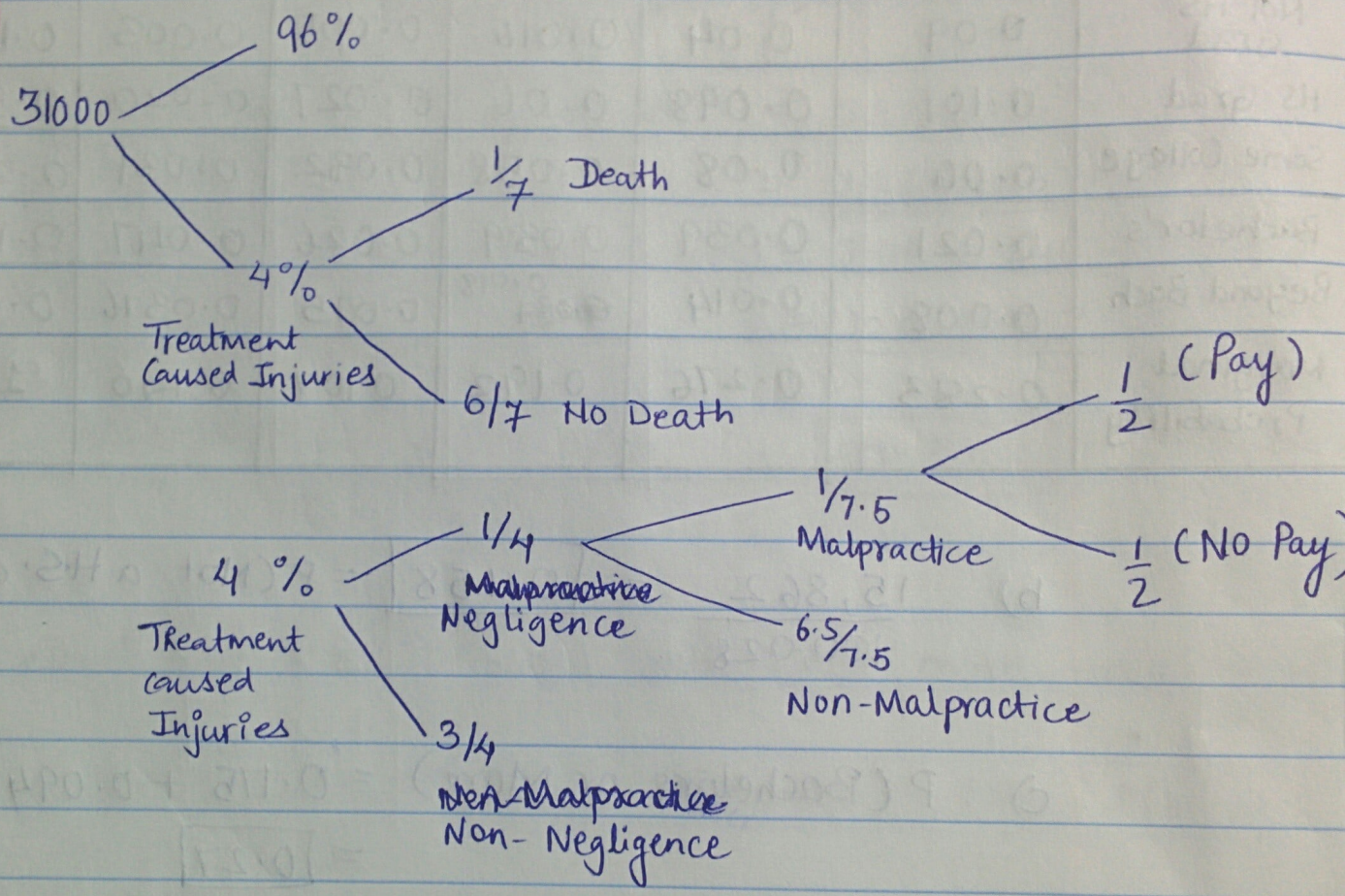
MGS-9920 - PROBABILITY AND STATISTICS THEORY I

HW-4

(49) (a) Prob (Treatment-caused injury due to negligence)
$= 0.04 \times 0.25 = \boxed{0.01}$



