3.75 Set up is

	selected	not	Total Pool
(AA) African American	?		$N1 = 8$ *
White			$N0 = 12$
	$n = 6$*	14	$N = 20$ *

*Parameters.

If done at random without regard to race, then ? should be hypergeometric

Expect about $8 \times 6/20 \simeq 2.5$ ie expect 2 or 3 or maybe 1 or 2, seldom get 0 this way.

My instinct is that <u>1 or fewer</u> wouldn't be THAT UNUSUAL.

The probabilities

$$P(? = 0) \quad \frac{\binom{8}{0}\binom{14}{6}}{\binom{20}{6}} = 0.024$$

$$P(? = 1) \quad \frac{\binom{8}{1}\binom{14}{5}}{\binom{20}{6}} = 0.163$$

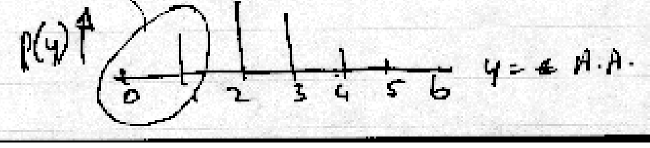
0.187

2	0.358
3	0.317
4	0.119
5	0.017
6	0.000....

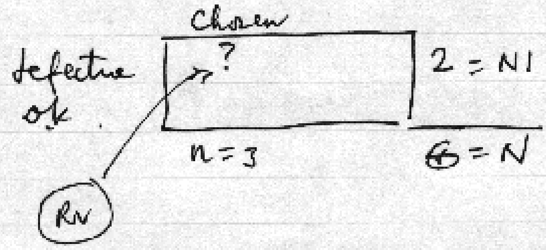
"tail area"

Check $\Sigma = 1$

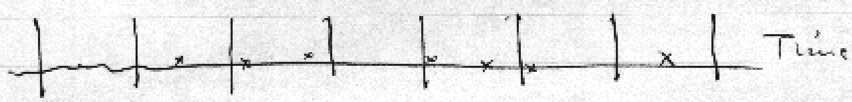
So P(1 or fewer) not that small.



3.77 Same as 3.75 but with



3.88



x = my imagination as to when cars arrive at tunnel. μ per 2 mins = 1

Q asks for prob of ≥ 3 in 2 min interval and "assume" or wants you to assume, a Poisson distribution. This is fine if traffic is well mixed and nobody is "tied" to anyone else, or that there isn't a Green/red traffic light a ½ km away!

(eg cars travelling together!) If bunching, or other nonhomogeneities, Poisson won't work

Poisson Prob (y arrivals | $\mu = 1$) $= e^{-\mu}\mu^y/y!$ ~~$= (e^{-1} \times 1)/1 = e^{-1}$~~

$$P(\geq 3) = \sum_{3}^{\infty} \text{Prob}(y|\mu)$$

Easier to work out $\sum_0^2 P(y)$ and subtract from 1 to get prob 3 or more —

3.91 Presume p(particular contact yields a sale) is same for every contact, and that contacts are independently chosen, and unrelated (e.g. not in same family or job or ...)

Then this fit Binomial
y = # sales, $n = 100$, $p = 0.03$
and want prob (Y = 1 or more)
= 1 − Prob(0)

~~Now~~ So $1 - \binom{100}{0}(0.97)^{100}(0.03)^{0}$

Since p is so small, and n large, can approximate this prob by 1 − Poisson Prob($0 \mid \mu = 3.0$)
[since $\mu = np = 100(0.03) = 3.0$].

Try it out and you will see that
$(1-0.03)^{100}$ is close to $e^{-3.0}$.

$\downarrow$ $\underline{0.0475}$ $\qquad$ $\downarrow$ $\underline{0.0498}$

3.97 If Y is Poisson Count with $\mu = 2.0$
then $E(Y) = 2$ and $Var(Y) = \mu = 2$

$R = 1600 - 50Y^2$

$E(R) = 1600 - 50\,E(Y^2)$

But $Var(Y) = E(Y^2) - [E(Y)]^2 \Rightarrow E(Y^2) = Var(Y) + [E(Y)]^2 = 2 + 4 = 6 \Rightarrow E(R) = 1600 - 50(6) = 1300$!

$(1-0.03)^{100}$ is close to e .

$\downarrow$ $\underline{0.0475}$ $\qquad$ $\downarrow$ $\underline{0.0498}$

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