Math 3339

Section 27204
MWF 10-11:00am AAAud 2

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Office Hours:
M & Th noon – 1:00 pm & T 1:00 – 2:00 pm
and by appointment

Test 1

Ch 1 - 4.8   (Stop w/ Discrete Distr.)

- 12 - 15 problems -

R Studio / no calculator

75 min.

19. Suppose that for events A and B, $P(A)=0.4$, $P(B)=0.3$, and $P(A \cup B)=0.5$.

    a. Compute $P(A|B)$

    b. Are events A and B independent?

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{.2}{.3} = 2/3$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$.5 = .4 + .3 - x$$
$$.5 = .7 - x$$
$$x = .2$$

independent? No

$$P(A|B) = P(A)?$$

or $P(A \cap B) \stackrel{?}{=} P(A) \cdot P(B)$

$$.2 \neq (.4)(.3)$$

26. A restaurant serves three fixed-price dinners costing $12, $15, and $20. For a randomly selected couple dining at this restaurant, let X = the cost of the man's dinner and Y = the cost of the woman's dinner. The joint pmf of X and Y is given in the following table:

woman

$P(x, y)$		Y 12	15	20
	12	0.05	0.05	0.10
X *men*	15	0.05	0.10	0.35
	20	0	0.20	0.10

$\begin{array}{c}X\\.2\\.5\\.3\\\hline 1 \checkmark\end{array}$

$y \mid .1 \quad .35 \quad .55 \mid$

a. Compute the marginal pmf's of X and Y.
b. What is the probability that the man's and the woman's dinner cost at most $15 each?
$$P(Y \leq 15 \cap X \leq 15)$$
c. Are X and Y independent? Justify your answer. $\underset{.2}{P(X=12)} \cdot \underset{.1}{P(Y=12)} \neq \underset{.05}{P(X=12, Y=12)}$
d. What is the expected value of the total cost of the dinner for the two people?
e. Suppose the when a couple opens fortune cookies at the conclusion of the meal, they find the message "You will receive as a refund the difference between the cost of the more expensive and the less expensive meal that you have chosen." How much does the restaurant expect to refund?

total cost:	24	27	30	32	35	40
$P(c)$	.05	.1	.1	.1	.55	.1	$= 1$

$$E[C] = 24(.05) + 27(.1) + 30(.1) + 32(.1) + 35(.55) + 40(.1)$$

diff	0	3	5	8
p(D)	.25	.1	.55	.1

(above the 3: 12,15)

$$E[D] = 0 + 3(.1) + 5(.55) + 8(.1)$$

W = weatherman says rain

28. Marie is getting married tomorrow, at an outdoor ceremony in the desert. In recent years, it has rained only 5 days each year. Unfortunately, the weatherman has predicted rain for tomorrow. When it actually rains, the weatherman correctly forecasts rain 90% of the time. When it doesn't rain, he incorrectly forecasts rain 10% of the time. What is the probability that it will rain on the day of Marie's wedding?

$$P(R) = \frac{5}{365}$$

$$P(\sim R) = \frac{360}{365}$$

$$P(W \mid R) = .9$$

$$P(W \mid \sim R) = .1$$

$$P(R \cap W)$$

$$R \overset{W}{\nearrow} .9$$
$$\frac{5}{365} \quad \sim W \searrow .1$$

$$\sim R \overset{W}{\nearrow} .1 \quad P(\sim R \cap W)$$
$$\frac{360}{365}$$
$$\sim W \searrow .9$$

$$\text{Find } P(R \mid W) = \frac{P(R \cap W)}{P(W)}$$

$$= \frac{P(R) \cdot P(W \mid R)}{P(R) \cdot P(W \mid R) + P(\sim R) \cdot P(W \mid \sim R)}$$

$$= \frac{\frac{5}{365}(.9)}{\frac{5}{365}(.9) + \frac{360}{365}(.1)}$$

Q 4 # 9   Sample of 2 from

$$1, 2, 4, 5, 8$$

$$5\,C_2 = 10$$

$$P(\text{range} = 3)$$

Possible ranges: 1 , 3 , 4 , 7 , 2 , 6

(2,4)

(2,8)

$$\begin{pmatrix} 1,2 \\ 5,4 \end{pmatrix}$$ (1,4)(2,5)   (1,5)

(5,8)

