BIOL570 external problem set #5

Question #1 A bag has 2 black marbles and 7 white marbles. You reach into the bag and draw a marble. Then you return the marble to the bag, shake the bag (to randomize it), and draw another marble. You do this until you have drawn a total of four marbles.

a. What is the probability that the first draw is a white marble (Write this as an equation using probability notation).

b. What is the probability that the first draw is a black marble.

c. What is the chance that all four draws were white?

d. What is the chance that all four draws were black?

Question #2 In population genetics we often calculate the probability of a zygote's genotype, by treating alleles contributed by each parent as random draws from the same pool of alleles (this is the random mating assumption). A particular locus has a common allele (T) at frequency of 90% and one other allele (t). Assume that the organism is diploid and the gene is autosomal (in other words, a zygote's genotype consists of two copies of the gene).

a) What is the probability that a zygote will have at least on T allele ?

b) What is the probability that mother and father contribute the same allele to the zygote (in other words, what is the chance that the zygote will be homozygous at this locus)?