Squishy Logic Challenge

Now you know the basic logic gates, let's see what other problems we can solve!
Use the same things we did in the last book and build them together to make extra cool things.

Feel free to do whichever activity you want in this book (you don't have to do them in order), but they do get harder at the end of the book!

Umbrella Indecision!

Should you take an umbrella today? Let a computer decide!

Create a machine that tells you to take an umbrella by turning on the light. You should only take an umbrella if it's raining.

Your circuit should have ONE switch, label it "raining?".

1. If it's raining, put a token on the raining switch
2. If it's **not** raining, remove the token.

Test your circuit!

Try it for when it's:

- Raining
- Not raining

When does your circuit light up?

Dinner Decider!

Create a machine that decides what restaurant to go to!

Angela and Beth are going out to dinner, but they need to decide where. They can only go to a restaurant that serves a cuisine that they both like.

Create a circuit that lights up when Angela and Beth BOTH like a restaurant. Your circuit should have TWO switches, label one for Angela and one for Beth

1. If Angela likes a restaurant, place her token on her switch.
2. If Beth likes a restaurant, place her token on her switch.

Angela likes:	**Beth likes:**
Indian Steak Sushi	Italian Sushi Thai

Test your circle for these restaurants:

- Steve's Steakhouse
- A Taste of India
- Mario's Italian eatery
- Bite of China
- Sushi Train
- Thai-tanic

When does your circuit light up?

School Commute Suggester

Create a circuit to plan the best commute to school!

- Julia likes to minimise her environmental impact when she travels to school so she likes to catch public transport whenever she can!
- But sometimes the trains don't run due to track work and sometimes the buses run late and she needs another way to get to school.
- When she can't get public transport, her parents drive her to school.

Create a circuit to tell Julia's parents IF she needs a lift to school
Your circuit should have TWO switches, one labelled bus is late and the other train has track work

1. The light should turn on if she needs a lift.
2. The circuit should light up when the buses are running late AND the train has track work.
3. Place tokens on these switches when the label is true.

Test your circuit:

What happens when:

- The train has track work
- The busses are running late
- There is track work and the bas is late
- The bus is on time and the trains are running

When does your circuit light up?

Meeting Matcher

Booking meetings can be hard. Make a computer do the work!

- Renee has a very busy schedule!
  She's only has two time slots in the week that are not booked up:
  - Wednesday at 2pm
  - Friday at 9am.
- Renee is so busy she doesn't even have time to talk to people trying to book meetings with her
- Help her by making a machine people can use to find out if she's free when they are.

Create a circuit that lights up IF a person shares a free slot with Renee. The circuit should have TWO switches, one labelled Wednesday 2pm and one labelled Friday 9am

1. The person asking should put tokens down on the switches they are available for.
2. The light should light up if they are free for either Wednesday 2pm, Friday 9am, or both!

Test your circuit with the following people:

Person	Times they're free
Lisa	Any time on Wednesday
Jenny	Only on Mondays
Clara	Friday Mornings and Saturdays
Tina	Wednesdays, Thursdays and Fridays

When does your circuit light up?
Can they book a meeting with Renee?

Paint Picker

Paint preferences are an important matter! Agreeing on them is hard work! Save the arguing, make a computer figure it out!
Ellen, Fiona, Gabe and Hannah are painting their house.
They need to choose a colour that they all agree on.

Build a circuit that will only light up WHEN everyone agrees on a suggested colour. The circuit should have FOUR switches, one switch for each person.

1. Each person has a token to place on their switch, they put the token down when they like the suggested colour.

Person	Colours they like
Lisa	Green, Pink, Orange
Jenny	Yellow, Green
Clara	Red, Orange
Tina	Pink, Orange, Yellow, Red, Green

Test your circuit with the following colours:

- Pink
- Red
- Orange
- Blue
- Purple
- Yellow
- Green.

What colour can they paint their house?

Fussy Food Finder

Looking at menus is a lot of work for a fussy eater! Automate it!
Tahlia is a fussy eater. She only likes to eat 3 things; risotto, sausages and tacos. Make a circuit that lights up if the restaurant serves at least one of the foods Tahlia eats.

Build a circuit to check a restaurant for the THREE foods Tahlia eats and lights up IF there is something on the menu she will EAT.

1. The circuit should have three switches, labelled risotto, sausages and tacos. You can have 3 tokens, one for each food
2. Put the token on the circuit if the food is on the menu.

Test your circuit with the following restaurants:

Restaurant	Foods they serve
Italian Bowl	Pizza, Pasta and Risotto
Thai La Ong	Noodles and Curry
German Sausage House	Sausage and Schnitzel
European Palace	Escargot, German sausage, Risotto
Foods of the World	All foods!

What restaurants can Tahlia eat at?

Choc Stopper

Evie really likes chocolate! Every day Evie's mum puts out two chocolates on the kitchen counter. One for Evie and one for her sister. Evie is allowed to eat at most one of these chocolates, or she'll get in trouble.

Create a circuit with TWO switches, one for each CHOCOLATE.

1. Put a token down on the switch if Evie eats a chocolate.
2. The light should shine when Evie is not in trouble.
3. If she eats both chocolates she is in trouble.
4. If Evie only eats either one of the chocolates, she is good.
5. If Evie eats neither chocolate she is also good.

Hint: Try combining your "And circuit" and your "Not circuit" from before.

Allergy Alert

Liz is allergic to raspberries and milk. Help her build a system that alerts her when a food contains either or both of these things.