(b) Prob (Person admitted to hospital will die from a treatment caused injury) $= 0.04 \times 0.142$
$= \boxed{0.0056}$

(c) Prob (Negligent treatment-caused injury, Malpractice claim paid) $= 0.04 \times 0.25 \times 0.133 \times 0.5$
$= \boxed{0.000665}$

51. (a) Joint Probability Table

Educ. Level	HOUSEHOLD INC Under 25	25-49.9	50-74.9	75-99.9	100 or more	Total Marg Prob
Not HS Grad	0.09	0.04	0.016	0.005	0.003	0.158
HS Grad.	0.101	0.098	0.06	0.027	0.020	0.307
Some College	0.06	0.08	0.058	0.032	0.031	0.263
Bachelor's	0.021	0.039	0.039	0.026	0.047	0.175
Beyond Bach.	0.008	0.014	~~0.081~~ 0.018	0.015	0.0376	0.094
Marginal Probability	0.283	0.276	0.192	0.107	0.140	1

b) $\frac{15,862}{100,028} = \boxed{0.158}$ = P (Not a H.S. grad)

c) P (Bachelors or More) = 0.175 + 0.094

$= \boxed{0.27}$

d) P (Bachelors ∩ 100K$ or more) ~~0.283~~

$= \boxed{0.047}$

e) P (Inc. < 25K) = $\boxed{0.283}$

f) P (Bachelors ∩ <25K) = $\boxed{0.021}$

(g) Yes, Independent

(45) a) $P(\text{age} \geq 65) = \frac{34,991,753}{281,421,906} = \boxed{0.1243}$

b) P (pres drugs taken regularly) :

$\Rightarrow$ P (drugs regularly above 65 yrs) $= 0.82 \times 34,991,753$

$= \underline{28693237}$

P (drugs regularly below 65 yrs) $= 0.49 \times 246,430,153$

$= \underline{120,750,774}$

$$\frac{28693237 + 120750774}{281421906} = \boxed{0.531}$$

c) P (age $\geq$ 65 and takes 5 or more prescriptions)

$= 0.1243 \times 0.4$ [P(A and B) = P(A) x P(B)]

$= \boxed{0.049}$

d) P (age $\geq$ 65 | 5 or more prescriptions)

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

$$= \frac{0.4}{P(\text{5 or more prescriptions})}$$

$$= \frac{0.4}{0.58} = \boxed{0.68}$$

HW - 5

(55) (a) prob distribut^n

x	$f(x)$	$x f(x)$
9	0.3	2.7
10	0.2	2.0
11	0.25	2.75
12	0.05	0.6
13	0.2	2.6
		10.65 → $\Sigma x \cdot f(x)$

(b) Expected value = $\Sigma x \cdot f(x)$

= **10.65**

(c) variance (x) = $\Sigma (x-u)^2 \cdot f(x)$

x	u	$x-u$	$(x-u)^2$	$f(x)$	$(x-u)^2 \cdot f(x)$
9	10.65	-1.65	2.7225	0.3	0.816
10	10.65	-0.65	0.4225	0.2	0.084
11	10.65	0.35	0.1225	0.25	0.030
12	10.65	1.35	1.8225	0.05	0.091
13	10.65	2.35	5.5225	0.2	1.104
					2.127

variance = 2.127

(d) Expected value of expense = $ 10.65 million
Income projection = $ 12.00 million
So, Financial position of the college is GOOD because Income exceeds expense by $ 1.35 million

(57) (a) expected value (at least 10 Internet Users) : from 18-54 age grp

$x = np$

$10 = n(0.4) = \frac{10}{0.4} = \boxed{25}$

(b) expected value (at least 10 users from 55 & older)

$10 = n(0.12)$

$n = \frac{10}{0.12} \approx \boxed{84}$

(c) Std. Deviation for 25 ppl

$\sigma = \sqrt{np(1-p)}$

$= \sqrt{25(0.4)(1-0.4)} = \sqrt{6} = \boxed{2.44}$

(d) Std. Deviation for 84 people

$$\sigma = \sqrt{84\,(0.12)\,(1-0.12)}$$

$$\left(\sigma = \sqrt{np(1-p)}\right)$$

$$\sigma = \sqrt{8.87}$$

$$\boxed{\sigma = 2.97}$$

(61) Poisson Distribution because No. of occurrences in a specific interval of time.

