

Probability: To Tree or not to Tree II... The Return: This Time It's Personal

In the previous worksheet all the problems involved taking balls from a bag *without replacement*. In this worksheet all the questions involve replacement. Every time a ball is taken its colour is noted and then the ball is replaced in the bag. This means that the events of each ball being taken out are *independent*. So the $\mathbb{P}(\text{red})$, say, remains constant throughout. As before look for shortcuts to speed everything up.

1. A bag contains 4 white and 3 black balls. I pick a ball from the bag.
 - (a) Calculate the probability I pick a black ball. $\frac{3}{7}$
 - (b) Calculate the probability I pick a white ball. $\frac{4}{7}$
 - (c) Calculate the probability I pick a red ball. :-)
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2. A bag contains 4 red and 3 blue balls. I pick five balls from the bag.
 - (a) Calculate the probability I pick five balls of the same colour. $\frac{181}{2401}$
 - (b) Calculate the probability I pick three red balls and two blue balls in *that* order. $\frac{576}{16807}$
 - (c) Calculate the probability I pick three red balls and two blue balls in *any* order. $\frac{5760}{16807}$

3. A bag contains 5 red, 4 blue and 3 yellow balls. I pick four balls from the bag.
 - (a) Calculate the probability that all four balls are the same colour. $\frac{481}{10368}$
 - (b) Calculate the probability my selection contains exactly two yellows. $\frac{27}{128}$
 - (c) Calculate the probability my selection contains all three colours. $\frac{5}{12}$

4. A bag contains 5 red, 4 blue and 3 yellow balls. I pick six balls from the bag.
 - (a) Calculate the probability that all six balls are the same colour. $\frac{10225}{1492992}$
 - (b) Calculate the probability my selection contains two of each colour. $\frac{125}{1152}$
 - (c) Calculate the probability my selection contains five of one colour and one of another. $\frac{16127}{248832}$
 - (d) Calculate the probability my selection contains three of one colour and three of another. $\frac{65515}{746496}$
 - (e) Calculate the probability my selection contains three of one colour, two of another and one of another. $\frac{25}{54}$
 - (f) Calculate the probability all three colours are represented in my hand. \square

5. A bag contains 2 red, 3 yellow, 4 blue and 5 green balls. I take eight from the bag.
 - (a) Calculate the probability my selection is all the same colour. $\frac{462978}{14^8}$
 - (b) Calculate the probability that only two colours are represented in my hand. \square
 - (c) Calculate the probability of exactly two of each colour. \square

6. A bag contains 1 red, 2 yellow, 3 blue, 4 green and 5 white balls. I take eight from the bag. Calculate the probability that all five colours are represented in my selection. \square