Tree Diagrams And Conditional

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

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 $\mathbb{P}$(Two reds). $\boxed{\frac{25}{81}}$

   (c) Find $\mathbb{P}$(Two yellows). $\boxed{\frac{16}{81}}$

   (d) Find $\mathbb{P}$(A red and a yellow in that order). $\boxed{\frac{20}{81}}$

   (e) Find $\mathbb{P}$(A red and a yellow in any order). $\boxed{\frac{40}{81}}$

2. Do the previous question *without* replacement. $\boxed{\frac{5}{18}, \frac{1}{6}, \frac{5}{18}, \frac{5}{9}}$

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) $\mathbb{P}$(Two reds). $\boxed{\frac{1}{11}}$

   (c) $\mathbb{P}$(Both same colour). $\boxed{\frac{19}{66}}$

   (d) $\mathbb{P}$(Two reds|Both same colour). $\boxed{\frac{6}{19}}$

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) $\mathbb{P}$(Tall|Blonde). $\boxed{\frac{3}{5}}$

   (b) $\mathbb{P}$(Blonde|Tall). $\boxed{\frac{9}{14}}$

   (c) $\mathbb{P}$(Brunette|Not Short). $\boxed{\frac{5}{14}}$

5. A quick survey was taken of 30 A Level students as to whether they studied Maths or English. The results are contained below.
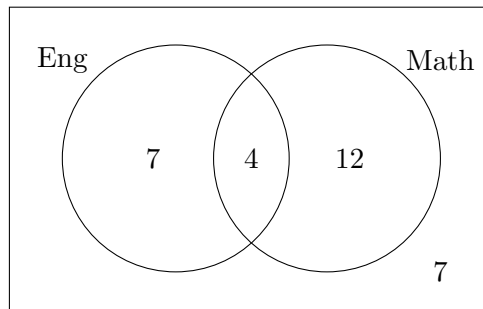
(a) $\mathbb{P}(\text{Maths})$. $\boxed{\frac{8}{15}}$

(b) $\mathbb{P}(\text{English})$. $\boxed{\frac{11}{30}}$

(c) $\mathbb{P}(M \text{ and } E)$. $\boxed{\frac{2}{15}}$

(d) $\mathbb{P}(M \text{ or } E)$. $\boxed{\frac{23}{30}}$

(e) $\mathbb{P}(M|E)$. $\boxed{\frac{4}{11}}$

(f) $\mathbb{P}(E|M')$ (note the dash next to that M). $\boxed{\frac{1}{2}}$

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. $\boxed{\frac{38}{63}}$

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? $\boxed{\frac{28}{43}}$

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.) □