.5)+P(X=2) = .2+.4 = \boxed{0.6}$

b. Find the mean profit and the variance of the profit.

$\mu_X = E[X] = x_1 p_1 + x_2 p_2 + \cdots + x_n p_n$

$\mu = 1(0.1)+1.5(0.2)+2(0.4)+4(0.2)+10(0.1) = 3$

\$ 3 mill

$\sigma_X^2 = Var[X] = E[X^2] - (E[X])^2$

$\sigma^2 = 1(0.1)+1.5^2(0.2)+2^2(0.4)+4^2(0.2)+10^2(0.1) - 3^2$

$= \boxed{6.35}$ $\sigma = sqrt(6.35)$

c. Gabelli Partners owes its source of capital a fee of \$200,000 plus 10% of the profits X. So the firm actually retains Y = .9X – 0.2 from the investment. Find the mean and standard deviation of Y.

$E[Y] = aE[X]+b$ $a = 0.9$ $b = -0.2$

$E(Y) = 0.9(3) - 0.2 = \boxed{2.5}$

$\sigma_Y = \sqrt{a^2 Var[X]} = \sqrt{0.9^2(6.35)} = \boxed{2.2679}$

FR

10. A headache remedy is said to be 80% effective in curing headaches caused by simple nervous tension. An investigator tests this remedy on 6 randomly selected patients suffering from nervous tension.
a. What kind of distribution does X have? Binomial or Geometric

Know properties! (4)

n=6

b. Calculate the mean and standard deviation of X.

$\mu = np = 6(.8) = \boxed{4.8}$

$\sigma = \sqrt{np(1-p)} = \sqrt{6(0.8)(0.2)} = \boxed{0.9798}$

1-0.8

c. Determine the probability that three subjects experience headache relief with this remedy.

P(X=3)

k

n=6
p=0.8

Command: Answer:

(k, n, p)
dbinom(3,6,0.8) 0.08192

d. Determine the probability that at most one subject experiences headache relief with this remedy.

$P(X \leq 1)$

Command: Answer:

pbinom(1,6,0.8) 0.0016

FR

11. A basketball player completes 64% of her free-throws. We want to observe this player during one game to see how many free-throw attempts she makes before completing one.
a. What type of distribution is this? Binomial or Geometric

Know the properties! (4)

b. What is the probability that the player misses 3 free-throws before she has makes one?

$P(X=4)$

Command: dgeom(4-1, .64)

Answer: 0.0299

c. How many free-throw attempts can the player expect to throw before she gets a basket?

$\mu = \frac{1}{p} = \frac{1}{0.64} = 1.5625$ $\boxed{2}$

d. Determine the probability that it takes more than 5 attempts before she makes a basket.

$P(X>5) = 1 - P(X \leq 5)$

Command: 1 - pgeom(5-1, 0.64)

Answer: 0.0060

12. A manufacturer produces a large number of toasters. From past experience, the manufacturer knows that approximately 1% are defective. In a quality control procedure, we randomly select 50 toasters for testing. We want to determine the probability that no more than one of these toasters is defective.

Binomial or Geometric

13. Draw a card from a standard deck of 52 playing cards, observe the card, and replace the card within the deck. Count the number of times you draw a card in this manner until you observe a jack.

Binomial or Geometric

Do the Practice Test (20 attempts) via your CASA account. It counts for extra credit!

Formulas to be provided.

It will be a handout or link!

$$s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$$

$$s = \sqrt{s^2}$$

$${}_nP_n = n(n-1)(n-2)\ldots 3\cdot 2\cdot 1 = n!$$

$${}_nP_r = \frac{n!}{(n-r)!}$$

$$P = \frac{n!}{r!s!t!}$$

$${}_nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

$$(A \cup B)^c = A^c \cap B^c$$

$$P(E) = \frac{n(E)}{n(S)}$$

$$P(E^c) = 1 - P(E)$$

$$P(E \cup F) = P(E) + P(F) - P(E \cap F)$$

$$P(E \mid F) = \frac{P(E \cap F)}{P(F)}$$

$$\mu_X = E[X] = x_1 p_1 + x_2 p_2 + \cdots + x_n p_n$$

$$\sigma_X^2 = Var[X] = (x_1 - \mu_X)^2 p_1 + (x_2 - \mu_X)^2 p_2 + \cdots + (x_n - \mu_X)^2 p_n$$

$$= \sum (x_i - \mu_X)^2 p_i$$

$$\sigma_X^2 = Var[X] = E[X^2] - (E[X])^2$$

$$E[W] = E[aX + b] = aE[X] + b$$

$$\sigma_W^2 = Var[W] = Var[aX + b] = a^2 Var[X]$$

$$E[X+Y]=E[X]+E[Y]$$

$$\sigma^2_{X+Y}=Var[X+Y]=Var[X]+Var[Y]$$

$$E[X-Y]=E[X-Y]=E[X]-E[Y]$$

$$\sigma^2_{X-Y}=Var[X-Y]=Var[X]+Var[Y]$$

$$P(X=k)=\binom{n}{k}p^k(1-p)^{n-k}$$

$$P(X\geq k)=1-P(X\leq(k-1))$$

$$\mu=E\left[X\right]=np$$

$$\sigma^2=np(1-p)$$

$$P(X=n)=(1-p)^{n-1}p$$

$$P(X>n)=(1-p)^n$$

$$E[X]=\mu=\frac{1}{p}$$

$$\sigma^2=\frac{1-p}{p^2}$$