

P.7 Probability Distributions

P.5 Homework Answers

1. a) 0.2625 b) 0.75 c) 0.4875 d) 0.712

2. $\frac{4}{6} \approx 0.667$

3. a) $\frac{8}{25} = 0.32$ b) $\frac{6}{16} = 0.375$

4. $\frac{5}{9} \approx 0.556$

5. a) $\frac{3}{4}$ b) 1 c) $\frac{1}{2}$ d) $\frac{3}{10}$

6. $\frac{13}{50} = 0.26$ 7. $\frac{5}{6} \approx 0.833$ 8. $\frac{1}{10}$

9. $\frac{2}{3} \approx 0.667$

10. a) $\frac{22}{25} = 0.88$ b) $\frac{3}{6}$

11. $\frac{31}{36} \approx 0.861$

12. $\frac{27}{49} \approx 0.551$

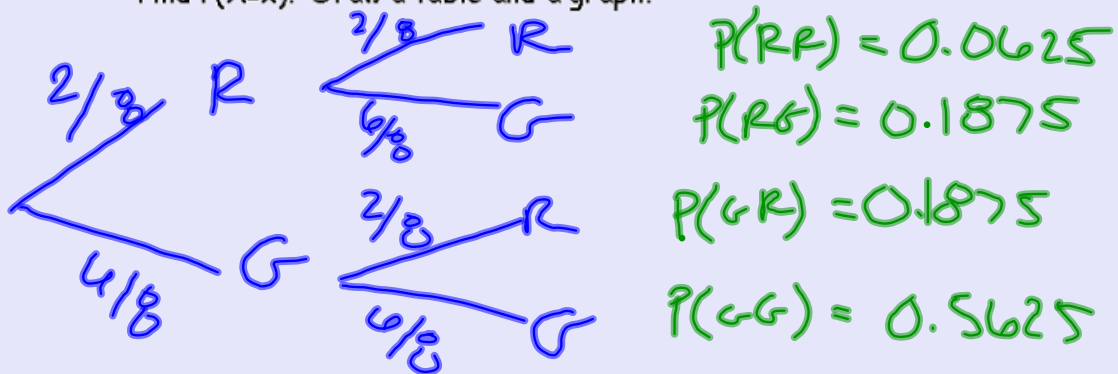
13. a. 0.65 b. 0.35 c. 0.22 d. 0.28 e. 0.571 f. 0.25

14. $\frac{2}{9}$

P.7 Probability Distributions

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Example 1: A box contains 2 red marbles and 6 green marbles. Two marbles are chosen at random with replacement. Let x be the number of green marbles obtained. Find $P(X=x)$. Draw a table and a graph.



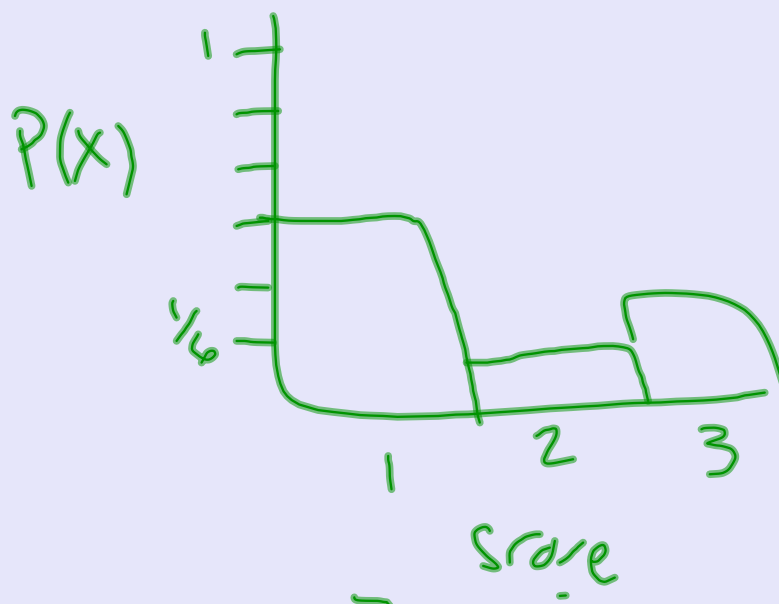
X	$P\{X=x\}$
0	0.0625
1	0.375
2	0.5625



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Example 2: A fair die has faces labeled 1, 1, 1, 2, 3, 3. Let x be the score when the die is thrown. Find $P(X=x)$. Draw a table and a graph.

