

Day 3 Notes

KEY

NAME: _____

UNIT 4 •

Lesson 5: Applying Expected Value

outcome₁ • prob₁ +

outcome₂ • prob₂ + ...

Prerequisite Practice 4.5.1: Calculating Expected Value

Find the expected value of winnings for each game.

1. Juan is playing a game in which he can win \$100 with probability 0.1, \$200 with probability 0.2, or \$300 with probability 0.7. What is the expected value of Juan's winnings?

$$100(.1) + 200(.2) + 300(.7) =$$
$$\$260$$

2. Marina is playing a game in which she needs to throw a ball into a bucket. If she throws the ball into the bucket, she will win \$100; if not, she will win \$0. The probability that Marina will throw the ball into the bucket is 0.2. What is the expected value of Marina's winnings?

Yes	+100	• 2	
No	0		\$20

3. Linda estimates the number of questions she answered correctly on a test. She answered 10 correctly with probability 0.6, 20 correctly with probability 0.3, and 50 correctly with probability 0.1. What is the expected value of the number of questions Linda answered correctly?

$$10(.6) + 20(.3) + 50(.1)$$

17 questions

4. Mara is playing a game. There are two marbles in a bag. If she chooses the purple marble, she will win \$10. If she chooses the orange marble, she will win \$200. What is the expected value of Mara's winnings from the game?

10	1/2	
200	1/2	\$105

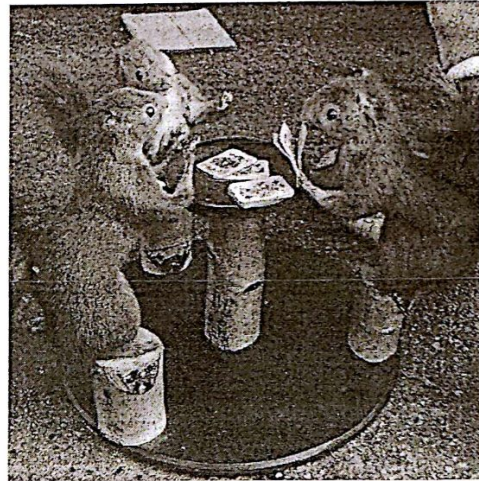
5. Benjamin plays a game in which he will win 110 points with probability 0.6 and 120 points with probability 0.4. What is the expected number of points that he will win by playing the game?

110	• 6	
120	• 4	114 pts

Probability and Statistics – Expected Value Worksheet

1. A \$20 bill, two \$10 bills, three \$5 bills and four \$1 bills are placed in a bag. If a bill is chosen at random, what is the expected value for the amount chosen?

$$\begin{array}{r}
 20 \quad \frac{1}{10} \\
 10 \quad \frac{2}{10} \\
 5 \quad \frac{3}{10} \\
 1 \quad \frac{4}{10}
 \end{array}
 \quad \$5.90$$



HH HT
TT TH

In a game you flip a coin twice, and record the number of heads that occur. You get 10 points for 2 heads, zero points for 1 head, and 5 points for no heads. What is the expected value for the number of points you'll win per turn?

$$\begin{array}{r}
 HH \quad 10 \quad \frac{1}{4} \\
 HT/TH \quad 0 \quad \frac{2}{4} \\
 TT \quad 5 \quad \frac{1}{4}
 \end{array}
 \quad 3.75$$

3. There is an equally likely chance that a falling dart will land anywhere on the rug below. The following system is used to find the number of points the player wins. What is the expected value for the number of points won?

$\frac{6}{15}$ Black = 40 points
 $\frac{6}{15}$ Gray = 20 points
 $\frac{3}{15}$ White = 0 points



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	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

4. A mysterious card-playing squirrel (pictured) offers you the opportunity to join in his game. The rules are:

- To play you must pay him \$2. -2
 - If you pick a **spade** from a shuffled pack, you win \$9.
- Find the expected value you win (or lose) per game.

$$\text{spade } 9 \quad \frac{1}{4}$$

$$2.25 - 2 = .25$$

5. A dice game involves rolling 2 dice. If you roll a 2, 3, 4, 10, 11, or a 12 you win \$5. If you roll a 5, 6, 7, 8, or 9 you lose \$5. Find the expected value you win (or lose) per game.

$$\begin{array}{r}
 12 \quad \$5 \\
 \hline
 36 \quad +5 \\
 \\
 24 \quad -\$5 \\
 \hline
 36
 \end{array}$$

$$\begin{array}{r}
 -5 \\
 \hline
 3 = \\
 \$ \\
 \hline
 -1.67
 \end{array}$$

Practice w/ Expected Value:

$$1) \frac{13}{52}(10) + \frac{9}{52}(8) - \frac{30}{52}(6) = \$.42$$

yes, expected value is \$.42

$$2) \frac{1}{6}(25) + \frac{1}{6}(5) + \frac{1}{6}(0) + \frac{2}{6}(10) - \frac{1}{6}(15) = -.83$$

Not crazy b/c you expect to lose \$.83

$$3) \text{EV of game 1: } \frac{5}{12}(4) + \frac{4}{12}(2) - \frac{3}{12}(10) = -.1667$$

*you paid \$10

$$100 \text{ games: } 100(-.1667) = \$-16.67$$

lose \$16.67

$$4) \text{Want } EV = 0$$

X = what he should charge

$$\frac{1}{9}(x - 9000) + \frac{8}{9}(-9000) = 0$$

$$X = \$81,000$$

$$5) \text{pay } \$1,000 \text{ to enter}$$

$$EV = \frac{1}{20}(3500) + \frac{1}{10}(2500) + \frac{1}{4}(500) + \frac{3}{5}(-1000)$$

$$= \$-50$$

Not worthwhile, expected to lose \$50

$$6) EV = .35(-30000) + .4(0) + .25(55000) = \$3250$$

do the project!

$$7) EV = .75(120000) + .25(-98,000) = \$65,500$$

do the project!

$$8) EV = \frac{12}{52}(.80) + \frac{15}{52}(.40) + \frac{25}{52}(.30) = \$.44$$

If you paid \$.50 and got \$.44, you lost money