

D Michaelmas Tree Diagrams And Conditional

The notation $\mathbb{P}(A|B)$ means the probability of A given that B has occurred.

1. A bag contains 5 red balls and 4 yellow balls. A ball is removed, its colour recorded *and replaced*. A second ball is then taken.

- (a) Draw a tree diagram of the situation.
 (b) Find $\mathbb{P}(\text{Two reds})$.
 (c) Find $\mathbb{P}(\text{Two yellows})$.
 (d) Find $\mathbb{P}(\text{A red and a yellow in that order})$.
 (e) Find $\mathbb{P}(\text{A red and a yellow in any order})$.

$$\frac{25}{81}$$

$$\frac{16}{81}$$

$$\frac{20}{81}$$

$$\frac{40}{81}$$

2. Do the previous question *without* replacement.

$$\frac{5}{18}, \frac{1}{6}, \frac{5}{18}, \frac{5}{9}$$

3. A bag contains 4 red, 3 yellow and 5 green balls. Two balls are taken from the bag at once.

- (a) Draw a tree diagram of the situation.
 (b) $\mathbb{P}(\text{Two reds})$.
 (c) $\mathbb{P}(\text{Both same colour})$.
 (d) $\mathbb{P}(\text{Two reds}|\text{Both same colour})$.

$$\frac{1}{11}$$

$$\frac{19}{66}$$

$$\frac{6}{19}$$

4. A survey is taken of the heights and hair colour of a selection of 30 people.

	Tall	Short	TOTAL
Brunettes	5	10	15
Blondes	9	6	15
TOTAL	14	16	30

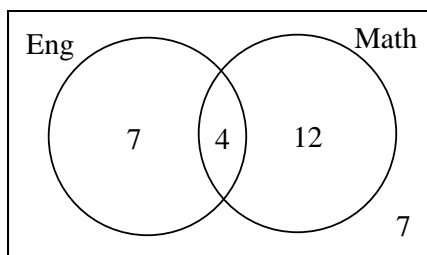
- (a) $\mathbb{P}(\text{Tall}|\text{Blonde})$.
 (b) $\mathbb{P}(\text{Blonde}|\text{Tall})$.
 (c) $\mathbb{P}(\text{Brunette}|\text{Not Short})$.

$$\frac{3}{5}$$

$$\frac{9}{14}$$

$$\frac{5}{14}$$

5. A quick survey was taken of 30 A Level students as to whether they studied Maths or English. The results are contained below.



- (a) $\mathbb{P}(\text{Maths})$. $\frac{8}{15}$
- (b) $\mathbb{P}(\text{English})$. $\frac{11}{30}$
- (c) $\mathbb{P}(M \text{ and } E)$. $\frac{2}{15}$
- (d) $\mathbb{P}(M \text{ or } E)$. $\frac{23}{30}$
- (e) $\mathbb{P}(M|E)$. $\frac{4}{11}$
- (f) $\mathbb{P}(E|M')$ (note the dash next to that M). $\frac{1}{2}$
6. If I wake up before 7 o'clock there is a $\frac{5}{6}$ probability that I will have marked all my prep before lessons. If I wake up after that time there is only a $\frac{1}{7}$ probability I will have marked all my preps. The probability that I wake up before 7 o'clock is $\frac{2}{3}$. Find the probability that on a random morning I will have marked all my preps before lessons. $\frac{38}{63}$
7. Apple and Samsung produce mobile phones for my company. Apple produce 70% of the phones we use and Samsung 30%. The probability that an Apple phone will fail is $\frac{1}{5}$ and the probability that a Samsung will fail is $\frac{1}{4}$. A random employee comes to see me with a failed phone. What is the probability that it is an Apple phone? $\frac{28}{43}$
8. A bag contains 4 square counters and 5 circular counters. Three counters are taken from the bag. Find the probability that I get two of one type and one of another? [*Think: there is a quick(ish) way.*]
9. A bag contains 3 blue and n red balls. Two balls are removed from the bag at once. If the probability that they are different colours is $\frac{3}{5}$ then find the possible values of n ? (A tree diagram would be useful.)