x	$P(X=x)$
1	$\frac{3}{6}$
2	$\frac{1}{6}$
3	$\frac{2}{6}$



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Example 3: Is $P(x) = \binom{3}{x} (0.6)^x (0.4)^{3-x}$ for $x = 0, 1, 2, 3$ a probability distribution?
Why or why not?

nCr
 $3Cx$

x	$P(X=x)$
0	0.064
1	0.288
2	0.432
3	0.216

Yes!

$$\sum P(X=x) = 1$$

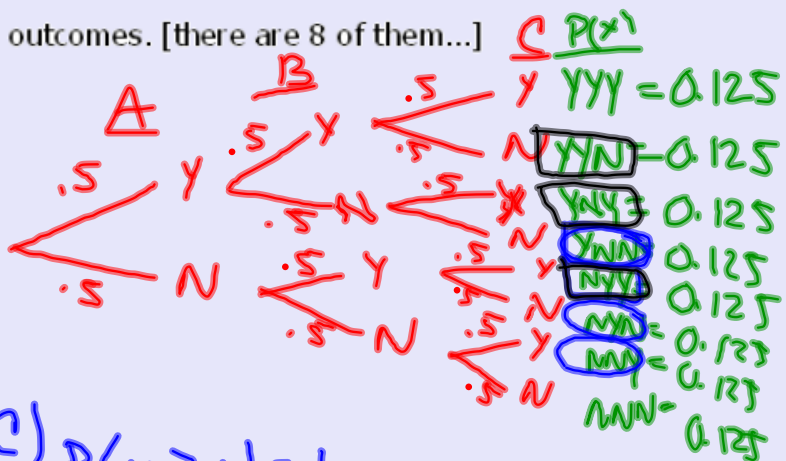
Check for Understanding:

1. A supermarket has three checkout points A, B, and C. Consumer affairs checks for the accuracy of weighing scales at each checkout. If a weighing scale is accurate, yes (Y) is recorded. If not, no (N) is recorded. Let the random variable x be the number of accurate weighing scales at the supermarket.

- a) List all the possible outcomes. [there are 8 of them...]
 b) Find $P(X=x)$.
 c) Find $P(x \geq 1)$.

b)

