

Chance Map

Assign values, build distributions, graph probabilities.

HIGH SCHOOL • MA.912.DP.6.1

MA.912.DP.6.1 "Define a random variable for a quantity of interest by assigning a numerical value to each individual outcome 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 assigns one number to each outcome. Combine outcomes with the same number, then make a bar graph with x-values on the horizontal axis and probabilities on the vertical axis.

WORKED EXAMPLE

A bag has 2 black cards and 5 white cards. Let $X=14$ for a black card and $X=21$ for a white card. Find and graph the distribution.

1. List X-values: 14, 14, 21, 21, 21, 21, 21.
2. $P(X=14)=2/7$.
3. $P(X=21)=5/7$.
4. Draw bars at 14 and 21 with those heights.

Answer: Distribution: 14: 2/7, 21: 5/7.

PRACTICE 5 problems

- 1** Flip a fair coin. Let $X=3$ for heads and $X=9$ for tails. Give the distribution and bar heights.

ANSWER _____

- 2** A spinner has equal sectors A, A, B, B, B, C. Let $A=0$, $B=4$, and $C=10$. Give the distribution.

ANSWER _____

- 3** Roll a fair die. Let $X=1$ for an odd roll and $X=0$ for an even roll. Give the distribution.

ANSWER _____

- 4** Draw one card from cards labeled 1, 1, 1, 6, 6, 9. Let X be the card label. Give the distribution.

ANSWER _____

- 5** Roll a fair die. Let $X=\text{roll} - 1$. List the distribution.

ANSWER _____

APPLY IT Show your work

- 1** An esports prize wheel has 8 equal sections labeled 0, 0, 5, 5, 5, 15, 15, 30 bonus points. Let X be the points won. Make a distribution and bar graph.

WORK SPACE

ANSWER _____

- 2** At a lunch gaming event, one of 6 equal match cards is drawn. The cards award 1, 1, 4, 4, 4, or 10 bonus points. Let X be the points awarded. Make a distribution and bar graph.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Flip 3 fair coins. Let X be the number of heads. Give the distribution, graph it, and explain why the bars for $X=1$ and $X=2$ have equal heights.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Flip a fair coin. Let $X=3$ for heads and $X=9$ for tails. Give the distribution and bar heights.	$X=3$: $1/2$; $X=9$: $1/2$. Bars at 3 and 9 each have height $1/2$.
2	A spinner has equal sectors A, A, B, B, B, C. Let $A=0$, $B=4$, and $C=10$. Give the distribution.	$X=0$: $1/3$; $X=4$: $1/2$; $X=10$: $1/6$. Use these as bar heights.
3	Roll a fair die. Let $X=1$ for an odd roll and $X=0$ for an even roll. Give the distribution.	$X=0$: $1/2$; $X=1$: $1/2$. Bars at 0 and 1 each have height $1/2$.
4	Draw one card from cards labeled 1, 1, 1, 6, 6, 9. Let X be the card label. Give the distribution.	$X=1$: $1/2$; $X=6$: $1/3$; $X=9$: $1/6$. Use these as bar heights.
5	Roll a fair die. Let X =roll minus 1. List the distribution.	$X=0, 1, 2, 3, 4, 5$, each with probability $1/6$. All six bars have height $1/6$.

PART 2 • APPLY IT

- $X=0$: $1/4$; $X=5$: $3/8$; $X=15$: $1/4$; $X=30$: $1/8$. Draw bars at 0, 5, 15, and 30 with those heights.** Count how many of the 8 sections have each point value. Divide each count by 8.
- $X=1$: $1/3$; $X=4$: $1/2$; $X=10$: $1/6$. Draw bars at 1, 4, and 10 with those heights.** Combine cards with the same point value. Divide each frequency by 6.

CHALLENGE

$X=0$: $1/8$; $X=1$: $3/8$; $X=2$: $3/8$; $X=3$: $1/8$. The bars at 1 and 2 both have height $3/8$ because there are 3 outcomes with one head and 3 outcomes with two heads.

Accept equivalent fractions and correctly scaled bar graphs. Each graph should place x -values on the horizontal axis and probabilities on the vertical axis.