



# Digital Technologies @ Home

## Unplugged activities for students

## PRIMARY STUDENTS

Robot Dance (F-2)

Messy Drawer (F-2)

We're going on a computer hunt (F-2)

Is it a pig or a dog? (F-2, 3-4)

Tech Talk Find a Word (F-2, 3-4)

DT Laundry (F-2, 3-4)

Race up If Mountain (3-4, 5-6)

Number Guessing with Algorithms (3-4, 5-6)

Flat Pack Lego (3-4, 5-6)

Pirate Treasure Hunt (3-4, 5-6)

Tech Collect (3-4, 5-6)

Marble Run (3-6)

Wombot Carrot Hunt (5-6)

Maze Escape (5-6)

Cracking a Code (5-6)

Unscrambling a secret message (5-6)



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[help@grokacademy.org](mailto:help@grokacademy.org)



## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years F-2

# Robot Dance

With thanks to the South Australian Commissioner for Children and Young People, who developed this activity with the Australian Computing Academy for the Commissioner's Digital Challenge.

### This activity teaches...

Students create a set of instructions for someone else to follow. Computers follow instructions when they perform many tasks (like opening an app or playing a video). The instructions given to computers are very clear so that every computer will follow the instructions in the same way. Instructions are also found in other places like recipes. Instructions are followed in order from start to finish. Instructions don't need to be written - they can be pictures, sounds and symbols.

These pictures, sounds and symbols are examples of how we represent things around us. For example, we might use  to represent a book. It's not an actual book, but we understand that we are talking about books when we see this symbol. There are many examples of **representation** in our homes - symbols on our clothes tell us how to wash them, and packaged food in your pantry contains symbols to explain how healthy it is, or how to recycle packaging, to name a few. How many other examples can you find?

This activity is targeted towards students in years F to 4. The activity is expected to take 1 to 2 hours.

### You will need...

- 2 printed sets of dance moves
- 1 dance card (use a piece of card from home, or a blank sheet of paper).
- For the advanced option, a Cody Buttons torso and body parts printout.
- Craft supplies, coloured pens, scissors and glue to decorate the Cody Buttons robot and attach it to the dance card.

### Getting started (read this with your child):

- You will make your very own dance routine for our robot, Cody Buttons.
- Choose the pictures of Cody doing different dance moves and put them in the order you like best.
- Stick them to your Dance Card.
- Share the Dance Card with other people so they can do your dance!





Teachers

Parents  
and carers

## Step by step

1. Print the pages in this pack to suit your needs.
2. Cut out the dance moves – depending on the age of the child, they might like to do this themselves.
3. Tell your child they can create their own dance routine by putting together a set of instructions. They will do this by putting the 6 moves from the print outs into their chosen order by sticking them to their base card (use glue or other method) to create their unique ‘dance card’.
4. Children can further personalise their set of instructions by colouring or adding further craft materials to their ‘dance card’.
5. Put on some of your child’s favourite music.
6. Children can perform their dance themselves or present their ‘dance card’ to you / another family member or carer to perform the moves. Children are able to present their work by displaying their dance card if there are limitations on their movement.

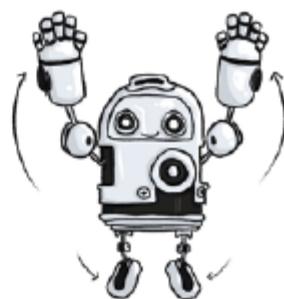
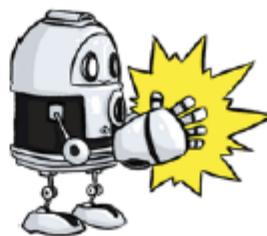
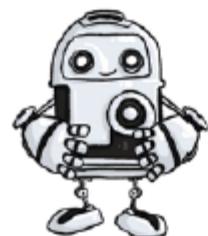
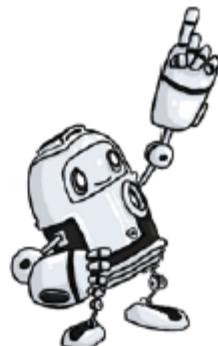
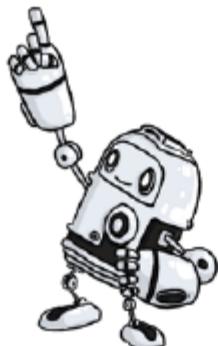


# Robot Dance

Create Cody Button's own dance: print out and cut up these moves.

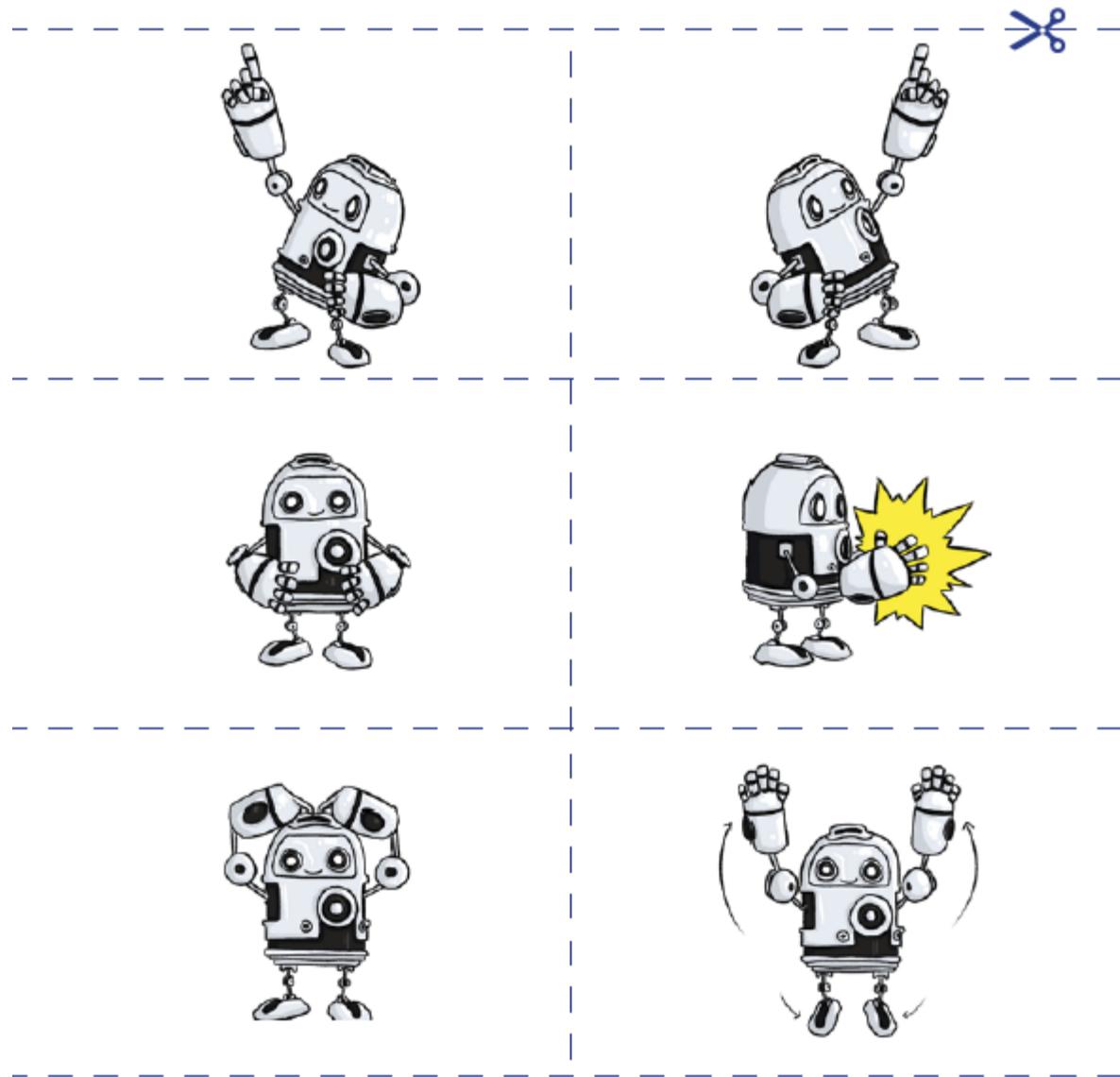


Students



# Robot Dance

Create Cody Button's own dance.



# Robot Dance

Glue your dance moves onto this dance card.



Students

1

2

3

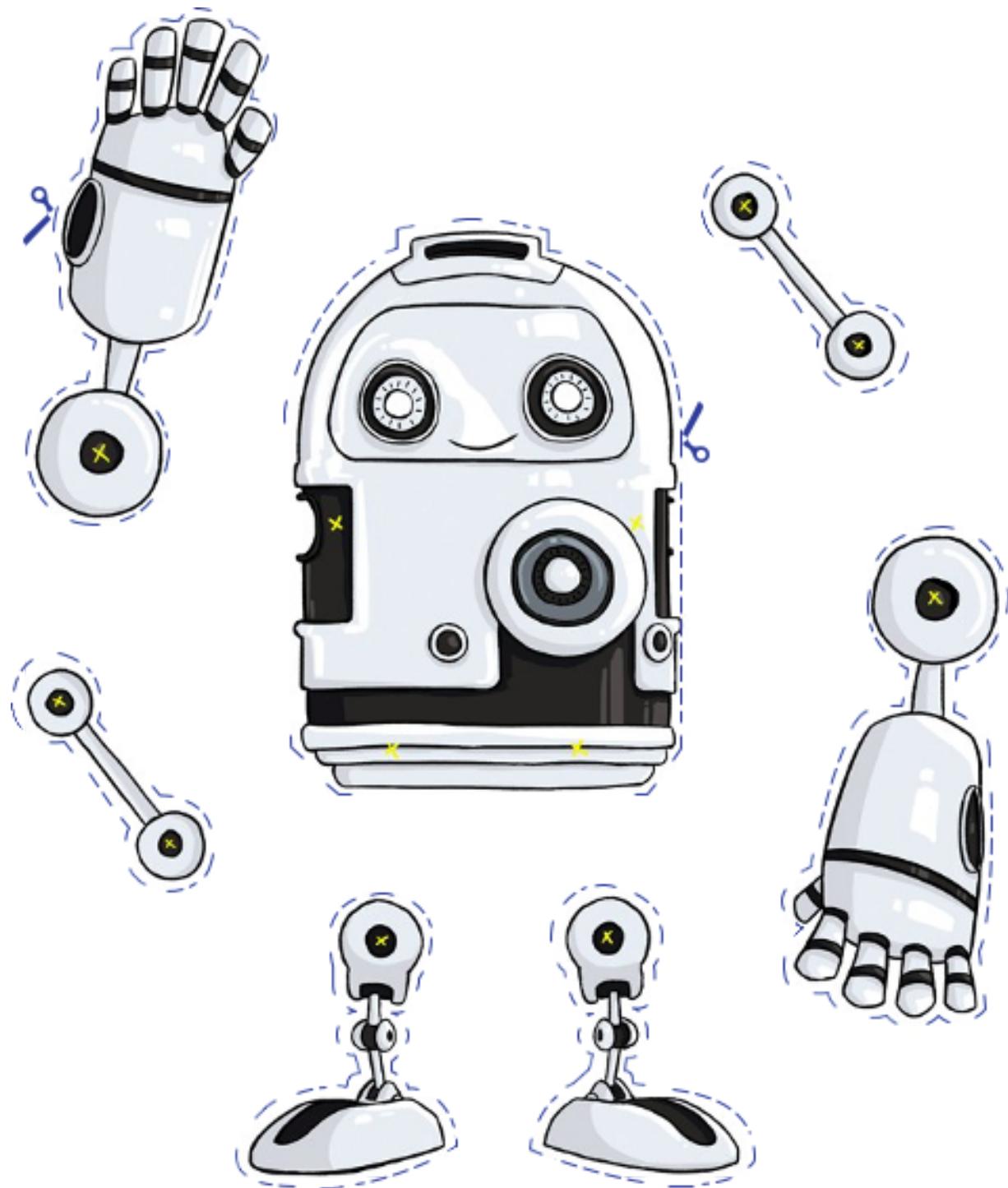
4

5

6

# Robot Dance

Use this page if you want to create a Cody Buttons with moveable arms and legs.



# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

As an extension, provide children with a template or multiple templates of Cody with detachable limbs that can be attached with butterfly clips to create custom dance moves.

If your child would like to create multiple repeats of the same move, they could write the number of repetitions on the card, or you could create discs with different numbers on them to add to each move as an additional part of the Challenge.

## Keep the conversation going

- Was it easy or difficult to create a dance for Cody?
- When others performed your dance, did they do it in the way you expected?
- Are there other ways you could create a dance routine for someone else? (Children consider other ways - maybe making a video?)
- How many dances could you create with these 6 moves? The same moves, in different orders, can create many different dances.
- Where else have you seen instructions with pictures? (Building blocks? Recipes?)
- How would you like to improve your dance?
- If your child did the extension activity using a Cody with moveable limbs, could a person actually do that dance move?

