MATH1550
Exercise Set 8 - Solutions

- Expected value
- Properties of expected value
- Multivariate expected value

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1. Let X be a discrete random variable with the following probability distribution:

$$P(X=0)=\frac{1}{3}, \quad P(X=1)=P(X=6)=\frac{1}{165},$$

$$P(X=2)=P(X=5)=\frac{1}{11}, \quad P(X=3)=P(X=4)=\frac{13}{55}$$

Find $E(X)$.

Solution.

$$E(x)=0\cdot\frac{1}{3}+1\cdot\frac{1}{165}+2\cdot\frac{1}{11}+3\cdot\frac{13}{55}+4\cdot\frac{13}{55}+5\cdot\frac{1}{11}+6\cdot\frac{1}{165}=\frac{7}{3}$$

□

2. Two coins are tossed. The first coin has a probability of 0.6 that it will land on heads, and the second coin has a probability of 0.7 that it will land on heads. Let X be the total number of heads.

(a) What is the range of X?

(b) Find the probability distribution for X.

(c) Compute $E(X)$.

Solution. (a) The range of X is:

$$\{0,1,2\}$$

(b)

$$P(X=0)=(0.4)(0.3)=0.12$$

$$P(X=1)=(0.6)(0.3)+(0.4)(0.7)=0.46$$

$$P(X=2)=(0.6)(0.7)=0.42$$

or

x	$P(X=x)$
0	0.12
1	0.46
2	0.42

(c)

$$E(X)=0\cdot(0.12)+1\cdot(0.46)+2\cdot(0.42)=1.3$$

□

3. You are playing a dice game where two (regular) dice are rolled and you are paid the amount shown (the sum of the two dice) in dollars. If the game costs \$7 to play, what can you expect to win or lose; i.e. what is the expected value of this game?

Solution. Let X be the sum of both dice. The range of X is $\{2,3,4,5,6,7,8,9,10,11,12\}$ and as we have seen in earlier examples the probability distribution for X is given by

$$f(x) = \frac{6-|7-x|}{36}.$$

The expected value of X is

$$\begin{aligned}
E(X) &= \sum_{x=2}^{12} x \cdot f(x) \\
&= 2\cdot\frac{1}{36} + 3\cdot\frac{2}{36} + 4\cdot\frac{3}{36} + 5\cdot\frac{4}{36} + 6\cdot\frac{5}{36} + 7\cdot\frac{6}{36} + 8\cdot\frac{5}{36} + 9\cdot\frac{4}{36} + 10\cdot\frac{3}{36} + 11\cdot\frac{2}{36} + 12\cdot\frac{1}{36} \\
&= \frac{252}{36} \\
&= 7.
\end{aligned}$$

Since it costs \$7 to play the game and our expected payout is \$7, we can expect to break even in the long run.

We can arrive at this in a different way. Let Y be the profit made from each roll; that is Y is the sum of both dice minus 7. Then the range of Y is $\{-5,-4,-3,-2,-1,0,1,2,3,4,5\}$. The probability distribution for Y is $g(y) = P(Y=y) = P(X=y+7) = f(y+7) = \frac{6-|-y|}{36}$. The expected value of Y is

$$\begin{aligned}
E(Y) &= \sum_{x=2}^{12} y \cdot g(y) \\
&= (-5)\cdot\frac{1}{36} + (-4)\cdot\frac{2}{36} + (-3)\cdot\frac{3}{36} + (-2)\cdot\frac{4}{36} + (-1)\cdot\frac{5}{36} + 0\cdot\frac{6}{36} \\
&\quad + 1\cdot\frac{5}{36} + 2\cdot\frac{4}{36} + 3\cdot\frac{3}{36} + 4\cdot\frac{2}{36} + 5\cdot\frac{1}{36} \\
&= 0.
\end{aligned}$$

Therefore our expected profit is 0. We might have seen this coming because of the symmetry in both the values for Y, and its probability distribution. ☐

4. You run a business buying and selling coconuts. You have \$1,000, and coconuts are currently selling for \$2 each. In one week you can sell the coconuts, but the price will change to either half the price (\$1) or double the price (\$4), with each of these being equally likely.

   (a) If your goal is maximize the *expected* amount of money you have after a week (i.e. after you are able to sell) how many coconuts should you buy at \$2 each?

