HW5
Andrew Michaelson

These are the solutions in blue to at least 60% of the problems for chapter 5.
Everything that is not in blue is part of my notes.

Problem 5.9

part a — Since the coin is fair the next toss should be just as likely to be a heads or a tail each time it is tossed, rather than being more likely to be a tail than a head.

part b — Since the coin is fair the next toss should be just as likely to be a heads or a tail each time it is tossed, rather than being more likely to be a head than a tail.

part c — The binomial formula contains p (the actual proportion) not the sample proportion.

Problem 5.11

part a — Yes, a binomial distribution does apply in this case.
A binomial distribution applies since there are only two outcomes irritable or not. Also the chance is the same in each case.
p in this case is not known .
n in this case is 200 .

part b — No, a binomial distribution does not apply in this case.
A binomial distribution does not apply since we are counting tosses not heads versus tails.

part c — Yes, a binomial distribution does apply in thise case.
Since the chance of success is 1/12 and the chance you are not sucessful is the same this is binomial.
p in this case is 1/12
n in this case is 500 .

Problem 5.13

part a

B_caught(10, 0.7)
B_missed(10, 0.3)

	0.2
	0.1
	0.04
	0.01
	0
	0
	0
sum	0.3504

part b

The probability of missing 4 or more errors out of 10 with a success 70% is (10 4)*(0.7^4)*(0.3)^6+(10 5)*(0.7^5)*(0.3^5)+ (10 6)*(0.7^6)*(0.3^4)+(10 7)*(0.7^7)*(0.3^3)+ (10 8)*(0.7^8)*(0.3^2)+(10 9)*(0.7^9)*(0.3^1)+ (10 10)*(0.7^10)*(0.3^0) which is equal to 0.3504 .

Problem 5.15

part a

Mean_caught = n*p, which in this case is 10*0.7 = 7 .
Mean_missed = n*p, which in this case is 10*0.3 = 3 .
The means of these two cases do add to 10=3+7

part b

σ_caught=((n*p)*(1-p))^0.5 which is (7*0.3)^0.5 = 1.45 .

part c

For p=0.9, σ_caught=((10*0.9)*(1-0.9))^0.5 which is 0.95 .
For p=0.99 σ_caught=((10*0.99)*(1-0.99))^0.5 which is 0.31 .
For p ~= 1 σ_caught=((10*1)*(1-1))^0.5 which ~= 0 .

Problem 5.23

X

part a

0.30=X/1011 303.3
n*p=1011*0.30=303.3
Thus, I can use the approximaton that X is almost N, and the sample proportion is approximately N since n*p is greater than or equal to 10 in this case.
Thus the data fits a normal distribution and I can find a Z-score for this data.
z=(x-μ)/ó μ = p which is 0.3, and ó = ((p*(1-p))/n)^0.5
Thus, ó = 0.0144 .
Z=(0.28-0.3)/(((0.3)*(1-0.3))/1011)^0.5, Z=(0.32-303.3)/14.57

-1.39 (continued on next page)

Problem 5.23 part a

(continued) (0.28-0.3)/(((0.3)*(1-0.3))/1011)^0.5

1.39

	Z	Z
	-1.39	1.39
P(X)	0.0823	0.9177
P1(X)-P2(X)	0.8354	

part b

	Z	Z
	-2.68	2.68
P(X)	0.0037	0.9963
P1(X)-P2(X)	0.9926	

part c

	Z	Z
	3.2	-3.2
P(X)	1	0
P1(X)-P2(X)	1	

The true p approaches 1.

Problem 5.41

part a

10/(20^0.5) is actually standard deviation and not variance.

part b Actually larger sample sizes will have smaller standard deviations.

part c The mean does not change as a sample size changes.

Problem 5.42

part a The standard deviation is 300/(10^0.5) which is 94.8683 .

part b

30=300/(n^0.5)
30*(n^0.5)=300
(300/30)=(n^0.5)
n=(300/30)^2
n is 100 songs that you would need to sample to a SD of 30 here.

Problem 5.43

SD_x=0.003/(4^0.5) which is 0.0015 mm.

The mean_x is 40.135 mm .

Problem 5.46

part a

mean of lightning strikes = 6 .
SD is 2.4 .

part b

mean of lightning strikes per 1 Km is 6 .
SD per 1 Km is 2.4 = SD/(10^0.5), so
2.4*(10^0.5) is 7.59 .

Problem 5.48

part a

Z = (23-20.8)/4.8
Z = 0.63
P is 1-(0.7357) which is 0.2643 .

part b

SD_x = 4.8/(25^0.5) is 0.9600 .
mean is 20.8

part c

Z = (23-20.8)/(0.9600) is 2.2917 .
P is 1-(0.9890) which is 0.0110 .

part d

The normal probabilty is probably more accurate in part c,
since with a larger sample set, the standard deviation is smaller.

Problem 5.49

part a

The mean is 0.5 .
SD is 0.7/(50^0.5) which is 0.0990 .

part b

0.6=x/50, x=50*0.6 which is 30 .
Z = (0.6-0.5)/0.0990 which is 1.01, so P is 0.1562

4.2

7

3

1.45

0.95
0.31
0

14.57
0.0144

94.8683

100

0.0015

7.59

0.63

0.2643

0.9600

2.2917
0.0110

0.0990

500 30
0.1010

-1.01
0.1562