## Keep learning

Dancing is an example of a small set of instructions that are repeated in different combinations. Students can explore using a set of instructions to control our favourite animal, the wombot, in an online activity available here: [cmp.ac/blockly-wombot](http://cmp.ac/blockly-wombot)

Students can explore other symbols around the house by completing our DT Laundry unplugged activity: [cmp.ac/laundry](http://cmp.ac/laundry)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to create a six step dance and submit their dance card, and if possible, demonstrate their dance.

## Linking it back to the Australian Curriculum: Digital Technologies



Data representation: Recognise and explore patterns in data and represent data as pictures, symbols and diagrams (ACTDIK002 - see [cmp.ac/datarep](http://cmp.ac/datarep))

Refer to [aca.edu.au/curriculum](http://aca.edu.au/curriculum) for more curriculum information.



## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents and carers

This activity is for: Years F-2

# Messy Drawer - tidy up and reveal secrets

### This activity teaches...

In this activity students count, sort and explore items around the house. In computing, collecting and sorting data is a key concept. In our data-driven world, knowing what data to collect, and finding patterns in it unlocks knowledge.

Representing data and telling a story with it allows scientists to communicate complex ideas simply. Using computers to interpret and represent data allows huge amounts of data to be processed in short amounts of time.

This activity is targeted towards students in years F to 2 and is expected to take up to 60 minutes.



### You will need...

A messy drawer!

Optional textas and craft materials.

### Getting started (read this with your child):

Every home has a messy drawer. Maybe it's full of knives and forks, pens, bits of string or lego. Let's see what we can find (while we tidy up, hopefully!)

### Step by step

Choose a messy drawer in the house.

Check there's nothing sharp or hazardous (like smelly old socks) before you start with your child.

Tip out the drawer, or remove the items.

Sort the contents of the drawer. How you sort it is up to you and your child. Can you sort by shape? Purpose? Size? Colour?

Record the number of each type on the grid on the next page (there is a finished example on page 5).

Sort a second time using another criteria. And a third time!

Present the results of your favourite way of sorting in two different ways (a graph, drawing, etc.)

Put everything away (tidily, of course.)

# Mystery drawer - tidy up and reveal secrets

Find patterns, sort and count things in a messy drawer.



Students

What's in the drawer?	
My drawer is in the: (eg kitchen)	
It is a place for: (eg knives and forks)	
Round 1: I'm sorting by: (eg item)	
This is what I found: (eg forks, 3)	

Round 2: I'm sorting by:	
This is what I found:	
Round 3: I'm sorting by:	
This is what I found:	

# Mystery drawer - tidy up and reveal secrets

Find patterns, sort and count things in a messy drawer.



## Step 2

Choose your favourite way of sorting.

Present your data below, in two different ways. You can use colour, pictures or numbers. (Use another sheet of paper if you like.)

**Step 3: What's the silliest way you could sort the drawer?**

**Step 4: What's an interesting fun fact to share about what's in the drawer?**



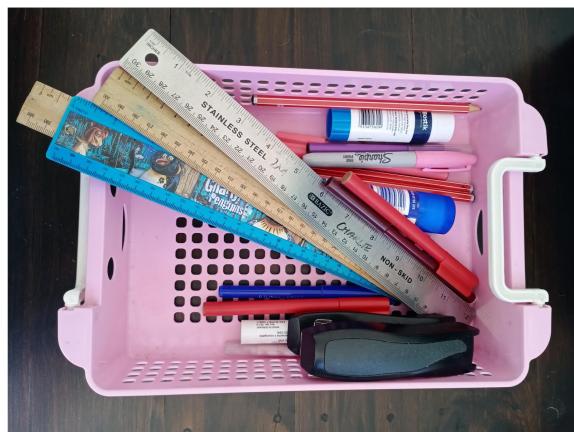
# Mystery drawer - tidy up and reveal secrets

Find patterns, sort and count things in a messy drawer.


 Parents  
and carers


Teachers

Here's a picture of what was in the stationery drawer. To keep it manageable, we've chosen around 20 items. We've picked three ways to sort items, and recorded them in the worksheet. If students have a phone handy they can take pictures of this activity too.



## What's in the drawer?

My drawer is in the:	<i>Study</i>
It is a place for:	<i>Pens and pencils</i>
Round 1: I'm sorting by:	<i>What they are</i>
I found:	
<i>Pencils</i>	<i>3</i>
<i>Pens</i>	<i>9</i>
<i>Rubber bands</i>	<i>1</i>

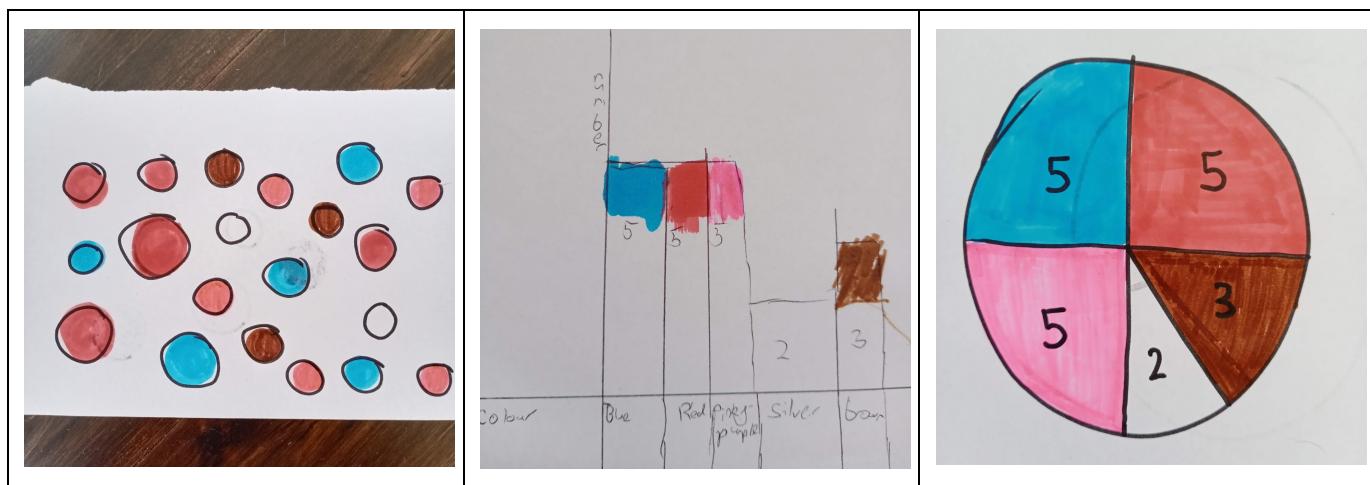
Rulers	4
Glue sticks	2
Stapler	1
Round 2: I'm sorting by:	Colour
I found:	
Blue things	5
Red things	5
Pinky purple things	5
Things with silver on them	2
Brown things	3
Round 3: I'm sorting by:	What they are made of
I found:	
Plastic things	12
Wooden things	5
Metal things	2
Rubber things	1

## Images of each way of sorting the drawer contents.



## Step 2

Choose your favourite way of sorting. Show your data below, in two different ways. (Students might use tally marks, numbers, pictures, blocks of colours or other ways to present their findings.) Here are some examples.



# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

Older students could explore presenting their work in histograms or pie charts.

Older students could work with larger sets of items. Students could report back and compare results with other students: does everyone have the same things in their stationery drawer or cutlery drawer?

In the classroom, you could adapt this activity to explore items around the classroom, the library, or even explore the school grounds and collect leaves, twigs etc in various locations.

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to submit their worksheets from this activity, with photos if possible.

## Linking it back to the Australian Curriculum: Digital Technologies



Recognise and explore patterns in data and represent data as pictures, symbols and diagrams (ACTDIK002)  
[cmp.ac/datarep](http://cmp.ac/datarep)

Collect, explore and sort data, and use digital systems to present the data creatively (ACTDIP003)  
[cmp.ac/dataint](http://cmp.ac/dataint)

Refer to [aca.edu.au/curriculum](http://aca.edu.au/curriculum) for more curriculum information.

## Keep learning

Explore ways that we can represent information in our unplugged drawing activity: [cmp.ac/pig-dog](http://cmp.ac/pig-dog)

Investigate creating sets of instructions in a fun unplugged activity with our favourite friend, the Wombot: [cmp.ac/wombot](http://cmp.ac/wombot)

An interesting reflection question is to ask what the sorting activity taught students about the drawer contents, which they might not have otherwise realised. (An example is that in the third example above we can see that most of our stationery is made of plastic.)



## Digital Technologies @ Home

Unplugged activities for students



Teachers



Parents  
and carers

This activity is for: Years F-2

# We're going on a computer hunt

### This activity teaches...

We are surrounded by computers and digital systems, often without realizing it. Some digital systems are obvious - a laptop computer, or a smartphone. Others are much harder to find, because they don't look like a computer. A washing machine, air conditioner or fridge that adapts to different situations probably contains a computer. Cars are full of digital systems to help us with navigation, safety, entertainment and driving.

Digital systems are made of components. On a laptop, components include a screen, keyboard, power supply, processor, and storage. Digital systems also consist of both hardware and software. Hardware is what you can see and touch (or physical parts inside the device) while software is the code that gives the device instructions to perform a specific task.

Digital systems are created to do a specific task: for example, a smart washing machine is really good at washing clothes, but terrible at toasting bread. A laptop lets us view, change, and create data. You wouldn't expect it to keep food cold though! In this activity students explore digital systems around them and consider the components that make those systems, and what the purpose of the system is.

It is expected to take up to 1 hour.

### Getting started (read this with your child):

Have you ever thought about how many computers are in your home? Computers come in all shapes and sizes and do lots of different things. We call them digital systems. We're going to explore and find digital systems around our home. Once we find them we'll figure out what they do!

### Step by step

Follow the instructions on the following pages with your child.



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[help@grokacademy.org](mailto:help@grokacademy.org)

# We're going on a computer hunt



Students

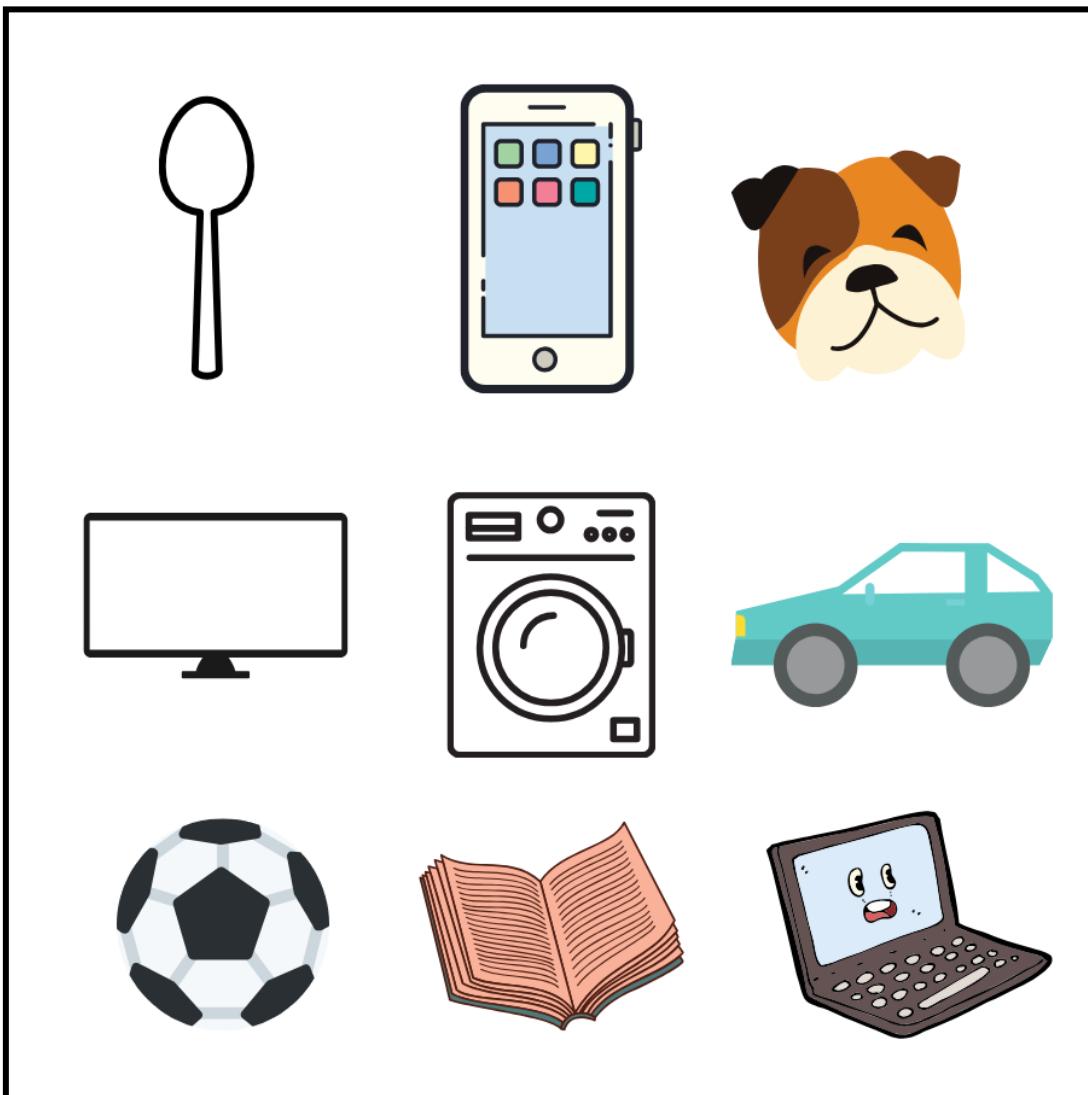
## Step 1

How many digital systems do you think there are in your home? Have a guess and write your answer here:

---

## Step 2

Circle all the things which contain **digital systems** below.



