1. **Give an example of 3 events A, B, C which are pairwise independent but not independent. Hint: find an example where whether C occurs is completely determined if we know whether A occurred and whether B occurred, but completely undetermined if we know only one of these things.**

Consider two fair, independent coin tosses, and let A be the event that the first toss is Heads, B be the event that the second toss is Heads, and C be the event that the two tosses have the same result. Then A, B, C are dependent since P(A\B \ C) = P(A\B) = P(A)P(B)=1/4 6= 1/8 = P(A)P(B)P(C), but they are pairwise independent: A and B are independent by definition; A and C are independent since P(A \ C) = P(A \ B)=1/4 = P(A)P(C), and similarly B and C are independent.

1. **A bag contains one marble which is either green or blue, with equal probabilities. A green marble is put in the bag (so there are 2 marbles now), and then a random marble is taken out. The marble taken out is green. What is the probability that the remaining marble is also green?**

Let E1 and E2 be the events that marble is green and blue respectively in the bag. Let A be the event of picking up a green marble

Then P(E1)=P(E2)=1/2,P(A/E1)=1,P(A/E2)=1/2

Now, if the marble taken out is green, then probability that remaining marble is also green is P(E1/A)

P(E1/A)=P(E1)P(A/E1)P(E1)P(A/E1)+P(E2)P(A/E2)

=12×112×1+12×12=122+14=12×43=23