#5744 There are 23 bulbs in a box and 10 of them are red. The lamplighter takes 2 bulbs at random. What is the probability that chosen bulbs are red?

Solution The probability space Ω in question consists of pairs of bulbs (first bulb, second bulb). Hence $|\Omega| = \binom{23}{2}$, the event A we are interested in is (1 bulb is red, 2 bulb is red), hence $|A| = \binom{10}{2}$. Note, that it does not matter whether pairs are ordered. Finally, $\mathbb{P}(A) = \frac{|A|}{|\Omega|} = \frac{10 \cdot 9}{23 \cdot 22} \approx 0.177$.

This result can be obtained using conditional probability: let A be the event that the first bulb is red, B — the second bulb is red. We are interested in $\mathbb{P}(A \cap B) = \mathbb{P}(A)\mathbb{P}(B|A) = \frac{10}{23} \cdot \frac{9}{22} = \frac{90}{506}$.

Answer $\frac{90}{506} \approx 0.177$