# We're going on a computer hunt



## Step 3

Digital systems do important jobs for us.

For each thing you circled at step 2, finish this sentence (we've done one for you.)

A car helps us get places.

A \_\_\_\_\_ helps us \_\_\_\_\_.

# We're going on a computer hunt



Students

## Step 4

Walk around the house and see how many digital systems you can find. Make a list here:

1. \_\_\_\_\_.

2. \_\_\_\_\_.

3. \_\_\_\_\_.

4. \_\_\_\_\_.

5. \_\_\_\_\_.

6. \_\_\_\_\_.

7. \_\_\_\_\_.

8. \_\_\_\_\_.



# We're going on a computer hunt

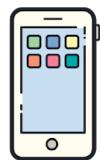


## Step 5:

Show your list to your carer, and with their help, have a turn with the digital systems you have found. Talk about what each one does.

## Step 6:

Match up the digital systems below with what they do - draw lines to connect words with pictures.



**Clean clothes**



**Tell the time**



**Talk to people**



**Cool food**



**Research, make docs**



**Play games**

# Answer key



Teachers

## Step 1:

Most people will be surprised at the number of digital systems in their homes. Homes are estimated to have around 15 connected devices each, and this doesn't include things like smart washing machines and other appliances. Devices that in the past were electrical but not digital systems are increasingly incorporating technology to allow them to adapt to what is happening around them. Things like kettles, heaters, watches and alarm clocks were once electrical but would not have been considered a digital system.

The hallmarks of a digital system are:

- A power source;
- A way to store data;
- A processor to process data;
- Taking inputs (such as pressing buttons, using a mouse, touching a screen); and
- Returning outputs (information on a screen, a change of temperature, sound from a speaker).

## Step 2

Using the criteria above, we can determine that the telephone, laptop, washing machine, tv, and car are digital systems. The dog, despite containing a microchip, is not!

## Step 3

A car helps us get places.

A washing machine helps us clean clothes.

A laptop helps us find and save information (there are many possible answers).

A tv helps us watch programs.

A telephone helps us contact people.

## Step 6

Mobile phone: talk to people

Game controller: play games

Fridge: cool food

Washing machine: clean clothes

Smart watch: tell the time

Laptop: research, make docs



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# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

For older students extend the discussion by identifying **components** of digital systems: ask students to identify inputs, outputs, power sources, storage and processing components as well as peripheral devices.

There is a useful video to watch here:

<https://www.youtube.com/watch?v=xfKn5OjHLqQ>  
explaining the components of digital systems in an engaging way.

For greater curriculum coverage you could also include a discussion around exploring how people safely use common information systems to meet information, communication and recreation needs (ACTDIP005 - see [cmp.ac/impact](#)).

## Keep learning

Students can complete a word search to build their vocabulary around digital systems:

[cmp.ac/techtalk](#)

Another unplugged activity this age group will enjoy is the messy drawer activity, where they explore and sort the contents of a drawer at home:  
[cmp.ac/drawer](#)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to submit their completed worksheet.

## Linking it back to the Australian Curriculum: Digital Technologies

### Digital systems



Recognise and explore digital systems (hardware and software components) for a purpose (ACTDIK001: refer to [cmp.ac/systems](#))

Refer to [aca.edu.au/curriculum](#) for more curriculum information.



## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years F-4

# Is it a pig or a dog?

## This activity teaches Data Representation

Data representation is the method of representing data. **Good** data representation presents information and ideas clearly and depends on the situation.

This activity is designed to do in **pairs**, and suits either **two siblings working together**, or a parent/carer and child.

It is targeted towards primary students, with a younger sibling from F-4, and an elder from years 3-4.

It should take about **15 minutes**.

### Getting started (read this with your child/sibling):

We're both going to draw a picture of a pig and a dog.

You should each have a piece of paper with two boxes.

In secret, draw a pig in one of them, a dog in the other, but **don't tell each other which is which!** Don't show each other what you're drawing either!

To make it even trickier, you're going to have just 30 seconds per drawing!

Find a timer, and get started.

Ready.... Set.....

GO!



# Draw a pig and a dog!

Or a dog and a pig?



**Student 1 page:**

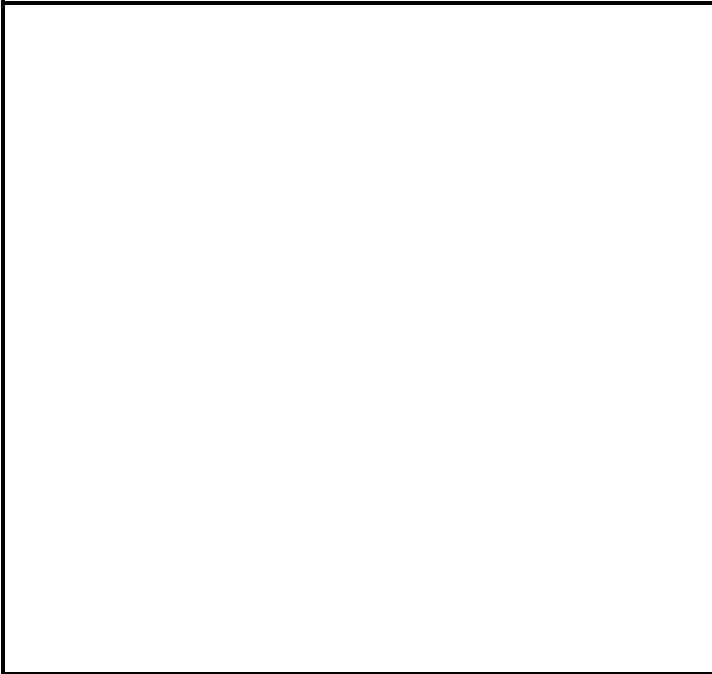
Drawing 1

Drawing 2



**Student 2 / Parent page:**

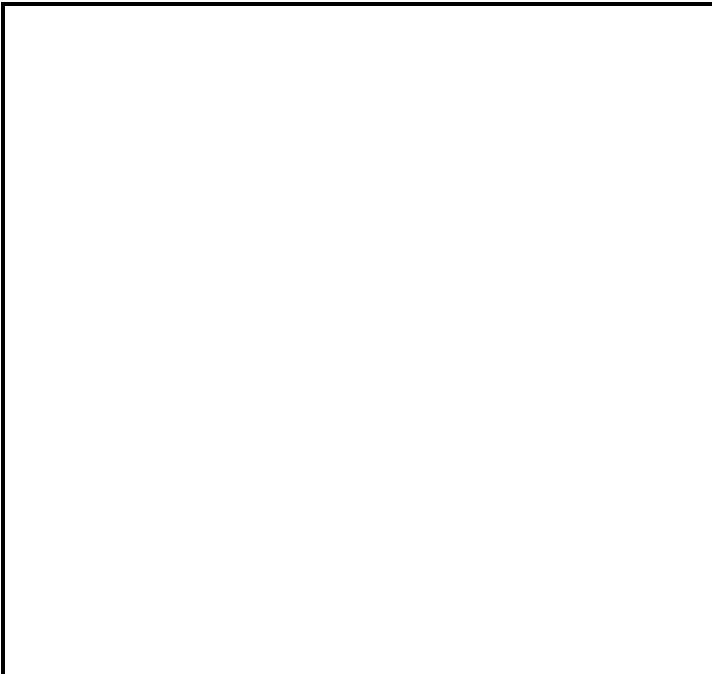
Drawing 1

Parents  
and carers

Students

OR

Drawing 2





Students

Parents  
and carers

# Discuss

Pigs and dogs!

Times up!

Compare your pictures.

Swap worksheets and guess which one is a pig, and which one is a dog.

Student 1 first pic: _____	Student 2 / parent first pic: _____
Student 1 second pic: _____	Student 2 / parent second pic: _____

Did you guess right?

Did your picture look like a real life pig?



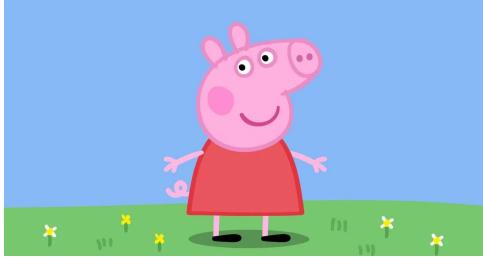


Students


 Parents  
and carers

Probably not! There's no time to draw a realistic pig in 30 seconds. You would have drawn a **representation** of a pig and a dog.

There are lots of different ways to represent pigs and dogs depending on the situation!

<p>This is a good way to draw a pig for a <b>cartoon</b>.</p> 	<p>This is a good pig symbol for a <b>game</b></p> 
<p>This is a good dog for a <b>cartoon</b></p> 	<p>This is a good dog for a <b>poop warning sign</b></p> 
<p>This is a good dog for a <b>danger sign</b></p> 	<p>This is a watch out for pigs <b>road sign</b></p> 

The way you choose to **represent** a pig and dog depends on the situation!

**Make your own!**

Draw a happy cartoon pig

Draw a wild pig



Draw a watch out for dog poo sign

Draw a sniffer dog

Draw a guide dog

Draw a don't feed the pig sign

# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

Students can try representing other animals as simply as possible.

For older students you can add additional constraints, like trying to draw a giraffe, or a kangaroo in as few lines as possible.

Or make a challenge to express a different idea! How does a warning sign about giraffes for cars differ from a don't feed the giraffes sign?

## Keep the conversation going

- Can you represent other animals so they're not confused with pigs and dogs? Try drawing a Lion! Or a cat!
- Do you think people from the 1800s would recognise Peppa pig as a pig?



- What's the difference between what arabic numbers and roman numerals represent? When is it better to use arabic numbers?

## Keep learning

For students interested in doing more offline data representation activities try DT Laundry:

[cmp.ac/laundry](http://cmp.ac/laundry)

For online coding courses try Blockly Tree:

[cmp.ac/blocklytree](http://cmp.ac/blocklytree)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to come up with 5 different types of ball/seat/shoe, then draw a picture to represent each one.

## Linking it back to the Australian Curriculum: Digital Technologies



### Data representation

Recognise and explore patterns in data and represent data as pictures, symbols and diagrams. (ACTDIK008 - see [cmp.ac/datarep](http://cmp.ac/datarep)).

Refer to [aca.edu.au/curriculum](http://aca.edu.au/curriculum) for more curriculum information.





## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years 1-3

# Tech talk find a word

A fun find-a-word activity to improve younger students' awareness of digital systems and their functions.

### This activity teaches...

Younger students in years 1 to 3 can improve their vocabulary and spelling as well as learning to identify basic digital systems.

This exercise improves students ability to scan for information, for example scanning search engine results for information or a piece of code.

### Getting started (read this with your child):

How many types of digital technology can you name? For example (point to if near) – computer, laptop etc.

Let's look at this list of words together (refer to the word search) and see which ones we already know, and which ones are new. (Give hints if need be.)

### Step by step

Ask your child to find the words in the list, if they get stuck they can move onto the next one and come back to it.

They are written only downwards and across. There are no diagonal or backwards words.

### Keep the conversation going (after the activity)

- Do you have these technologies in your house?
- Can your child point them out or can they already name these devices on sight?
- Do they know what each of them does? What purpose do they serve?
- How do these technologies make our lives easier?

### Linking it back to the Australian Curriculum: Digital Technologies



#### Digital Systems

Recognise and explore digital systems (hardware and software components) for a purpose (ACTDIK001 - see [cmp.ac/systems](http://cmp.ac/systems))

Refer to [aca.edu.au/curriculum](http://aca.edu.au/curriculum) for more curriculum information.)



### Keep learning

Learn about simple algorithms using Flatso the wom-bot!

Draw arrows on Flatso and test out simple sequences of instructions.

For more information head to [cmp.ac/wombot](http://cmp.ac/wombot)

# Tech talk

Can you find the 9 words hidden below?

Some words are down and some are across.

Circle them and colour in the pictures when you are done.



