There are five cards numbered $-2$, $-1$, 0, 1, and 2. You draw two cards numbered $X$ and $Y$ at random without replacement. What is $E[X^2 + Y^2]$?

**Solution:** The random variable $X^2$ takes values 0, 1, 4, with probabilities $1/5$, $2/5$, $2/5$, respectively, so $E[X^2] = (2/5) \cdot 1 + (2/5) \cdot 4 = 2$. By symmetry the same is true for $Y^2$. Using linearity of expectation, $E[X^2 + Y^2] = E[X^2] + E[Y^2] = 4$. 