

Using Tree Diagrams

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10.1 Using Tree Diagrams

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[Figure 1]

Luis is making a sandwich and has a number of different ingredients available. He can choose between white bread and wheat bread, swiss cheese and cheddar cheese, and for meat he can choose turkey, ham or tuna. Based on these variables, how many different kinds of sandwiches can Luis make?

In this concept, you will learn to calculate **probability** by using tree diagrams.

Tree Diagram

Probability is a mathematical way of calculating how likely an **event** is likely to occur. An **event** is a result of an **experiment** or activity that might include such things as:

- flipping a coin
- spinning a spinner
- rolling a number cube
- choosing an item from a jar or bag

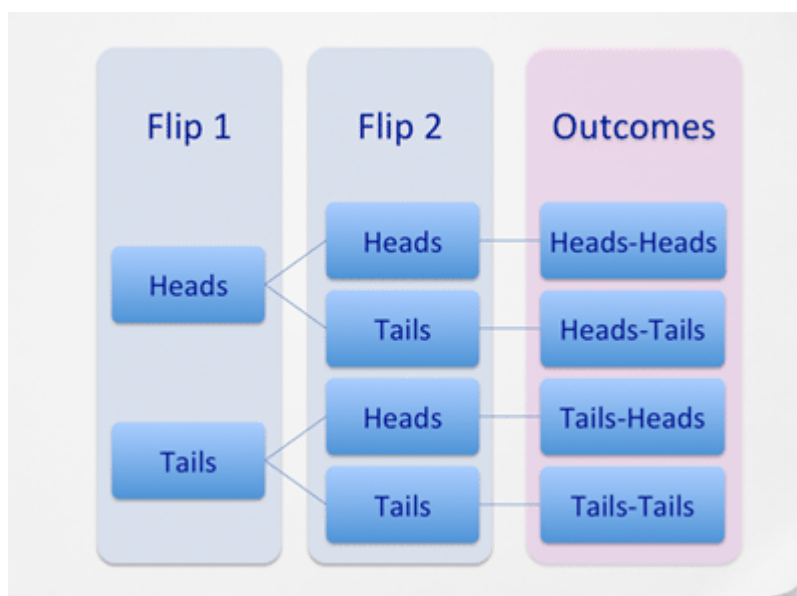
An important concept when calculating probability is to think about **outcomes**. An **outcome** is a possible result of some event occurring. When you flip a coin, “heads” is one outcome; tails is a second outcome. **Total outcomes** are computed simply by counting all possible outcomes.

One good way to count the total number of outcomes for an event is to make a **tree diagram**. A tree diagram is a branching diagram that shows all possible outcomes for an event.

Let's look at an example.

If you flip a coin two times, how many different outcomes are possible?

First, make a tree diagram. To make a tree diagram, split the different events into either-or choices. The first choice breaks flip 1 down into heads or tails. Each outcome of flip 1 is broken down again for flip 2.



[Figure 2]

Next, analyze the tree diagram. The pink box shows the total number of outcomes for both flips:

heads - heads

heads - tails

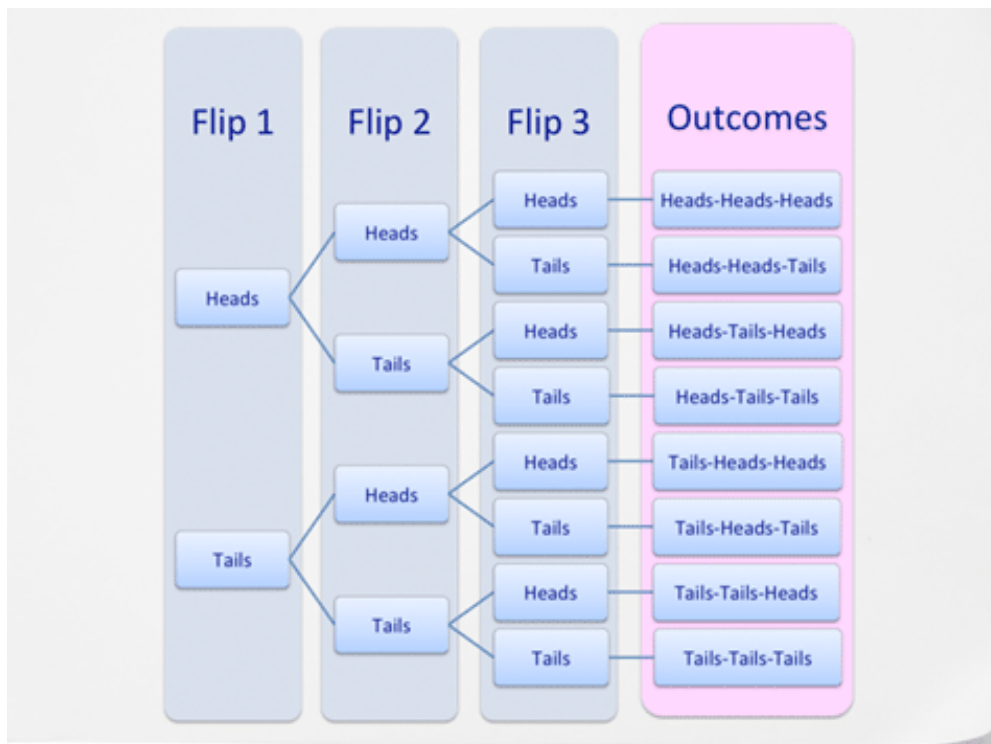
tails - heads

tails - tails

The answer is 4.

There are 4 possible outcomes.

What happens when you increase the number of flips to three? Just add another section to your tree diagram.



[Figure 3]

In all, there are now 8 total outcomes.

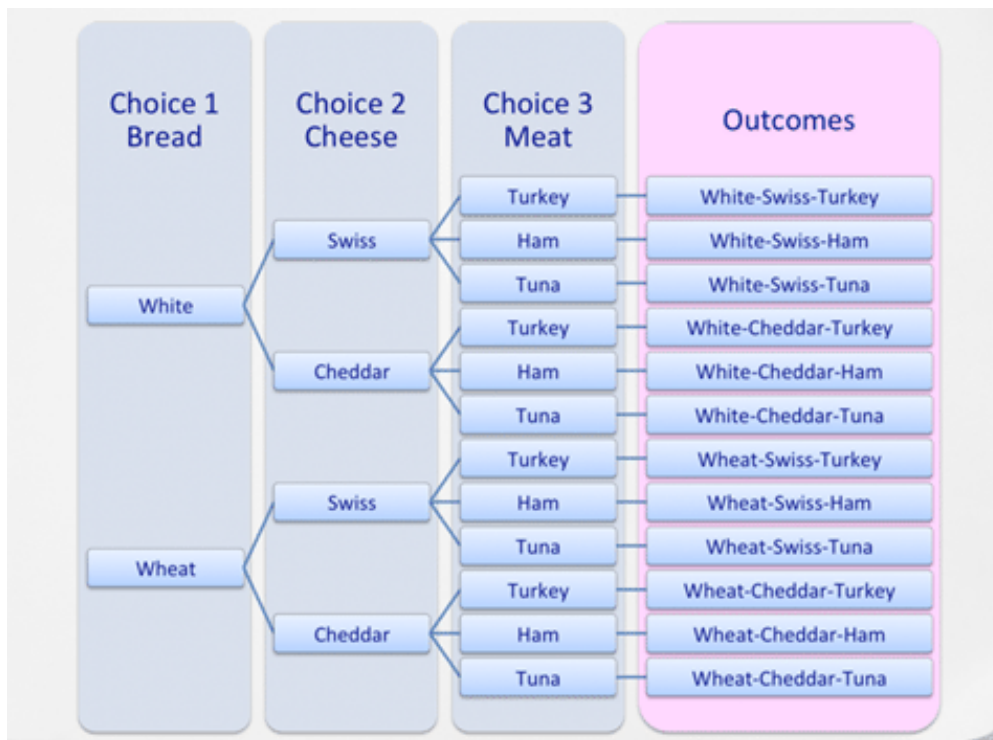
<i>HHH</i>	<i>TTT</i>
<i>HHT</i>	<i>TTH</i>
<i>HTH</i>	<i>THT</i>
<i>HTT</i>	<i>THT</i>

Examples

Example 1

Earlier, you were given a problem about Luis and his sandwiches. He needs to figure out how many sandwiches he could make.

