

1. A coin is flipped until heads is obtained twice.
 - (a) Give the event A that two heads have been obtained by the fourth flip.
 - (b) Give the event B that two heads are obtained on consecutive flips.
 - (c) Give the event $A \cup B$.
 - (d) Give the event $A \cap B$.

2. A coin is flipped and a four-sided die is rolled.
 - (a) What is the probability of getting heads on the coin or an even on the die?
 - (b) What is the probability of getting heads on the coin or an even on the die?

A single card is drawn from a standard deck of cards (no jokers). We define the following events:

Event B: A black card is drawn

Event C: A club is drawn

Event D: A diamond is drawn

Event K: A king is drawn

1. Give each of the following probabilities:

$$P(B) \quad P(C) \quad P(D) \quad P(K) \quad P(C \cup D) \quad P(K \cup D)$$

2. Which is true?

$$P(C \cup D) = P(C) + P(D)$$

$$P(K \cup D) = P(K) + P(D)$$

3. Draw a Venn Diagram for the two events involved in the true statement from Exercise 2, labelling each region of the diagram with its probability.

4. Draw a **new** Venn diagram for the two events from the false statement from Exercise 2, labelling each region of the diagram with its probability.

5. Alter the false statement from Exercise 2 in such a way as to make it true.

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Event B: A black card is drawn

Event C: A club is drawn

Event D: A diamond is drawn

Event K: A king is drawn

6. (a) Give $P(B)$, $P(C)$, $P(B \cup C)$ and $P(B \cap C)$. What do you notice? Why is this?

(b) Sketch a Venn diagram for Events B and C , without probabilities. Do you see how it illustrates your answers to (a)?

7. Find each probability: $P(C|B)$ $P(B|C)$ $P(K|D)$

8. Give $P(B)$, $P(C)$, $P(K)$ and compare with your answers to Exercise 7. What do you notice?

9. Give the *reduced* forms of $P(K)$ and $P(D)$. Give a mathematical statement that indicates how $P(K \cap D)$ relates to the probabilities of the two individual events.

10. Does the same sort of statement hold for Events B and C ?

11. What is $P(C \cap D)$? What kind of events are they?