MAT 1372
Exam II practice
Spg 12
Halleck
solutions

1. a) $P(X=4)=1-(.1+.3+.4)=.2$

b)

X	X^2	$P(x)$	$xP(x)$	$x^2P(x)$
3	9	.1	.3	.9
1	1	.3	.3	.3
0	0	.4	0	0
4	16	.2	.8	3.2
			1.4	4.4

$\mu = 1.4$

$Var(X)=E(X^2)-\mu^2$
$= 4.4-(1.4)^2$
$= 4.4-1.96$
$= 2.44$ $\quad \sigma=\sqrt{2.44}=1.56$

2. $P(X)=\binom{n}{x}p^x q^{n-x}$ $\qquad \binom{7}{5}=\frac{7\cdot 6\cdot 5!}{5!\,2!}=21$

a) $P(5)=\binom{7}{5}.5^5 .5^2=.1641$

b) $P(6)=\binom{7}{6}.5^6 .5 = 7\cdot .5^7=.0547$ $\qquad P(x\geq 5)=P(5)+P(6)+P(7)$
$P(7)=\binom{7}{7}.5^7 = .00781$ $\qquad = .2266$

c) $P(5)=21(.4)^5(.6^2)=.07741$
$P(6)=7(.4)^6\,.6 = .01720$
$P(7)=.4^7 = .00164$
$P(x\geq 5)=.09625$

3. $\mu=np=6000(.3)=1800$ $\qquad \sigma=\sqrt{npq}=\sqrt{6000(.3)(.7)}=35.50$

4. a) $\lambda=3$ $\left(\frac{6}{10}=\frac{\lambda}{5}\right)$ $\quad P(0)=e^{-\lambda}=e^{-3}=.04979$

b) $P(1)=e^{-\lambda}\frac{\lambda}{1!}=3e^{-3}=.14936$

c) $P(x\geq 2)=1-(P(0)+P(1))$
$=1-(e^{-3}+3e^{-3})$
$=1-4e^{-3}=.80085$

5.

X	Y	X^2	XY	Y^2
2	9	4	18	81
4	3	16	12	9
4	7	16	28	49
6	5	36	30	25
16	24	72	88	164

$SS_{xx}=72-\frac{16^2}{4}=8$

$SS_{xy}=88-\frac{16\cdot 24}{4}=-8$

$SS_{yy}=164-\frac{24^2}{4}=20$

$b=\frac{-8}{8}=-1$
$a=6-(-1)4=10$

a) $y=10-x$

$\bar{x}=4$
$\bar{y}=6$

b) $b=\frac{-1}{1}$: For every hour on computer, alertness level falls by 1
$a=10$: Before computer work, alertness level is 10.

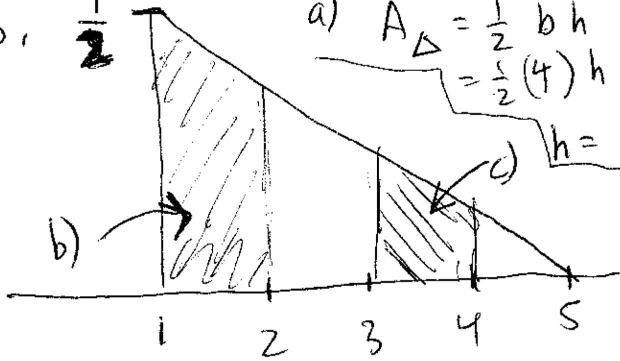
c) If $x=10$, $y=10-10=0$
After 10 hrs on computer, alertness level will be 0

d) $r=\frac{-8}{\sqrt{8\cdot 20}}=\frac{-8}{\sqrt{160}}=\frac{-8}{\sqrt{16}\sqrt{10}}=\frac{\cancel{-8}^{\,-2}}{\cancel{4}\sqrt{10}}=\frac{-2}{\sqrt{10}}\cdot\frac{\sqrt{10}}{\sqrt{10}}=\frac{-2\sqrt{10}}{10}=\frac{-\sqrt{10}}{5}=-.632$

$|r|$: $\begin{cases} \leq .5 & \text{weak} \\ .5-.8 & \text{moderate} \\ >.8 & \text{strong}\end{cases}$

So correlation is moderate.
Since $r^2=.40$, 40% of total variation can be explained by the linear relation with x

6. $\frac{1}{2}$



a) $A_{\triangle} = \frac{1}{2} b h$
$= \frac{1}{2}(4) h = 1$
$h = \frac{1}{2}$

b) $P(2 < x)$

$\left.\begin{matrix}(5,0)\\(1,\frac{1}{2})\end{matrix}\right\} m = -\frac{1}{8}$

