Dr Oliver Mathematics
Worked Examples
Probability 2

From: Edexcel 2020 June Paper 2H (Calculator)

1. There are only red sweets and yellow sweets in a bag.

   There are n red sweets in the bag.
   There are 8 yellow sweets in the bag.

   Sajid is going to take at random a sweet from the bag and eat it.

   He says that the probability that the sweet will be red is $\frac{7}{10}$.

   (a) Show why the probability cannot be $\frac{7}{10}$. (3)

Solution

The probability that the sweet will be red is

$$\frac{n}{n+8}.$$

Can this be equal to $\frac{7}{10}$? Well, we cross-multiply:

$$\begin{aligned}\frac{n}{n+8} = \tfrac{7}{10} &\Rightarrow 10n = 7(n+8)\\ &\Rightarrow 10n = 7n + 56\\ &\Rightarrow 3n = 56\\ &\Rightarrow n = 18\tfrac{2}{3}.\end{aligned}$$

A fraction of a sweet! Hence, the probability *cannot* be $\frac{7}{10}$.

After Sajid has taken the first sweet from the bag and eaten it, he is going to take at random a second sweet from the bag.

Given that the probability that both the sweets he takes will be red is $\frac{3}{5}$,

(b) work out the number of red sweets in the bag. (5)
You must show all your working.

Solution

$$\mathrm{P}(RR) = \tfrac{3}{5} \Rightarrow \frac{n}{n+8} \times \frac{n-1}{n+7} = \tfrac{3}{5}$$
$$\Rightarrow 5n(n-1) = 3(n+7)(n+8)$$

$\times$	n	$+7$
n	n^2	$+7n$
$+8$	$+8n$	$+56$

$$\Rightarrow 5n(n-1) = 3(n^2 + 15n + 56)$$
$$\Rightarrow 5n^2 - 5n = 3n^2 + 45n + 168$$
$$\Rightarrow 2n^2 - 50n - 168 = 0$$
$$\Rightarrow 2(n^2 - 25n - 84) = 0$$

add to: -25
multiply to: -84
$\Big\}$ $-28, +3$

$$\Rightarrow 2(n-28)(n+3) = 0$$
$$\Rightarrow n = 28 \text{ or } n = -3;$$

$n \neq -3$ and, hence, $\underline{\underline{n = 28}}$.