   (b) If your goal is maximize your *expected* number of coconuts after a week, how many coconuts should you buy at \$2 each (vs. buying a week later at the new price)?

Solution. (a) Let n be the number of coconuts that you buy at \$2 apiece, and let X be the random variable whose value is the total amount of money you have after a week. Then the range of X is

$$\{(1000-2n)+n,\ (1000-2n)+4n\} = \{1000-n, 1000+2n\}.$$

Each outcome is assumed equally likely, so

$$P(X=(1000-n) = 0.5, \quad P(X=(1000+2n) = 0.5.$$

The expected amount of money after a week is

$$E(X) = (1000 - n)(0.5) + (1000 + 2n)(0.5) = 1000 + (0.5)n.$$

This shows that the more coconuts we buy at \$2 (the larger n is) the more money we can expect to have after a week. Therefore we should buy 500 coconuts (by spending all of the \$1000 we initially had).

(b) Let Y be the total number of coconuts we have after a week (i.e. the number we buy at \$2 each, plus the number we buy at the new price). The range of Y is

$$\left\{n + (1000 - 2n), n + \frac{1}{4}(1000 - 2n)\right\} = \left\{1000 - n, 250 + \frac{n}{2}\right\}$$

Again, each of these outcomes is equally likely. The expected total number of coconuts is

$$E(Y) = (1000 - n)(0.5) + \left(250 + \frac{n}{2}\right)(0.5) = 625 - \frac{1}{4}n.$$

This shows that buying any positive number of coconuts at \$2 each decreases the expected total number after a week. Therefore we shouldn't buy any coconuts at \$2 each, and wait to buy them after a week.

□

5. A game of chance is called *fair*, if each player's expected value is zero. If the casino pays us \$10 for rolling a 3 or a 4 with a regular 6-sided die, what should we have to pay for rolling a 1,2,5, or 6, in order to make this a fair game?

Solution. Let X be the random variable which gives the payout for each roll of the game. If we assume that the payout is k for each of 1,2,5, or 6 (i.e. it is the same amount for each) then X has range $\{k, 10\}$. The probability distribution for X is

$$f(x) = \begin{cases} \frac{2}{6} = P(\{3,4\}) & \text{for } x = 10 \\ \frac{4}{6} = P(\{1,2,5,6\}) & \text{for } x = k. \end{cases}$$

So the expected value for X is,

$$\begin{aligned} E(X) &= k \cdot f(k) + 10 \cdot f(10) \\ &= k \cdot \frac{4}{6} + 10 \cdot \frac{2}{6} \\ &= \frac{2}{3}(k + 5). \end{aligned}$$

For this to be a fair game we must have $0 = E(X) = \frac{2}{3}(k+5)$. This implies that $k = -5$; i.e. we must pay \$5 any time we roll a 1,2,5, or 6. □

6. The probability density of X is given by

$$f(x) = \begin{cases} \frac{1}{8}(x+1) & \text{for } 2 \leq x \leq 4 \\ 0 & \text{otherwise.} \end{cases}$$

Find $E(X)$.

Solution.

$$\begin{aligned}
E(X) &= \int_{-\infty}^{\infty} x \cdot f(x)\, dx \\
&= \int_2^4 x \cdot \frac{1}{8}(x+1)\, dx \\
&= \frac{1}{8}\int_2^4 x^2 + x\, dx \\
&= \frac{1}{8}\left(\frac{x^3}{3} + \frac{x^2}{2}\right)\Big|_2^4 \\
&= \frac{1}{8}\left(\frac{64}{3} + \frac{16}{2} - \frac{8}{3} - \frac{4}{2}\right) \\
&= \frac{37}{12}
\end{aligned}$$

□

7. Let X be a random variable with the following distribution

x	-2	-1	1	2
$P(X=x)$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

Let $Y = X^2$.

(a) Find the distribution $g(y)$ of Y.

(b) Find the joint distribution $f(x,y)$ of X and Y.

(c) Find the expected value of $2X+Y$.

(d) Find $E(X)$, $E(Y)$ and $E(XY)$. Note that this example shows that $E(XY) = E(X)E(Y)$, however X and Y are not independent.

