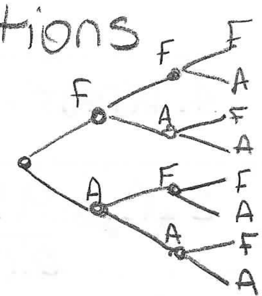
STA 2023

Test 2 Study Guide Solutions



1. F = favor
   A = against

   a. $2 \times 2 \times 2 = 8$ total outcomes
   S = {FFF, FFA, FAF, FAA,
   AFF, AFA, AAF, AAA}

   b. Event i = {FFF, FFA, FAF, AFF} compound event
   Event ii = {FFA, FAF, AFF} compound event
   Event iii = {FFA, FAF, FAA, AFF, AFA, AAF, AAA} compound event
   Event iv = {FAA, AFA, AAF, AAA} compound event

2. a. $P(\text{Closed}) = \frac{7400}{15000} = .493$

   b. $P(\text{insufficient work}) = \frac{4600}{15000} = .307$

   c. $P(\text{abolished}) = \frac{3000}{15000} = .2$

3. a. i. $P(BO) = \frac{1010}{2000} = .505$

   ii. $P(HS) = \frac{1000}{2000} = .5$

   iii $P(BO \mid <HS) = \frac{140}{400} = .35$

   iv. $P(>HS \mid WO) = \frac{70}{570} = .123$

   v. $P(HS \text{ \& } SA) = \frac{250}{2000} = .125$

   vi. $P(BO \text{ or } >HS) = \frac{1190}{2000} = .595$

   b. Yes, mutually exclusive & therefore dependent.
   (all mutually exclusives events are dependent)

   c. NO, mutually nonexclusive.
   Independence - check if $P(WO) \stackrel{?}{=} P(WO \mid HS)$

   Dependent events $\quad .285 = \frac{570}{2000} \neq \frac{300}{1000} = .3$

   d. A = {SA} $\quad \bar{A}$ = {BO, WO}

   e. B = {HS, >HS} $\quad \bar{B}$ = {<HS}

4. $P(PF) = .3$ $P(GF) = .09$ $P(PF \& GF) = .3 \times .09 = \boxed{.027}$

5. ${}_9C_2 = \frac{9!}{2!(7)!} = \frac{9 \times 8}{2} = \frac{72}{2} = \boxed{36}$

for order matters, ${}_9P_2 = \frac{9!}{7!} = 9 \cdot 8 = \boxed{72}$

6. $6 \times 5 \times 4 \times 2 = 240$ possible outfits

7. a. Total outcomes possible $= 10 \times 10 \times 10 = 1000$

$P(\text{win}) = \frac{1}{1000} = \boxed{.001}$

b. i. Still 1000 possible outcomes but more than one way to win $3 \times 2 \times 1 = 6$ ways to win since I can arrange 3 unique digits in 6 ways.

So $P(\text{win}) = \frac{6}{1000} = \boxed{.006}$

ii. Still 1000 possible outcomes but more than one way to win. Ex. 001 is drawn then 001, 010 and 100 all win. We calculate # of ways 0's can be placed which is ${}_3C_2 = 3$, then 1's only have 1 way to be placed so 3 possible winning combinations $P(\text{win}) = \frac{3}{1000} = \boxed{.003}$

iii. 1000 possible outcomes. If all # are the same then only 1 way to arrange them so $P(\text{win}) = \frac{1}{1000} = \boxed{.001}$

8. a. discrete

b. discrete

c. continuous

d. continuous

e. continuous

f. discrete

9.a. $P(x \ge 3) = P(x=3) + P(x=4) + P(x=5) = .309 + .360 + .168 = \boxed{.837}$

b. $P(x=0) = \boxed{.0021}$

(c&d)

x	$P(x)$	$xP(x)$	$x^2P(x)$
0	.002	0	0
1	.029	.029	.029
2	.132	.264	.528
3	.309	.927	2.781
4	.360	1.44	5.76
5	.168	.84	4.2

$\Sigma x P(x) = 3.5$ $\quad 13.298 = \Sigma x^2 P(x)$

$\mu = 3.5$

We would expect the number of successful cures to be about 4 cancer patients.

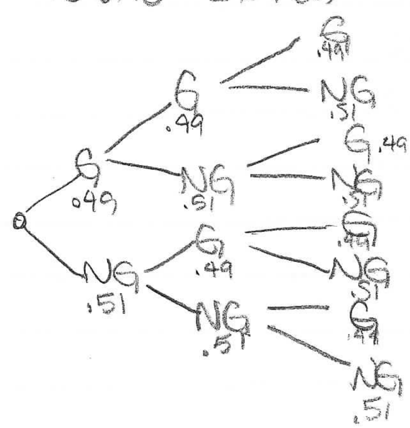
$\sigma = \sqrt{13.298 - 3.5^2} = \sqrt{13.298 - 12.25}$
$= \sqrt{1.048} = \boxed{1.024}$

10.

x	$P(x)$	$xP(x)$	$x^2P(x)$
0	.133	0	0
1	.127	.127	.127
2	.122	.244	.488
3	.118	.354	1.062

$E(x) = .725$ $\quad 1.677$

$\sigma = \sqrt{1.677 - .725^2}$
$= \sqrt{1.151}$
$\boxed{\sigma = 1.073}$



$P(GGG) = .49 \times .49 \times .49 = .118$

GGNG
GNGG
GNGNG
NGGG
NGGNG
NGNGG

2 guns $P(x=2) = .49 \times .49 \times .51 = .122$

1 gun $P(x=1) = .49 \times .51 \times .51 = .127$

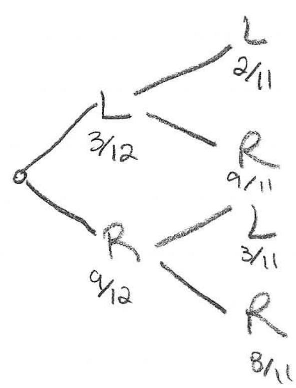
$P(NGNGNG) = .51 \times .51 \times .51 = .133$

11.

x	$P(x)$	$xP(x)$	$x^2P(x)$
0	.545	0	0
1	.410	.410	.410
2	.045	.090	.180

$\boxed{\mu = .5}$ $\quad .59$

$\sigma = \sqrt{.59 - .5^2}$
$= \sqrt{.34}$
$\boxed{\sigma = .583}$



$P(LL) = \frac{3}{12} \cdot \frac{2}{11} = .045$

$P(LR) = \frac{3}{12} \cdot \frac{9}{11} = .205$

$P(RL) = \frac{9}{12} \cdot \frac{3}{11} = .205$

$P(RR) = \frac{9}{12} \cdot \frac{8}{11} = .545$

12. a. x is an integer value between 0 and 20.

b. $P(x=6) = {}_{20}C_6 (.348)^6 (.652)^{20-6}$

$= \boxed{.173}$

13.

x	$P(x)$
0	.6983
1	.2573
2	.0406
3	.0036
4	.0002
5	.0000
6	.0000
7	.0000

$n=7$
$p=.05$
$q=.95$

a. $P(x \leq 2) = P(x=0) + P(x=1) + P(x=2)$

$= .6983 + .2573 + .0406$

$= \boxed{.9962}$

b. $\mu = n \cdot p = 7 \cdot .05 = \boxed{.35}$

$\sigma = \sqrt{n \cdot p \cdot q} = \sqrt{7 \cdot .05 \cdot .95} = \sqrt{.3325} = \boxed{.577}$