

3

Solving a Problem by Conducting an Experiment

You will need

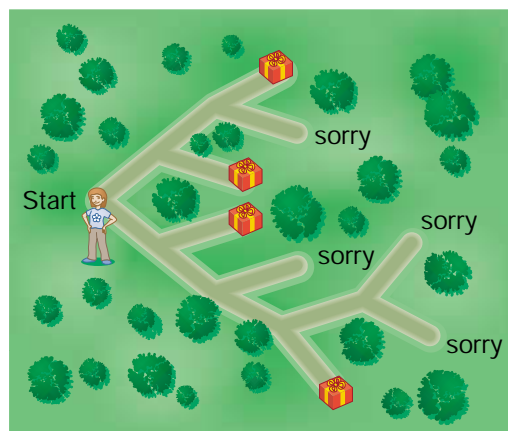
- a play coin
- a counter

Goal

Use an experiment as a problem solving strategy.

Tara made up an activity for her birthday party. There are prizes at the end of some paths of a maze, but not other paths. There are four prizes and eight paths.

? What is the probability that a party guest will end up with a prize?



Tara's Method

Understand the Problem

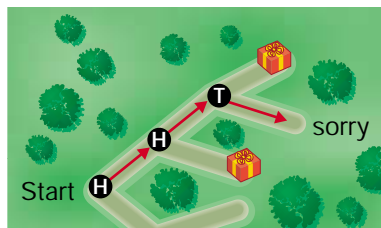
I need to calculate the fraction of the time I could expect to win a prize. I predict that I'll win half the time or 50%, since I know there are four prizes and eight paths.

Make a Plan

I'll conduct an experiment. I'll flip a coin each time I come to a place in the path where I have to choose whether to go left or right. If it's heads, I'll go left. If it's tails, I'll go right. This way, the choice is **random**.

For example, if I get **heads, heads, tails**, I follow the red path and I don't get a prize.

I'll do the experiment 20 times and see what fraction of the time I get a prize.



random

A result is random if what happens is based on chance. Something that is not random has to happen a certain way.

For example, the day after Tuesday is always Wednesday. That's not random.

If you put the names of the days of the week in a bag and pick Tuesday out, it is random which day you will pick next.

Carry Out the Plan

These are my results. Sometimes I knew if I would get a prize after only two tosses. Sometimes it took three, or four, or five tosses before I was sure.

1st toss	2nd toss	3rd toss	4th toss	5th toss	Win a prize?
H	H	T			
T	H				✓
H	H	T			
H	T				✓
T	H				✓
H	H	H			✓
T	T	H			
H	T				✓
T	H				✓
T	T	H			

1st toss	2nd toss	3rd toss	4th toss	5th toss	Win a prize?
H	T				✓
H	H	H			✓
T	T	T	H	H	
H	T				✓
T	H				✓
T	T	H			
T	T	H			
H	T				✓
H	H	T			
T	T	T	T		✓

H means turn left, T means turn right, ✓ means I win a prize.

The probability that I get a prize is $\frac{12}{20}$. That's equivalent to $\frac{60}{100}$, so the percent is 60%.

Look Back

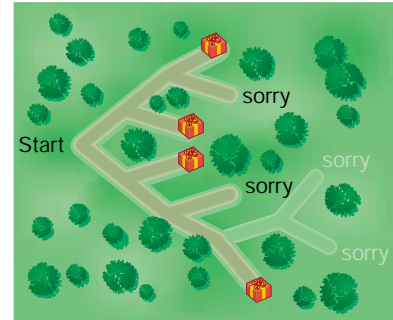
I won more than half the time. My prediction was a bit low.

Reflecting

1. Why was a coin flip a good model to make the path choice random?
2. Is an experiment a good way to solve this problem? Explain.

Checking

3. Predict the probability of winning a prize if the faded paths are removed.
Try the experiment using 20 trials again.
Compare your results with your prediction.



Practising

- 4.

Start at 5 on a number line. Conduct an experiment by tossing a coin 4 times. Go left if you toss heads; go right if you toss tails. Repeat the experiment a total of 20 times. What is the probability that you end up on 5?

5. Start with a counter in the centre square.
Conduct an experiment to determine the probability that you end up in the yellow section of the grid after one turn. The counter moves four times in a turn.
Toss the first coin. Move right if it's heads or left if it's tails.
Toss the second coin. Move up if it's heads or down if it's tails.
Repeat the two tosses.
Record whether or not you end up in the yellow section.
6. Kurtis's mom tosses a coin to decide who has to do the dishes each night, Kurtis or his sister. Heads means Kurtis does the dishes and tails means his sister does.
Conduct an experiment to determine the probability that Kurtis does the dishes more than 3 times in the next week.

