2.27: **(a):** $P(\text{1st is blue}) = \frac{3}{10} = 0.3$

(b): $P(\text{2nd is blue GIVEN 1st is blue... with replacement}) = \frac{3}{10} = 0.3$

(c): $P(\text{2nd is blue GIVEN 1st is orange... with replacement}) = \frac{3}{10} = 0.3$

(d): $P(\text{1st is blue AND 2nd is blue... with replacement}) = 0.3^2 = 0.09$

(e): When drawing with replacement, the draws are independent. The probabilities of the second draw do not change based on the result of the first draw.

2.28: **(a):** $\frac{4}{12} \times \frac{3}{11} \approx 0.0909$

(b): $\frac{7}{12} \times \frac{6}{11} = 0.318$

(c): We first calculate the probability of the *complement*.

$$P(\text{no black socks}) = \frac{9}{12} \times \frac{8}{11} = 0.545$$

Then, we use the complement rule.

$$P(\text{at least 1 black sock}) = 1 - 0.545 = \boxed{0.455}$$

(d): 0

(e): We are interested in the union of three mutually exclusive events.

$$\begin{aligned} P(\text{2 blues OR 2 grays OR 2 blacks}) &= P(\text{2 blues}) + P(\text{2 grays}) + P(\text{2 blacks}) \\ &= \frac{4}{12} \cdot \frac{3}{11} + \frac{5}{12} \cdot \frac{4}{11} + \frac{3}{12} \cdot \frac{2}{11} \\ &\approx \boxed{0.288} \end{aligned}$$

2.29: **(a):** When drawing without replacement, we can calculate conditional probabilities by considering which chips are left. After a blue is drawn, we have 5 reds, 2 blues, and 2 oranges.

$$P(B_2|B_1) = \frac{2}{9} = 0.22222$$

(b): After an orange is drawn, we have 5 reds, 3 blues, and 1 oranges.

$$P(B_2|O_1) = \frac{3}{9} = 0.3333$$

(c): We use the general rule for joint probabilities.

$$\begin{aligned} P(B_1 \text{ AND } B_2) &= P(B_1) \cdot P(B_2|B_1) \\ &= \frac{3}{10} \cdot \frac{2}{9} \\ &\approx \boxed{0.0666} \end{aligned}$$

(d): Nope. The probabilities of the second draw change with different first draws.