30. a) We cannot conclude that \( A = B \). For instance, if \( A \) and \( B \) are both subsets of \( C \), then this equation will always hold, and \( A \) need not equal \( B \).

b) We cannot conclude that \( A = B \); let \( C = \emptyset \), for example.

c) By putting the two conditions together, we can now conclude that \( A = B \). By symmetry, it suffices to prove that \( A \subseteq B \). Suppose that \( x \in A \). There are two cases. If \( x \in C \), then \( x \in A \cap C = B \cap C \), which forces \( x \in B \). On the other hand, if \( x \notin C \), then because \( x \in A \cup C = B \cup C \), we must have \( x \in B \).

32. This is the set of elements in exactly one of these sets, namely \( \{2,5\} \).

34. The figure is as shown; we shade that portion of \( A \) that is not in \( B \) and that portion of \( B \) that is not in \( A \).

36. There are precisely two ways that an item can be in either \( A \) or \( B \) but not both. It can be in \( A \) but not \( B \) (which is equivalent to saying that it is in \( A \setminus B \)), or it can be in \( B \) but not \( A \) (which is equivalent to saying that it is in \( B \setminus A \)). Thus an element is in \( A \oplus B \) if and only if it is in \( (A \setminus B) \cup (B \setminus A) \).

38. a) This is clear from the symmetry (between \( A \) and \( B \)) in the definition of symmetric difference.

b) We prove two things. To show that \( A \subseteq (A \oplus B) \oplus B \), suppose \( x \in A \). If \( x \in B \), then \( x \notin A \oplus B \), so \( x \) is an element of the right-hand side. On the other hand if \( x \notin B \), then \( x \in A \oplus B \), so again \( x \) is in the right-hand side. Conversely, suppose \( x \) is an element of the right-hand side. There are two cases. If \( x \notin B \), then necessarily \( x \in A \oplus B \), whence \( x \in A \). If \( x \in B \), then necessarily \( x \notin A \oplus B \), and the only way for that to happen (since \( x \in B \)) is for \( x \) to be in \( A \).