First, to figure this out, Luis can create a tree diagram to show all of his choices and calculate the sandwich outcomes.



[Figure 4]

Next, Luis will count up the number of options of sandwich choices.

You can see that the tree diagram begins with the bread choices, then adds the second layer of the cheese options, and finally adds the meat choices. Therefore there are 12 possible options.

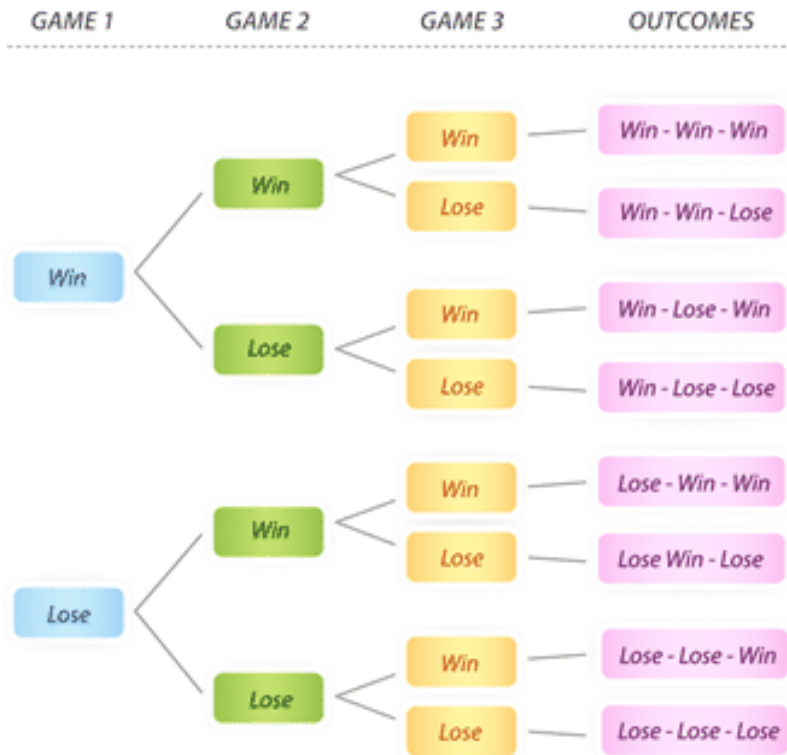
The answer is 12.

There are twelve possible sandwich outcomes for Luis.

Example 2

How many possibilities are there for a win-win-win?

List the possible outcomes for the three games.



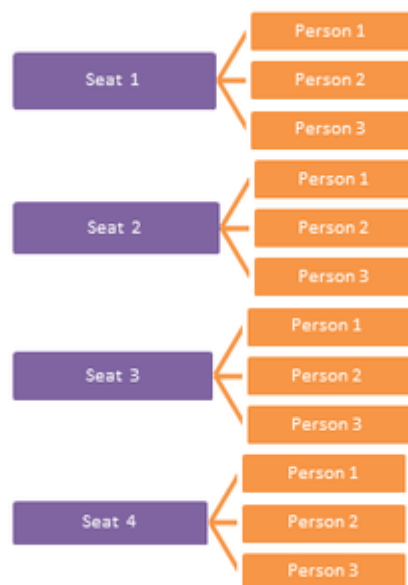
[Figure 5]

You can see that when you break out all of the options (the pink column) that there is one chance for a win-win-win.

Example 3

A car has four seats. How many different options are there if three people ride in the car? Use a tree diagram to calculate the total possible outcomes.

First, draw the tree diagram.



[Figure 6]

Next, count the number of possible outcomes (in orange).

There are 12 orange squares.