Solution. (a) Since $Y = X^2$, the range of Y is $\{1, 4\}$, and

$$P(Y=1) = P(X=-1) + P(X=1), \quad P(Y=4) = P(X=-2) + P(X=2).$$

In summary, the distribution for Y is

y	1	4
$P(Y=y)$	$\frac{1}{2}$	$\frac{1}{2}$

(b) The joint distribution is

		x			
		-2	-1	1	2
y	1	0	$\frac{1}{4}$	$\frac{1}{4}$	0
	4	$\frac{1}{4}$	0	0	$\frac{1}{4}$

(c)

$$
\begin{aligned}
E(2X+Y) &= \sum_x \sum_y (2x+y) \cdot f(x,y) \\
&= (2(-2)+1) \cdot f(-2,1) + (2(-2)+4) \cdot f(-2,4) + (2(-1)+1) \cdot f(-1,1) \\
&\quad + (2(-1)+4) \cdot f(-1,4) + (2(1)+1) \cdot f(1,1) + (2(1)+4) \cdot f(1,4) \\
&\quad + (2(2)+1) \cdot f(2,1) + (2(2)+4) \cdot f(2,4) \\
&= (-3) \cdot 0 + (0) \cdot \frac{1}{4} + (-1) \cdot \frac{1}{4} + (2) \cdot 0 + (3) \cdot \frac{1}{4} + (6) \cdot 0 + (5) \cdot 0 + (8) \cdot \frac{1}{4} \\
&= 2.5.
\end{aligned}
$$

(d) Let $g(x)$ denote the probability distribution of X, and $h(y)$ denote the probability distribution for Y. Then

$$E(X) = \sum_x x \cdot h(x) = (-2) \cdot \frac{1}{4} + (-1) \cdot \frac{1}{4} + (1) \cdot \frac{1}{4} + (2) \cdot \frac{1}{4} = 0.$$

$$E(Y) = \sum_y y \cdot g(y) = (1) \cdot \frac{1}{2} + (4) \cdot \frac{1}{2} = 2.5.$$

We also have

$$
\begin{aligned}
E(XY) &= \sum_x \sum_y (xy) \cdot f(x,y) \\
&= ((-2) \cdot 1) \cdot f(-2,1) + ((-2) \cdot 4) \cdot f(-2,4) + ((-1) \cdot 1) \cdot f(-1,1) \\
&\quad + ((-1) \cdot 4) \cdot f(-1,4) + (1 \cdot 1) \cdot f(1,1) + (1 \cdot 4) \cdot f(1,4) \\
&\quad + (2 \cdot 1) \cdot f(2,1) + (2 \cdot 4) \cdot f(2,4) \\
&= (-2) \cdot 0 + (-8) \cdot \frac{1}{4} + (-1) \cdot \frac{1}{4} + (-4) \cdot 0 + (1) \cdot \frac{1}{4} + (4) \cdot 0 + (2) \cdot 0 + (8) \cdot \frac{1}{4} \\
&= 0.
\end{aligned}
$$

Note that $f(-2,1) = 0 \neq g(-2) \cdot h(1) = \frac{1}{4} \cdot \frac{1}{2}$ and therefore X and Y are not independent, but clearly $E(XY) = E(X) \cdot E(Y)$. We proved in class that independence implies $E(XY) = E(X) \cdot E(Y)$, but the reverse implication does not hold, as this example shows.

$\square$

8. The joint probability density of X and Y is given by

$$f(x,y) = \begin{cases} \frac{2}{7}(x+2y) & \text{for } 0 \leq x \leq 1, 1 < y < 2 \\ 0 & \text{elsewhere.} \end{cases}$$

Find the expected value of $g(X,Y) = \frac{X}{Y^3}$.

Solution.

$$\begin{aligned}
E\left(\frac{X}{Y^3}\right) &= \int_1^2 \int_0^1 \frac{2x(x+2y)}{7y^3}\,dx\,dy \\
&= \frac{2}{7}\int_1^2 \frac{x^3}{3y^3} + \frac{x^2}{y^2}\Big|_0^1\,dy \\
&= \frac{2}{7}\int_1^2 \frac{1}{3y^3} + \frac{1}{y^2}\,dy \\
&= \frac{2}{7}\left[-\frac{1}{6y^2} - \frac{1}{y}\right]_1^2 \\
&= \frac{5}{28}
\end{aligned}$$

□

9. The probability density of X is given by

$$f(x) = \begin{cases} \frac{x}{2} & \text{for } 0 < x \le 1 \\ \frac{1}{2} & \text{for } 1 < x \le 2 \\ \frac{3-x}{2} & \text{for } 2 < x < 3 \\ 0 & \text{elsewhere.} \end{cases}$$

Find the expected value of $g(X) = X^2 - 5X + 3$.