(8,4) (1,8)
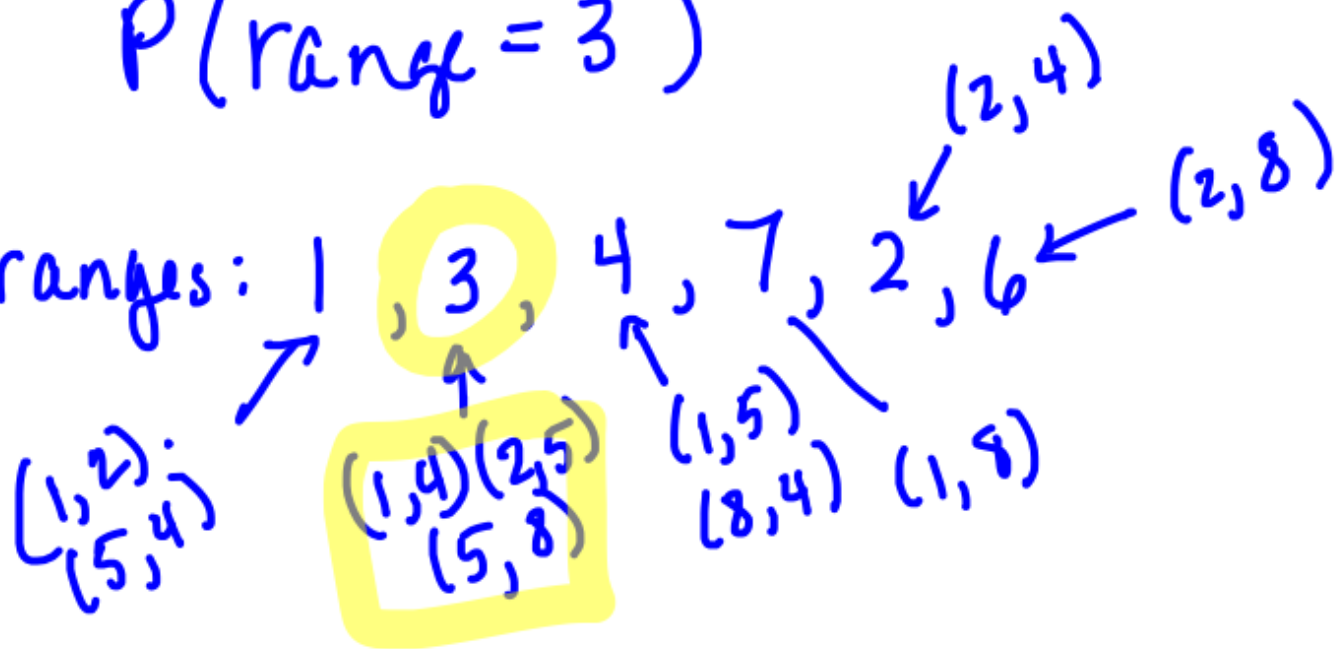
24. The average number of homes sold by the Happy Homes Realty company is 2 homes per day. What is the probability that exactly 3 homes will be sold tomorrow by this company?

$$X \sim \text{Poisson} (\lambda = 2)$$

$$P(X = 3) = dpois(3, 2)$$

16. A distribution of grades in an introductory statistics class (where A = 4, B = 3, etc) is:

X	0	1	2	3	4
P(X)	.10	.15	.30	.30	?

a. Find $P(X = 4)$

b. Find $P(1 \leq X < 3)$ $= P(1 \leq X \leq 2) = P(x=1) + P(x=2)$

c. Find the mean grade in this class.

d. Find the standard deviation for the class grades.

e. Find the lowest grade X_0 such that $P(X \geq X_0) < 0.5$

c. $E[x] = 0(.1) + 1(.15) + 2(.3) + 3(.3) + 4(.15)$

d. $E[x^2] = 0(.1) + 1(.15) + 4(.3) + 9(.3) + 16(.15)$

   $Var[x] = E[x^2] - E[x]^2$

   $\sigma_x = \sqrt{Var[x]}$

e. $P(X \geq 4) = .15$ $P(x \geq 2) = .75$

   $\boxed{P(x \geq 3) = .45}$

$V[x] = 2.1^2$

17. Suppose you have a distribution, X, with mean = 28 and **standard deviation** = 2.1. Define a new random variable Y = 2X + 1.
    a. Find the mean of Y. $E[Y] = E[2X + 1] = 2E[X] + 1$
    b. Find the **variance** of Y. $V[Y] = V[2X + 1] = 4V[X]$
    c. Find the standard deviation of Y. $26x$
    d. Let W = X + X for X in the above problem. Find the **variance** of W.

$$E[aX \pm bY] = aE[X] \pm bE[Y]$$

$$Var[aX \pm bY] = a^2 V[X] + b^2 V[Y]$$

3. Joe Dimaggio had a career batting average of .325. What was the probability that he would get at least one hit in five official times at bat?

$$X \sim \text{Binomial} \underset{n}{(5}, \underset{P}{.325)}$$

$$P(X \geq 1) = 1 - P(X = 0) = 1 - \text{dbinom}(0, 5, .325)$$

(Q3)

5 num

min	Q1	med.	Q3	max
14	27	39	50	45

$n = 33$

how many less than 39

16

Employment data 75% of workers married 40% college grads 30% M + C.G.

a) $P(m \text{ or } CG) = 1$

b) Disjoint

c) Ind. + Disjoint

$P(m \cup CG) = .75 + .4 - .3 \neq 1$

$P(m) \cdot P(CG) = \frac{3}{4} \cdot \frac{4}{10} = \frac{3}{10}$

d) ind.

e) none

popper # 8   1-6 = $\underline{\underline{A}}$