AP Stats 7.1 – 7.4

$\boxed{7.1}$ a) $P(X < 3) = \frac{2}{6} = \frac{1}{3}$

$\boxed{7.2}$ a) GGG GBB GGB BBB each prob. = $1/8$

BGB GBG

BBG BGG

b) $P(X = 2) = 3/8$

c)

X	0	1	2	3
prob.	$1/8$	$3/8$	$3/8$	$1/8$

$\boxed{7.3}$ a) $P(X = 5) = .01$ 1%

b) $.48 + .38 + .08 + .05 + .01 = 1$

all prob. between 0 and 1

c) $P(X \leq 3) = .48 + .38 + .08 = .94$

d) $P(X < 3) = .48 + .38 = .86$

e) $P(X \geq 4)$ or $P(X > 3) = .05 + .01 = .06$

f) 01 → 48 would mean class 1

49 → 86 " " class 2

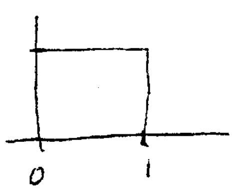
87 → 94 " " class 3

95 → 99 " " class 4

00 " " class 5

Generate 2 digit random numbers

The proportion from 01 to 94 will give $P(X \leq 3)$

$\boxed{7.4}$ 

a) $P(0 \leq X \leq .4) = 0.4$

b) $P(.4 \leq X \leq 1) = 0.6$

c) $P(.3 \leq X \leq .5) = 0.2$

d) $P(.3 < X < .5) = 0.2$

e) $P(.226 \leq X \leq .713) = 0.487$

AP Stats

$\boxed{7.5}$ a) $P(X \leq .49) = 0.49$

b) $P(X \geq .27) = 0.73$

c) $P(.27 < X < 1.27) = P(.27 < X < 1) = 0.73$

d) $P(.1 \leq X \leq .2 \text{ or } .8 \leq X \leq .9) = 0.1 + 0.1 = 0.2$

e) $P(\text{not } (0.3 < X < 0.8)) = 1 - 0.5 = 0.5$

f) $P(X = 0.5) = 0$

$\boxed{7.6}$ a)

1,1	2,1	3,1	4,1	5,1	6,1
1,2	2,2	3,2	4,2	5,2	6,2
1,3	2,3	3,3	4,3	5,3	6,3
1,4	2,4	3,4	4,4	5,4	6,4
1,5	2,5	3,5	4,5	5,5	6,5
1,6	2,6	3,6	4,6	5,6	6,6

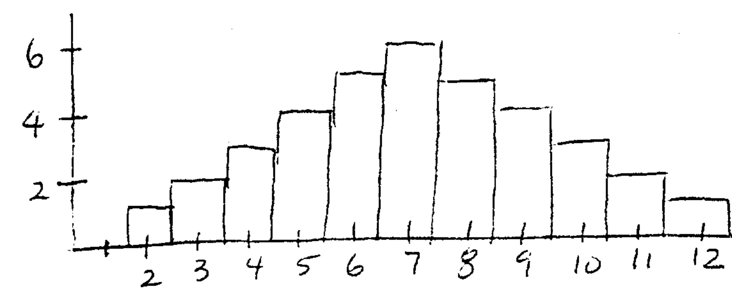
b) $1/36$

c) possible sums:
2, 3, 4, ... 12

for example: sum of 3
2 ways (1,2) (2,1)

Sum	2	3	4	5	6	7	8	9	10	11	12
prob.	$1/36$	$2/36$	$3/36$	$4/36$	$5/36$	$6/36$	$5/36$	$4/36$	$3/36$	$2/36$	$1/36$

c)



d) $P(7 \text{ or } 11) = \frac{6}{36} + \frac{2}{36}$
$= 8/36 \text{ or } 2/9$

e) $P(\text{not } 7) = 1 - 6/36$
$= 30/36 = 5/6$

$\boxed{7.7}$ a) all are between 0 and 1
total $.25 + .32 + .17 + .15 + .07 + .03 + .01 = 1$

