Independent Events

Two events are independent when one happening does not affect the probability the other happens.

Sometimes it is obvious events are independent but other times it is not.

Let event A be get a Head spinning a coin

Let event B be get a 5 rolling a die

Clearly these are independent events

$$P(A) = \frac{1}{2} \qquad P(B) = \frac{1}{6}$$

What is the $P(A \cap B)$ ie both happening

H 1	T 1
H 2	T 2
H 3	T 3
H 4	T 4
H 5	T 5
H 6	T 6

12 equally likely outcomes

$$P(H5) = P(A \cap B) = \frac{1}{12}$$

But $P(A) \times P(B)$

$$= \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$$

This leads to the 'AND' rule for INDEPENDENT events

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

Examples What is the probability of rolling a 5 on three consective rolls of a die

$$P(5,5,5) = \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$$

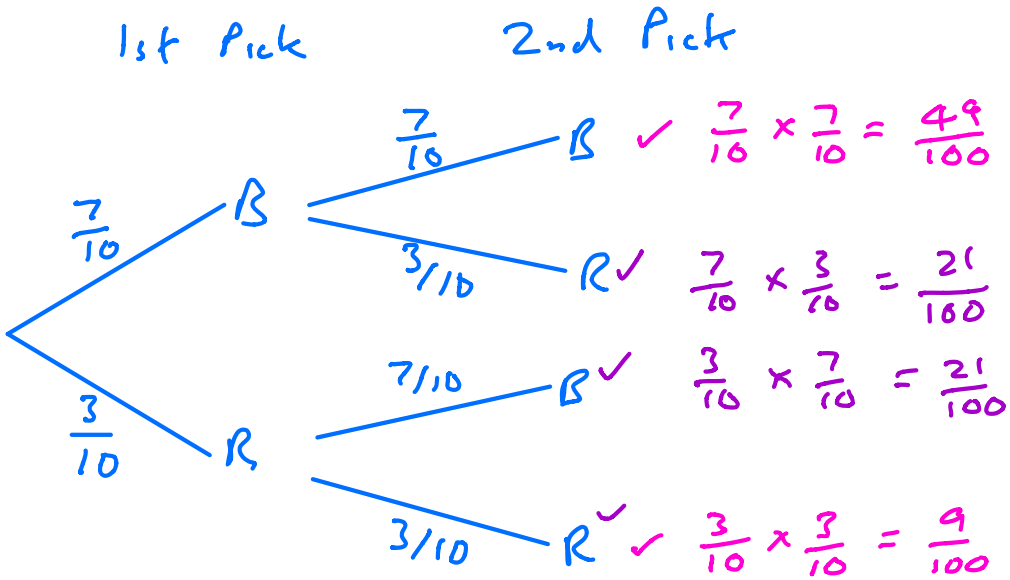
Probability Trees

PROBABILITY TREES **EXERCISE**

1. A bag contains 7 blue balls and 3 red balls. A ball is selected at random, its colour noted and it is replaced. A second ball is selected at random and its colour noted. Represent the various possible outcomes on a probability tree and calculate:

a) The probability both balls selected are the same colour.

b) The probability at least one of the balls is red.



a) $P(\text{Both the same colour}) = \frac{49}{100} + \frac{9}{100} = \frac{58}{100}$

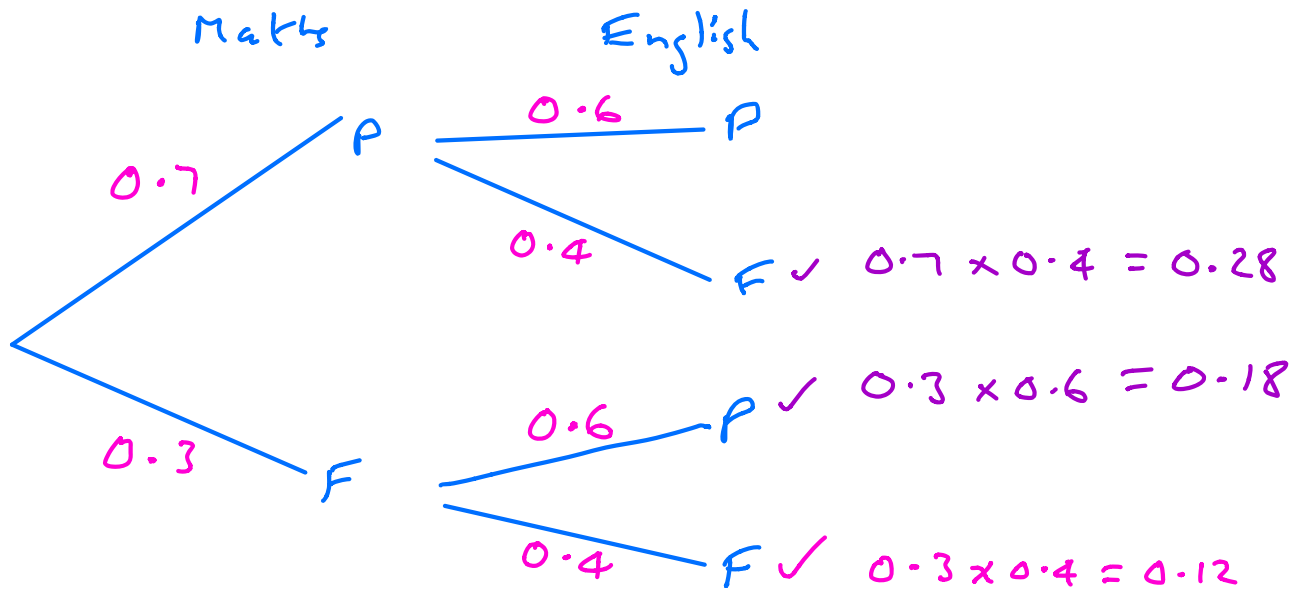
b) $P(\text{At least one Red}) = P(BR) + P(RB) + P(RR)$

$= \frac{21}{100} + \frac{21}{100} + \frac{9}{100} = \frac{51}{100}$

2. John takes exams in Maths and English. The probability he passes in Maths is 0.7 and the probability he passes in English is 0.6. Represent the possible outcomes on a probability tree and calculate:

a) The probability John fails both exams.

b) The probability he passes exactly one of the exams.



a) $P(FF) = 0.12$

b) $P(\text{exactly one pass}) = P(PF) + P(FP)$

$= 0.28 + 0.18$

$= 0.46$