Problem 8.41 Consider the random experiment of selecting a number uniformly distributed over the range {1, 2, 3, …, 120}. Let A, B, and C be the events that the selected number is a multiple of 3, 4, and 6, respectively.

a) What is the probability of event A, i.e. **P**[A]?
b) What is **P**[B]?
c) What is $\mathbf{P}\left[A \cap B\right]$?
d) What is $\mathbf{P}[A \cup B]$?
e) What is $\mathbf{P}[A \cap C]$?

Solution

(a) From a counting argument, $\mathbf{P}(A) = \frac{40}{120} = \frac{1}{3}$

(b) $\mathbf{P}(B) = \frac{30}{120} = \frac{1}{4}$

(c) $\mathbf{P}(A \cap B) = \frac{12}{120} = \frac{1}{10}$

(d)

$$\mathbf{P}(A \cup B) = \mathbf{P}(A) + \mathbf{P}(B) - \mathbf{P}(A \cap B)$$
$$= 1/3 + 1/4 - 1/10 = \frac{20 + 15 - 6}{60} = \frac{29}{60}$$

(e) $\mathbf{P}(A \cap C) = \mathbf{P}(C) = \frac{20}{120} = \frac{1}{6}$