30. 3 1 each

a. $\frac{25}{500} = 1/20$

b. $\frac{25}{500} = 1/20$

c. $\frac{250}{500} = 1/2$

36. 3 1 each

$1 \to U(1,2)$ $2 \to (1/2, 3)$ $3 \to (1/3, 4)$

a. $P(\text{pass}^{1st}) = \frac{.5}{1} = 1/2$

b. $P(\text{pass } 2 \mid \text{pass } 1) = \frac{2.25 - .5}{2.5} = .7$

c. $.5(.7)\left(\frac{2.75 - 1/3}{3\,2/3}\right) = .5(.7)(.659)$
$= .23065$

40. $U(50,70)$ 2 1 each

a. $E(X) = 60$ $V(X) = \frac{(70-50)^2}{12} = 33.\overline{3}$

b. worst case scenario is 70 min per run.
Need at least 5 tubes (larger is ok)

46. 3 1 each

a. $\int_{30}^{\infty} \frac{1}{40} e^{-x/40}\,dx = \underline{.472367}$

b. Same as a. due to memoryless

c. $\int_0^t \frac{1}{40} e^{-x/40}\,dx = .5 = 1 - e^{-t/40}$

$\Rightarrow .5 = e^{-t/40}$ $\ln .5 = -t/40$

$t = -40 \ln .5 = \underline{27.72589}$

50. 4 1 each

a. $E(X) = 1/.45$ $V(X) = \left(\frac{1}{.45}\right)^2 =$
$= 2.2\overline{2}$ 4.94

b. $\int_0^{1/4} .45 e^{-.45x}\,dx = .106403$

c. $\int_1^{\infty} .45 e^{-.45x}\,dx = .637628$

d. memoryless

$\int_{1/2}^{\infty} .45 e^{-.45x}\,dx = .798516$

can use complements also easier to integrate

2 62. area of crater $= \pi X^2 = Y$

$E(Y) = \pi E(X^2) = \pi(100 + 10^2) = \underline{200\pi}$

$V(Y) = V(\pi X^2) = \pi^2 V(X^2)$

$E(X^4) = \int_0^{\infty} \frac{x^4}{10} e^{-x/10} = 240000$

$V(X^2) = E(X^4) - [E(X^2)]^2$
$= 240000 - (200)^2 = 200000$

$\Rightarrow V(Y) = \underline{200000\pi^2}$

68. Poisson$(\lambda = 2)$ 4 .2 each pdf & $E(Y), V$

a. Gamma $(2, 1/2)$

$E(X) = 1$ $V(X) = 1/2$

$f(x) = \begin{cases} 4xe^{-2x} & , 0 < x < \infty \\ 0 , & \text{o.w.} \end{cases}$

b. Gamma $(3, 1/2)$

$E(X) = 3/2$ $V(X) = 3/4$

$f(x) = \begin{cases} 16x^2 e^{-2x} & , 0 < x < \infty \\ 0 , & \text{o.w.} \end{cases}$

70. Gamma $(5.5, 5)$ 3 total

2 a. $E(X) = 27.5$ $V(X) = 137.5$
$\sigma(X) = 11.72604$

b. $75\% \Rightarrow k = 2$ by Tcheby

1 (better interval if you do exact)

$27.5 \pm 2(11.72604)$

$\Rightarrow (4.04792, 50.95208)$

74. Gamma $(1.6, 150)$ 3 total

2 a. $E(X) = 240$ $V(X) = 36000$
$\sigma(X) = 189.7367$

b. $1 - \frac{1}{k^2} = 8/9$ $k = 3$

1 $\mu \pm 3\sigma \Rightarrow$

$240 \pm 569.2101 \Rightarrow$

$(0, 809.2101)$

78. a. $P(z \le 1.2) = .8549$ b. $P(-1.5 \le z) = .9332$

c. $P(-1.4 \le z \le -.2) = .3399$ d. $P(-.25 \le z \le 1.76) = .5595$

e. $P(|z| > 2) = .0456$

80. bef 3 1 each

b. closest z is .77 or .78

e. $z = 1.96$

f. $z = .675$ (i.e. .67 or .68)

Mat 59

82 bd $N(15,3)$ 2 1 each

b. $P(X \ge 11) = P(z \ge 4/3) = .0918$

d. $P(12 \le x \le 20) = P(-1 \le z \le 5/3) = .7938$

88. $N(.353, .021)$ 2 1 each

a. standardize ⇒ Gwynn is more unusual

b. $P(X \ge .4) = P\left(z > \frac{.4 - .353}{.021}\right)$

$= P(z > 2.238) = .0125$

94. a. $P(14 \le x \le 24) =$ 3 1 each

$P(-2 \le z \le .5) = \underline{.6687}$

b. 95% z ⇒ 1.645

$x = \mu + \sigma z = 22 + 4(1.645) = \underline{28.58}$

c. $P(\text{legal}) = .6687$ Geo(p)

$P(X=3) = (1-.6687)^3(.6687)$

$= \underline{.02431620}$ 4 1 each

100. $N(8, 2.2) \Rightarrow Y$ X = # failures before 5 successes

a. $P(7 \le \cancel{X} \le 9) = P(-.45 \le z \le .45)$

$= 1 - 2P(z \le -.45) = \underline{.3472}$

b. $P(X = 0) = (.3472)^5 = \underline{.005045}$

c. $P(X > 5) = P(X \ge 6)$

$= 1 - P(X \le 5) = 1 - .2424 = \underline{.7576}$

d. Geo(.3472) ⇒ NB(5, .3472)

$E(X) = \frac{5(1-.3472)}{.3472} = 9.400922$

$Y = 550 + 60(X+5) \Rightarrow 550 + 60(14.4)$

$\underline{1414} = E(Y)$

106. abd 3 1 each

a. $Beta(\alpha = 2, \beta = 2)$

b. $c = \frac{\Gamma(4)}{\Gamma(2)\Gamma(2)} = 3! = 6$

d. $P(X \ge .75) = \int_{.75}^{1} 6x(1-x)dx = .15625$

114. $Beta(1,2)$ 3 1 each

a. $E(X) = 1/3$ $V(X) = 1/18$

b. $P(X > .4) = \int_{.4}^{1} 2(1-x)dx = .36$

c. $P(X < .1) = \int_0^{.1} 2(1-x)dx = .19$

137. $E(e^{tX}) = \int_a^b e^{tx}\frac{1}{b-a}dx$

2

$= \frac{e^{tb} - e^{ta}}{t(b-a)}$

they might have a different version for a

3 138. a. $M_Y(t) = e^{td}M_X(ct)$

alg. $= \frac{e^{(bc+d)t} - e^{(ac+d)t}}{t((bc+d)-(ac+d))} \sim Uni(ac+d, bc+d)$

b. Imao / mn took like b.

142.

2 $E(e^{tz}) = \int_{-\infty}^{\infty} e^{tz}\frac{1}{\sqrt{2\pi}}e^{-\frac{1}{2}z^2}dz$

$= \int_{-\infty}^{\infty}\frac{1}{\sqrt{2\pi}}\exp\left\{-\frac{1}{2}(z^2 - 2zt + t^2\right\}e^{t^2/2}dz$

$= e^{t^2/2} \cdot \underbrace{\int_{-\infty}^{\infty} \text{Normal pdf}}_{1}$

$= e^{t^2/2}$

I am not 100% of my H's on this, so feel free to correct/check using theirs.