Example of calculating the expected value of a discrete random variable
Let X be the number of girls born in 4 independent births of babies.
Calculate

$$\begin{aligned}
E(X) &= \sum_{\omega} X(\omega)P(\{\omega\}) \\
&= 0P(\{(b,b,b,b)\}) \\
&\quad + 1P(\{g,b,b,b\}) + 1P(\{b,g,b,b\}) + 1P(\{b,b,g,b\}) + 1P(\{b,b,b,g\}) \\
&\quad + 2P(\{g,g,b,b\}) + 2P(\{g,b,g,b\}) + 2P(\{g,b,b,g\}) \\
&\qquad + 2P(\{b,g,g,b\}) + 2P(\{b,g,b,g\}) + 2P(\{b,b,g,g\}) \\
&\quad + 3P(\{g,g,g,b\}) + 3P(\{g,g,b,g\}) + 3P(\{g,b,g,g\}) + 3P(\{b,g,g,g\}) \\
&\quad + 4P(\{g,g,g,g\}) \\
&= 0(1/16) + 1(4/16) + 2(6/16) + 3(4/16) + 4(1/16) \\
&= \sum_{j} x_j P(X = x_j)
\end{aligned}$$

In either case, we see that

$$E(X) = \frac{(0)(1) + (1)(4) + (2)(6) + (3)(4) + (4)(1)}{16} = 32/16 = 2$$