1) a) $P(16-20) = .08$ $\quad P(A|16-20) = .06$
$P(21-30) = .15$ $\quad P(A|21-30) = .03$
$P(31-65) = .49$ $\quad P(A|31-65) = .02$
$P(\geq 66) = .28$ $\quad P(A|\geq 66) = .04$

$$P(A) = P(A|16-20)P(16-20) + P(A|21-30)P(21-30) + P(A|31-65)P(31-65) + P(A|\geq 66)P(\geq 66)$$

$$= (.06)(.08) + (.03)(.15) + (.02)(.49) + (.04)(.28) = .0303$$

b) $$P(16-20|A) = \frac{P(A|16-20)\,P(16-20)}{P(A)} = \frac{(.06)(.08)}{.0303} = .1584$$

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2) a) NEG. BINOMIAL $f(x) = \binom{x-1}{r-1} p^r (1-p)^{x-r}$ $\quad X \equiv$ NO. OF TRIAL ON WHICH rTH SUCCESS OCCURS

$p \equiv$ PROB. OF SUCCESS
$(1-p) \equiv$ PROB. FAILURE

SINCE rTH SUCCESS IS ON LAST TRIAL (xTH), MUST HAVE $r-1$ SUCCESSES IN PREVIOUS $x-1$ TRIALS. SO $x = r, r+1, \ldots$

b) $P(X=5) = f(5) = \binom{4}{2}(.7)^3(.3)^2 = 6(.7)^3(.3)^2 = .18522$
$x=5;\ r=3$

c) $A \equiv$ MAKE 3RD SHOT ON 5TH ATTEMPT ; $B \equiv$ MAKE 5TH SHOT ON 7TH ATTPT.

$$P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{(.18522)(.7)(.7)}{(.18522)} = (.7)^2 = .49$$

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3 a) $$P(X \leq 95) = P\left(\frac{X-\mu}{\sigma} \leq \frac{95-115}{12}\right) = P(Z \leq -1.67) \simeq .0475$$

b) USE BINOMIAL, $n=300$, $p=.0475$, $(1-p)=.9525$

$$P(X<3) = P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$$

$$= \binom{300}{0}(.0475)^0(.9525)^{300} + \binom{300}{1}(.0475)^1(.9525)^{299} + \binom{300}{2}(.0475)^2(.9525)^{288}$$

$$= (.9525)^{288}\left((.9525)^2 + 300(.0475)(.9525) + 44850(.0475)^2\right)$$

$$= (.9525)^{288}(115.673) = .00000947$$

4) a) $\mu = E(Y) = \int_1^\infty y \frac{3}{y^4}\,dy = \int_1^\infty 3y^{-3}\,dy = 3\frac{y^{-2}}{-2}\Big|_1^\infty = -\frac{3}{2}\left(\frac{1}{y^2}\Big|_1^\infty\right)$

$= -\frac{3}{2}(0-1) = \frac{3}{2}$

$E(Y^2) = \int_1^\infty y^2 \frac{3}{y^4}\,dy = \int_1^\infty 3y^{-2}\,dy = 3\frac{y^{-1}}{-1}\Big|_1^\infty = -3\left(\frac{1}{y}\Big|_1^\infty\right) = -3(0-1)$

$= 3$

SO $\sigma^2 = E(Y^2) - \mu^2 = 3 - \frac{9}{4} = \frac{12}{4} - \frac{9}{4} = \frac{3}{4}$

b) $n=5$ $\quad \bar{Y} \equiv$ AVG COMPUTED

$P(\bar{Y} \geq 3.5) = P\left(\frac{\bar{Y}-\mu}{\sigma/\sqrt{n}} \geq \frac{3.5-1.5}{.75/\sqrt{5}}\right) = P\left(Z \geq \frac{2\sqrt{5}}{.75}\right) = P(Z \geq 5.96)$

$= 0$

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5) $n=10$ $\quad \alpha = .1$ $\quad \bar{X} \pm t_{\frac{\alpha}{2}} \frac{S}{\sqrt{n}} \Rightarrow 39.1 \pm t_{.05} \frac{(17.3)}{\sqrt{10}}$

$\bar{X} = 39.1$

$S = 17.3$ $\quad$ 9 DOF $\quad \Rightarrow 39.1 \pm \underbrace{(1.833)(17.3)}_{(10.027)} \frac{}{\sqrt{10}}$ → 49.1278, 29.0721

SO, THE 90% CI IS (29.0721, 49.1278)

b) YES, CLAIM IS VALID SINCE $\mu = 30 \in (29.0721, 49.1278)$

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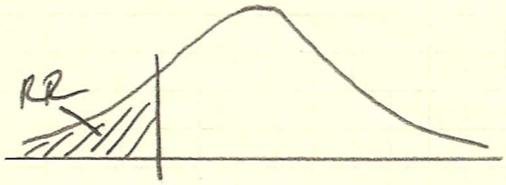
6) $n=100$ $\quad \mu = 120$ $\quad H_0: \mu = 120$ $\quad$ USE $Z = \frac{\bar{X}-\mu}{\sigma/\sqrt{n}} \simeq \frac{\bar{X}-\mu}{s/\sqrt{n}}$

$\bar{X} = 115$ $\quad \alpha = .01$ $\quad H_a: \mu < 120$

$S = 24$

SINCE n IS LARGE!

$Z = \frac{115-120}{24/\sqrt{100}} = \frac{(-5)(10)}{24} = -2.083$



$-Z_{.01} = -2.325$

SINCE $Z = -2.083 > -Z_{.01}$, IT IS NOT IN REJ. REGION

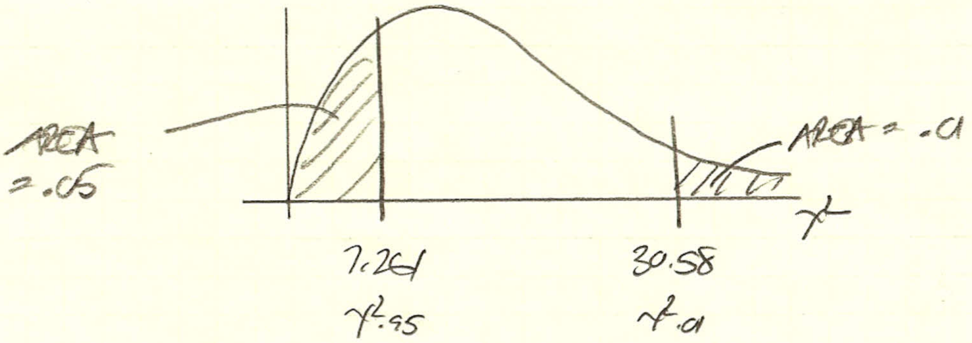
∴ FAIL TO REJECT H_0. NO DIFF. IN B.W. BETW. SES BABIES & POP. IN GENERAL

7) $\sigma^2 = 25$
$n = 16$
(15 DOF)

REJECT IF $S^2 > 50.967$ or $S^2 < 12.102$

$$\frac{(n-1)S^2}{\sigma^2} > \frac{(15)(50.967)}{25} \quad \text{or} \quad \frac{(n-1)S^2}{\sigma^2} < \frac{(15)(12.102)}{25}$$

$$\chi^2 > 30.58 \quad \text{or} \quad \chi^2 < 7.261$$



SO PROB. REJECT = $.05 + .01 = .06$