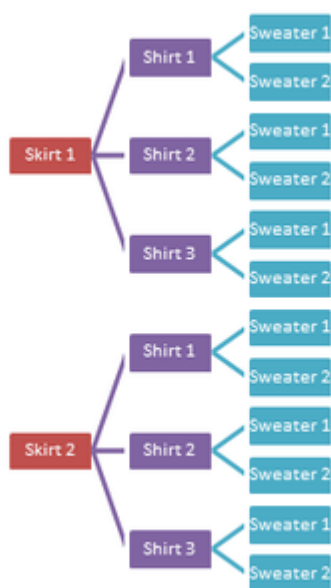
The answer is 12.

The answer is that there are 12 options.

Example 4

Candice has two skirts, three shirts and two different sweaters. How many possible outfits can she create? Use a tree diagram to calculate the total possible outcomes.

First, draw the tree diagram.



[Figure 7]

Next, count the number of possible outcomes (in blue).

There are 12 blue squares.

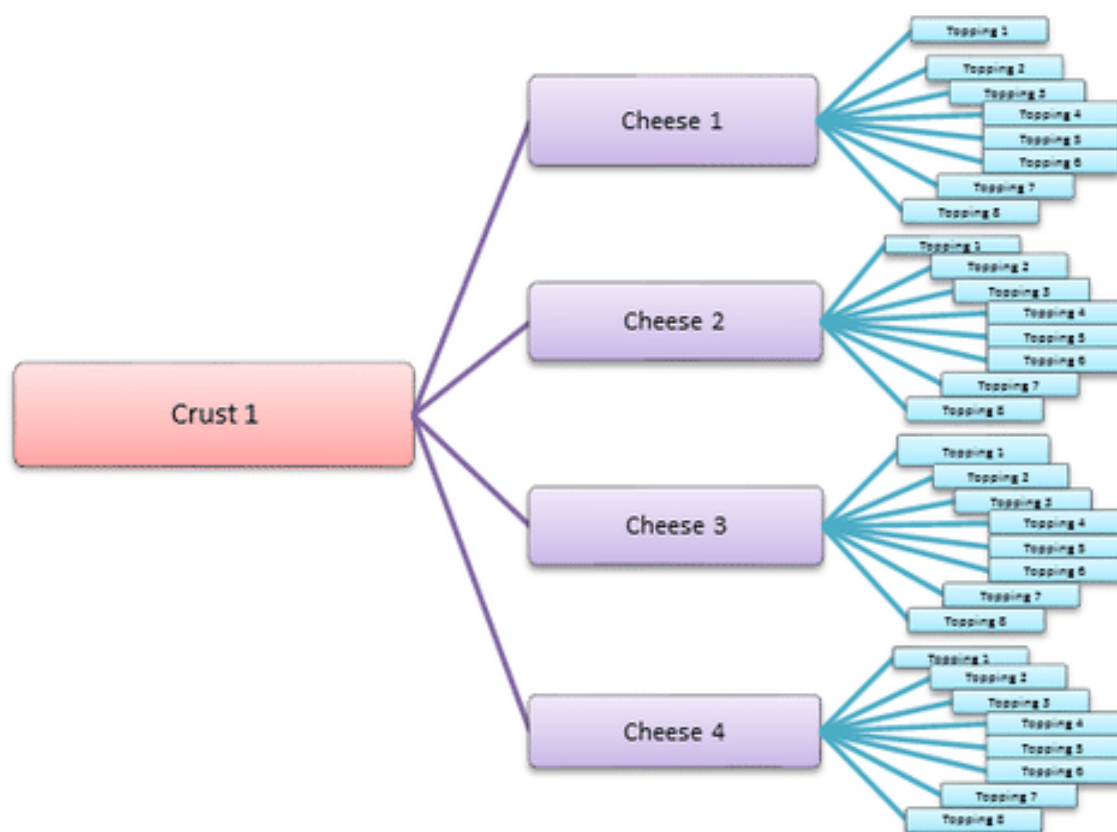
The answer is 12.

The answer is that there are 12 options.

