

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 $\frac{2}{11}$ and costs you \$7 with probability $\frac{9}{11}$. Find the expected value.

1. Multiply each outcome by its probability.
2. $\$17 \times \frac{2}{11} = \$\frac{34}{11}$, and $-\$7 \times \frac{9}{11} = -\$6\frac{3}{11}$.
3. Add: $\$34/11 + (-\$63/11) = -\$29/11$.

Answer: $-\$29/11$

PRACTICE 6 problems

- 1** A reward app gives you \$10 with probability $\frac{1}{2}$ and \$0 with probability $\frac{1}{2}$. Find the expected value.

ANSWER _____

- 2** A game gives you \$14 with probability $\frac{1}{3}$ and costs you \$8 with probability $\frac{2}{3}$. Find the expected value.

ANSWER _____

- 3** A bonus offers \$16 with probability $\frac{3}{8}$ and \$24 with probability $\frac{5}{8}$. Find the expected value.

ANSWER _____

- 4** A game gives you \$20 with probability $\frac{1}{4}$ and costs you \$6 with probability $\frac{3}{4}$. Find the expected value.

ANSWER _____

- 5** A prize wheel gives \$24 with probability $\frac{1}{6}$, \$18 with probability $\frac{1}{3}$, and \$0 with probability $\frac{1}{2}$. Find the expected value.

ANSWER _____

- 6** A game costs you \$12 with probability $\frac{1}{4}$, gives you \$6 with probability $\frac{1}{2}$, and gives you \$22 with probability $\frac{1}{4}$. 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 $\frac{1}{4}$, an \$8 gift card with probability $\frac{1}{4}$, or no gift card with probability $\frac{1}{2}$. 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 $\frac{1}{2}$ or \$6 with probability $\frac{1}{2}$. What is your expected profit?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

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 $\frac{1}{3}$, or \$0 otherwise. Pass B costs \$4 and gives a \$16 gift-card value with probability $\frac{1}{2}$, or \$0 otherwise. Find each expected net value and explain which pass is the better choice.

PART 1 • PRACTICE

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

PART 2 • APPLY IT

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

CHALLENGE

Choose Pass B. Pass A has expected net value $\$30 \times \frac{1}{3} - \$13 = -\$3$. Pass B has expected net value $\$16 \times \frac{1}{2} - \$4 = \$4$, 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.