Students

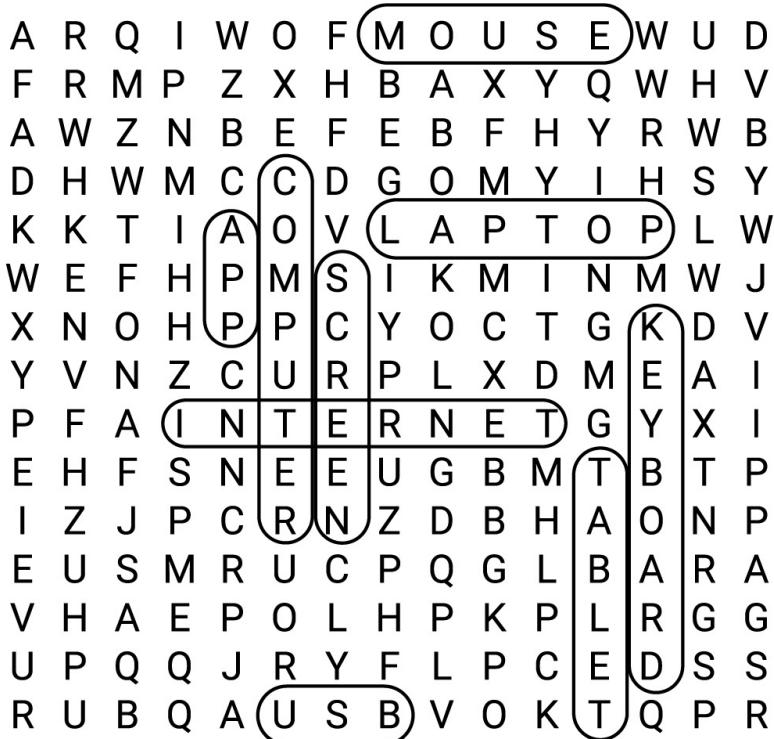
A	R	Q	I	W	O	F	M	O	U	S	E	W	U	D
F	R	M	P	Z	X	H	B	A	X	Y	Q	W	H	V
A	W	Z	N	B	E	F	E	B	F	H	Y	R	W	B
D	H	W	M	C	C	D	G	O	M	Y	I	H	S	Y
K	K	T	I	A	O	V	L	A	P	T	O	P	L	W
W	E	F	H	P	M	S	I	K	M	I	N	M	W	J
X	N	O	H	P	P	C	Y	O	C	T	G	K	D	V
Y	V	N	Z	C	U	R	P	L	X	D	M	E	A	I
P	F	A	I	N	T	E	R	N	E	T	G	Y	X	I
E	H	F	S	N	E	E	U	G	B	M	T	B	T	P
I	Z	J	P	C	R	N	Z	D	B	H	A	O	N	P
E	U	S	M	R	U	C	P	Q	G	L	B	A	R	A
V	H	A	E	P	O	L	H	P	K	P	L	R	G	G
U	P	Q	Q	J	R	Y	F	L	P	C	E	D	S	S
R	U	B	Q	A	U	S	B	V	O	K	T	Q	P	R

App  
Computer  
Internet  
Keyboard  
Laptop  
Mouse  
Screen  
Tablet  
USB


 Parents  
and carers

# Answer key

Do not show this to your child.  
Use this only to give your child a hint if they get stuck.



App  
Computer  
Internet

Keyboard  
Laptop  
Mouse

Screen  
Tablet  
USB





## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years F-4

# DT Laundry

### This activity teaches...

We use conventions and shared context to understand the signs and symbols around us.

For example, we understand that a walking green person means it is safe to cross the street. But only because we all agree that is what it means! Many ideas can be communicated using symbols and conventions. Laundry symbols are an example of a convention that can be confusing even if you've been washing clothes for years!

Computers also use conventions to store different kinds of data using binary numbers. In this activity we teach students to recognise how to represent ideas (a.k.a data) using symbols in real life examples. In later years, students can transfer their understanding of symbols and abstraction in the real world to the world of digital technologies.

This activity will take up to **60 minutes**. Print pages 2 and 3 for students. If you are a teacher, read through page 6 for further information.

### Getting started (read this with your child):

Did you know many of your items of clothing need to be washed in different ways?

Some items are delicate and need to be hand washed, some cannot be ironed.

How can we tell which is which? Clothing has writing and symbols on it that can tell us!

### You will need...

Dirty Laundry (clean clothes are fine too)

### Step by step

1. Guess what the example laundry symbols mean
2. Explore laundry symbols on your own clothing
3. Create your own laundry symbols
4. Discuss what makes a good or a bad laundry symbol



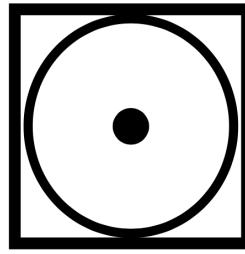
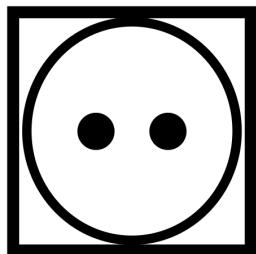
# DT Laundry

Unlock the secret symbols hidden on your clothes



## Guess the laundry symbol

Guess what instructions each symbol represents.  
Write your guesses below.



## Find symbols on your clothes

Look at your dirty laundry. What symbols are there?  
Copy 2 of the symbols you saw below.





Students

**Draw your own symbols**

Draw your own symbols for the instructions below.

Cold wash only

Do not hang in sunlight

Iron on high heat

Wash with peanut butter

**Invent your own instructions**

Invent a new instruction and draw a symbol for it.  
Ask another person if they can guess what it means.

---



# Answer key

## Guess the laundry symbol

1. Iron, steam or dry (any temperature)
3. Tumble dry with medium heat

2. Hand wash
4. Tumble dry with low heat

Have a discussion with your student.

Did you know about all of the symbols? Did you have to use the image below to understand them?

What made them easy or hard to understand? Are there any repeated patterns in the symbols?



Teachers



Parents  
and carers

## Find symbols on your own clothes

Here is a list of symbols you might find on your clothing.

### *Washing Symbols*

CLOTHING CARE LABELS EXPLAINED

 WASHING INSTRUCTIONS	 DO NOT WASH	 HAND WASH ONLY	 MACHINE WASH NORMAL	 MACHINE WASH PERMANENT PRESS	 MACHINE WASH GENTLE	 MACHINE WASH COLD	
 MACHINE WASH WARM	 MACHINE WASH HOT	 MACHINE WASH HOT	 MACHINE WASH HOT	 MACHINE WASH HOT			
		 BLEACHING INSTRUCTIONS	 DO NOT BLEACH	 BLEACH	 NON- CHLORINE BLEACH		
 DRY CLEANING INSTRUCTIONS	 DO NOT DRY CLEAN	 DRY CLEAN	 ANY SOLVENT	 PETROLEUM SOLVENT ONLY	 DRY CLEAN LOW HEAT	 DRY CLEAN NO STEAM	
 DRYING INSTRUCTIONS	 DO NOT TUMBLE DRY	 TUMBLE DRY NORMAL	 TUMBLE DRY NO HEAT	 TUMBLE DRY LOW HEAT	 TUMBLE DRY HIGH HEAT	 LINE DRY	
 IRONING INSTRUCTIONS	 DO NOT IRON	 IRON, ANY TEMP STEAM	 IRON LOW HEAT	 IRON MEDIUM HEAT	 IRON HIGH HEAT	 DO NOT STEAM	

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laundrapp.com

Source: <https://laundrapp.com/guides/laundry-symbols/>



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the University of Sydney). Find out more: [grokacademy.org](http://grokacademy.org), get help:  
[help@grokacademy.org](mailto:help@grokacademy.org)



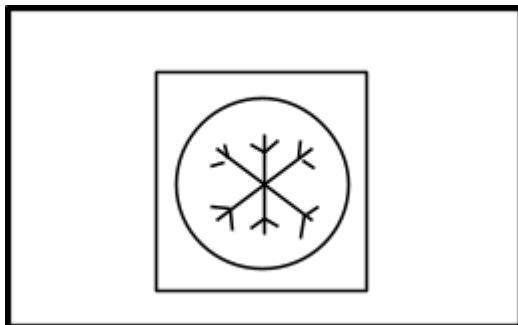
Teachers


 Parents  
and carers

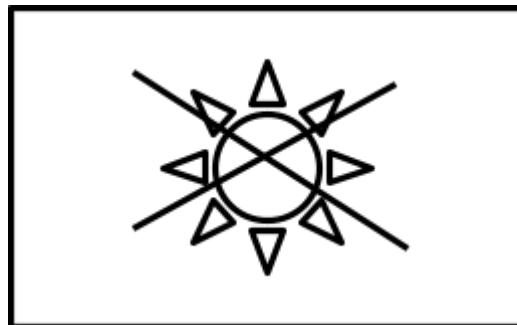
### Draw your own symbols

This is a creative task, so there are many correct answers. Here are some example symbols.

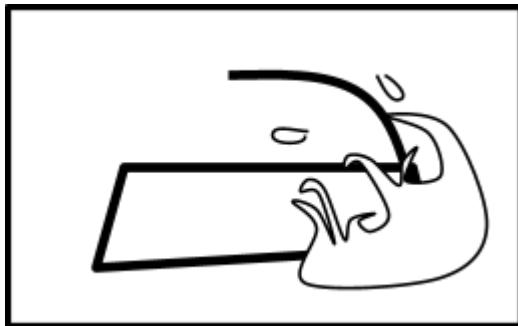
What makes these symbols easy or hard to understand?



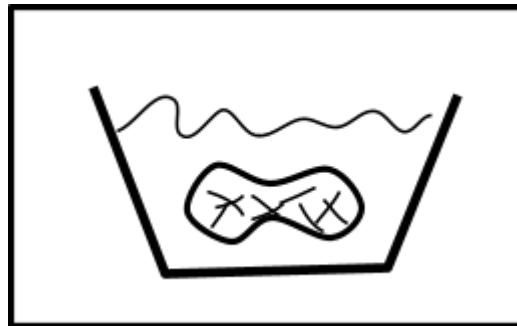
Cold wash only



Do not hang in sunlight



Iron on high heat



Wash with peanut butter

### Invent your own instructions

This is also a creative task. For this task and the previous task you should discuss the answers to the following questions.

What would it look like on a tiny clothing tag?

Is it better than the existing symbols?

What other things could the new symbol accidentally represent?

Are the instructions sensible?

# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

This topic is interesting for people of all ages. For older students try engaging in a discussion about data representation appropriate for their year level.

Read more about data representation at

[cmp.ac/datarep](https://cmp.ac/datarep)

What do the number of dots in some of the laundry symbols mean? (● cold, ●● warm, ●●● hot)

Did you know this before? Would using numbers or letters make it easier or harder?

What are some other places we see symbols? (e.g. road signs, buttons in apps, bathroom signs, food packaging)

What are the benefits of using symbols instead of words and numbers? (e.g., readable in any language)  
What are the benefits of using words and numbers instead of symbols? (e.g., you don't have to be a laundry expert to understand them)

How could you represent the data in these symbols with a computer? (e.g., using pictures, words, numbers, binary, objects)

Discuss how efficiently each of the above representations can be stored. (e.g, compare bitmap and vector images, compare words vs number representations)

Discuss the difference between what a symbol looks like and what the symbol represents. (e.g., an emoji can be a symbol that represents a hamburger, for example, but it looks different on different devices)

## Keep learning

For students of all ages you can try the Lego Algorithmics DT Mini Challenge where students learn about representing and following instructions.

[cmp.ac/algorithmics](https://cmp.ac/algorithmics)

Or you can print out animal trading cards and use symbols and simple decisions to classify living things

[cmp.ac/animalcards](https://cmp.ac/animalcards)

[cmp.ac/classifying](https://cmp.ac/classifying)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to submit the second page of their worksheet with their invented laundry symbols. You could also ask them to –with some parental help– record and submit a video explaining their symbols.

## Linking it back to the Australian Curriculum:Digital Technologies



### Data representation

Recognise and explore patterns in data and represent data as pictures, symbols and diagrams (ACTDIK002 - see [cmp.ac/datarep](https://cmp.ac/datarep)) (Years F-2)

Recognise different types of data and explore how the same data can be represented in different ways. (ACTDIK008 - see [cmp.ac/datarep](https://cmp.ac/datarep)) (Years 3-4)

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.



Teachers



Parents  
and carers



## Digital Technologies @ Home

Unplugged activities for students

This activity is for: Years 3-4, 5-6

# Race Up If Mountain!

### This activity teaches...

This activity is designed to teach decision making in programming as well as starting to teach students about variables. The game is based on a path up a mountain blocked with a number of smaller 'if mountains' that must be passed to reach the finish. The students must roll the dice and follow the flowchart at each mountain, trying to roll a number that will allow them to pass. The statements have been written in flowcharts that mimic the decision making of computers.

It is targeted towards primary students in years 5-6 and can be expected to take between 1 and 1.5 hours to complete.

An extension for students that are familiar with Python syntax has been included but is by no means expected. In the extension the flowcharts have been translated into Python coded 'If statements' (the name for decision making statements in code). The Python statements are logically identical to the flowcharts and can be used concurrently for students that are keen but inexperienced.

### Getting started (read this with your child):

This is a board game where players race up the mountain, it's a game of luck and climbing! First we will build up the board, then we will race to reach the top of the mountain, stopping at smaller mountains along the way. The flowcharts on those mountains will help you decide if you can pass, they are similar to how computers make decisions.

