

Chance Value Maps

Define a random variable and display its distribution.

HIGH SCHOOL • HSS-MD.A.1

CCSS.Math.Content.HSS-MD.A.1 "(+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions."

NAME _____

DATE _____

MAP OUTCOMES TO NUMBERS

A random variable gives each outcome in a sample space a number. Find the probability of each possible value, then graph the values on a horizontal axis and their probabilities as bar heights.

WORKED EXAMPLE

Three equally likely reward cards are shown. Let X be the points on the selected card. Use the figure to make the probability distribution for X .

Card A, $X = 10$			
Card B, $X = 20$			
Card C, $X = 30$			

- Assign 10, 20, and 30 to cards A, B, and C.
- Each card has probability $1/3$.
- Draw bars at 10, 20, and 30, each with height $1/3$.

Answer: $P(X = 10) = 1/3$, $P(X = 20) = 1/3$, $P(X = 30) = 1/3$.

PRACTICE 4 problems

- 1** A fair spinner has equal sections A, B, C, and D. A and B earn 0 points, C earns 1 point, and D earns 2 points. Let X be points earned. List the distribution, then draw its bar graph.

ANSWER _____

- 2** Flip two fair coins. Let X be the number of heads. List the probability distribution for X .

ANSWER _____

- 3** Draw one tile at random from tiles labeled 1, 1, 2, 4, and 4. Let X be the tile number. List the distribution and draw its bar graph.

ANSWER _____

- 4** Roll a fair number cube. Let X be the number of letters in the English name of the result. List the probability distribution for X .

ANSWER _____

APPLY IT Show your work

- 1** A music-quiz app randomly gives one of four equally likely bonus cards. Let X be the points earned. Use the table to list the distribution for X , then draw its bar graph.

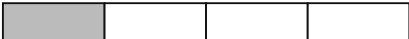
BONUS CARDS

Card	Points
Indie	0
Pop	2
Rock	2
Dance	5

ANSWER _____

- 2** A gaming club opens one random loot chest. Let X be the number of bonus tokens earned. Use the fraction bars to list the distribution and name the most likely value of X .

$x = 0$ 

$x = 1$ 

$x = 4$ 

ANSWER _____

CHALLENGE One step up

A playlist randomly selects one of 8 songs. Three songs are instrumental and five have lyrics. Define $X = 0$ for an instrumental song and $X = 1$ for a song with lyrics. Is X a valid random variable? Explain, then give its distribution.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A fair spinner has equal sections A, B, C, and D. A and B earn 0 points, C earns 1 point, and D earns 2 points. Let X be points earned. List the distribution, then draw its bar graph.	$P(X = 0) = 1/2$, $P(X = 1) = 1/4$, $P(X = 2) = 1/4$. Bar heights: 0 to $1/2$, 1 to $1/4$, 2 to $1/4$.
2	Flip two fair coins. Let X be the number of heads. List the probability distribution for X .	$P(X = 0) = 1/4$, $P(X = 1) = 1/2$, $P(X = 2) = 1/4$.
3	Draw one tile at random from tiles labeled 1, 1, 2, 4, and 4. Let X be the tile number. List the distribution and draw its bar graph.	$P(X = 1) = 2/5$, $P(X = 2) = 1/5$, $P(X = 4) = 2/5$. Bar heights: 1 to $2/5$, 2 to $1/5$, 4 to $2/5$.
4	Roll a fair number cube. Let X be the number of letters in the English name of the result. List the probability distribution for X .	$P(X = 3) = 1/2$, $P(X = 4) = 1/3$, $P(X = 5) = 1/6$.

PART 2 • APPLY IT

- $P(X = 0) = 1/4$, $P(X = 2) = 1/2$, $P(X = 5) = 1/4$. Bar heights: 0 to $1/4$, 2 to $1/2$, 5 to $1/4$. There are four equally likely cards. Two cards give 2 points, while one card gives each other value.
- $P(X = 0) = 1/2$, $P(X = 1) = 1/4$, $P(X = 4) = 1/4$. The most likely value is 0. Read each shaded fraction as the probability for its labeled X -value. The bar for 0 is the largest.

CHALLENGE

Yes. X assigns a numerical value to every song, and different songs may have the same value. $P(X = 0) = 3/8$ and $P(X = 1) = 5/8$.

Accept equivalent probability forms and correctly scaled bar graphs with the stated x -values and bar heights. For the challenge, students must state that every outcome receives a number and that repeated values are allowed.