

Dr Oliver Mathematics

Worked Examples

Probability 6

From: Edexcel GCSE Mathematics (9-1) Practice Tests Set 10: Paper 2H/3H (Calculator)

1. Hannah has a bag that only contains yellow sweets and orange sweets. (5)
Hannah takes at random 2 sweets from the bag.

The probability that Hannah takes exactly 1 yellow sweet from the bag is $\frac{12}{35}$.

Originally there were 3 yellow sweets in the bag.

Work out how many orange sweets there were originally in the bag.
Show your working clearly.

Solution

Let there be x orange sweets. Then there are $(x + 3)$ sweets in total and, if we take one away, there are $(x + 2)$ sweets.

$$\begin{aligned}\frac{12}{35} &= P(O, Y) + P(Y, O) \\ \Rightarrow \frac{12}{35} &= \left(\frac{x}{x+3} \times \frac{3}{x+2}\right) + \left(\frac{3}{x+3} \times \frac{x}{x+2}\right) \\ \Rightarrow \frac{12}{35} &= \frac{2 \times 3x}{(x+3)(x+2)} \\ \Rightarrow \frac{2}{35} &= \frac{x}{(x+3)(x+2)} \\ \Rightarrow 2(x+3)(x+2) &= 35x\end{aligned}$$

\times	x	$+2$
x	x^2	$+2x$
$+3$	$+3x$	$+6$

$$\begin{aligned}\Rightarrow 2(x^2 + 5x + 6) &= 35x \\ \Rightarrow 2x^2 + 10x + 12 &= 35x \\ \Rightarrow 2x^2 - 25x + 12 &= 0\end{aligned}$$

$$\left. \begin{array}{l} \text{add to:} \\ \text{multiply to: } (+2) \times (+12) = +24 \end{array} \right\} \begin{array}{l} -25 \\ -24, -1 \end{array}$$

$$\Rightarrow 2x^2 - 24x - x + 12 = 0$$

$$\Rightarrow 2x(x - 12) - 1(x - 12) = 0$$

$$\Rightarrow (2x - 1)(x - 12) = 0$$

$$\Rightarrow 2x - 1 = 0 \text{ or } x - 12 = 0$$

$$\Rightarrow x = \frac{1}{2} \text{ or } x = 12;$$

since we are only allowed a whole number of sweets,

$$\underline{\underline{x = 12.}}$$