Mod. 10

10.1.1

(a.) $E = \{\{H,H,H,H\}, \{H,T,H,H\}, \{H,H,T,H\}, \{H,T,T,H\}\}$

$P(a) = \frac{2^2}{2^4} = \frac{4}{16} = \boxed{\frac{1}{4}}$

(b.)

$E = \{\{H,H,T,T\}, \{H,H,H,H\}, \{H,H,T,H\}, \{H,H,H,T\},$
$\{T,H,H,T\}, \{T,H,H,H\}, \{T,T,H,H\}, \{H,T,H,H\}\}$

$P(b) = \frac{8}{16} = \boxed{\frac{1}{2}}$

(c.)

$E = \{\{T,H,H,H\}, \{T,H,H,T\}, \{T,T,H,H\}\}$

$P(c) = \boxed{\frac{3}{16}}$

10.1.2

(a.) $\frac{(n-1)!}{n!} = \boxed{\frac{1}{n}}$

(b) $\frac{(n-2)!}{n!} = \boxed{\frac{1}{n\cdot(n-1)}}$

(c.) $\frac{2(n-1)!}{n!} = \boxed{\frac{2}{n}}$

16.1.4

a. $\binom{10}{5} = 252$

b. $\cancel{\binom{10}{5}\binom{8}{4}}$

$\binom{8}{3} + \binom{8}{3} = 112/252 = \boxed{\frac{28}{63}}$

c. $\cancel{\frac{1}{252}} = \frac{2}{256} = \boxed{\frac{1}{126}}$

16.1.5

a. $\binom{52}{5}$ choosing 5 cards $= 2598960$

$P(a) = \frac{3,744}{2598960} = \boxed{0.00144}$

b. $\boxed{\frac{\binom{13}{1}\binom{4}{3} \cdot 48}{\binom{52}{5}}}$

c. $\boxed{\frac{\binom{4}{1}\binom{13}{5}}{\binom{52}{5}}}$

d. $\boxed{\frac{\binom{4}{2}\binom{13}{1}\binom{12}{3}\binom{4}{1}^3}{\binom{52}{5}}}$

$\boxed{16.2.1}$

a. $P(a) = \boxed{2^{n} + \left(\frac{1}{2^n}\right)}$ ← Prob that it is all Tails

b. $P(b) = \boxed{1 - 2\left(\frac{1}{2}\right)^{n}}$

c. $\cancel{P(c) = 1 - \left(\frac{2}{2^n}\right)}$ ← ~~one two possibili~~ $\boxed{P(c) = 1 - \left(\frac{1}{2^n}\right)} = \cancel{\frac{2n-1}{2n}}$

iff $n = 2k$

$\boxed{16.2.2}$

a. $2 \cdot \frac{(n-1)!}{n!} = \boxed{2\left(\frac{1}{n}\right)}$

b. $\cancel{\frac{(n-1)!}{n!} + \frac{(n-1)!}{n!}} -$

$\boxed{= 2\left(\frac{1}{n}\right) + \frac{(n-2)!}{n!}}$ ← C is first + F is last $= 2\left(\frac{1}{n}\right)$

+

C is first and F is last $= \frac{(n-2)!}{n!}$

c. $P(c) = \boxed{1 - \frac{(n-2)!}{n!}}$ ← F and C are together

d. $\boxed{P(d) = 2 \cdot \left(\frac{(n-2)!}{n!}\right)}$

$\boxed{16.2.5}$

a. 10 chars long

$\underline{n=10}$, U, L, #

$52+10 = 62$

Sample size = $\underline{62^{10}}$ elements

$P(a) = \frac{26^2 \times 10 \times 62^7}{62^{10}} = \boxed{\frac{26^2 \cdot 10}{62^3}}$

$\boxed{16.3.1}$

a. $P(a) = \frac{18}{36} = \frac{3}{6} = \boxed{\frac{1}{2}}$

$P(b) = \frac{6}{36} = \boxed{\frac{1}{6}}$

(5,5)(5,5)(6,6)(6,6)(5,6)(6,5)

$P(c) = \boxed{1/6}$

b. $P(A|C) = \frac{|A \cap C|}{|C|} = \frac{3/36}{1/6} = \boxed{\frac{1}{2}}$

c. $P(B|C) = \frac{|B \cap C|}{|C|} = \frac{2}{6} = \boxed{\frac{1}{3}}$

d. $P(A|B) = \frac{|A \cap B|}{|B|} = \frac{4}{6} = \cancel{3}\ \boxed{\frac{2}{3}}$

10.3.3

(a) $\boxed{\dfrac{7! \cdot 2}{8!}}$

(b) ~~6!~~ $P(b) = \dfrac{7!}{8!} = \boxed{\dfrac{1}{8}}$

(c) False, They have an intersection

$\boxed{10.3.6}$ $H = 1/3$, $T = 2/3$

(a) $P(a) = \boxed{(1/3)^{10}}$

(b) $P(b) = \boxed{(1/3)^5 \cdot (2/3)^5}$

(c) $P(c) = \boxed{(1/3) \cdot (2/3)^9}$

$\boxed{10.4.1}$ $\bar{S}$ = biased , S = Fair

$\bar{S}(H) = .75$, $\bar{S}(T) = .25$

~~P(F)~~

$P(S) = P(\bar{S}) = .5$

$\boxed{P(S|T) = \dfrac{(.25)(.5)}{.75} = \boxed{1.67}}$

$P(\bar{S}|H) =$

16.2

16.4.3

$P(d) = .03$ P = Positive

~~$P(fp) = .02$~~

$P(fn) = .04$

$P(P|\bar{d}) = .02$

$P(\bar{P}|d) = .04$

$$P(d|P) = \frac{.96 \cdot .03}{.96 \cdot .03 + .97 \cdot .02}$$

$\boxed{= .059}$

16.3

16.4.4 H = has HIV , P = Testing Positive

$P(H) = .0001$

250 out of 10,000 test positive

$P(P) = .025$

$\cancel{\frac{250}{.0001}}$ $.0001 \cdot 250 = .025$

$\boxed{P(H) = .0001}$ ← Says it in description.