# Problem of the Week
Problem C and Solution
Marbles, Marbles

Problem

A box contains 6 red marbles, 5 blue marbles, 2 yellow marbles, and 3 green marbles. Several orange marbles are added to the box. All the marbles in the box are identical except for colour.

A marble is then randomly selected from the box, and the probability that a blue or green marble is selected is $\frac{2}{7}$.

How many orange marbles were added to the box?
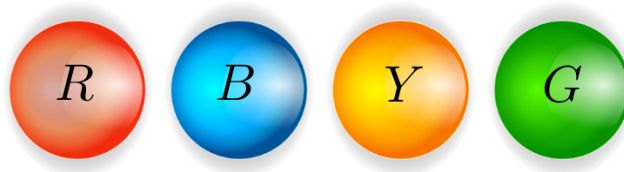
Solution

The number of blue and green marbles in the box is $5 + 3 = 8$.

Let n be the total number of marbles in the box after adding some orange marbles. Since the probability of picking a blue or green marble is $\frac{2}{7}$, we must have $\frac{8}{n} = \frac{2}{7}$.

If we multiply the numerator and denominator of the fraction $\frac{2}{7}$ by 4, we obtain $\frac{2}{7} = \frac{2 \times 4}{7 \times 4} = \frac{8}{28}$. Therefore, $\frac{8}{n} = \frac{8}{28}$. Since the fractions are equal and the numerators are equal, the denominators must also be equal. It follows that $n = 28$.

In the beginning, there were $5 + 6 + 3 + 2 = 16$ marbles in the box. Since there were 16 marbles in the box and there are now 28 marbles in the box, then $28 - 16 = 12$ orange marbles were added to the box.

Therefore, 12 orange marbles were added to the box.