1. [5pt] If we draw a card randomly from a deck of cards (total 52), let event A = face card, event B = club card

a. Are the above events A and B disjoint? Why?

No, the intersection of the two events is not empty

\[ A \cap B = \{J♣, Q♣, K♣\} \neq \emptyset \]

b. Find the probability that the card drawn is a face card or a club card.

\[ P(A) = \frac{12}{52}, P(B) = \frac{13}{52} \]
\[ P(A \cap B) = \frac{3}{52} \]

Use the additive law,

\[ P(A \cup B) = P(A) + P(B) - P(A \cap B) = \frac{12}{52} + \frac{13}{52} - \frac{3}{52} = \frac{22}{52} = 0.423 \]

2. [5pt] A batch of 9 parts contains 4 defective parts and 5 good parts. An inspector plans to choose a random sample of 3 of the parts for inspection.

a. What’s the probability that two parts are good and one part is defective?

\[
P(\text{all three good}) = \binom{5}{2} \binom{4}{1} \binom{9}{3} = \frac{40}{84} = 0.476
\]

b. What is the probability that at least one part is good?

Let event \( A = \{\text{at least one part is good}\} \)

the complement of \( A \), \( \overline{A} = \{\text{no one is good}\} = \{\text{all three defective}\} \)

\[
P(\overline{A}) = \binom{5}{0} \binom{4}{3} \binom{9}{3} = \frac{4}{84} = 0.0476 , \quad P(A) = 1 - P(\overline{A}) = 1 - 0.0476 = 0.9524
\]