LESSON MAKER PRO

What Could Happen?

List outcomes, describe events, and find their probabilities.

HIGH SCHOOL · S.P.1.1

S.P.1.1 "Describe events as subsets of a sample space."

NAME _____ DATE _____

EVENTS WITHIN A SAMPLE SPACE

The sample space S is the set of all possible outcomes. An event E is a subset of S containing the outcomes that meet a condition. When all outcomes are equally likely, P(E) = number of outcomes in E / number of outcomes in S.

WORKED EXAMPLE

A raffle draws one ticket from tickets labeled 32, 35, 38, 41, 44, 47, and 50. Let E be the event that the ticket number is divisible by 4. List S and E, then find P(E).

1. List every possible outcome: S = {32, 35, 38, 41, 44, 47, 50}.
2. Select the outcomes divisible by 4: E = {32, 44}.
3. There are 2 outcomes in E and 7 in S, so P(E) = 2/7.

Answer: S = {32, 35, 38, 41, 44, 47, 50}; E = {32, 44}; P(E) = 2/7.

PRACTICE 6 problems

1 One of the equally likely tickets labeled 0, 2, 4, 6, and 8 is drawn. List the event E that the number is less than 5, then find P(E).

ANSWER _____

2 A fair six-sided die is rolled. List the event E that the result is a multiple of 3, then find P(E).

ANSWER _____

3 A fair coin is flipped twice. Use H for heads and T for tails. List the sample space S and the event E of getting exactly one head.

ANSWER _____

4 One letter is chosen at random from the letters in BEATS. List the event E of choosing a vowel, then find P(E).

ANSWER _____

5 One of six equally likely stickers is labeled K, L, M, N, P, or Q. The event A is {K, M, P}. List the event that A does not happen, then find its probability.

ANSWER _____

6 An integer from 1 through 9 is chosen at random. Let A be the event that the number is odd, and let B be the event that the number is greater than 6. List the outcomes in both A and B, then find their probability.

ANSWER _____

APPLY IT Show your work

1 A merch pop-up randomly features one of the six equally likely items in the table. List the sample space S and the event E that the item is a hoodie or is black. Then find P(E).

POSSIBLE MERCH ITEMS

Style	Black	White	Blue
Hoodie	black hoodie	white hoodie	blue hoodie
Tee	black tee	white tee	blue tee

ANSWER _____

2 A game generates a code by choosing a digit from {0, 1, 2} twice. Each choice is independent, and all digits are equally likely. Write each code as an ordered pair. List the sample space S and the event E that the digits add to at least 3. Then find P(E).

WORK SPACE

ANSWER _____

CHALLENGE One step up

A fair four-sided red die and a fair four-sided blue die are rolled. Each die has faces numbered 1 through 4. Write each outcome as (red, blue). List the event E that the sum is even and the red result is greater than the blue result. Find P(E), and explain how you know your list is complete.

WORK SPACE AND ANSWER

ANSWER KEY

What Could Happen?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	One of the equally likely tickets labeled 0, 2, 4, 6, and 8 is drawn. List the event E that the number is less than 5, then find P(E).	**E = {0, 2, 4}; P(E) = 3/5.**
2	A fair six-sided die is rolled. List the event E that the result is a multiple of 3, then find P(E).	**E = {3, 6}; P(E) = 1/3.**
3	A fair coin is flipped twice. Use H for heads and T for tails. List the sample space S and the event E of getting exactly one head.	**S = {HH, HT, TH, TT}; E = {HT, TH}.**
4	One letter is chosen at random from the letters in BEATS. List the event E of choosing a vowel, then find P(E).	**E = {E, A}; P(E) = 2/5.**
5	One of six equally likely stickers is labeled K, L, M, N, P, or Q. The event A is {K, M, P}. List the event that A does not happen, then find its probability.	**A does not happen for {L, N, Q}; its probability is 1/2.**
6	An integer from 1 through 9 is chosen at random. Let A be the event that the number is odd, and let B be the event that the number is greater than 6. List the outcomes in both A and B, then find their probability.	**A and B = {7, 9}; P(A and B) = 2/9.**

PART 2 · APPLY IT

1. **S = {black hoodie, white hoodie, blue hoodie, black tee, white tee, blue tee}; E = {black hoodie, white hoodie, blue hoodie, black tee}; P(E) = 4/6 = 2/3.** All three hoodies meet the condition, as does the black tee. That gives 4 favorable outcomes out of 6.
2. **S = {(0,0), (0,1), (0,2), (1,0), (1,1), (1,2), (2,0), (2,1), (2,2)}; E = {(1,2), (2,1), (2,2)}; P(E) = 3/9 = 1/3.** There are 3 choices for each position, giving 9 equally likely ordered pairs. Three pairs have a sum of at least 3.

CHALLENGE

E = {(3,1), (4,2)}; P(E) = 2/16 = 1/8. Of the pairs with red greater than blue, only these two have an even sum. The dice have 4 × 4 = 16 equally likely outcomes.

Accept event outcomes in any order and equivalent fractions. For coin flips and dice, order matters because the flips or dice are distinguishable.