Solution.

$$\begin{aligned}
E(X^2-5X+3) &= \int_{-\infty}^{\infty}(x^2-5x+3)f(x)\,dx \\
&= \int_0^1 (x^2-5x+3)\left(\frac{x}{2}\right)\,dx + \int_1^2 (x^2-5x+3)\left(\frac{1}{2}\right)\,dx \\
&\quad + \int_2^3 (x^2-5x+3)\left(\frac{3-x}{2}\right)\,dx \\
&= \frac{1}{2}\left[\frac{x^4}{4} - \frac{5x^3}{3} + \frac{3x^2}{2}\right]_0^1 + \frac{1}{2}\left[\frac{x^3}{3} - \frac{5x^2}{2} + 3x\right]_1^2 \\
&\quad + \frac{3}{2}\left[\frac{x^3}{3} - \frac{5x^2}{2} + 3x\right]_2^3 - \frac{1}{2}\left[\frac{x^4}{4} - \frac{5x^3}{3} + \frac{3x^2}{2}\right]_2^3 \\
&= \frac{1}{2}\left[\frac{1}{4} - \frac{5}{3} + \frac{3}{2}\right] + \frac{1}{2}\left[\left(\frac{8}{3} - 10 + 6\right) - \left(\frac{1}{3} - \frac{5}{2} + 3\right)\right] \\
&\quad + \frac{3}{2}\left[\left(9 - \frac{45}{2} + 9\right) - \left(\frac{8}{3} - 10 + 6\right)\right] - \frac{1}{2}\left[\left(\frac{81}{4} - 45 + \frac{27}{2}\right) - \left(4 - \frac{40}{3} + 6\right)\right] \\
&= \frac{1}{24} - \frac{13}{12} - \frac{19}{4} + \frac{95}{24} \\
&= -\frac{11}{6}.
\end{aligned}$$

□

10. The probability that Ms. Brown will sell a piece of property at a profit of \$3,000 is $\frac{3}{20}$, the probability that she will sell at a profit of \$1,500 is $\frac{7}{20}$, the probability that she will break even is $\frac{7}{20}$ and the probability that she will lose \$1,500 is $\frac{3}{20}$. What is her expected profit?

Solution. Let random variable X represent the profit of the sale. Then range of X is $\{-1500, 0, 1500, 3000\}$ and the probability distribution for X is

x	$P(X = x)$
-1500	$\frac{3}{20}$
0	$\frac{7}{20}$
1500	$\frac{7}{20}$
3000	$\frac{3}{20}$

Thus the expected profit is (in dollars)

$$E(X) = (-1500) \cdot \frac{3}{20} + (0) \cdot \frac{7}{20} + (1500) \cdot \frac{7}{20} + (3000) \cdot \frac{3}{20} = 750.$$

$\square$

11. The joint probability density of X and Y is given by

$$f(x, y) = \begin{cases} \frac{2}{5}(2x + 3y) & \text{for } 0 < x < 1, 0 < y < 1 \\ 0 & \text{elsewhere.} \end{cases}$$

Find $E(XY)$.

Solution.

$$\begin{aligned} E(XY) &= \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} xyf(x, y)\, dx\, dy \\ &= \int_0^1 \int_0^1 xy \left(\frac{2}{5}(2x + 3y) \right) dx\, dy \\ &= \frac{2}{5} \int_0^1 \left[\frac{2x^3y}{3} + \frac{3}{2}x^2y^2 \right]_0^1 dy \\ &= \frac{2}{5} \int_0^1 \frac{2y}{3} + \frac{3}{2}y^2\, dy \\ &= \frac{2}{5} \left[\frac{y^2}{3} + \frac{y^3}{2} \right]_0^1 \\ &= \frac{1}{3}. \end{aligned}$$

$\square$

12. The number of minutes that a flight from Phoenix to Tucson is early or late is a continuous random variable with probability density

$$f(x) = \begin{cases} \frac{1}{243}(36 - x^2) & \text{for } -6 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$