### You will need...

- Scissors
- Glue
- A six-sided die (if you don't have any dice, there is one you can make on the board).
- A playing piece for as many players as you have, for example, 2 bottle caps for 2 players.
- Coloured pencils to colour in your board.

**Step by step instructions are on the next page**



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Developed by the Grok Academy Limited (formerly the Australian Computing Academy, the University of Sydney). Find out more: [grokacademy.org](http://grokacademy.org), get help:

[help@grokacademy.org](mailto:help@grokacademy.org)

# Race up If Mountain!

Build your board and race up the mountain!  
Climbing over If Statements flowcharts along the way!

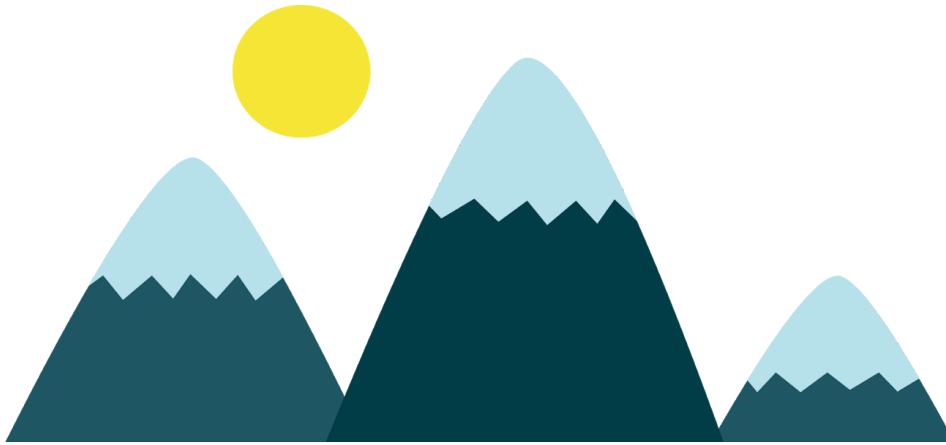


Image originally created by Nicole Turner on [Pixabay](#)

## Step 1

Colour in your board and your dice. You can colour in the mountains as well, but make sure you can still read what they say.

## Step 2

Cut out your mountains. Make sure you also cut around the tabs with letters on! This is important! You need them to stick your mountains to the board. Fold your mountains in half. Then you can cut out your die if you need to.

## Step 3

Stick your mountains to your board, make sure you stick the mountain with 'A' to the 'A' squares on the board. Once you've built your mountains, you can fold and stick your die.

## Step 3

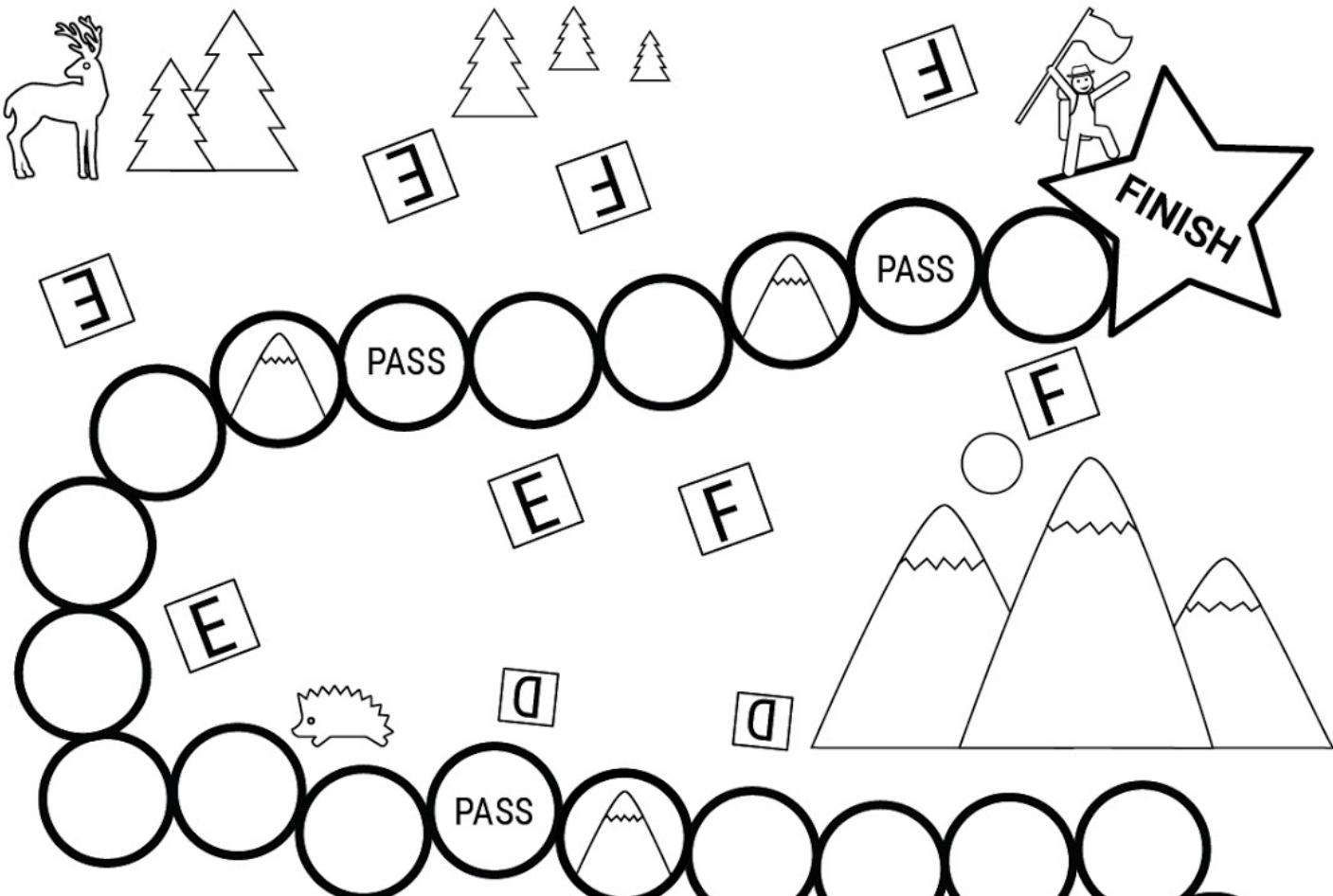
Find players and find a token for each of them. Once there are at least 2 players, you're ready to go!

## Step 4

Read the rules of the game so you know how to play and start your race!

## The Rules

- Every player starts at START.
- Take turns to roll the die. Whoever rolls the highest number goes first, second highest goes second etc. If two people roll the same number they have to roll again.
- Move your token as many places as you rolled, rolling a 3 means you move forward 3 places.
- When you land on a mountain you must play the mountain. Roll the die and follow the flowchart. If you pass the mountain, you move to the 'PASS' circle.
- The Loop! If you land on the 'LOOP' circle, you're stuck in a loop! You have to roll a 4 or more to escape!
- The final two mountains use variables. If there is an x variable, roll the die and that number becomes x. If there is a y variable, roll the die again, that roll becomes y. Use those for x and y on the flowchart.
- You must re-roll each variable every turn.
- To win the game, be the first to reach FINISH!

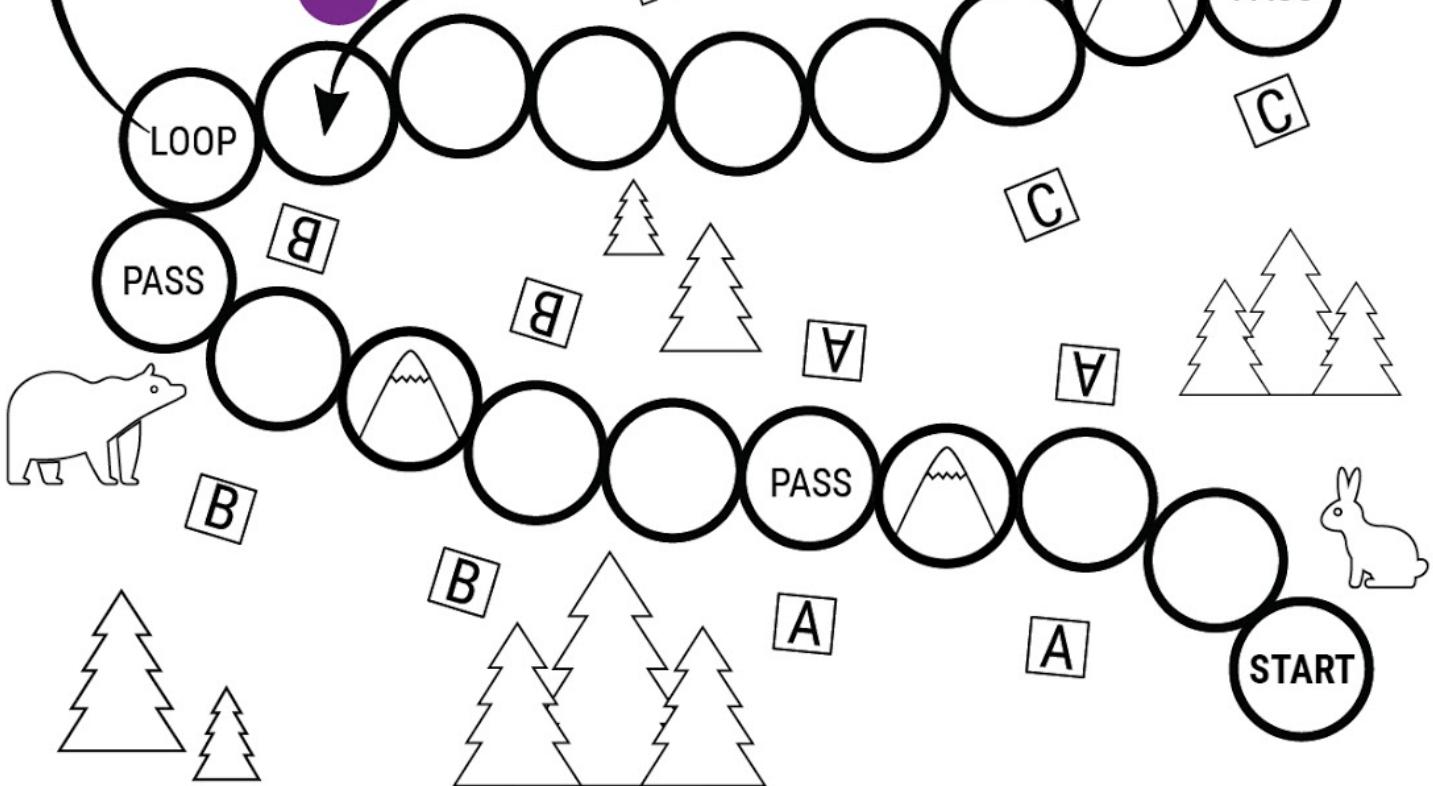


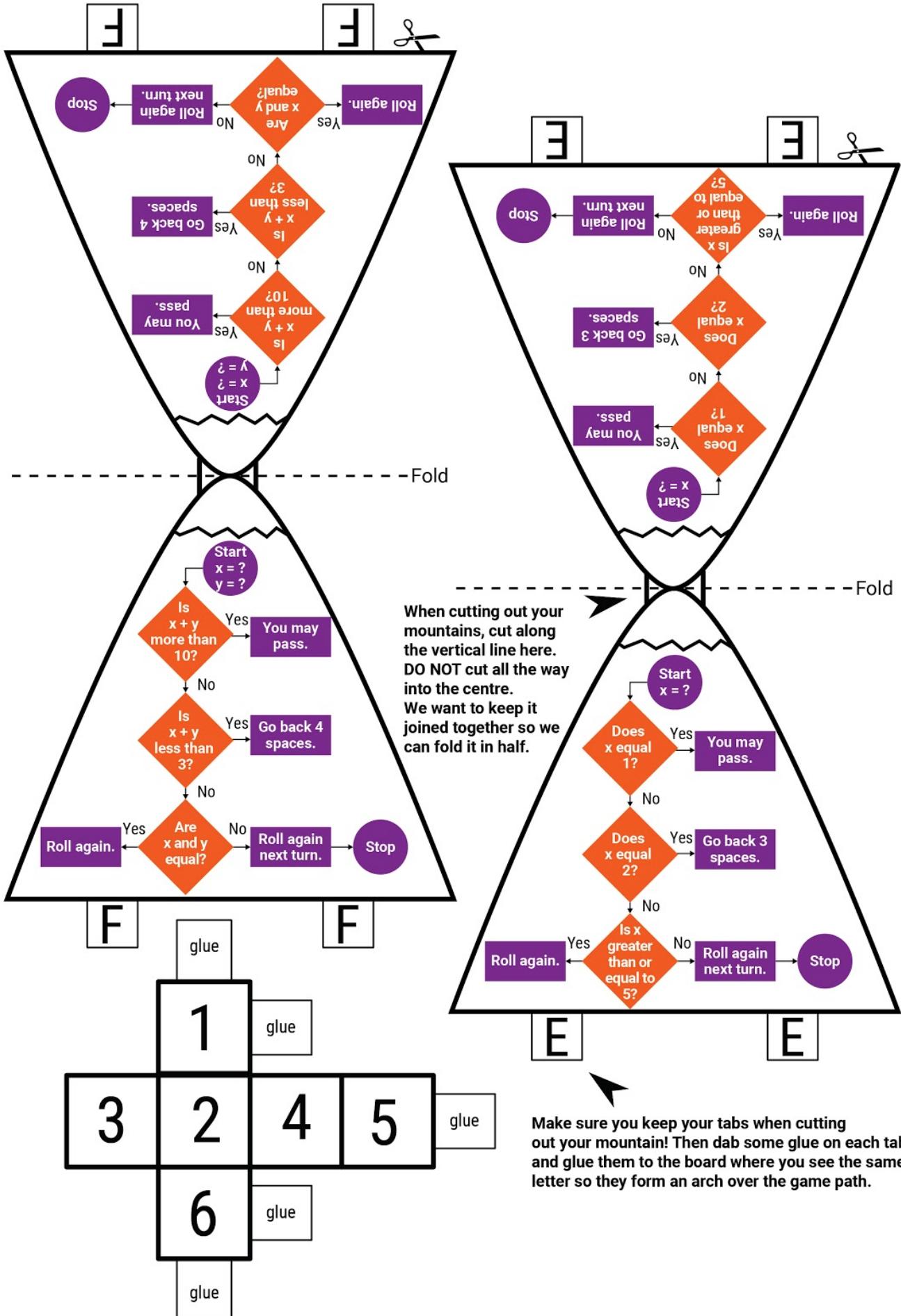
You're in the loop!  
Use logic to exit the loop ►

