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#MAT 455 HOME WORK2
#QUESTION#1.32
#Simulate flipping three fair coins and counting the number of heads.
#X~Shows the number of Heads counte.
#(a) Use your simulation to estimate  $P(X = 1)$  and  $E(X)$ 
####  $x \sim \text{Bin}(n=3, P=0.5)$ ####
p1=0.5 # this is the probability of head
simlist1<-replicate(10000, rbinom(n=1, size=3, prob=p1))

x1=subset(simlist1,simlist1==1) #for the  $p(x1=1)$ 
prob_x1=length(x1)/length(simlist1)
mean(simlist1) #E(x)
##prob_x1 gives the probability of  $x=1$ 
#####

#(b) Modify the above to allow for a biased coin where  $P(\text{Heads}) = 3/4$ 
#x follows a binomial distribution with  $\text{Bin}(n=3, p=3/4)$ 
p2=3/4 # The true probability is changed to 3/4 for the biased coin
simlist2<-replicate(10000, rbinom(n=1, size=3, prob=p2))

x2=subset(simlist2,simlist2==1) # for the  $p(x2=1)$ 
prob_x2=length(x2)/length(simlist2)
mean(simlist2) # for the  $E(x2)$ 
#Prob_x2 gives us the probability of  $x=1$  for the biased coin.

#####
#QUESTION#1.37 Simulate the results of Exercise 1.28. Estimate the mean and variance of the number of accidents per
day.
#  $X \sim \text{pois}(\lambda)$ , and  $\lambda \sim U(0,3)$ 
trials<-1000000
simlist3<-replicate(trials,rpois(1,lambda = runif(1,0,3)))
var(simlist3)
mean(simlist3)

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