1.A chicken lays n eggs. Each egg independently does or doesn’t hatch, with probability p of hatching. For each egg that hatches, the chick does or doesn’t survive (independently of the other eggs), with probability s of survival. Let N ⇠ Bin(n, p) be the number of eggs which hatch, X be the number of chicks which survive, and Y be the number of chicks which hatch but don’t survive (so X + Y = N). Find the marginal PMF of X, and the joint PMF of X and Y . Are they independent?

P(X=i,Y=j)=P(x=i,Y=j|N=i+j)P(N=i+j)

=P(X=i|N=i+j)P(N=i+j)

=(i+j/i)s^i(1-s)^j(n/1+j)p^i+j(1-p)^n-i-j

=(n!/i!j!(n-i-j)!)(ps)^i(p(1-s))^j(1-p)^n-i-j