



**Who says all the fun has to happen at The Tech Interactive?
This computational thinking activity will expand your
problem-solving skills and can be done anywhere!**



Introduction

While it can be obvious when something has visible dirt on it, it's harder to tell when something has invisible contamination that needs to be cleaned away! Sticky handprints from a PB&J sandwich, food and pet allergens, pollen and germs can all be hard to spot. Can you create a series of questions, or an algorithm, to help figure out what surfaces have been touched and contaminated?

Design Challenge

Create a sequence of questions to help you figure out what surfaces are contaminated after you or someone else does a task.

Subject:

Computational Thinking

Ages:

8+

Time:

20+ min




(Optional) +1 hr to make
colored cornstarch

Key Concepts:

Critical thinking,
problem solving,
iteration, algorithms

Materials

Don't limit yourself to just the items on this list. Use whatever you have on hand — be creative!


Powder "contaminant"	A way to record your questions	Cleaning supplies
<ul style="list-style-type: none">• Cornstarch (recommended)• Flour• Chalk <p>Optional: Food coloring</p> 	<ul style="list-style-type: none">• Notebook/paper• Something to write with 	<ul style="list-style-type: none">• Damp towel 

Instructions

(Optional) Create a colorful cornstarch "contaminant"

If you use cornstarch as your "contaminant," you may want to color it. Dying the cornstarch could make it easier to see on lighter surfaces, which may help when cleaning up!

1. Set the oven to 175°F.
2. Add food coloring to ½ tbsp of cornstarch. Use a spoon or whisk to break up chunks and blend the dye in.
 - The more dye you add, the deeper the color will be ... and the longer it will take to dry!
3. Spread your cornstarch in a thin layer in a baking tray and bake until dry (around 1 hour).

 *Tip: While your cornstarch is baking, create your algorithm!*

4. Once your cornstarch is dried out, use the spoon to break up chunks and mix the powder into an even color.

Step 1: Create your algorithm

Come up with a series of yes/no questions that will help you figure out what surfaces in the house might be contaminated by someone doing a simple task. Think of it like a 20 questions game! This series of questions is your algorithm. No one likes long interviews, so the fewer questions needed, the better!

Write down your questions so you can use them later. Think about how to keep track of the question order, and how to decide when questions should be skipped.

 *Tips:*

- Pressed for time? Consider limiting your algorithm to a specific room in your house.
- Consider creating a flowchart or list to organize it! Check out the examples on the next page to get you started.

1

2

3

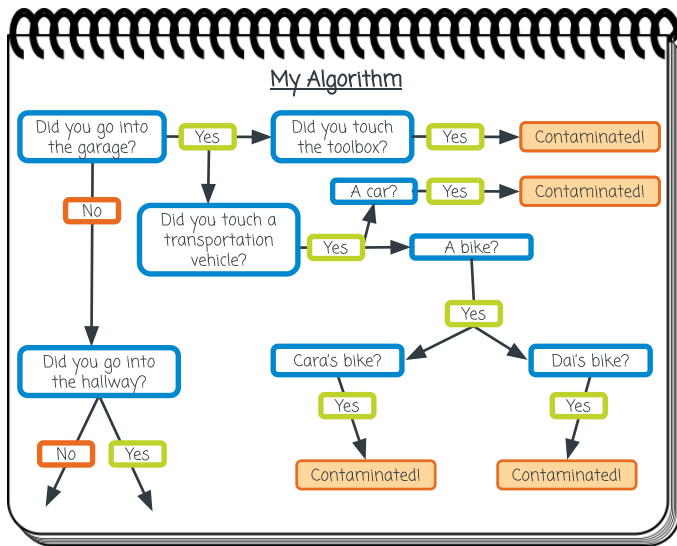
Algorithm:

Step-by-step instructions to solve a problem. Designing algorithms is an important computational thinking skill that is used widely in computer programming.

Where might you have seen algorithms?

Recipes, instructions for making furniture or building blocks sets, sports play diagrams, and online map directions are all examples of algorithms you might see in your everyday life.

