

Please box your final answers. Calculators are allowed, but not required. Answers may be left as fractions and/or expressions that may contain square-root ( $\sqrt{\cdot}$ ), factorial ( $!$ ), permutation ( $P_r^n$ ), and combination ( $C_r^n$ ) notation.

1. City crime records show that 20% of all crimes are violent and 80% are nonviolent, involving theft, forgery, and so on. Ninety percent of violent crimes are reported versus 70% of nonviolent crimes.

(a) (4 points) What is the overall reporting rate for crimes in the city?

(b) (4 points) If a crime in progress is reported to the police, what is the probability that the crime is violent? What is the probability that it is nonviolent?

(c) (2 points) Refer to part (b). If a crime in progress is reported to the police, why is it more likely that it is a nonviolent crime? Wouldnt violent crimes be more likely to be reported? Can you explain these results?

2. A random variable  $x$  can equal 0, 1, 2, 3, 4, or 5. A portion of the probability distribution is shown here.

$x$	0	1	2	3	4	5
$p(x)$	.16	.20	.35	0.10	$p(4)$	.04

(a) (2 points) Find  $p(4)$ .

(b) (4 points) Find the expected value  $E[x]$ , i.e. the population mean  $\mu$ .

(c) (4 points) Find the standard deviation  $\sigma$  for the random variable  $x$ .

3. A company has 10 applicants for 3 positions: 3 women and 7 men. Suppose that the 10 applicants are equally qualified and that no preference is given for choosing either gender. Let  $x$  equal the number of women chosen to fill the two positions.

(a) (8 points) Fill in the following chart with all possible values of the random variable  $x$ , along with the corresponding probabilities  $p(x)$ .

$x$	
$p(x)$	

(b) (2 points) Sketch a probability histogram for  $x$ .  
*Don't spend much time on this. It doesn't have to be perfect.*

4. (4 points) You can insure a \$50,000 diamond for its total value by paying a premium of  $D$  dollars. If the probability of loss in a given year is estimated to be .01, what premium should the insurance company charge if it wants the expected gain to equal \$1,000?