Example 5

Sam is trying to create a pizza. He has two crust options, four different cheese options and 8 different toppings to choose from. How many pizzas can he make if he only chooses one topping? Use a tree diagram to calculate the total possible outcomes.

First, draw a tree diagram. Because of the number of choices, you can draw the tree diagram for one crust choice and double your options for the second crust type.



[Figure 8]

Next, count the total options for the first crust choice.

There are 32 possible choices of one cheese and one topping for one crust choice.

Then, double your options since you have two choices of crust.

$$32 \times 2 = 64$$

The answer is 64.

Therefore Sam has 64 different options for his pizza with one topping.

Review

Use a tree diagram to figure out all of the different outcomes.

1. Jeff's Jet Ski rentals have 3 different Jet Ski models: the single, the double, and the racer. Renters can rent for a half hour or a full hour. How many rental choices are there?
2. Cable Com offers Basic Cable, Premium Cable, and Super Premium Cable service. Cable Com offers these services for home use, small business use, or large business use. How many different cable choices are there?
3. The *Gotham Gazette* offers the following newspaper choices:

- home or office delivery
- weekdays only, weekends only, or all seven day delivery
- monthly or weekly payments

How many different kinds of choices can you get?

4. On Main Street, Jiri has to go through 4 traffic lights that can be either red or green. How many different outcomes are there for the 4 lights?

5. I-Cone high tech ice cream shop offers the following options.

- cone: sugar, waffle
- size: teeny, mega, huge
- flavors: shocking blueberry, marvelous mango, chocolate attack

How many different choices are there?

6. To remodel her kitchen, Gretchen has the following choices: Floor: tile or wood; Counter: Granite or Formica; Sink: white, steel, stone. How many different choices can Gretchen make?

7. Jeff has five different pairs of socks and three pairs of shoes. How many possible combinations are there?

8. What if Jeff has six different pairs of socks and three pairs of shoes? How many possible combinations are there?

9. What if Jeff has six different pairs of socks and four pairs of shoes? How many possible combinations are there?

10. What if Jeff has eight different pairs of socks and three pairs of shoes? How many possible combinations are there?

11. Jessie has three sweaters, two turtlenecks and three jackets. How many possible combinations are there?

12. What if Jessie has two sweaters, three turtlenecks and three jackets? How many possible combinations are there?

13. What if Jessie has four sweaters, three turtlenecks and three jackets? How many possible combinations are there?

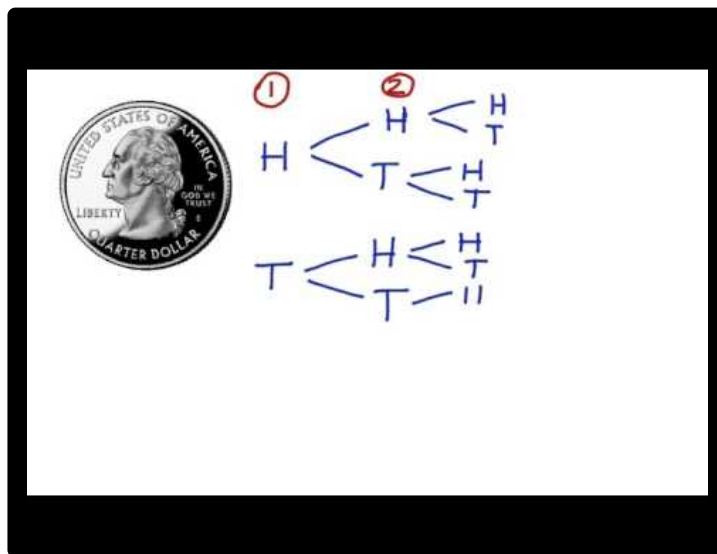
14. What if Jessie has three sweaters, two turtlenecks, two scarfs and three jackets? How many possible combinations are there?

15. What if Jessie has four sweaters, two turtlenecks, two scarfs and three jackets? How many possible combinations are there?

Review (Answers)

To see the review answers, return to the [Table of Contents](#) and select 'Other Versions' or 'Resources'.

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