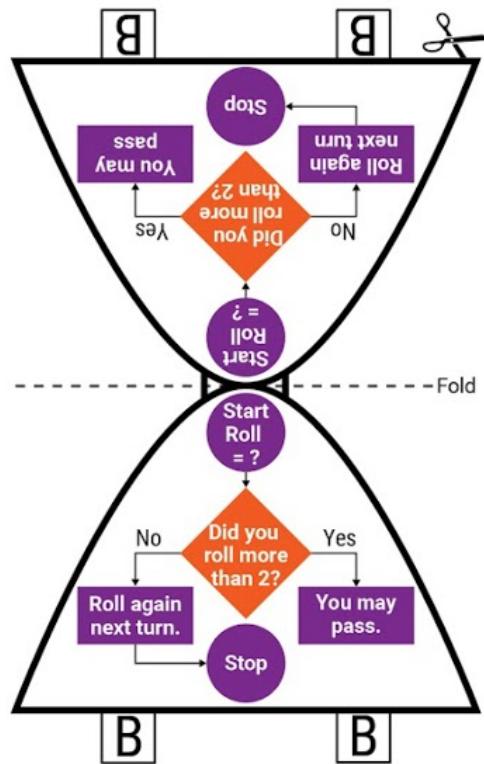
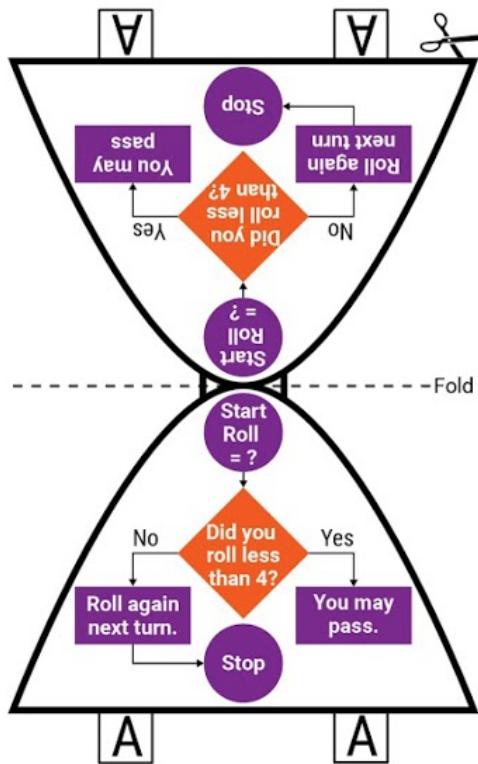
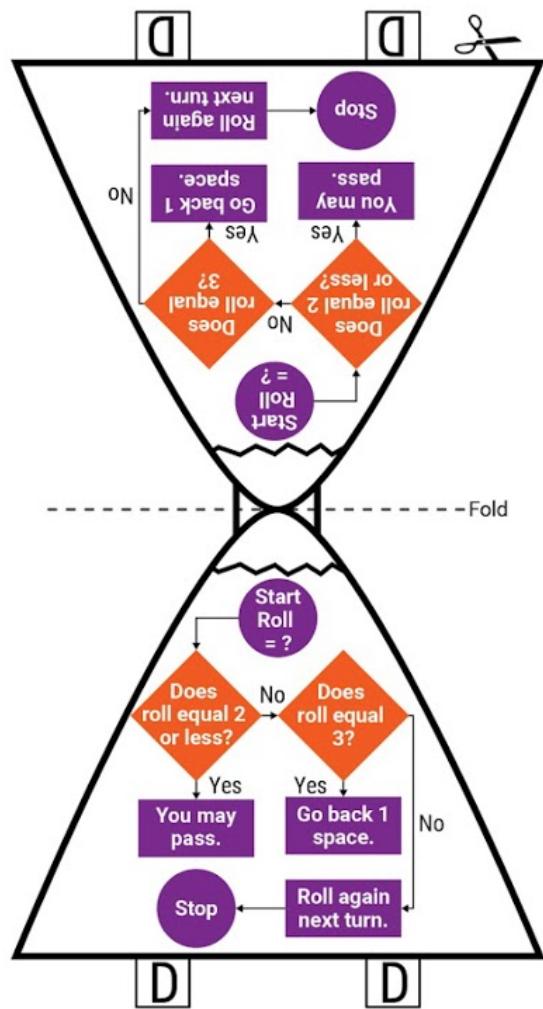
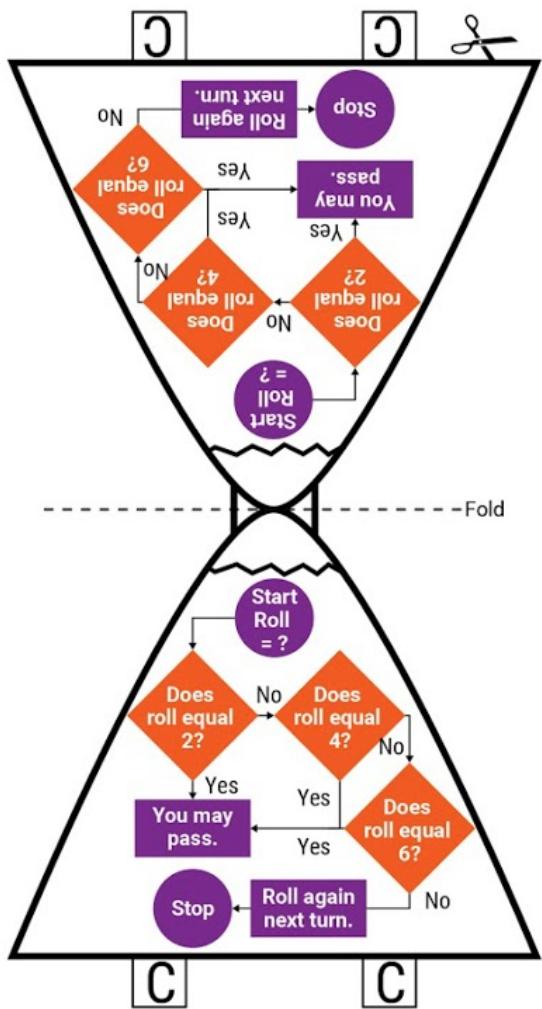
Start  
Roll  
= ?



Race up.  
If Mountain!







# More information for teachers

Here are some further activities, online resources, assessment ideas and curriculum references.



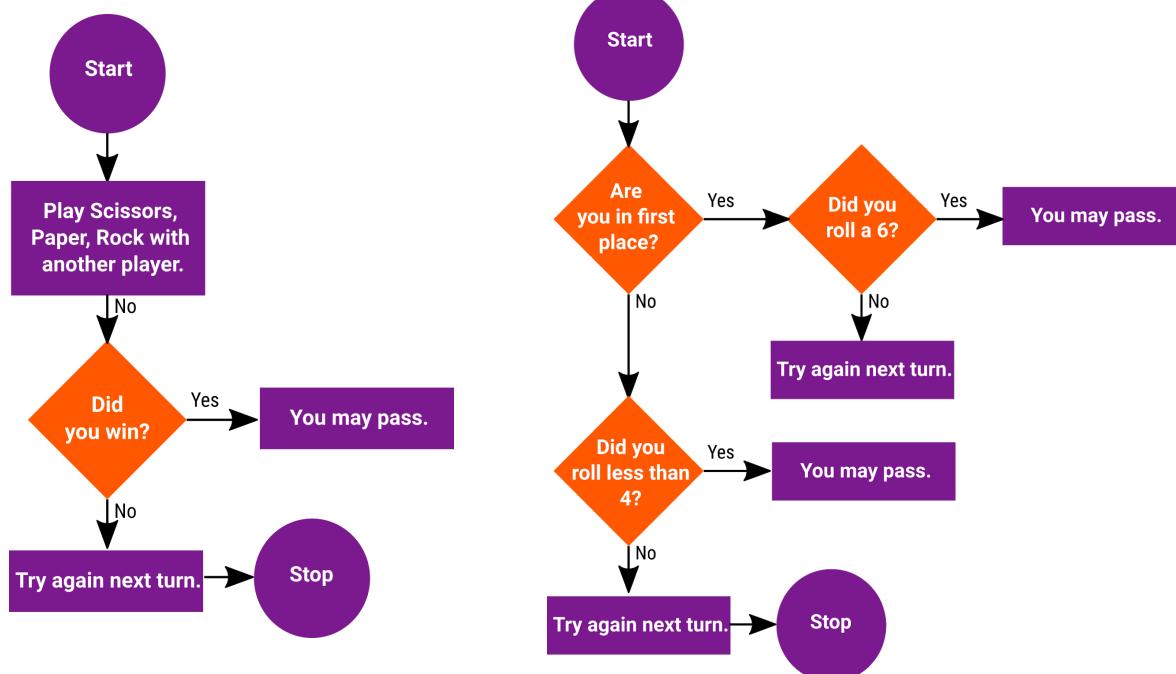
Teachers

## Keep the conversation going:

Making your own flowcharts.

Encourage students to come up with their own mountain flowcharts using die rolls as the deciding factor.

What are other things that your flowcharts can check, aside from the number rolled on the die? For example:



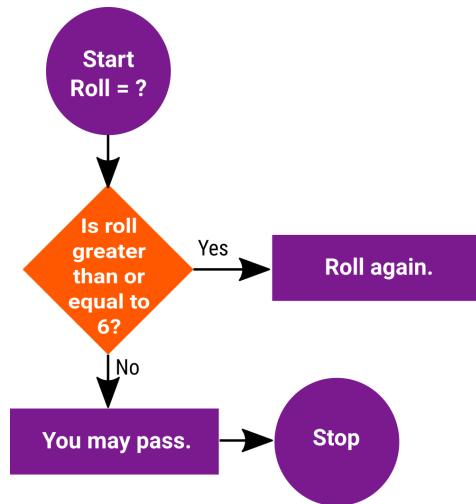


Teachers

What happens if we accidentally write a flowchart that never lets us pass the mountain?

This is called an ‘infinite loop’ because you are stuck in the loop for infinity and can’t get out.

Ask the student how they would fix it to show that they understand.

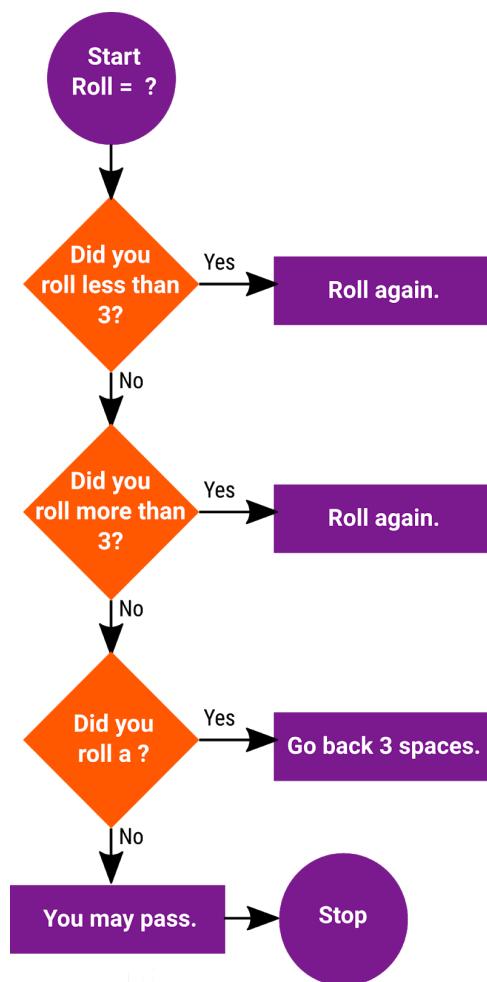


Sometimes they are harder to see.

