Non-Calc Book Review Solutions ch.15

(1) $0.3 + 1/k + 2/k + 0.1 + 0.1 = 1$

(a) $0.5 + 3/k = 1$

$3/k = 0.5$

$3 = 0.5k$

$\boxed{6 = k}$

(b)

-2	-1	0	1	2
$3/10$	$1/6$	$2/6$	$1/10$	$1/10$

$-2(3/10) + -1(1/6) + 0(2/6) + 1(1/10) + 2(1/10)$

$-6/10 - 1/6 + 0 + 1/10 + 2/10$

$-3/10 - 1/6$

$-9/30 - 5/30 = -14/30 = \boxed{-7/15}$

(4) (a)

	2	2	4	4
1	2	2	4	4
2	4	4	8	8
3	6	6	12	12
4	8	8	16	16

(b)

x	2	4	6	8	12	16
$P(X=x)$	$1/8$	$2/8$	$1/8$	$2/8$	$1/8$	$1/8$

(c) $2(1/8) + 4(2/8) + 6(1/8) + 8(2/8) + 12(1/8) + 16(1/8)$

$2/8 + 8/8 + 6/8 + 16/8 + 12/8 + 16/8$

$8/8 + 8/8 + 32/8 + 12/8$

$1 + 1 + 4 + 1\,4/8 = \boxed{7\,1/2}$

(d)

x	£10	£5
$P(X=x)$	$2/8$	$6/8$

$10(2/8) + 5(6/8)$

$20/8 + 30/8 = 50/8 = 25/4 = 6\,1/4 = 6.25$

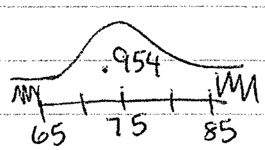
10 weeks $= 10 \cdot 6.25 = \boxed{\$62.50}$

(5) $X \sim B(5, 1/3)$

$P(X=3) = \binom{5}{3}\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2$ or ${}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2$

(6) $2(0.1) = \boxed{0.2}$

(7)



(a) $a = 85$

(b) $x + .954 + x = 1$

$2x = .046$

$x = .023$

$P(X > 85)$

$\boxed{.023}$

Ch. 15 Calc Book Review Solutions

(1) (a) $P(1 \text{ or } 6) = 2/6$ or $1/3$

$D \sim B(3, 1/3) \Rightarrow P(D \geq 1)$ means roll 1 or 6 once, twice, or 3 times

$P(D \geq 1) = 1 - P(D = 0)$

$1 - \text{binompdf}(3, 1/3, 0) = \boxed{19/27}$

(b)

d	-5	1
$P(D=d)$	$8/27$	$19/27$

← Sum of 1

(c) (i) $-5(8/27) + 1(19/27) = -7/9$

$\boxed{\text{lose } \$0.78}$

(ii) $-7/9 \cdot 9 = -7$

$\boxed{\text{lose } \$7}$

(2) $S \sim B(8, 0.3)$

(a) $P(X=3) = \text{binompdf}(8, 0.3, 3) = \boxed{0.254}$

(b) $P(X \geq 3) = 1 - P(X \leq 2) = 1 - \text{binomcdf}(8, 0.3, 2) = \boxed{0.448}$

(3) $P(6) = 1/6$

$D \sim B(6, 1/6)$ $P(D=3) = \text{binompdf}(6, 1/6, 3) = 0.05358$

6 die → $P(6)$ → getting 3 sixes

not on our test

$X \sim B(5, 0.05358)$ $P(X=2) = \text{binompdf}(5, 0.05358, 2)$

5 throws → P(three 6's) → getting 3 sixes twice

$\boxed{0.0243}$

(4) (a) $H \sim B(10, 0.2)$

(i) $P(X=4) = \text{binompdf}(10, 0.2, 4) = \boxed{0.0881}$

(ii) $P(X>5) = 1 - P(X \leq 5) = 1 - \text{binomcdf}(10, 0.2, 5) = \boxed{.00637}$

(b) $P(X=0) = \text{binompdf}(10, 0.2, 0) = 0.107$

$P(X=1) = \text{binompdf}(10, 0.2, 1) = 0.268$

$P(X=2) = 0.302$

$P(X=3) = 0.201$

probabilities continue to decrease

so most likely number is $\boxed{2}$

not on test

(c) $H \sim B(n, 0.2)$

$P(X \geq 1) > 0.95$

$1 - P(X=0) > 0.95$

$0.05 > P(X=0)$

$P(X=0) < 0.05$

$\binom{n}{0}(0.2)^0(0.8)^n < 0.05$

$(1)\cdot(1)\cdot(0.8)^n < 0.05$

$0.8^n < 0.05$

$\log 0.8^n < \log 0.05$

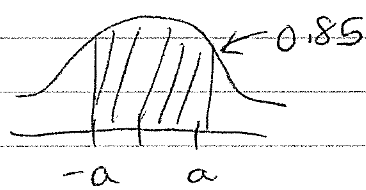
$n \log 0.8 < \log 0.05$

$n > \dfrac{\log 0.05}{\log 0.8}$

$n > 13.4 \longrightarrow$ 14 people

(5) $P(|z| \leq a) = 0.85$

$P(z \leq a)$ $P(z \geq -a)$



$P(-a \leq z \leq a) = 0.85$

Two tails $= 1 - 0.85 = 0.15$

one tail $= \frac{1}{2}(0.15) = .075$

$P(z \leq a) = .85 + .075$

$P(z \leq a) = 0.925$

invNorm $(.925, 0, 1) = \boxed{1.44}$

(6) (a) $T \sim N(71, \sigma^2)$

$P(T < 80) = 0.85$

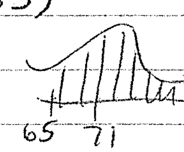
$z = \dfrac{80-71}{\sigma} = \dfrac{9}{\sigma}$