b) $P(X \geq 5) = .07 + .03 + .01 = 0.11$

c) $P(X > 5) = .03 + .01 = .04$

d) $P(2 < X \leq 4) = .17 + .15 = .32$

e) $P(X \neq 1) = 1 - .25 = .75$

f) $P(X > 2) = 1 - (.25 + .32) = .43$

AP Stats

$\boxed{7.8}$ a) $P(X = 12) = .752$ 75.2%

b) all probabilities are between 0 and 1

total $.010 + .007 + .007 + .013 + .032 + .068$

$+ .070 + .041 + .752 = 1.000$

c) $P(X \geq 6) = 1 - (.010 + .007) = .983$

d) $P(X > 6) = 1 - (.010 + .007 + .007) = .976$

e) $P(X \geq 9)$ or $P(X > 8) = .068 + .070 + .041 + .752 = .93$

$\boxed{7.9}$ a) $P(A \text{ and } B \text{ and not } C) = (.6)(.6)(.4) = .144$

b) Support = S SSS SSO SOO OOO

Oppose = O SOS OSO

OSS OOS

$P(SSS) = .6^3 = .216$

$P(SSO) = (.6)(.6)(.4) = .144$ (also SOS and OSS) $3(.144) = .43$

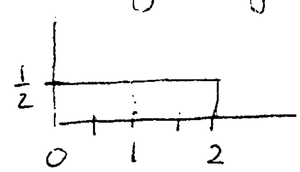
$P(SOO) = .4^2(.6) = .096$ (also OSO, OOS) $3(.096) = .28$

$P(OOO) = .4^3 = .064$

c)

Value of X	0	1	2	3
prob.	.216	.432	.288	.064

d) majority $P(X \geq 2) = .288 + .064 = .352$

$\boxed{7.10}$ 

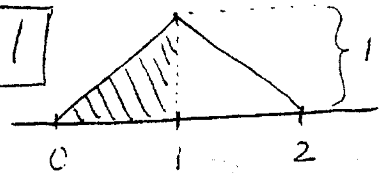
area $= (\frac{1}{2})(2) = 1$ b) $P(y \leq 1) = \frac{1}{2}$

c) $P(.5 < y < 1.3) = (.8)(\frac{1}{2}) = .4$

d) $P(y \geq .8) = (1.2)(\frac{1}{2}) = .6$

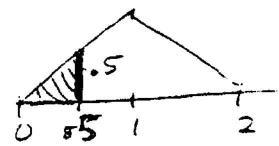
AP Stats

7.11



$\frac{1}{2} \cdot b \cdot h$

Area $= \frac{1}{2}(2)(1) = 1$



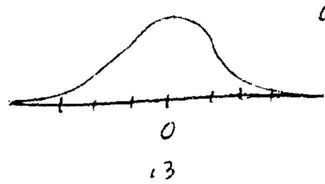
Y = sum of two #s

b) $P(Y < 1) = \frac{1}{2}(1) = 1/2$

c) $P(Y < .5) = \frac{1}{2}(.5)(.5)$
$= .125$

d) Do a simulation

7.13 $\mu = 0.3$
$\sigma = 0.023$



a) $P(\hat{p} \geq 1/2) = P\left(z \geq \frac{1/2 - .3}{.023}\right)$
$= P(z \geq 8.7)$
$= 0$

b) $P(\hat{p} < .25) = P\left(z < \frac{.25 - .3}{.023}\right) = P(z < -2.17)$
$= .0150$

c) $P(.25 < \hat{p} < .35) = P\left(-2.17 < z < \frac{.35 - .3}{.023}\right)$
$= P(-2.17 < z < 2.17)$
$= .9700$

7.15 a) $\mu = .15$
$\sigma = .0092$

$P(\hat{p} \geq .16) = P\left(z \geq \frac{.16 - .15}{.0092}\right)$
$= P(z \geq 1.09)$
$= .1379$

b) $P(.14 \leq \hat{p} \leq .16) = P(-1.09 \leq z \leq 1.09)$
$= .7242$

AP Stats

$\boxed{7.17}$ $\mu_x = 0(.10) + 1(.15) + 2(.30) + 3(.30) + 4(.15)$
$= 2.25$

$\boxed{7.18}$ a) X is the payoff (either win \$3 or lose)

Values of X	0	3
prob.	.75	.25

b) $\mu_x = 0(.75) + 3(.25) = .75$ $\boxed{\$.75}$

c) If it costs \$1.00 to play and the avg. payoff is \$.75, the casino makes \$.25 per bet on average. (in the long run).

$\boxed{7.19}$ Choosing a 3-digit # $\underline{10} \cdot \underline{10} \cdot \underline{10} = \boxed{1000 \text{ ways}}$
If the winning # is $\underline{123}$ you could have 312, 321, 123, 132, 213, 231 and win

\$83.33

$P(\text{winning}) = \frac{6}{1000}) \Rightarrow P(\text{losing}) = \frac{994}{1000}$

expected payoff $= 83.33(.006) + 0(.994) = \underline{\underline{0.50}}$
(the bet cost \$1.00 and pays off \$.50)

AP Stats | 7.21, 22, 23

7.21 Do randInt(0,1,10) and count how many times you get 3 or more heads or tails in a row.
Keep track of your winnings (or loses!).
Do at least 20 trials. Calculate the mean of your winnings.

7.22 a) Each outcome is independent. The wheel has no "memory" of what has come before. On any one spin red and black are equally likely to occur.
b) Removing a card changes the composition of the deck so each draw is not independent.
If you have 5 red cards, your chance of gettin a red is now $\frac{26-5}{52-5} = \frac{21}{47}$ or 44.68%

7.23 If each "at-bat" is independent the 35% figure applies only to the average of hits in the long-run (the whole season or whole career.) It has no meaning for an individual at-bat.