If the posted arrival time is 12:00pm, find the expected arrival time. (Take negative values to mean early, positive values to mean late)

Solution. Let X be the continuous random variable representing the number of minutes past 12:00 that the flight arrives. Then

$$\begin{aligned}
E(X) &= \int_{-\infty}^{\infty} x \cdot f(x)\, dx \\
&= \int_{-\infty}^{-6} x \cdot f(x)\, dx + \int_{-6}^{3} x \cdot f(x)\, dx + \int_{3}^{\infty} x \cdot f(x)\, dx \\
&= \int_{-\infty}^{-6} x \cdot 0\, dx + \int_{-6}^{3} x \cdot \left(\frac{1}{243}(36 - x^2)\right)\, dx + \int_{3}^{\infty} x \cdot 0\, dx \\
&= \int_{-6}^{3} \frac{36x}{243} - \frac{x^3}{243}\, dx \\
&= \frac{18x^2}{243} - \frac{x^4}{972}\bigg|_{-6}^{3} \\
&= \frac{18(9)}{243} - \frac{81}{972} - \frac{18(36)}{243} + \frac{1296}{972} \\
&= -0.75
\end{aligned}$$

Therefore the expected arrival time is 0.75 minutes, or 45 seconds, before 12:00pm. □

13. Find the expected value for a random variable X with probability density function given by

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 \le x < 2 \\ 0 & \text{otherwise} \end{cases}$$

Solution.

$$\begin{aligned}
E(X) &= \int_{-\infty}^{\infty} x \cdot f(x)\, dx \\
&= \int_{-\infty}^{0} x \cdot f(x)\, dx + \int_{0}^{1} x \cdot f(x)\, dx + \int_{1}^{2} x \cdot f(x)\, dx + \int_{2}^{\infty} x \cdot f(x)\, dx \\
&= \int_{-\infty}^{0} x \cdot 0\, dx + \int_{0}^{1} x \cdot x\, dx + \int_{1}^{2} x \cdot (2 - x)\, dx + \int_{2}^{\infty} x \cdot 0\, dx \\
&= \int_{0}^{1} x^2\, dx + \int_{1}^{2} 2x - x^2\, dx \\
&= \left(\frac{x^3}{3}\right)\bigg|_{0}^{1} + \left(x^2 - \frac{x^3}{3}\right)\bigg|_{1}^{2} \\
&= \frac{1}{3} + 4 - \frac{8}{3} - 1 + \frac{1}{3} \\
&= 1.
\end{aligned}$$

□

14. Let X be the number of points rolled with a regular 6-sided die. Find the expected value of $3X^2+2X-1$.

Solution. Let $g(X) = 3X^2 + 2X - 1$. Then, from our theorem on expected value of a function of a random variable, we have

$$E(g(X)) = \sum_x g(x) \cdot f(x),$$

where the sum is taken over all values in the range of X, namely $\{1, 2, 3, 4, 5, 6\}$, and $f(x) = \frac{1}{6}$ (for all x) is the probability distribution of X. Thus

$$\begin{aligned}
E(g(X)) &= \sum_{x=1}^{6}(3x^2 + 2x - 1) \cdot \frac{1}{6} \\
&= \frac{(3(1)^2 + 2(1) - 1)}{6} + \frac{(3(2)^2 + 2(2) - 1)}{6} + \frac{(3(3)^2 + 2(3) - 1)}{6} \\
&\quad + \frac{(3(4)^2 + 2(4) - 1)}{6} + \frac{(3(5)^2 + 2(5) - 1)}{6} + \frac{(3(6)^2 + 2(6) - 1)}{6} \\
&= \frac{4}{6} + \frac{15}{6} + \frac{32}{6} + \frac{55}{6} + \frac{84}{6} + \frac{119}{6} \\
&= 51.5.
\end{aligned}$$

□

15. Let X be a discrete random variable with the probability distribution given below. Find the expected value of X.

x	$f(x)$
-2	$\frac{1}{20}$
-1	$\frac{3}{20}$
0	$\frac{6}{20}$
1	$\frac{2}{20}$
2	$\frac{7}{20}$
3	$\frac{1}{20}$

Solution.

$$E(X) = (-2)\frac{1}{20} + (-1)\frac{3}{20} + (0)\frac{6}{20} + (1)\frac{2}{20} + (2)\frac{7}{20} + (3)\frac{1}{20} = \frac{14}{20}.$$

