Stats M12 – Spring 2001

Homework Solutions #9

Section 8. 3 – p.354

2-
a) X-sqr = 6.4
b) P-hat (X-sqr >= 6.4) = 153/400 = .3825

Ans.: There's no reason to suspect it's unfair, because there is about 38% probability of getting this outcome.

4 –
E (x) = total tickets/ # locations = 90/6 = 15

X-squr = 13.73

Ans.: No, it has probability close to zero to get this outcome.

5 –
a) X-sqr = 3.8
b) No, there is no evidence that the die is unfair for that outcome has42% of chances to occur. (72 + 49 + 23 + 11 + 9 + 1 + 2 +1/ 400)

Section 8.4, p.365

3-
E(x) = 10
X-sqr = 22.8
Ans.: Yes, the students tend to prefer certain numbers over others, for the probability of having that outcome is less than 2.3%.

Section 8.5, p.376

1-
d.f.= 3
a) P-hat(X-sqr >= 5.7) = .08 (= 4/50)
b) P-hat (X-sqr >= 9.9) = .04 (= 2 outcomes out of 50).

2-
d.f.=5

a) P-hat (X-sqr >= 6) = .24
b) P-hat (X-sqr >= 9.9) = .04
c) P-hat (X-sqr >= 11.2) = .04
d) P-hat (X-sqr >= 9.6) = .06

5-
E (x) = 15

a) X-sqr = 4
b) N – 1 = 5
c) P-hat (X-sqr > = 4) = .50
d) Yes, because this outcome is likely to happen on average 50% of the time.

<u>Section 8.6, p. 383</u>

1-
Using table 8.14, P-hat (X-sqr> = 4.4) = ~ .50
Using table 8.21, P-hat (X-sqr> = 4.4) = ~ .50

2-
Using table 8.14, P-hat (X-sqr >= 7.4) =~ .24
Using table 8.21, P-hat (X-sqr >= 7.4) =~ .20

3-
Using table 8.14, P-hat (X-sqr >= 9.2) =~ .11
Using table 8.21, P-hat (X-sqr > = 9.2) = ~ .10

4-
Using table 8.14, P-hat (X-sqr > = 11.2) =~ .07
Using table 8.21, P-hat (X-sqr > = 11.2) = ~ .05

5 –
Using table 8.15, P-hat (X-sqr > = 4.6) =~ .12
Using table 8.21, P-hat (X-sqr > = 4.6) =~ .20

11-
E(x) = 16
X-sqr = 204/16 = 12.75
P-hat (X-sqr = 12.75) = ~ .05

12-

E (x) = 38
X-sqr = 203.37
P (X-sqr = 203.37) =~ 0

<u>Section 8.7, p. 390</u>

1-

a) E(x) = 5
b) X-sqr = 11.6 => Pr(X-sqr >=11.6) < .05 (From Table C, df = 5)
c) (30*.23) = 6.9, (30*.18) = 5.4, (30*.18) = 5.4, (30*.15) = 4.5, (30*.15) = 4.5, (30*.11) = 3.3
d) X-sqr = 1.39 + 1.07 + 1.07 + 2.72 + 2.72 + .88 = 9.85
P (X-sqr >= 9.85) < ~.10 but > 0.05

2-
X-sqr = (314 – 312)^2/ 312 + (101-104)^2/104 + (108-104)^2/104 + (32-35)^2/35
X-sqr = .013 + .087 + .154 + .257 = .511
P (X-sqr> =.511)=~ .90
This does not cast doubt on the theory. However, many have questioned that perhaps this data set is a little too good to be true. In fact, there is evidence that Mendel "fudged" his data to get it to fit the theory!

6-

a) (167*.59) = 98.53, (167*.31) = 51.77, (167*.08) = 13.36, (167*.02) = 3.34

X-sqr = .2028 + .8853 + .5217 + .0346 = 1.6444
P (X-sqr = 1.6444) is between .90 and .50.