AP Stats 7.24, 25, 27, 28a

$\boxed{7.24}$ $\mu_X = 40$ $\sigma_X = 2$ $\mu_Y = 25$ $\sigma_Y = 1$

$\mu = 40 + 5 + 25 = 70$ $\boxed{70 \text{ minutes}}$

$\boxed{7.25}$ a) Independent (different years)
b) Not independent (storm may last more than 1 day)
c) Not independent (nearby - similar weather)

$\boxed{7.27}$ $\mu_X = 2.25$

$\sigma_X^2 = (0-2.25)^2(.10) + (1-2.25)^2(.15) + (2-2.25^2)(.30) + (3-2.25)^2(.30) + (4-2.25)^2(.15) = 1.3875$

$\sigma_X = \sqrt{1.3875} = \boxed{1.1779}$

$\boxed{7.28}$ a) $\mu_X = 0(.03) + 1(.16) + 2(.30) + 3(.23) + 4(.17) + 5(.11)$
$= \boxed{2.68}$

$\sigma_X^2 = (2.68-0)^2(.03) + (1-2.68)^2(.16) + (2-2.68)^2(.30) + (3-2.68)^2(.23) + (4-2.68)^2(.17) + (5-2.68)^2(.11)$
$= 1.7176$

$\sigma_X = \sqrt{1.7176}$
$= \boxed{1.3106}$

AP Stats 7.29, 30, 31, 32

7.29 Since the two times are independent

$$\sigma^2_{X+Y} = \sigma_X^2 + \sigma_Y^2 = 2^2+4^2 = 20$$

$$\sigma_{X+Y} = \sqrt{20} \approx \boxed{4.472 \text{ seconds}}$$

7.30 since the times are independent

$$\sigma^2_{X+Y} = 2^2+1^2 = 5 \quad \sigma_{X+Y} = \sqrt{5} \approx \boxed{2.236}$$

7.31 $\mu_w = 120$ $\sigma_w = 28$ $\mu_m = 105$ $\sigma_m = 35$

a) Two randomly selected students could be assumed to be unrelated.

b) $\mu_{w-m} = \mu_w - \mu_m = 120 - 105 = \boxed{15}$

$$\sigma^2_{w-m} = \sigma_w^2 + \sigma_m^2 = 28^2 + 35^2 = 2009$$

$$\sigma_{w-m} = \sqrt{2009} \approx \boxed{44.822}$$

c) Unless we know that the distributions are normal we cannot find that probability. The mean and standard deviation do not give us enough information.

$\boxed{7.32}$ a) $\mu_X = 540(.1) + 545(.25) + 550(.3) + 555(.25) + 560(.1) = \boxed{550°}$

$$\sigma_X^2 = (540-550)^2(.1) + (545-550)^2(.25) + (550-550)^2(.3) + (550-555)^2(.25) + (560-550)^2(.1) = 32.5$$

$$\sigma_X = \sqrt{32.5} \approx \boxed{5.701°}$$

b) $\mu_{X-550} = \mu_X - 550 = 550-550 = \boxed{0°}$

$$\sigma^2_{X-550} = \sigma_X^2 = 32.5$$

$$\sigma_{X-550} = \boxed{5.701°}$$

c) $\mu_{\frac{9}{5}X+32} = \frac{9}{5}\mu_X + 32 = \frac{9}{5}(550)+32$

$$= \boxed{1022°}$$

$$\sigma_{\frac{9}{5}X+32} = \frac{9}{5}\sigma_X = \frac{9}{5}(5.701) = \boxed{10.2618°}$$

$\boxed{7.32}$ a) $\mu_X = 540(.1) + 545(.25) + 550(.3)$
$+ 555(.25) + 560(.1) = \boxed{550°}$

$\sigma_X^2 = (540-550)^2(.1) + (545-550)^2(.25) +$
$(550-550)^2(.3) + (550-555)^2(.25)$
$+ (560-550)^2(.1) = 32.5$

$\sigma_X = \sqrt{32.5} \approx \boxed{5.701°}$

b) $\mu_{X-550} = \mu_X - 550 = 550 - 550 = \boxed{0°}$

$\sigma^2_{X-550} = \sigma_X^2 = 32.5$

$\sigma_{X-550} = \boxed{5.701°}$

c) $\mu_{\frac{9}{5}X+32} = \frac{9}{5}\mu_X + 32 = \frac{9}{5}(550) + 32$
$= \boxed{1022°}$

$\sigma_{\frac{9}{5}X+32} = \frac{9}{5}\sigma_X = \frac{9}{5}(5.701) = \boxed{10.2618°}$