LESSON MAKER PRO

Chance Cash Choices

Use expected value to compare possible outcomes.

HIGH SCHOOL · HSS-MD.A

CCSS.Math.Content.HSS-MD.A "Calculate expected values and use them to solve problems"

NAME _____ DATE _____

EXPECTED VALUE

Multiply each possible outcome by its probability. Then add the products. If there is a cost to play or buy, include that cost as a negative outcome.

WORKED EXAMPLE

An online game gives you $17 with probability 2/11 and costs you $7 with probability 9/11. Find the expected value.

1. Multiply each outcome by its probability.
2. $17 x 2/11 = $34/11, and -$7 x 9/11 = -$63/11.
3. Add: $34/11 + (-$63/11) = -$29/11.

Answer: -$29/11

PRACTICE 6 problems

1 A reward app gives you $10 with probability 1/2 and $0 with probability 1/2. Find the expected value.

ANSWER _____

2 A game gives you $14 with probability 1/3 and costs you $8 with probability 2/3. Find the expected value.

ANSWER _____

3 A bonus offers $16 with probability 3/8 and $24 with probability 5/8. Find the expected value.

ANSWER _____

4 A game gives you $20 with probability 1/4 and costs you $6 with probability 3/4. Find the expected value.

ANSWER _____

5 A prize wheel gives $24 with probability 1/6, $18 with probability 1/3, and $0 with probability 1/2. Find the expected value.

ANSWER _____

6 A game costs you $12 with probability 1/4, gives you $6 with probability 1/2, and gives you $22 with probability 1/4. Find the expected value.

ANSWER _____

APPLY IT Show your work

1 At an esports tournament, a mystery prize ticket costs $10. It gives a $24 gift card with probability 1/4, an $8 gift card with probability 1/4, or no gift card with probability 1/2. What is the expected net gain or loss from buying one ticket?

WORK SPACE

ANSWER _____

2 You buy a vintage shirt for $10 to resell online. You think you can sell it for $22 with probability 1/2 or $6 with probability 1/2. What is your expected profit?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Choose between two digital tournament passes based only on expected net value. Pass A costs $13 and gives a $30 gift-card value with probability 1/3, or $0 otherwise. Pass B costs $4 and gives a $16 gift-card value with probability 1/2, or $0 otherwise. Find each expected net value and explain which pass is the better choice.

WORK SPACE AND ANSWER

ANSWER KEY

Chance Cash Choices

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A reward app gives you $10 with probability 1/2 and $0 with probability 1/2. Find the expected value.	**$5**
2	A game gives you $14 with probability 1/3 and costs you $8 with probability 2/3. Find the expected value.	**-$2/3**
3	A bonus offers $16 with probability 3/8 and $24 with probability 5/8. Find the expected value.	**$21**
4	A game gives you $20 with probability 1/4 and costs you $6 with probability 3/4. Find the expected value.	**$1/2**
5	A prize wheel gives $24 with probability 1/6, $18 with probability 1/3, and $0 with probability 1/2. Find the expected value.	**$10**
6	A game costs you $12 with probability 1/4, gives you $6 with probability 1/2, and gives you $22 with probability 1/4. Find the expected value.	**$11/2**

PART 2 · APPLY IT

1. **Expected net loss of $2** The expected gift-card value is $24 x 1/4 + $8 x 1/4 = $8. Subtract the $10 ticket cost to get -$2.
2. **$4 expected profit** The possible profits are $12 and -$4. Their expected value is $12 x 1/2 + (-$4) x 1/2 = $4.

CHALLENGE

Choose Pass B. Pass A has expected net value $30 x 1/3 - $13 = -$3. Pass B has expected net value $16 x 1/2 - $4 = $4, which is $7 higher.

Accept equivalent fractional, decimal, or dollar forms when they are exact. For word problems and the challenge, accept correct expected values with a clearly stated gain or loss conclusion.