HW10 KEY

28 points total, 2 points per problem part unless otherwise noted.

Q1 BCG Study

1A. (**4 pts**)
Study1: OR = 0.195 (5.123 OK)
Study2: OR = 1.012 (0.988 OK)
Study3: OR = 0.624 (1.603 OK)

2A. (**4 pts**)
BD p-value = 0.000145
Reject H0, conclude that the odds ratios are not the same for all studies. Hence, we should not combine information across studies.

```
TB<-array(c( 619, 2537, 10, 8,
            87892, 87886, 499, 505,
            7232, 7470, 45, 29),
        dim=c(2,2,3),
        dimnames=list( Trt=c("Ctrl","Trt"),
                    Response=c("TBneg","TBpos"),
                    Study=c("1","2","3")))
#A Odds Ratios by Study
library(lawstat)
cmh.test(TB)
```

```
##
##  Cochran-Mantel-Haenszel Chi-square Test
##
## data:  TB
## CMH statistic = 0.53072, df = 1.00000, p-value = 0.46631, MH
## Estimate = 0.95700, Pooled Odd Ratio = 0.95685, Odd Ratio of level
## 1 = 0.19519, Odd Ratio of level 2 = 1.01209, Odd Ratio of level 3
## = 0.62391
```

```
#B BD Test
library(metafor)
cmh <- rma.mh(ai=TB[1,1,],bi= TB[1,2,], ci=TB[2,1,],
di=TB[2,2,])
#Breslow Day Test
#cmh$BD
cmh$BDp
```

```
## [1] 0.0001456754
```

Q2 Bomb Hits Poisson

2A. NBombHits/NGrids = 0.927
Note: using "raw" data from the book muhat = 0.933 (OK)

2B. (**6 pts**)
X2 = 1.030
df = 5 − 2 = 3
p-value = 0.794
Fail to Reject H0; no evidence against the Poisson distribution.
Note: using muhat = 0.933, X2 = 1.0185, p-value = 0.797 (OK)

```r
#A
Y <- seq(0, 4, 1)
Obs <- c(229, 211, 93, 35, 8)
Muhat<-sum(Obs*Y)/sum(Obs)
Muhat
```

```
## [1] 0.9270833
```

```r
#B
#Calculate the corresponding Poisson Probabilities
Prob <- dpois(Y, Muhat)
#"Fix" the final entry so that the probabilities sum to 1
Prob[5] <- 1-sum(Prob[1:4])
#sum(Prob)
#Calculate Expected values and Contributions to Chisquare TS
Exp <- Prob*sum(Obs)
X2 <- (Obs-Exp)^2/Exp
cbind(Y, Obs, Prob, Exp, X2)
```

```
##      Y Obs       Prob        Exp           X2
## [1,] 0 229 0.39570617 227.926755 0.0050536183
## [2,] 1 211 0.36685260 211.307096 0.0004463069
## [3,] 2  93 0.17005146  97.949643 0.2501180049
## [4,] 3  35 0.05255063  30.269161 0.7393941810
## [5,] 4   8 0.01483914   8.547345 0.0350502750
```

```r
#Run GOF Test
ChiSqTS <- sum(X2)
ChiSqTS
```

```
## [1] 1.030062
```

```r
pval <- 1-pchisq(ChiSqTS, 5-2)
pval
```

```
## [1] 0.7939783
```

```r
rm(Y, Obs, Muhat, Prob, Exp, X2, ChiSqTS, pval)
```

Q3 Poisson Data

3A. (**4 pts**) Summary Statistics

```
mean(Y)
```

```
## [1] 48.38
```

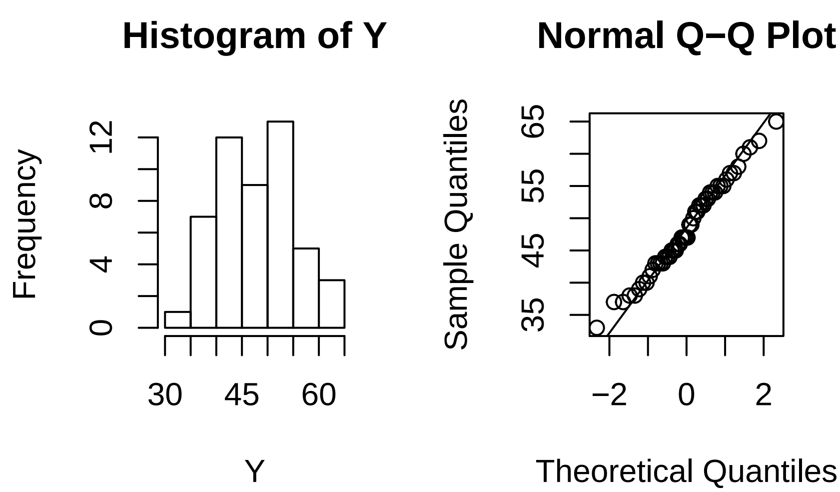
```
sd(Y)
```

```
## [1] 7.342607
```

```
var(Y)
```

```
## [1] 53.91388
```

```
par(mfrow=c(1,2))
hist(Y)
qqnorm(Y);qqline(Y)
```



3B. 95% CI: (46.293, 50.467)

3C. (**4 pts**) 95% CI: (46.452, 50.308)
NOTE: 2pts for (2322.601, 2515.399)

```
#B
t.test(Y)
```

```
##
##  One Sample t-test
##
## data:  Y
## t = 46.591, df = 49, p-value < 2.2e-16
```

```
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  46.29325 50.46675
## sample estimates:
## mean of x
##     48.38
```

```r
#C
sum(Y)
```

```
## [1] 2419
```

```r
LB <- 2419 - 1.96*sqrt(2419)
UB <- 2419 + 1.96*sqrt(2419)
LB/50
```

```
## [1] 46.45201
```

```r
UB/50
```

```
## [1] 50.30799
```