□

16. Let X be a discrete random variable with the probability distribution given below. Find $E(X^2)$.

x	$f(x)$
-2	$\frac{1}{20}$
-1	$\frac{3}{20}$
0	$\frac{6}{20}$
1	$\frac{2}{20}$
2	$\frac{7}{20}$
3	$\frac{1}{20}$

Solution.

$$E(X^2) = (-2)^2\frac{1}{20} + (-1)^2\frac{3}{20} + (0)^2\frac{6}{20} + (1)^2\frac{2}{20} + (2)^2\frac{7}{20} + (3)^2\frac{1}{20} = \frac{46}{20}.$$

□

17. Let X be a continuous random variable with the probability density given below. Find $E(X)$.

$$f(x) = \begin{cases} \frac{x}{2} & \text{for } 0 \le x \le 1 \\ \frac{1}{2} & \text{for } 1 < x \le 2 \\ \frac{3-x}{2} & \text{for } 2 < x \le 3 \\ 0 & \text{otherwise} \end{cases}$$

Solution.

$$\begin{aligned} E(X) &= \int_{-\infty}^{\infty} x f(x)\, dx \\ &= \int_0^1 \frac{x^2}{2}\, dx + \int_1^2 \frac{x}{2}\, dx + \int_2^3 \frac{3x - x^2}{2}\, dx \\ &= \left[\frac{x^3}{6}\right]_0^1 + \left[\frac{x^2}{4}\right]_1^2 + \left[\frac{3x^2}{4} - \frac{x^3}{6}\right]_2^3 \\ &= \frac{1}{6} - 0 + 1 - \frac{1}{4} + \frac{27}{4} - \frac{27}{6} - 3 + \frac{8}{3} \\ &= \frac{17}{6} \end{aligned}$$

□

18. A game of chance is called *fair* if each player's expected profit is zero. Consider a casino game where the player rolls two fair dice and wins the sum shown on the 2 dice (in dollars). How much should the casino charge the player in order to make this a fair game?

Solution. Let X be the sum of the two dice, and $f(x)$ its distribution. Then.

$$\begin{aligned} E(X) &= \sum_{x=2}^{12} x f(x) \\ &= \sum_{x=2}^{12} x \left(\frac{6 - |7 - x|}{36}\right) \\ &= \frac{2}{36} + \frac{6}{36} + \frac{12}{36} + \frac{20}{36} + \frac{30}{36} + \frac{42}{36} + \frac{40}{36} + \frac{36}{36} + \frac{30}{36} + \frac{22}{36} + \frac{12}{36} \\ &= 7 \end{aligned}$$

Therefore the casino should charge \$7 for one play in order to make this a fair game. □

19. A game of chance is called *fair* if each player's expected profit is zero. Suppose you are making wagers with your friend and you tell them that they have to pay you \$10 if they roll a 3 or a 4 with fair 6-sided die. In order to make the game fair, how much should your promise to pay your friend if they roll a 1, 2, 5, or 6?

Solution. Let X be the amount of money that you win by playing the game, and p be the amount you pay to your friend for rolling a 1,2,5 or 6; i.e. $-p$ is the amount you "win" on those numbers. The range of X is then $\{-p, 10\}$ and the expected winnings are

$$E(X) = (-p)\frac{4}{6} + 10\frac{2}{6}.$$

Thus if the game is to be fair, then

$$(-p)\frac{4}{6} + 10\frac{2}{6} = 0 \quad \Rightarrow \quad p = 5.$$

So you must agree to pay \$5 if your friend rolls 1,2,5 or 6. $\square$

20. The joint distribution for X and Y is given below. Find $E(X+Y)$.

		$x=0$	$x=1$
y	0		$\frac{1}{8}$
	1	$\frac{1}{8}$	$\frac{2}{8}$
	2	$\frac{2}{8}$	$\frac{1}{8}$
	3	$\frac{1}{8}$	

Solution.

$$E(X+Y) = \sum_{x=0}^{1}\sum_{y=0}^{3}(x+y)f(x,y) = (1)\frac{1}{8} + (2)\frac{2}{8} + (3)\frac{1}{8} + (1)\frac{1}{8} + (2)\frac{2}{8} + (3)\frac{1}{8} = 2.$$

$\square$