Problem 1 (15 points, 5 points for each part)

Let Y be a discrete random variable that represents the number of defected products from a factory and has the following probability mass function:

y	0	1	2	3
$f(y)$	0.94	0.03	0.02	0.01

Calculate (1) Pr $(Y > 1)$; (2) the mean of Y; and (3) the variance of Y.

Problem 2 (12 points, 6 points for each part)

Suppose that the probability to get the head from tossing a coin is p. If we toss the coin two times and assume the outcome from the first toss is independent of the outcome from the second toss.

(1) Define the random X as the number of **tails**. Find the probability mass function, the expected value, and the variance of X.

(2) Define the random Y as the following: $Y = 1$ if the outcome from the second toss is same as the outcome from the first toss and $Y = 0$ otherwise. Find the probability mass function, the expected value, and the variance of Y.

Problem 3 (10 points)

Based on data from the 2007 National Health Interview Survey, it is estimated that "10% of adults experienced feelings of sadness for all, most, or some of the time" during the 30 days prior to the interview. You interviewed a random sample of 68 people who have recently filed for unemployment benefits in your county and asked this same question in your survey.

(1) (**2 points**) Identify the implied target population for your study.

(2) (**2 points**) Let Y be the number of people with these feelings among your sample. We can assume that the proportion of your population with these feelings (feelings of sadness for all, most, or some of the time) is the same as the 10% nationally. What is the distribution of Y?

(3) (**3 points**) Using R find the probability that your sample will have 12 or more people with these feelings.

(4) (**3 points**) Using R find the probability that your sample will have at most 8 people with these feelings.