This infinite loop will never let you pass.

This is because every possible outcome from the dice rolls is caught in a “yes” flow. Since you are always caught by a “yes” flow, you will never follow the “no”s all the way to the “pass” block.

You will also never be able to go back 3 spaces. This is because you will follow the “greater than 3 → yes” flow to roll again every time you roll a 6. This means you will not be able to reach the “equal 6 → yes” flow.



### Thinking about mountain flowcharts and difficulty

How might we make the flowcharts of the last 2 mountains easier or harder to pass? Think about how much more likely it is to roll a number greater than 3 than it is to roll a 6.



Teachers

### For teachers creating a portfolio or learning or considering this task for assessment:

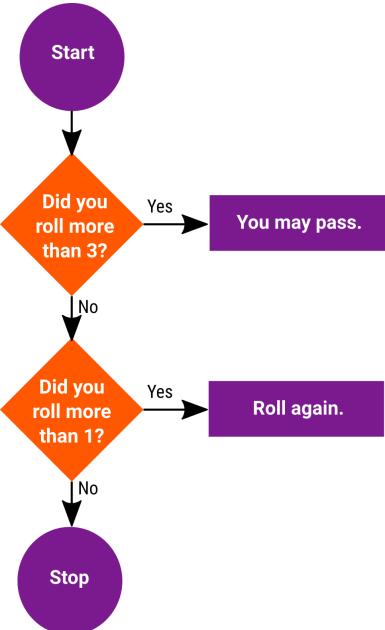
#### Ask students to design their own mountains.

The first mountains should be small flowcharts with easy odds to pass. They should get progressively trickier to pass. You can decide if they must include variables.

- Make sure the flowcharts are logically exhaustive (expanded below).
- Ask the students to explain why their last mountain is harder to pass than their first. This should demonstrate an understanding that the odds of rolling any number higher than 3 is higher than the odds of rolling a single number.

### Watch out! Common if statement pitfalls

It is important to make the if statement logic exhaustive. Don't miss any of the possible outcomes (dice numbers). For example:

<p>If we roll 1 in the above example then neither of the conditions apply.</p> <p>What is the player meant to do? They can't roll again or pass, so they are stuck!</p> <p>The solution is to add a final instruction block before the stop circle that gives an instruction to a player that they should follow if no other flows apply to them.</p>	 <pre> graph TD     Start((Start)) --&gt; Q1{Did you roll more than 3?}     Q1 -- Yes --&gt; Pass[You may pass.]     Q1 -- No --&gt; Q2{Did you roll more than 1?}     Q2 -- Yes --&gt; RollAgain[Roll again.]     Q2 -- No --&gt; Stop((Stop))     </pre>
---	--



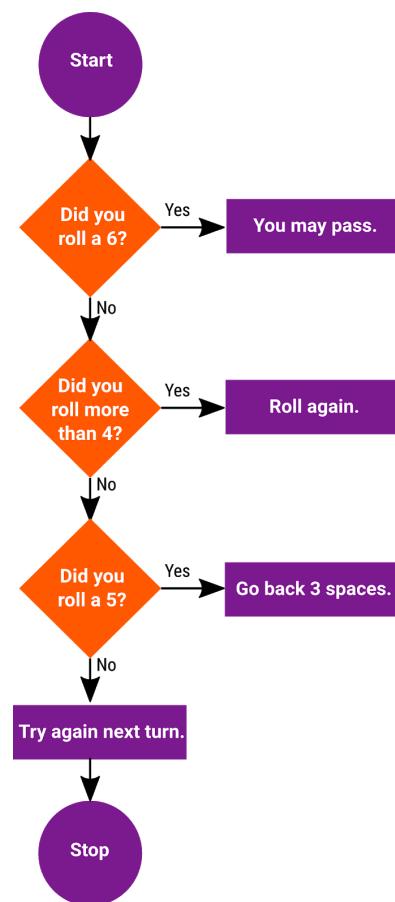
Teachers

It is important that students also understand the *sequential* nature of the flow charts, that they work from top to bottom and that you cannot jump to different diamonds.

In this example, if a player rolls a 5, they will never actually go back 3 spaces.

This is because they would follow the “more than 4 → yes” flow and roll again every time.

To fix this, you would need to swap the “more than 4” and “roll a 5” diamonds.



### Helping to Understand Variables

A table is also a good way to keep track of the variables in the last 2 mountains. The last 2 ask you to “roll for x” and “roll for x and y”. Here is an example table you can use to keep track of the variables. You can use this table as a reference when following the flowcharts, for example to work out  $(x+y)$ .

	What did you roll?	Fill in the number
Variable x		x =
Variable y		y =



### Linking it back to the Australian Curriculum:Digital Technologies

Algorithms - Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019 - see [cmp.ac/algorithms](http://cmp.ac/algorithms)) (5-6).

Refer to [aca.edu.au/curriculum](http://aca.edu.au/curriculum) for more curriculum information.



This page is for



Parents  
and carers

## Extension

Choose if you want to print this for your kids or keep it to yourself!

The flow charts can all be translated into Python Syntax if statements. We have provided these at the very end of the activity. A key component of the Python version is **comparison operators**, a table below can be provided to help them master these.

Comparison operators conversion table

Operator	In a sentence
$a < b$	a is <b>less than</b> b
$a \leq b$	a is <b>less than or equal to</b> b
$a > b$	a is <b>more than</b> b
$a \geq b$	a is <b>more than or equal to</b> b
$a == b$	a is <b>equal to</b> b

If your child has not learned about if statements and variables before,a good introduction to teaching if statements can be found at:

<https://medium.com/groklearning/programming-in-primary-school-introducing-if-statements-64875db05614>

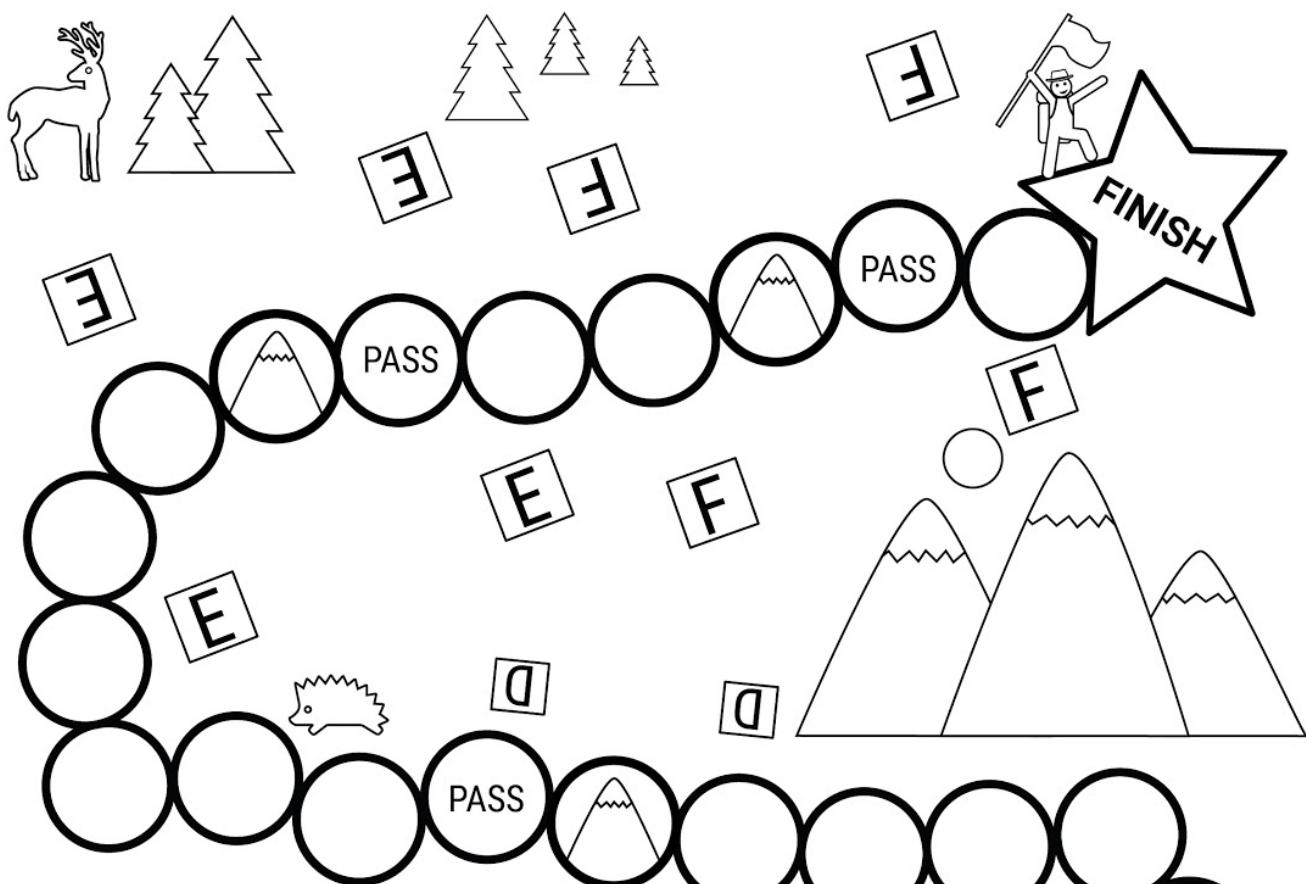
Is it also worth making sure the students can understand what the if statement conditions mean. Have them use the syntax and flow charts to write out sentences for the conditions, to help with their understanding.

If Statement	What does it mean in a sentence?	What numbers will work?
If roll > 3 You may pass	If you roll a number that is greater than 3, you can pass.	4, 5, 6
Else: Roll again	If you <b>do not</b> roll a number that is greater than 3, you have to roll again.	1, 2, 3

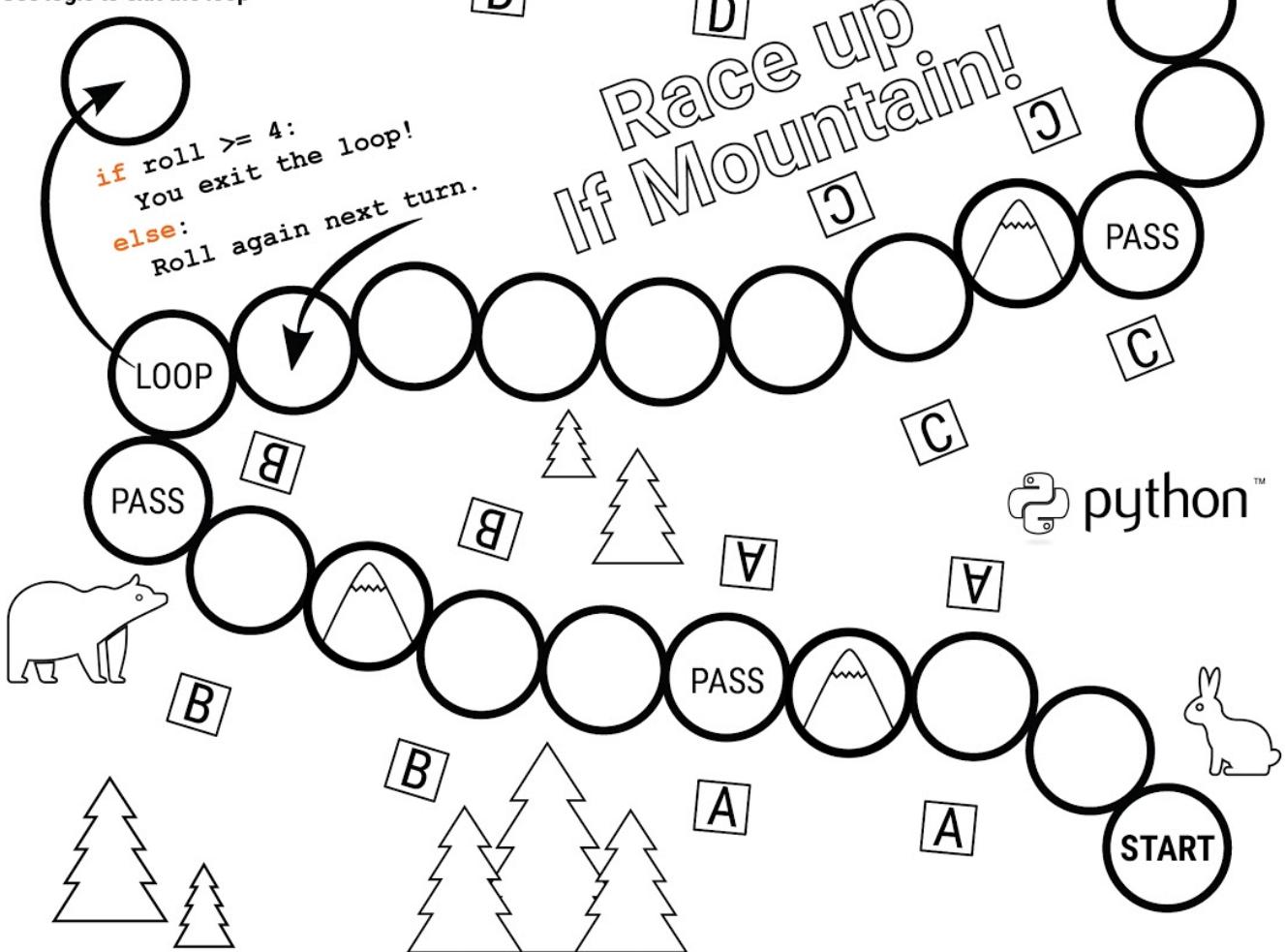
You should encourage them to create a table each time then get stuck with a mountain written in syntax. Using the tables can help students to understand the options available at each mountain and can be phased out as their confidence improves.

