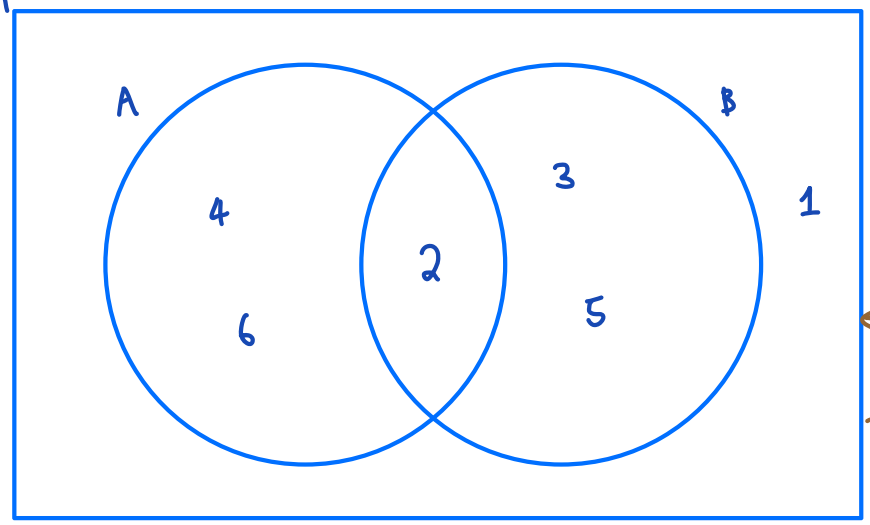
Venn Diagrams

greek letter "Xi" (sometimes S is used)



Ξ = sample space

A = even number

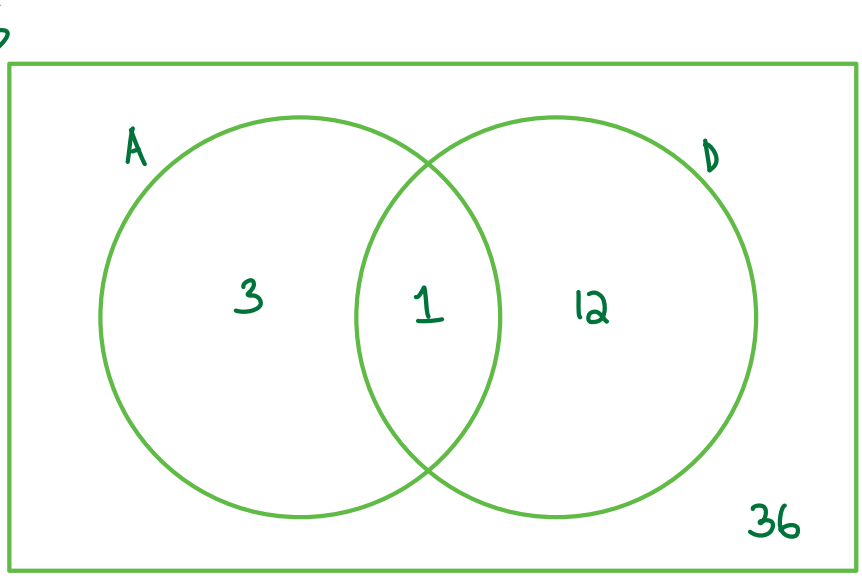
B = prime number

Types of venn diagrams:
Specific outcoms
Frequency
Probability

"Not": $A' = \{1, 2, 3, 5\}$

"Union" $A \cup B = \{2, 3, 4, 5, 6\}$

"Intersection" $A \cap B = \{2\}$



A = Aces
D = Diamond

$P(A \cap D) = \frac{1}{52}$

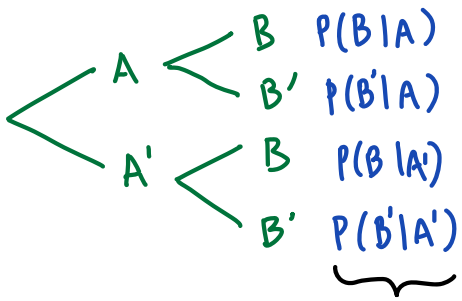
$P(A \cup D) = \frac{16}{52} = \frac{4}{13}$

$P(A') = \frac{49}{52}$

$P(A' \cap D) = \frac{12}{52} = \frac{3}{13}$

Conditional probability

A & B are NOT independent



"probability of B' given that A'."

Formula for this:

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

Full laws of probability

Independent

$P(A \cap B) = P(A) \times P(B)$

$P(A|B) = P(A)$

Mutually Exclusive

$P(A \cap B) = 0$

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

General

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

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

Example

a) Sample space: a list of all possible outcomes

b) Event: a set of one or more outcomes

$P(A) = \frac{1}{3}$ $P(B) = \frac{1}{4}$ A & B are independent

c) $P(A \cap B) = P(A) \times P(B) = \frac{1}{12}$

d) $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1}{12} \times 4 = \frac{1}{3}$

e) $P(A \cup B) = P(A) + P(B) - P(A \cap B) = \frac{7}{12} - \frac{1}{12} = \frac{1}{2}$

R = red R' = blue