# MATH 523: ITERATIVELY REWEIGHTED LEAST SQUARES: CODE

```
set.seed(322)

n<-100
X<-runif(n,-10,10)
b0<-1.0
b1<-0.5
mu<-exp(b0+b1*X)
Y<-rpois(n,mu)

glm.p<-glm(Y~X,family=poisson)

#Initialization
Xmat<-cbind(rep(1,n),X)
beta<-c(0,0)
eta<-Xmat %*% beta
muvec<-exp(eta)
W<-diag(as.vector(muvec))
Z<-eta+(Y-muvec)/muvec

eqns<-t(Xmat) %*% (Y-muvec)

#Recursion

while(sum(eqns^2) > 1e-8){

        beta<-solve(t(Xmat) %*% W %*% Xmat) %*% t(Xmat) %*% W %*% Z
        eta<-Xmat %*% beta
        muvec<-exp(eta)
        W<-diag(as.vector(muvec))
        Z<-eta+(Y-muvec)/muvec
        eqns<-t(Xmat) %*% (Y-muvec)
}

print(istep)
print(t(beta))
print(sqrt(diag(solve(t(Xmat) %*% W %*% Xmat))))

#Compare results
summary(glm.p)
```

# RESULTS

```
> print(istep)
[1] 155
> print(t(beta))
                      X
[1,] 1.058942 0.4941272
> print(sqrt(diag(solve(t(Xmat) %*% W %*% Xmat))))
                     X
0.06552041 0.00781589
>
> #Compare results
> summary(glm.p)

Call:
glm(formula = Y ~ X, family = poisson)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.7779  -0.6767  -0.2606   0.5064   2.6571

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 1.058942   0.065520   16.16   <2e-16 ***
X           0.494127   0.007816   63.22   <2e-16 ***
---
Signif. codes:  0  ***  0.001  **  0.01  *  0.05  .  0.1     1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 12184.02  on 99  degrees of freedom
Residual deviance:   109.39  on 98  degrees of freedom
AIC: 448.62

Number of Fisher Scoring iterations: 4
```