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 $\mathrm{E}[X^2 + Y^2]$?

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