

# Assignment 2

STAT 1

21315966

a)  $p(\text{not diseased}) = 1 - 0.01 = 0.999$

b)  $p(\text{diseased}) = 0.001$

$p(\text{positive}) = 98\% = 0.98$

$p(\text{negative}) = 1\% = 0.01$

c)  $p(\text{person actually has the disease})$

$$p(A/C) = \frac{p(A \cap C)}{p(C)}$$

$$= \frac{p(\text{diseased}) \times p(\text{positive})}{p(\text{diseased}) \times p(\text{positive}) + p(\text{not diseased}) \times p(\text{negative})}$$

$$= \frac{0.001 \times 0.98}{0.001 \times 0.98 + 0.999 \times 0.01}$$

$$= \frac{98}{1097} = 0.0893$$

23 a)  $p(x=x)$

1	0.60	} $p(x=x) = \binom{5}{x} \left(\frac{1}{2}\right)^x \left(\frac{1}{2}\right)^{5-x} = 0.15625$
2	0.20	
3	0.12	
4	0.06	
5	0.02	

$= \binom{5}{2} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^{5-2} = 0.3125$

$= \binom{5}{3} \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^{5-3} = 0.3125$

$= \binom{5}{4} \left(\frac{1}{2}\right)^4 \left(\frac{1}{2}\right)^{5-4} = 0.15625$

$= \binom{5}{5} \left(\frac{1}{2}\right)^5 \left(\frac{1}{2}\right)^{5-5} = 0.03125$

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b)	x	p(x)	p(x)
	1	0.60	
	2	0.80	$\rightarrow (0.6 + 0.2)$
	3	0.92	$\rightarrow (0.8 + 0.12)$
	4	0.98	$\rightarrow (0.92 + 0.06)$
	5	1	$\rightarrow (0.98 + 0.02)$

$$c) p(x \geq 4) = p(x=4) + p(x=5) \\ = 0.06 + 0.02 = 0.08.$$

$$p(x \leq 3) = p(x=1) + p(x=2) \\ = 0.60 + 0.20 = 0.80.$$

$$d) E(x) = \sum x \cdot p(x=x) \\ = (1 \times 0.6) + (2 \times 0.2) + (3 \times 0.12) + \\ (4 \times 0.06) + (5 \times 0.02) \\ = 1.7.$$

$$E(x^2) = \sum x^2 \cdot p(x=x) \\ = (1^2 \times 0.6) + (2^2 \times 0.2) + (3^2 \times 0.12) + \\ (4^2 \times 0.06) + (5^2 \times 0.02) \\ = 3.94.$$

$$\Rightarrow V(x) = E(x^2) - (E(x))^2 \\ = 3.94 - (1.7^2) \\ = 1.05.$$

$$S.D(x) = \sqrt{1.05} = 1.0247.$$

Assignment 2 ST221 21315966

$$\text{Q6. a) } p(x=1) = \frac{(2.5)^1 e^{-2.5}}{1!}$$
$$= 0.20521$$

$$\begin{aligned} \text{b) } p(x \geq 1) &= 1 - p(x \leq 0) \\ &= 1 - p(x=0) - p(x=1) \\ &= 1 - \frac{e^{-2.5} (2.5)^0}{0!} - \frac{e^{-2.5} (2.5)^1}{1!} \\ &= 1 - 0.20521 - 0.08209 \\ &= 0.71270 \end{aligned}$$

$$p(x \geq 1) = 0.71270.$$

c)