$$\boxed{f(x) = \frac{\mu^{x} \cdot e^{-\mu}}{x!}}$$

$$\boxed{f(20) = \frac{15^{20} \times (2.71828)^{-15}}{20!}}$$

=

$\boxed{\mu = 15}$, $\boxed{x = 20}$

HW 6

(39) (a) ~~Exponential~~ Normal Distribution Density Func^n

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} \times e^{-(x-\mu)^2/2\sigma^2}$$

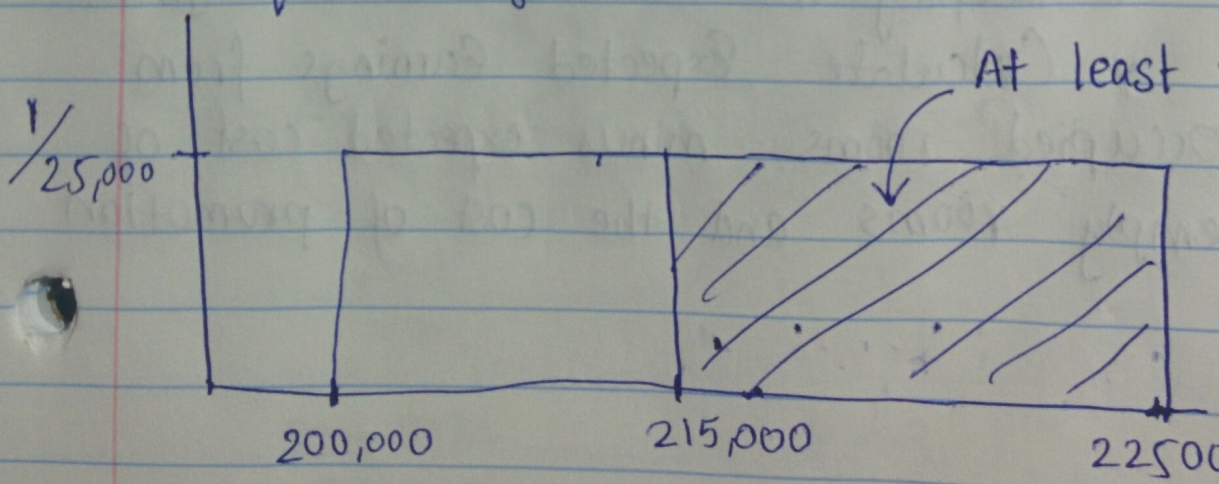
(b) $P(P > 215{,}000) = 10{,}000 \times \frac{1}{25{,}000}$ (225,000 − 215,000)

$= \boxed{0.40}$ (225,000 − 200,000)

(c) $P(P < 210{,}000) = 10{,}000 \times \frac{1}{25{,}000}$ (210,000 − 200000)

$= \boxed{0.4}$

(d) Yes, she should leave the house on Marke for another month because she has 40% prob. of selling the house for more than 215,000 whic is quite high.



(43) (a) $z = \frac{700-670}{30} = 1 \Rightarrow \left[z = \frac{x-\mu}{\sigma}\right]$

The area under std. Normal curve to the right of $z=1$ is $\boxed{0.1586}$ = P(All rooms rented)

(b) P (50 or more rooms, NOT rented)

$$z = \frac{(649-670)}{30} = -0.7$$

Area under std. Normal curve to the left of $z = -0.7$ is $\boxed{0.2419}$

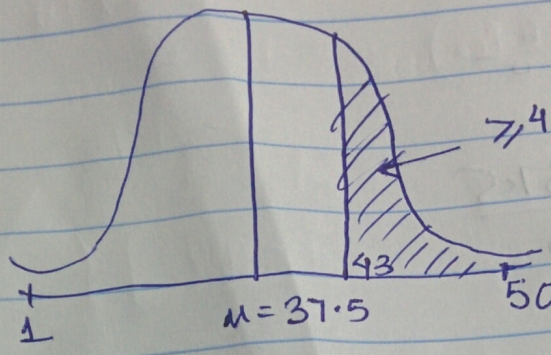
(c) Yes, I would encourage hotel to offer a promotion.