Sample algorithms



My Algorithm

1. Did you go into the garage?
 - Yes: Ask #2&3
 - No: Go to #8
 2. Did you touch the toolbox?
 - Yes: Toolbox needs decontamination! Go to #3
 - No: Go to #3
 3. Did you touch a transportation vehicle?
 - Yes: Ask #4&7
 - No: Go to #8
 4. Did you touch a bike?
 - Yes: Ask #5&6
 - No: Go to #7
 5. Did you touch Cara's bike?
 - Yes: Cara's bike needs decontamination! Go to #6.
 - No: Go to #6
 6. Did you touch Dai's bike?
 - Yes: Dai's bike needs decontamination! Go to #7
 - No: Go to #7
 7. Did you touch the car?
 - Yes: The car needs decontamination! Go to #8.
 - No: Go to #8
 8. Did you go into the hallway?
- ~~~~~
- ~~~~~


Step 2: Testing the algorithm

Ask a friend or family member to help you test your algorithm. Decide who will be the “Contaminator” and who will be the “Interviewer.”



Contaminator:

- Cover your hands in powder.
- Then leave the room to complete a task. DO NOT tell the Interviewer what you are planning to do.
- Do a simple task. Ex: Getting a hammer from a toolbox, taking a plate from a cabinet, writing a note with a pen, etc.
- When done, wash your hands and return.

 *Tip: Only touch the surfaces necessary to complete the task! That gives you less to clean up later.*

Interviewer:


- When the Contaminator returns, use the algorithm questions to try and figure out what surfaces are contaminated!
- Make sure you keep track of how many questions are asked, and what the answers are.

Together:

Check how you did! Retrace the Contaminator's steps together and to see how accurate the results of the algorithm are.

- How many contaminated surfaces were found?
- How many were missed? Which ones?

Were any surfaces incorrectly identified as contaminated?

 *Tip: Don't forget to wipe off the contamination marks as you count them!*

Step 3: Iterate on your algorithm

How can you revise and adjust your algorithm to get a better result? Are there any questions you could add or change?

Think about how you can improve your algorithm or take it further by trying one of the bonus challenges.

Bonus Challenges

Can you make your algorithm more efficient?

Try asking fewer questions and see if you can get the same result.

Try a more challenging task!

Have your contaminator:

- Interact with another person in the home (shake their hand or high five). Does your algorithm detect the second person?
- Do more than one task at a time (drink a glass of water and write a note).
- Do a more complex task with more steps (rearrange some chairs or organize a shelf).

Test it in a different environment

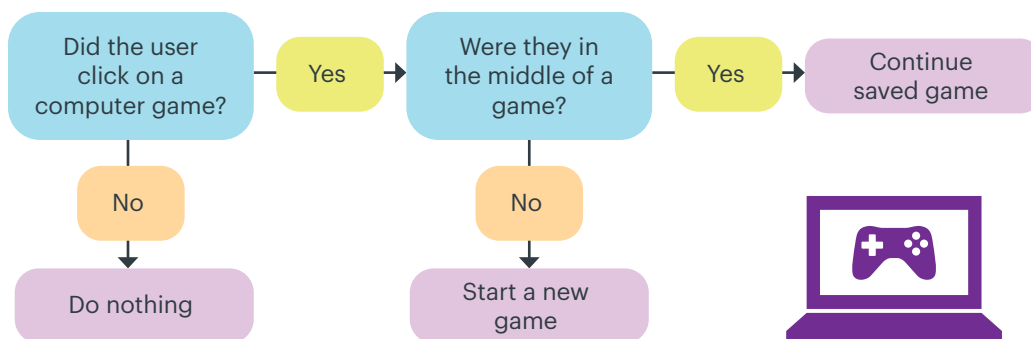
The best algorithms are useful in many situations. If your algorithm only works in *your* home, it is less helpful to other people. Send it to a friend to see if it works in their home, too!

More science!

Computer algorithms

Humans aren't the only ones who need procedures! Computers do exactly what they're told to do, following written instructions in a computer code created by people. These written instructions are called algorithms.

Computer algorithms are full of decision trees like the one you made! **IF** this happens, **THEN** that should be done. You can write out the computer logic in a similar flow chart, full of yes/no decisions:



Medical Procedures and Algorithms

It's human nature to make mistakes! Algorithms, procedures and checklists can help people catch those mistakes before they cause problems. Yes/No questions like you made are a good way to do that. They can make sure that all the important things have been completed correctly, in the right order.

The World Health Organization has created a [surgical safety checklist](#) that is used around the globe. It helps doctors and nurses make sure that they've completed important safety measures. While some of the things on the list may seem obvious (like confirming the person is the right patient!), even the most basic questions can help minimize potentially deadly mistakes.



Share Your Results! Keep us posted about your design challenges on social media with **#TheTechatHome**.



**The Tech
Interactive
at Home**

thetech.org/athome
Instagram Twitter Facebook