<u>Chapter 5 – Review</u>

1 – E (x) = np = 22.5
2 – E (x) = 60* 1/6 = 10
3- Type 0 = 150*.49 = 73.5
Type A = 150*.27 = 40.5
Type B = 150*.20 = 30
Type AB = 150*.04 = 6

4- P (0 and 0) = .49*.49= .24

5- E(x) = np = 50*.24 = 12

7-
E (purple/normal) = (624*9/16) = 351
E (purple/shrunken) = (624*3/16) = 117

E (yellow/normal) = (624*3/16) = 117
E (yellow/shrunken) = (624*1/16) = 39

9-

a) E(x) = (-1)*3/4 + (4)*1/4 = .25
b) He should try to answer the questions anyway for he's likely to win on average 0.25 for each attempted answer.

10-
a) It's (1/10)^3 = 1/1000 or .001
b) 5* 1/1000 = 1/200 or .005

<u>Part. A</u>

a) E (X) = -1 *.999 + 500 * .001 = - $ .50
E (total winning) = 2 * -.50 = - $ 1.00
SD (X) = √ ∑ (x – xbar)^2 p(x) = √(-1 – (-.50))^2 .999 = (500 – (-.50))^2* .001 = $ 15.84
SD (total winning) = √ (2) * 15.84 = $ 22.40

b) E(every day of the year) = 365* (-.5) = - $ 182.00
SD (total year) = √(365) * 15.84 = $ 302.62
Let Y = X1 + X2 + ... + x365, represent your total "winnings" after 365 plays.
P (Y < -.5) = P (Z < -.5 – (-182))/302.62) = P (Z < .60) = .7257 or 72.57%

<u>Chapter 9 - Review</u>

a) Z = (4.392 – 5)/2 = -.304
b) Z = (6.921 – 5)/2 = .9605
c) Z = (8.936 – 5)/2 = 1.968
d) Z = (.0638 – 5)/2 = -2.4681

9 –
a) Continuous
b) Discrete
c) Discrete
d) Continuous

12 –

a) Z = (4 – 5)/1 = -1
P(x < 4.0) = P(Z < -1) = .1587

b) Z = (6.5 – 5.5)/.75 = 1.33
1 - .9082 = .0918
P (X > 6.5) = .0918

c) Z = (-5.44 – (-7))/.6= .26
1- .6026 = .3974
P(X > -5.44) = .3974

d) Z = (4 – 6)/1.5 = -1.33
Z = (7 – 6)/1.5 = .67

P(4 < X < 7) = . 7486 - .0918 = .6508

13 –
a)

Z = (15.5 – 14.5)/.5 = 2
X = height of a randomly chosen semi
P(X > 15.5) = P(Z > 2) = 1 - P(Z <= 2) =
1 - .9772 = .0228 or 2.28%

b) 99.9% corresponds to 3.8 Z-scores

3.8 = (X – 14.5)/ .5
X = 1.5 + 14.5 = 16 feet height

14 –

a) Let X represent the # of people in a car. the pdf of X is, we're told, uniform and discrete on 1,2,3,4,5,6. E(X) = 1*(1/6) + 2*(1/6) + ... + 6*(1/6) = 3.5 people per car.
SD(X) = 1.708

b)

person	observed	expected
1	42	20
2	31	20
3	12	20
4	18	20
5	12	20
6	5	20

X-sqr = 48.1
P (X-sqr >= 48.1) =~ 0
Ans.: No, the goal hasn’t been met.

18 –
Note that X is binomial, n = 10, p = 0.75
P(X = 10) = 10!/0!10! (.75)^10 (.25)^0 = .75^10 = 0.0563

b)P(X >= 7) = P(X = 7) + P(X = 8) + P(X = 9) + P(X = 10) = 0.775875

c) P(X = 6) + P(X = 7) + P(X = 8) = 0.677848