Build a circuit with TWO switches, one for raspberries, one for milk, that lights up ONLY when a food is safe for her to eat.

1. Place a token down on the corresponding switch if it contains one of the allergy ingredients.
2. If you place either, or both tokens down, the light should turn off.

Hint: Try combining your "Or circuit" and your "Not Circuit" from before

Try it on the following recipes:

Recipe	Ingredients
Raspberry Ice cream	Milk, sugar, raspberries
Chocolate milk shake	Chocolate syrup, milk
Raspberry jam	Raspberries, sugar, gelatin
Salad Sandwich	Bread, salad

Dancing Duos

Alex and Bonnie are dance partners. So are Connie and Dani. They've all decided to start a dance school together!

- They're trying to workout when they can schedule their classes.
- They can teach a class if Alex and Bonnie are both available at the same time, or if Connie and Dani are both available at the same time.
- Alex and Bonnie, only dance together, Connie and Dani only dance together.
- The couples can not switch dance partners, you need a whole couple there to teach the class.

Make a circuit that finds out IF they can staff their dance studio on particular days. The circuit should have 4 switches.

1. Test a time by putting down tokens on the people who are available at that time.
2. The light should shine if Alex and Bonnie are available, or if Connie and Dani are available.
3. Or If both couples are available.
4. Otherwise the light should not shine.

Hint: Combine your "And circuit" and "If circuit" from before

Person	Available times
Alex	Monday, Tuesday
Bonnie	Tuesday, Wednesday
Connie	Wednesday ,Friday, Saturday
Dani	Wednesday, Thursday, Saturday

Test your circuit for every day of the week.

What days can their dance studio be open to teach partner dance classes?

Perfect Pizza Picker

Choosing the perfect pizza toppings is a very important task. Use a computer to make it easier!

- To make a good pizza it either needs to have mushrooms or pineapple on it!
- Mushrooms and pineapple at the same time is good too!
- But A pizza should never have anchovies! Yuk!

Make a circuit that figures out IF our pizza is perfect.
It should have 3 switches, one for mushrooms, one for pineapple and one for anchovies.

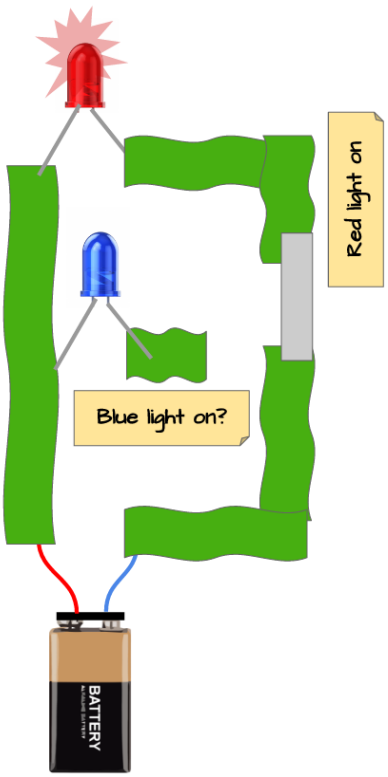
1. Place a token down on the switch if the pizza has that ingredient.
2. The light should shine if the pizza is perfect.
3. A pizza is only perfect if it contains either mushrooms, pineapple or both.
4. But it is never perfect if it has anchovies!

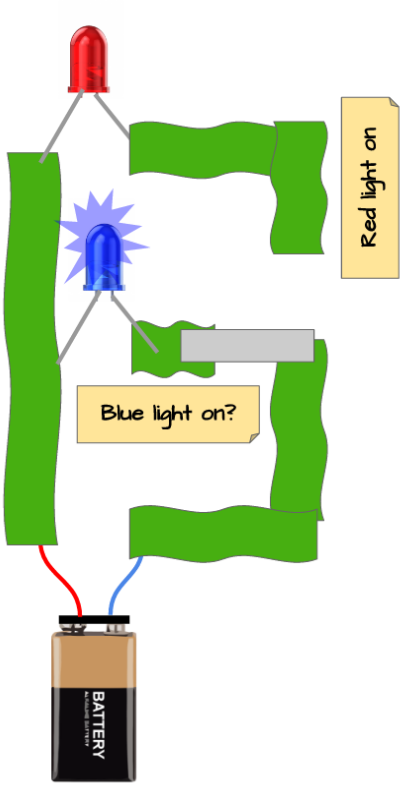
Hint: Combine your "Or Circuit" and "Not circuit" from before

What happens if the pizza has mushrooms, pineapple and anchovies?

Switches can be more than just on and off.

We can use a switch to toggle between two different options, see how the grey switch moves below.





Sandwich Supervisor

There are 2 crucial ingredients to making the perfect sandwich: Jam and Cheese. But never both at the same time! Ewww.

- A perfect sandwich will have exactly one of these ingredients.
- If it has both it is not perfect
- If it has neither it is not perfect.

Make a circuit with two toggle switches, one for jam, one for cheese, that lights up WHEN your sandwich is perfect

1. Each toggle switch has 2 labels, see above, label both options for the switch
2. Your circuit should still only have 1 light bulb**.**
3. Move the switch to the appropriate direction depending on if the sandwich has that ingredient.
4. The light should turn off if the sandwich doesn't have cheese or jam.
5. But should also turn off if it has both cheese and Jam!

Test it on:

- A jam sandwich
- A cheese and bacon sandwich
- A ham sandwich
- A cheese and jam sandwich.