Math 483 Exam 1 fall 2006 Name_____

YOU ARE BEING GRADED FOR WORK, NOT JUST THE FINAL ANSWER

age	0-19	20-39	40-59	60-79	80 and over
probability	0.29	0.33	0.21	0.14	?

.03

1) The above table represents the USA age distribution according to the 1990 Census. Find the probability that a randomly selected person in the United States will be 40 or over.

$1 - .29 - .33 =$

$.21 + .14 + .03 = \boxed{0.38}$

/6

y	0	2	3	4	5
p(y)	0.00	0.03	0.63	0.23	0.11

2) The table above displays the probability distribution for a discrete random variable Y.

a) Find E(Y). $\sum y P(y) = 0(0) + 2(.03) + 3(.63) + 4(.23) + 5(.11)$

$= \boxed{3.42}$

b) Find $E(Y^2)$. $\sum y^2 P(y) = 0^2(0) + 2^2(.03) + 3^2(.63) + 4^2(.23) + 5^2(.11)$

$= \boxed{12.22}$

c) Find the standard deviation of Y.

$SD = \sqrt{E(Y^2) - (E(Y))^2} = \sqrt{12.22 - (3.42)^2}$

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$= \sqrt{.5236} = \boxed{0.7236}$

$= \sqrt{\sum (y - E(Y))^2 P(y)} = \sqrt{0 + (2-3.42)^2 .03 + (3-3.42)^2 .63 + (4-3.42)^2 .23 + (5-3.42)^2 .11}$

$.0164 \quad 1 \quad .1764 \quad .3364 \quad 2.4964$

3) The table below shows examines the happiness of married couples and is taken from the 2002 General Social Survey. Let the event VH = very happy, PH = pretty happy and NH = not too happy, M = Male, F = Female.

gender	Very Happy	Pretty Happy	Not too Happy	total
Male	221	95	9	325
Female	149	120	9	278
total	370	215	18	603

← too many males in sample

compute

a) What is the probability that a married adult is very happy?

$$P(VH) = \frac{370}{603} = .6136$$

2 digits

b) What is the probability that a married adult is very happy given that their gender is female?

$$P(VH|F) = \frac{P(VH \wedge F)}{P(F)} = \frac{149/603}{278/603} = \frac{149}{278} = .5360$$

c) What is the probability that the married adult is male given that the married adult is very happy?

$$P(M|VH) = \frac{P(M \wedge VH)}{P(VH)} = \frac{221/603}{370/603} = \frac{221}{370} = .5973$$

d) Are the events VH and F independent? Explain.

NO, $P(VH) = .6136 \neq P(VH|F) = .5360$

.6136 .4610

or $P(VH \wedge F) = \frac{149}{603} = .2471 \neq P(VH)P(F) = \frac{370}{603}\frac{278}{603} = .2829$

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4) The chance of winning a bet of "red" in roulette is 0.4737. Suppose that a student plays roulette 9 times. Let X be the number of times the student wins.

a) Find the mean $E(X)$. $= np = 9\ (.4737) = \boxed{4.2633}$

b) Find the variance $V(X)$. $= np(1-p) = 9\ (.4737)(1-.4737)$

$= \boxed{2.2438}$

c) Find the probability that the student wins 5 times. Simplify.

$$P(y) = \binom{n}{y} p^y (1-p)^{n-y} = P(5) = \binom{9}{5} (.4737)^5 (.5263)^4$$

$$P(5) = \frac{9!}{5!\,4!} (.4737)^5 (.5263)^4$$

$$= \frac{9 \cdot 8 \cdot 7 \cdot 6}{4 \cdot 3 \cdot 2} (.4737)^5 (.5263)^4$$

$$= \boxed{.2306}$$

5) In how many ways can a committee consisting of three men and two women be chosen from a group of seven men and five women? Simplify.

$\binom{7}{3}_{M}\ \binom{5}{2}_{W} = \frac{7!}{3!4!}\ \frac{5!}{2!3!} = 35(10) = \boxed{350}$

1/1

e

6) The probability that a person who lives in Illinois will be a victim of a violent crime in the 2006 is approximately 0.0066. Assume that whether a person is or is not a victim is independent of all other Illinois residents. What is the probability that out of 100 randomly selected Illinois residents, none will be a victim of violent crime in 2006? DO NOT SIMPLIFY THE APPROPRIATE SYMBOL(S).

X = # who are not a victim

$P(X=100) = \boxed{(1-.0066)^{100}} = (.9934)^{100} = .5157$

1/1

OR Y = # who are a victim $P(Y=0) = \binom{100}{0}(.0066)^0(.9934)^{100} =$

7) Suppose that $P(A) = 0.7$, $P(B) = 0.2$ and $P(A \cap B) = 0.1$. Find $P(A \cup B)$.

1/1

$.7 + .2 - .1 = \boxed{.8}$

8) Suppose that $P(A) = 0.7$, $P(B) = 0.2$. Find $P(A \cap B)$ if A and B are disjoint.

$\boxed{0}$

OR $= P(A) + P(B) - P(A \cup B) = .7 + .2 - .9 = 0$

$P(A \cup B)$

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