$P(z < \frac{9}{\sigma}) = 0.85$

invNorm $(0.85, 0, 1) = 1.04$

$\dfrac{9}{\sigma} = 1.04$ $\boxed{\sigma = 8.65}$

(b) $P(X > 65)$



normalcdf(65, 10000, 71, 8.65)

$\boxed{.756}$

7 $X \sim N(\mu, \sigma^2)$

$P(X < 30) = 0.15$

$P\left(Z < \frac{30-\mu}{\sigma}\right) = 0.15$

invNorm(0.15, 0, 1)

$-1.04 = \frac{30-\mu}{\sigma}$

$-1.04\sigma = 30 - \mu$

$\mu = 1.04\sigma + 30$

$P(X > 50) = 0.1$

$P\left(Z < \frac{50-\mu}{\sigma}\right) = 0.9$

invNorm(0.9, 0, 1)

$1.28 = \frac{50-\mu}{\sigma}$

$1.28\sigma = 50 - \mu$

$\mu = -1.28\sigma + 50$

$1.04\sigma + 30 = -1.28\sigma + 50$

$2.32\sigma = 20$

$\boxed{\sigma = 8.62}$

$\mu = 1.04(8.62) + 30$ $\quad \mu = 38.9648$

$\boxed{\mu = 39.0}$

8 @ $S \sim N(\mu, 2^2)$ $\quad P(S > 35) = 0.2$

$P\left(Z > \frac{35-\mu}{2}\right) = 0.2$

$P\left(Z < \frac{35-\mu}{2}\right) = 0.8$

invNorm(0.8, 0, 1) =

$.842 = \frac{35-\mu}{2}$

$\boxed{\mu = 33.3}$

ⓑ $X \sim B(5, 0.2)$

$P(X = 0)$

binompdf(5, 0.2, 0)

$\boxed{0.328}$

ⓒ $P(X \geq 2)$

$1 - P(X \leq 1)$

1 − binomcdf(5, 0.2, 1)

$\boxed{0.263}$

Additional ch.15 Non Calc Review Solutions

(1) (a) $Z \sim N(0, 1^2)$

(b) Harri's score is 2 standard deviations below the mean

(c) $P(z > -2) = 1 - P(z < -2)$

$1 - 0.0228$ (from table)

$0.9772 \rightarrow \boxed{97.72\%}$

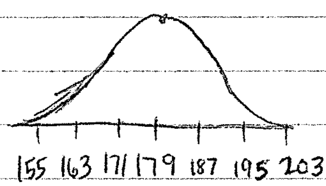
(d) $z = \dfrac{x - \mu}{6} \Rightarrow -2 = \dfrac{115 - 151}{6} \Rightarrow -2 = \dfrac{-36}{6} \Rightarrow -2 6 = -36$

$\boxed{6 = 18}$

(e) $\dfrac{196 - 151}{18} = \dfrac{45}{18} = \dfrac{5}{2} = 2.5 = z$ $\boxed{\text{2.5 standard deviations}}$

(2) (a) $H \sim N(179, 8^2)$

(b)



(c) (i) $z = \dfrac{x - \mu}{6}$

$z = \dfrac{195 - 179}{8} = 2$

$P(z > 2) = 1 - P(z < 2)$

$1 - .9772$ (from table)

$.0228$

$\boxed{2.28\%}$

(ii) $\dfrac{163 - 179}{8} = -2$ $\quad \dfrac{187 - 179}{8} = 1$

$P(-2 < z < 1)$

$P(z < 1) - P(z < -2)$

$.8413 - .0228$

$.8185$

$\boxed{81.85\%}$

(iii) $\frac{189-179}{8} = \frac{10}{8} = \frac{5}{4} = 1.25$ $\quad P(z<1.25)$

$.8944 \longrightarrow \boxed{89.44\%}$

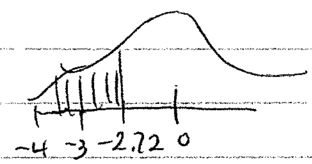
(iv.) $z = \#$ of σ above/below mean (above = pos / below = neg)

$P(z<1.32) = 0.9066 \Longrightarrow \boxed{90.66\%}$

(V.) $P(z< -2.72)$

0.0033

0.33%



(d) 90% percentile = probability (area) of 0.90

$P(z<z) = 0.90$

look for closest to 0.90 in table & go backwards $\rightarrow z \approx 1.28$

$z = \frac{x-\mu}{\sigma} \Rightarrow 1.28 = \frac{X-179}{8} \Rightarrow 10.24 = X-179$

$X = 189.24 \approx \boxed{189}$

(e) $P(z>2) \cdot P(-2<z<1)$

answer to (i) $\cdot$ answer to (ii)

$(.8185) \cdot (.0228)$

.01866180

$\boxed{1.87\%}$

$$\begin{array}{rl} 0.8185 & \leftarrow 4 \text{ places} \\ \times\ 0.0228 & +4 \text{ places} \\ \hline 65480 & 8 \text{ places} \\ 163700 & \\ 1637000 & \\ \hline .01866180 & \leftarrow 8 \text{ decimal places} \end{array}$$

(3) $H \sim B(20, 0.6)$

① fixed # of trials

② either success or failure

③ each trial is independent of the other

④ probability is the same each time

$\binom{20}{12}(0.6)^{12}(0.4)^{8}$