

**SOLUTION TO THE QUESTION FOR MATH 343 FOR
THE LECTURE OF 21 APRIL**

Problem 1. A standard six sided fair die is rolled. What is the expected value of the number that comes up?

Solution. Let X be the random variable whose value is the number shown on a roll of this die. The probability mass function is $f_X(x) = \frac{1}{6}$ when x is any of 1, 2, 3, 4, 5, or 6, and $f_X(x) = 0$ for all other real numbers x . Therefore

$$\begin{aligned} E(X) &= \sum_{x \in \mathbb{R}} x f_X(x) \\ &= (1) \left(\frac{1}{6}\right) + (2) \left(\frac{1}{6}\right) + (3) \left(\frac{1}{6}\right) + (4) \left(\frac{1}{6}\right) + (5) \left(\frac{1}{6}\right) + (6) \left(\frac{1}{6}\right) \\ &= \frac{1 + 2 + 3 + 4 + 5 + 6}{6} = \frac{7}{2} = 3.5. \end{aligned}$$

This completes the solution. □

More steps are shown than might be otherwise, in order to exhibit the relation with the average of the values. (This relation usually does not hold if the values are not equally probable.)