x	$P(X=x)$
0	0.125
1	0.375
2	0.375
3	0.125



c) $P(x \geq 1) = 1 - 0.125 = 0.875$

P.7 Probability Distributions

2. Find k for the probability distribution $P(x) = k(x+2)$ for $x = 1, 2, 3$.

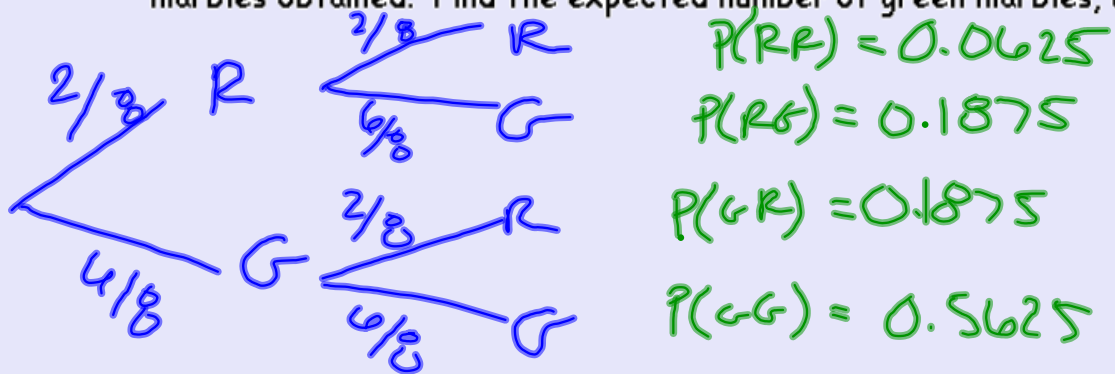
$$k(1+2) + k(2+2) + k(3+2) = 1$$

$$3k + 4k + 5k = 1$$

$$12k = 1$$

$$k = \frac{1}{12}$$

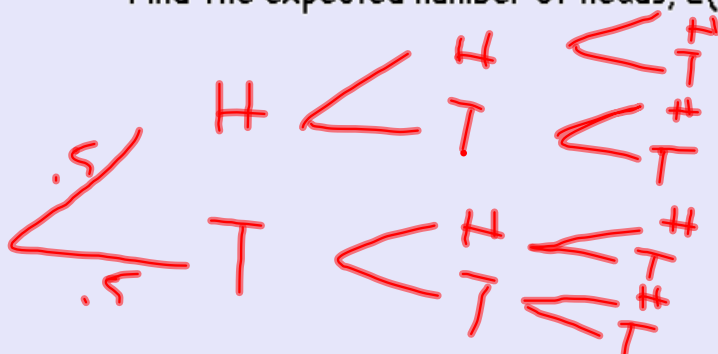
Example 1: A box contains 2 red marbles and 6 green marbles. Two marbles are chosen at random with replacement. Let x be the number of green marbles obtained. Find the expected number of green marbles, $E(X)$.



x	$P(X=x)$	$x \cdot P(x)$
0	0.0625	0
1	0.375	0.375
2	0.5625	+1.125

$E(X) = 1.5$

Example 2: A fair coin is thrown three times and the number of heads recorded.
Find the expected number of heads, $E(X)$.



b)

x	$P(X=x)$	$x P(x)$
0	0.125	0
1	0.375	0.375
2	0.375	0.75
3	0.125	0.375

$E(x) = 1.5$

Example 3: A charity fundraiser gets a license to run a gambling game. A player pays \$4 to roll a die. The payoffs to the player are as follows:

Result on Die	6	5, 4	3, 2, 1
Payoff	\$10	\$4	\$2

- Let x equal the money won in a single toss of the die. Find $P(X=x)$.
- What is your expected return at the end of one game?
What is your expected return after 100 games?
- Should you play this game? Why or why not?

a)

x	$P(X=x)$
2	$\frac{3}{6}$
4	$\frac{2}{6}$
10	$\frac{1}{6}$

b) $2\left(\frac{3}{6}\right) + 4\left(\frac{2}{6}\right) + 10\left(\frac{1}{6}\right)$
 $E(x) = \$4.00$

Check for Understanding:

1. In a game of chance, a player spins a spinner that has equal chances of landing on any of four regions. The payoffs are as indicated below:

Spinner	1	2	3	4
Winnings	\$1	\$2	\$5	\$8

- a) How much should the house expect to lose on this game? $\$4.00$
 b) How much should they charge people to play this game? $\geq \$4.00$

X	$P(X=x)$	
1	$\frac{1}{4}$	$\frac{1}{4}$
2	$\frac{1}{4}$	$\frac{2}{4}$
5	$\frac{1}{4}$	$\frac{5}{4}$
8	$\frac{1}{4}$	$\frac{8}{4}$
		$\frac{16}{4}$

$E(x) = \$4.00$
 winnings

2. The random variable X has a probability distribution given by

$$P(X = x) = \frac{x}{k}, \quad x = 1, 2, 3, 4.$$

- a) Find the value of the constant k .
 b) Calculate $E(X)$.

$$\frac{1}{k} + \frac{2}{k} + \frac{3}{k} + \frac{4}{k} = 1$$

$$\frac{10}{k} = 1$$

$$k = 10$$

x	$P(X=x)$
1	$\frac{1}{10}$
2	$\frac{2}{10}$
3	$\frac{3}{10}$
4	$\frac{4}{10}$

$$E(X) = 3$$

Attachments

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