Considerations :-

- ~~Increasing the Area under Normal Curve for Demand~~
- ~~Keeping the Mean Demand Higher~~
- Calculate Expected Earnings from occupied rooms minus expected cost of empty rooms and the cost of promotion

0·8
0.09
0·

(49) (a)



$x = 42.5$, $n = 50$
$\mu = 37.5$, $p = 0.75$

$\sigma = \sqrt{np(1-p)} = 3.06$

$n*p = 50 \times 0.75 = 37.5$ expected success
$n*(1-p) = 50 \times 0.25 = 12.5$ expected failure

$P(x \geq 43)$

$\approx P(x_n \geq 42.5)$

$z = \frac{x-\mu}{\sigma} = \frac{42.5 - 37.5}{3.06} = \boxed{0.051} \approx \boxed{5.16\%}$ of students expected to get an A.

(b)

$\mu = 37.5$
$\sigma = 3.06$

~~$z = \left(\frac{35 - 37.5}{3.06}\right) - \left(\frac{39 - 37.5}{3.06}\right)$~~

~~$= \frac{-2.5}{3.06} \quad \frac{+1.5}{3.06}$~~

~~$= -0.81 \quad 0.49$~~

~~$= 0.2090 \quad 0.3121$~~

(b) Continued :-

$$z_1 = \frac{35 - 37.5}{3.06}$$

$$= \underline{-0.81} \Rightarrow \boxed{0.209} \text{ area from } 35 \text{ to } 37.5$$

$$z_2 = \frac{39 - 37.5}{3.06}$$

$$= \frac{1.5}{3.06}$$

$$= \underline{0.49} \Rightarrow \boxed{0.312} \text{ area from } 37.5 \text{ to } 39$$

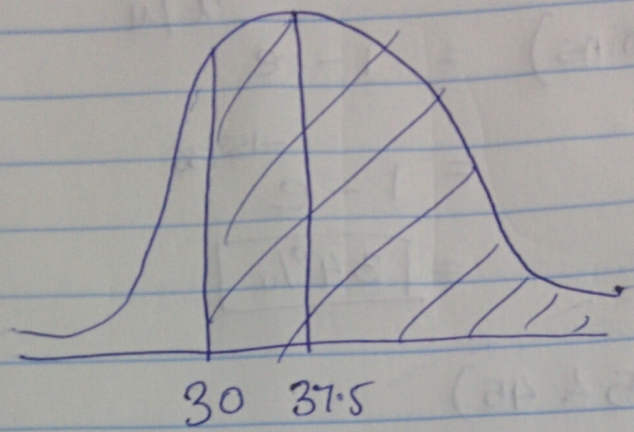
So the Area betw^n 35 to 39 is

$$= 0.209 \text{ and } 0.312$$

$$= 0.209 + 0.312$$

$$= \boxed{0.521} \text{ or } \boxed{5.21\%}$$

(c)



$$= \frac{29.5 - 37.5}{3.06}$$

$$= -\frac{8}{3.06} = -2.61 \sim 0.0045$$

$$1 - 0.0045 = \boxed{99.5\ \%}$$

(d) $x = 30$

$\mu = 12.5$

$\sigma = 3.06$

$$= \frac{30 - 12.5}{3.06}$$

$$= 5.71 \sim \underline{\text{very low prob.}}$$

(51) (a) $P(\leq 15 \text{ mins}) = 1 - e^{-x/\mu}$

$= 1 - e^{-15/36}$

$= \boxed{34\%}$

(b) $P(\text{betw}^{n} 15 \& 45)$

$\Rightarrow \left[1 - e^{-45/36}\right] - \left[1 - e^{-15/36}\right] = \boxed{37\%}$

(c) $P(\geq 60 \text{ mins})$

$\Rightarrow 1 - e^{-60/36}$

$= \boxed{0.81}$

$1 - 0.81$

$= 0.189 \approx \boxed{18.9\%}$