$y - y_1 = m(x - x_1)$
$y - 0 = -\frac{1}{8}(x-5)$
$y = -\frac{1}{8}x + \frac{5}{8}$
$y(2) = -\frac{1}{8}(2) + \frac{5}{8} = \frac{3}{8}$

$A_{\text{trap}} = \frac{1}{2}(b_1 + b_2) h$
$= \frac{1}{2}\left(\frac{1}{2} + \frac{3}{8}\right) 1 = \frac{7}{16}$

c) $P(3 < x < 4)$ $y(3) = -\frac{1}{8}(3) + \frac{5}{8} = \frac{2}{8} = \frac{1}{4}$
$y(4) = -\frac{1}{8}(4) + \frac{5}{8} = \frac{1}{8}$

$A_{\text{trap}} = \frac{1}{2}\left(\frac{1}{8} + \frac{2}{8}\right) 1$
$= \frac{3}{16}$

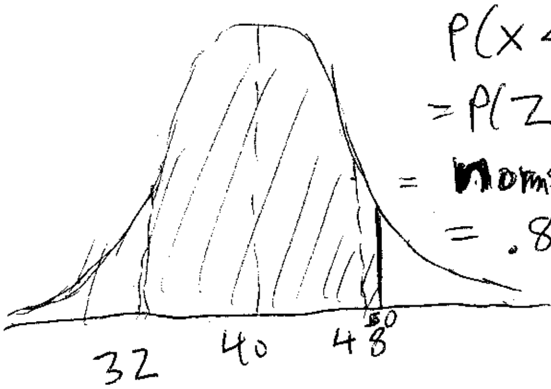
7. a) $R^2 = .8909$ a very strong correlation
$R = -.9439$ 89% of variation can be ascribed to x

b) $y = 88.6 - 2.8x$

c) For every absence, your final average decreases by 2.8%
If you have no absenses, then your final average is 88.6%

d) $y = 88.6 - 2.8(5) = 74.6$ ∴ Carol can expect her average to be 74.6%

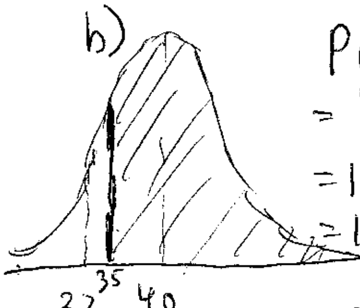
8. a)



$P(x < 50)$
$= P(Z < 1.25)$
$=$ normsdist(1.25)
$= .89435$

$x < 50$
$x - 40 < 10$
$\frac{x-40}{8} < \frac{10}{8}$
$Z < \frac{5}{4} = 1.25$

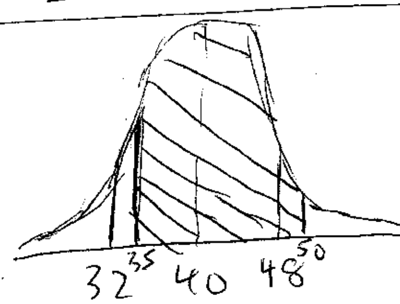
b)



$P(x > 35)$
$= 1 - P(x < 35)$
$= 1 - P(Z < -\frac{5}{8})$
$= 1 -$ normsdist$(-\frac{5}{8})$
$= .73401$

$x < 35$
$x - 40 < -5$
$\frac{x-40}{8} < -\frac{5}{8}$
$Z < -\frac{5}{8}$

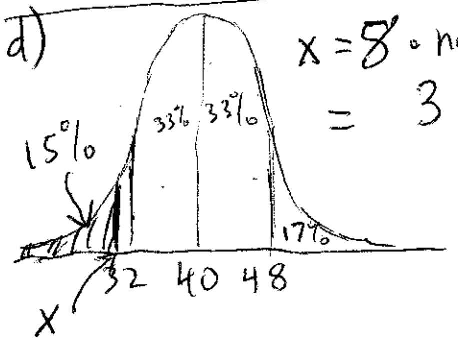
c)



$P(35 < x < 50)$
$= P(-\frac{5}{8} < Z < \frac{5}{4})$
$= P(Z < 5/4) - P(-\frac{5}{8})$
$=$ normsdist$(5/4)$
$-$ normsdist$(-5/8) = .62836$

$35 < x < 50$
$-5 < x - 40 < 10$
$-\frac{5}{8} < \frac{x-40}{8} < \frac{10}{8}$
$-\frac{5}{8} < Z < \frac{5}{4}$

d)



$x = 8 \cdot$ normsinv$(.15) + 40$
$= 31.709$