union

The union of two *events* A and B is the event of at least one of A and B occurring at a given time. The *probability* of the union is:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

where $P(A \cap B)$ denotes the *intersection* of the events A and B. The intersection has to be subtracted from the sum of $P(A)$ and $P(B)$, because it would be duplicated otherwise. For instance, the probability of drawing a red card or an ace from a standard deck of cards would be

$$P(Red \cup Ace) = P(Red) + P(Ace) - P(Red \cap Ace)$$
$$= \frac{1}{2} + \frac{1}{8} - \frac{1}{16} = \frac{9}{16} = 0.5625$$

Because there are two aces contributing to $P(Red)$ and two red cards contributing to $P(Ace)$, the red aces would be counted twice, hence $P(Red \cap Ace)$ has to be subtracted once.

When the events A and B are mutually exclusive, i.e. they cannot occur at the same time, then the union of A and B reduces to

$$P(A \cup B) = P(A) + P(B)$$

For instance, the probability of drawing a king or a queen from a deck is $\frac{1}{8} + \frac{1}{8}$, because it is impossible to draw a card that is a king and queen at the same time.

V,W,X,Y