

# Probability rules

1. For any event  $A$ ,  $0 \leq P(A) \leq 1$ ,
2. When each outcome is equally likely,  $P(A) = \frac{\text{the number of outcomes in } A}{\text{the total number of outcomes}}$ .
3.  $P(\text{something happens}) = 1$ .
4. If  $A$  and  $B$  are disjoint,  $P(A \text{ or } B) = P(A) + P(B)$ .
5.  $P(A \text{ doesn't happen}) = P(A^C) = 1 - P(A)$ .
6. If  $A$  and  $B$  are independent,  $P(A \text{ and } B) = P(A) * P(B)$ .
7.  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$  whether or not  $A$  and  $B$  are disjoint.
8.  $P(B \text{ given } A) = P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$ .
9.  $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$  whether or not  $A$  and  $B$  are independent.
10.  $A$  and  $B$  are independent exactly when  $P(B|A) = P(B)$  and  $P(A|B) = P(A)$ .

# Probability problems

1. Rolling two 6-sided dice, what's the probability that I roll a sum of 10?
2. What's the probability that I roll two 3s in a row?
3. What's the probability that I roll a 1 or a 2 on my first roll?
4. What's the probability that I roll a 1, 2, 3, 4, or 5 on my first roll?
5. If I roll a 6 the first time, what's the probability that I roll a 6 the second time?
6. Drawing cards from a standard deck of cards, if I draw a diamond the first time, what's the probability that I draw a diamond the second time?