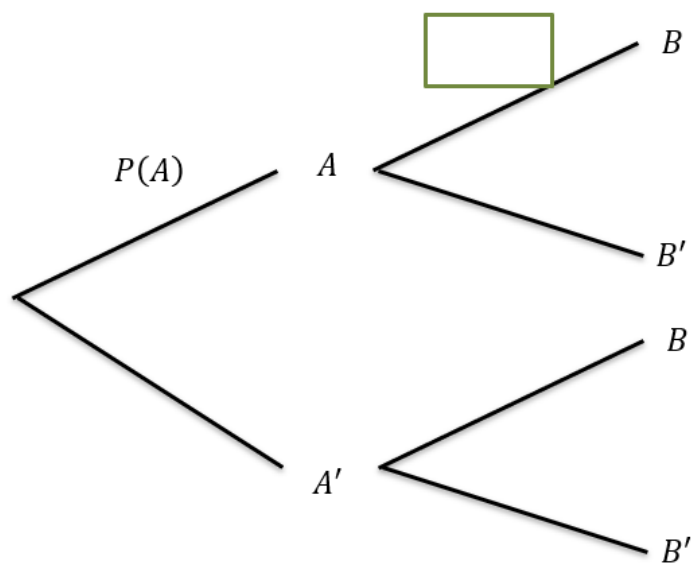


Conditional Probability

Think about how we formed a probability tree at GCSE:



$$P(A \cap B) = \boxed{}$$

Alternatively (and more commonly):

$$\pencil P(B|A) = \boxed{}$$

Examples

- 1 The following two-way table shows what foreign language students in Year 9 study.

B is the event that the student is a boy. F is the event they chose French as their language.

	B	B'	Total
F	14	38	52
F'	26	22	48
Total	40	60	100

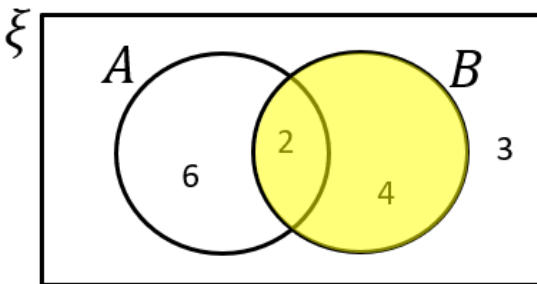
- a Determine the probability of:
 $P(F|B')$

Method 1: Using the formula:

Method 2: Restricted sample space.

- b $P(B|F') =$

- 2 Using the Venn Diagram, determine:



- a $P(A|B)$

Method 1: Using the formula

Method 2: Restricted sample space

- b $P(A'|B') =$

- c $P(B|A \cup B) =$

Further Examples

a Given that $P(A) = 0.5$ and $P(A \cap B) = 0.3$, what is $P(B|A)$?

b Given that $P(Y) = 0.6$ and $P(X \cap Y) = 0.4$, what is $P(X'|Y)$?
(Hint: Drawing a Venn Diagram will help!)

c Given that $P(A) = 0.5$, $P(B) = 0.5$ and $P(A \cap B) = 0.4$, what is $P(B|A')$?

Check your understanding

The events E and F are such that

$$P(E) = 0.28 \quad P(E \cup F) = 0.76 \quad P(E \cap F') = 0.11$$

Find

a) $P(E \cap F) =$

b) $P(F) =$

c) $P(E'|F') =$

Further Practice

1

$$P(A \cap B') = 0.4, P(A \cup B) = 0.75$$

Then:

$$P(B) = \boxed{}$$
$$P(A' \cap B') = \boxed{}$$

2

$$P(A) = 0.47 \text{ and } P(A \cap B) = 0.12 \text{ and } P(A' \cap B') = 0.03$$

Then:

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

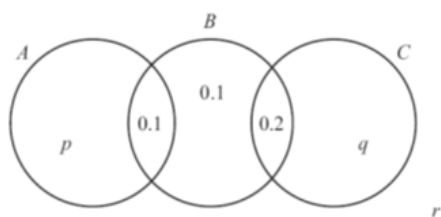
3

$$P(A') = 0.7, P(B') = 0.2, P(A \cap B') = 0.1$$

Then:

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

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



The Venn diagram in Figure 1 shows three events A , B and C and the probabilities associated with each region of B . The constants p , q and r each represent probabilities associated with the three separate regions outside B .

The events A and B are independent.

(a) Find the value of p . (3)

Given that $P(B|C) = \frac{5}{11}$,

(b) find the value of q and the value of r (4)

(c) Find $P(A \cup C|B)$ (2)

(a) (From earlier)

$$0.1 = (p + 0.1) \times 0.4$$

$$p + 0.1 = 0.25$$

$$p = 0.15$$

(b)

(c)