NAME: Markus Afonso Set: C

MATH 1350 **Statistics for Information Technology**

Lab # 5 – Binomial and Poisson Distributions

Answer/Grading Sheet

<table>
<tr><th>Step :</th><th>Answer (if requested)</th><th>Mark</th><th></th></tr>
<tr><td>6</td><td>a)

```
> dbinom(94,1000,0.094)
[1] 0.043191
```

b)

```
> 1 - pbinom(81,1000,0.094)
[1] 0.9143385
```

c)

```
> pbinom(65,1000,0.094)
[1] 0.0006092706
```

d)

```
> pbinom(99,1000,0.094)
[1] 0.7275475
```

e)

```
> 1 - pbinom(74,1000,0.094)
[1] 0.9849876
```

f)

```
> pbinom(19,1000,0.094)
[1] 2.295188e-22
```

g)

```
> pbinom(90,1000,0.094) - pbinom(50,1000,0.094)
[1] 0.3569564
```

h)

```
> dbinom(32,1000,0.094)
[1] 1.005326e-14
```

i)
μ= np
μ= (1000)(0.094)
μ= 94
j)
$s = \sqrt{n \cdot p \cdot (1 - p)}$
$s = \sqrt{1000 \cdot 0.094 \cdot (1 - 0.094)}$
$s = 9.2284$</td><td></td><td>/10</td></tr>
<tr><td>7</td><td>#7 using u = np = lamda
p <- 1.1/10000
a)

```
> dpois(2,p*200)
[1] 0. 01942095
```

b)

```
> dpois(1,p*500) + (dpois(2,p*500) - dpois(2,p*1000))
[1] 0. 203199
```

</td><td></td><td>/3</td></tr>
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Step:	Answer (if requested)	Mark	

	c)
	`> ppois(10,p*5000) - ppois(4,p*5000)`
	`[1] 0. 6172307`		

8	a)
	a = probability
	a <- 0.4/60
	`> dpois(2, a*60)`
	`[1] 0.0536256`
	b)
	`> ppois(3, a*300)`
	`[1] 0.8571235`
	c)
	`> 1 - ppois(3, a*120)`
	`[1] 0. 0474226`
			/3

R script

Paste your R script here. Make sure that it contains ALL of the elements worth points listed above.

```
# Lab 5
# Markus Afonso

library(mosaic)
# 6 a
dbinom(94,1000,0.094)
#b
1 - pbinom(81,1000,0.094)
#c
pbinom(65,1000,0.094)
#d
pbinom(99,1000,0.094)
#e
1 - pbinom(74,1000,0.094)
#f
pbinom(19,1000,0.094)
#g
pbinom(90,1000,0.094) - pbinom(50,1000,0.094)
#h
dbinom(32,1000,0.094)


#7 using u = np = lamda
p <- 1.1/1000

#a
dpois(2,p*200)
#b
```

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Step:	Answer (if requested)	Mark	

dpois(1,p*500) + (dpois(2,p*500) - dpois(2,p*1000))
#c
ppois(10,p*5000) - ppois(4,p*5000)
 	
#8
a <- 0.4/60
 	
dpois(2, a*60)
 	
ppois(3, a*300)
 	
1 - ppois(2, a*120)			

	Paper and Pencil problem #1 (this is just a space for your marks) 1.) 30/82 games assume '16 - '17 = '18 – '19 a) $b(x,n,p) = \frac{n!}{(n-x)!\,x!}\, p^x q^{n-x}$ $b(8, 10, 30/82) = \frac{10!}{(10-8)!\,8!} \cdot \left(\frac{30}{82}\right)^8 \cdot \left(1 - \frac{30}{82}\right)^{10-8}$ $b(8, 10, 30/82) = 0.005808$ b) $P(x > 79)$ $P(x \geq 80) = P(x=80) + P(x=81) + P(x=82)$ $= b(80, 82, 30/82) + b(81, 82, 30/82) + b(82, 82, 30/82)$ $= \left[\frac{82}{(82-80)!\,80!} \cdot \left(\frac{30}{82}\right)^{80} \cdot \left(1 - \frac{30}{82}\right)^{82-80}\right] + \left[\frac{82!}{(82-81)!\,81!} \cdot \left(\frac{30}{82}\right)^{81} \cdot \left(1 - \frac{30}{82}\right)^{82-81}\right] + \left[1 \cdot \left(\frac{30}{82}\right)^{82} \cdot \cancel{\left(1 - \frac{30}{82}\right)^{82-82}}\ 1\right]$ $= \left[1.54967 \times 10^{-32}\right] + \left[2.207511 \times 10^{-34}\right] + \left[1.553127 \times 10^{-36}\right]$ $= 1.5719 \times 10^{-32}$		/2
	Paper and Pencil problem #2		/3

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Step:	**Answer (if requested)**	**Mark**	
	2) $p = .65$ a) $x = 6$ $n = 6$ $b(x,n,s) = {}_nC_x \cdot p^x \cdot q^{n-x}$ $b(6,6,.65) = 1 \cdot (.65)^6 \cdot \cancel{(1-.65)^0}$ $= 0.07542$ b) $b(0,6,0.65) = {}_6C_0 \cdot (0.65)^0 \cdot (1-0.65)^{6-0}$ $= 0.001838$ c) $6 \cdot .65 = 3.9$ 3.9 out of the 6 are expected to be below the min size. Assumption: can't have a fraction of a sample so: 4 are expected to be undersize $\therefore\ P(x \geq 4) = P(x=4) + P(x=5) + P(x=6)$ $= [{}_6C_4 \cdot (0.65)^4 \cdot (0.35)^2] + [{}_6C_5 \cdot (0.65)^5 \cdot (0.35)^1] + [1 \cdot (0.65)^6 \cdot \cancel{(0.35)^0}]$ $= [0.32800] + [0.243661] + [0.0754189]$ ≈ 0.6471 chance that there will be more than 4 undersize samples.		
	Paper and Pencil problem #3		/3

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3) 0.1 per min = p

$\mu = \lambda = np$

a) $\lambda = 2 \cdot 0.1$

$\lambda = 0.2$

$p(x = 1 \text{ per } 2 \text{ mins}) = \dfrac{\lambda^x e^{-\lambda}}{x!}$

$p(x=1) = \dfrac{0.2^1 e^{-0.2}}{1!}$

$= 0.1637$

b) $\lambda = 10 \cdot 0.1$

$\lambda = 1$

$p(x \geq 2) = 1 - P(x \leq 1)$

$= 1 - [P(x=1) + P(x=0)]$

$= 1 - \left[\left(\dfrac{1^1 e^{-1}}{1!}\right) + \left(\dfrac{1^0 e^{-1}}{0!}\right)\right]$

$= 1 - [0.3678 + 0.3678]$

$= 0.2642$

b) $\lambda = 20 \cdot 0.1$

$\lambda = 2$

$p(x \leq 1) = P(x=1) + P(x=0)$

$= \dfrac{2^1 e^{-2}}{1!} + \dfrac{2^0 e^{-2}}{0!}$

$= 0.27067 + 0.13533$

$= .40600$

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Total /24