

③ A bag containing 5 red marbles and 3 black marbles. Three marbles are drawn one by one without replacement. What is the probability that at least one of the three marbles drawn is black, if first marble is red?

- $E_1 =$ ~~first~~ second marble is black & third is red
 $E_2 =$ _____ black _____ black
 $E_3 =$ _____ red _____ black

$$P(E_1) = P(R_1) P(B_1 | R_1) P(R_2 | R_1 B_1) = \frac{5}{8} \cdot \frac{3}{7} \cdot \frac{4}{6} = \frac{5}{28}$$

$$P(E_2) = P(R_1) \cdot P(B_1 | R_1) \cdot P(B_2 | R_1 B_1) = \frac{5}{8} \cdot \frac{3}{7} \cdot \frac{2}{6} = \frac{5}{56}$$

$$P(E_3) = P(R_1) \cdot P(R_2 | R_1) \cdot P(B_1 | R_1 R_2) = \frac{5}{8} \cdot \frac{4}{7} \cdot \frac{3}{6} = \frac{5}{28}$$

$$\text{Total } \frac{5}{28} + \frac{5}{56} + \frac{5}{28} = \frac{25}{56}$$