For random variables X and Y (which may be dependent),

$$E[X+Y] = E[X] + E[Y].$$

More generally, for random variables $X_1, X_2, \ldots, X_n$ and constants $c_1, c_2, \ldots, c_n$,

$$E\left[\sum_{i=1}^{n} c_i X_i\right] = \sum_{i=1}^{n} \big(c_i \cdot E\left[X_i\right]\big).$$

$$E[X+Y] = \sum_x \sum_y \big[(x+y)\cdot P(X=x, Y=y)\big] = \sum_x \sum_y \big[x\cdot P(X=x, Y=y)\big] + \sum_x \sum_y \big[y\cdot P(X=x, Y=y)\big]$$