Solving Strategy:

1) Since it is matching problem, so the first sock picked from the drawer does not matter when calculating the probability of match, the color of first sock does not matter either. After the first sock was taken out drawer, there are 9 socks with same color as the first socks and 10 socks with opposite color left in the drawer, namely the pool from which the socks are being drawn have 19 socks, and in which the number of socks matching with the first sock (same color) is 9, and the number of socks not matching with the first sock is 10, the probability of getting a pair of matching socks is 9 out 19, namely 9/19
2) Since 20 socks are different in color, pick two socks from 20 different socks, the number of ways socks can be combined in pairs is $\binom{2}{20} = \frac{20!}{2!(20-2)!} = 190$
3) Since there are only two colors of socks, white and black, all socks with same color are considered as same , so the total number of different ways these socks are combined in pairs is only **three**: both of two socks are white, both of two socks are black, or one sock is white and the other one is black.
4) Since there are 10 white socks in total 20 socks, so the probability of picking one white sock is 10 out 20, namely, 10/20=1/2
5) Just like picking one white sock from total 20 socks, picking a black sock from 20 socks (10 white socks and 10 black socks) has the probability of ½
6) After first picking a white sock, the probability of picking a second white sock is $\frac{10-1}{20-1} = \frac{9}{19}$
7) As same as problem 6, After first picking a black sock, the probability of picking a second black sock is also $\frac{10-1}{20-1} = \frac{9}{19}$
8) After first picking a white sock, the number of black socks is 10, total number of socks left is 20-1=19, so the probability of picking a black sock is $\frac{10}{20-1} = \frac{10}{19}$
9) The probability of first picking a white sock is $\frac{\text{the number of white socks}}{\text{total number of socks}} = \frac{10}{20} = \frac{1}{2}$, the probability of pick second white sock after first picking a white sock is $\frac{\text{the number of white socks}}{\text{total number of socks}} = \frac{10-1}{20-1} = \frac{9}{19}$, the total of probability of picking a pair of white sock is $\frac{1}{2} * \frac{9}{19} = \frac{9}{38}$
10) Since the number of white socks is equal to the number of black socks, so the probability of picking either a pair of white socks or a pair of black socks is equal to the probability of picking a pair of white socks(problem 9), namely $\frac{9}{38}$
11) If after picking a sock, then the sock picked is replaced in the drawer, that means the total number of socks in the drawer does not change even after a sock is picked. So the probability of picking a pair of white socks or a pair of black sock is $\frac{10}{20} * \frac{10}{20} = \frac{1}{4}$
12) Since there are only two colors (white or black), if the first two picking is different in color (do not match), the third picking (no matter white or black) would match with one of two socks picked previously, therefore at least 3 socks need to be picked to guarantee a matching pair.
13) Dependent trial means the probability of possible outcome of a trial is affected by the outcome of the previous trials. Independent trial, on the contrary, the likelihood of possible outcome does not change from trial to trial, namely the probability of possible outcome of each trial is independent

from each other. In Problem 10, because after each picking, the sock picked is not replaced in the drawer, the outcome of first pick directly affects the probability of possible outcome of second picking (because both of the number of socks with same color of first picked socks and the total number of sock pool from which second sock is drawing), so in the Problem 10, the probabilities of possible outcome of successive trials after the first one depend on the outcome of previous trials, that is dependent trial. In the Problem 11, However, the socks in the drawer are immediately replaced after each picking, so the number of sock pool from which sock is picked as well as the number of socks with each color stay unchanged all the time, the outcome of each picking does not affect the likelihood of possible outcomes of successive trials, therefore, the trials in Proble11 are independent each other.