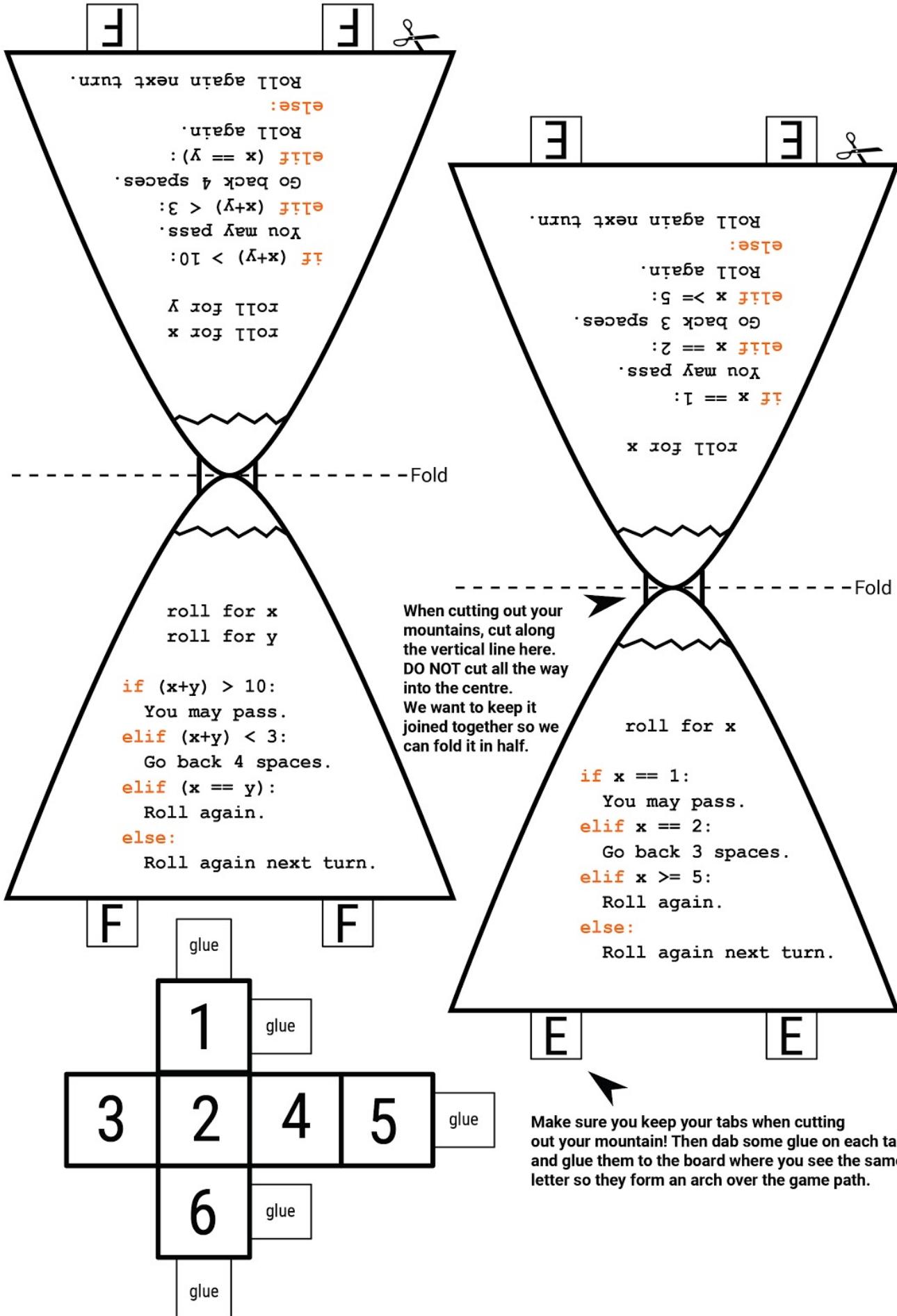


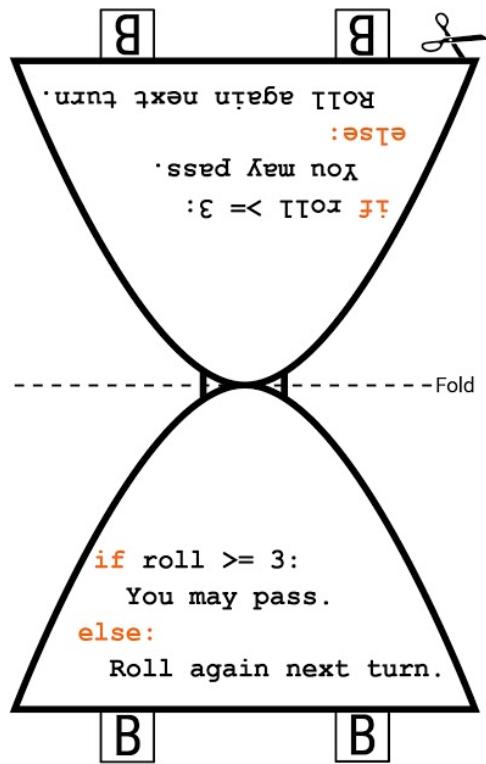
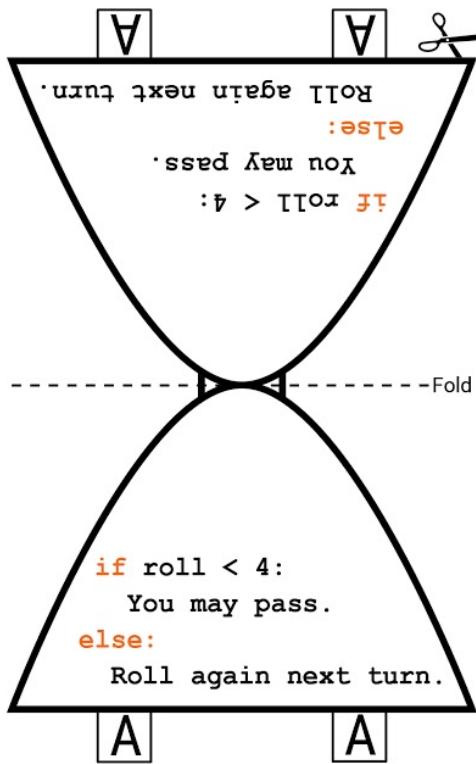
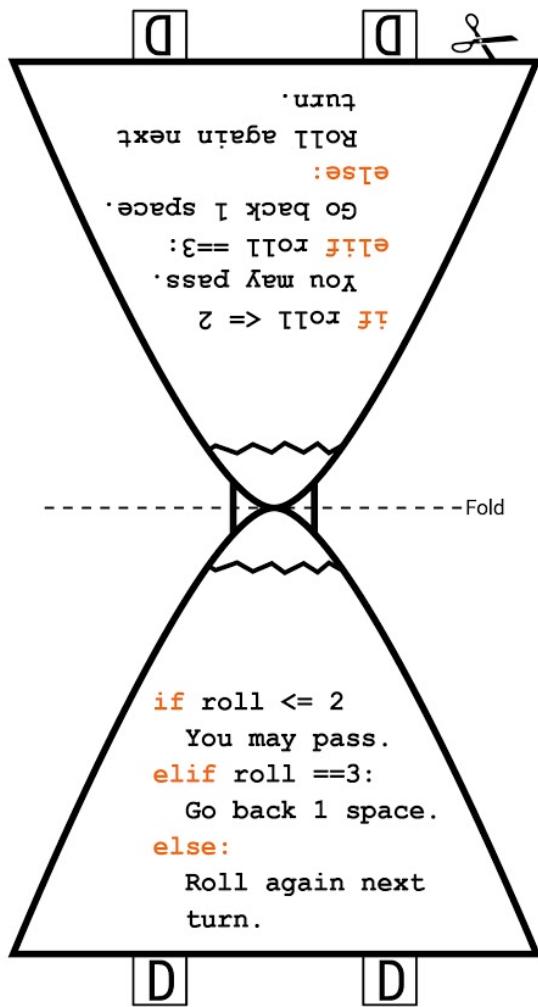
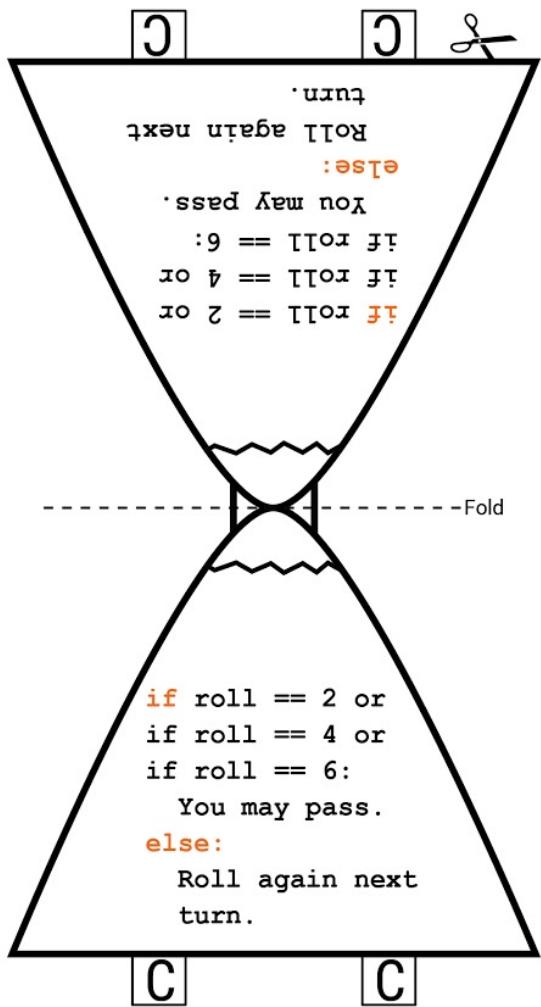
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the University of Sydney). Find out more: [grokacademy.org](http://grokacademy.org), get help:  
[help@grokacademy.org](mailto:help@grokacademy.org)



You're in the loop!  
Use logic to exit the loop









## Digital Technologies @ Home

Unplugged activities for students



Teachers



Parents  
and carers

This activity is for: Years 3-6

# Number guessing: I'm thinking of a number...

## This activity teaches...

Computers follow instructions to solve problems. It's our job, as humans, to decide on the best set of instructions to give to computers to solve problems. There are often lots of ways to solve the same problem. How do you know which is best?

This activity will take up to **60 minutes**. Print pages 2 and 3 for students. If you are a teacher, read through page 4 for further information.

## Getting started (read this with your child):

I'm thinking of a number between 1 and 100. Can you guess it?

We're going to experiment with different ways to guess a number, and come up with the best way.

## Step by step

With a partner, one person thinks of a number between 1 and 100 (person A), while the other one guesses it (person B). Person A can only say 'higher' or 'lower' after Person B guesses.

Follow the steps on the worksheet to create an algorithm to win the game by guessing the other person's number in the least number of guesses.





Students

# Number Guessing

I'm thinking of a number between 1 and 100 ... can you guess it?

## Step 1

With a family member, take turns thinking of a number from 1 to 100. One person thinks of the number, and the other person has to guess the number. (The first person has to tell you if the number they are thinking of is higher or lower than your guess.)

Record the results in the table on the right (the first line is an example). Play as many rounds as you like, and keep practicing to see how good you can get at this game.

Round	The number was..	I guessed it in __ guesses
1	74	12
2		
3		
4		
5		

## Step 2

Have you figured out the best way to play this game?

How can you guess the number with the smallest number of guesses? Write step by step instructions here:

Step 1	
Step 2	
Step 3	

***Hint: Will your instructions work for every game, or just one?***

***Try to come up with a general set of instructions that will always work.***

***Try using words like 'if', 'then' and 'repeat'***





Students

### Step 3

Play the game again, following the instructions you just made EXACTLY and record your results on the table on the right.

Round	The number was..	I guessed it in __ guesses
1		
2		
3		
4		

### Step 4

Do you need to change the instructions? If so, go back and change them.

### Step 5

Now think of a number between 1 and 1,000. Before you start guessing, how many total guesses do you think it will take to guess the number? Write your guess here: \_\_\_\_\_

### Step 6

Play four rounds and record your results here.

Round	The number was	I guessed it in _ guesses
1		
2		
3		
4		

You've created an **algorithm** to find a number out of a big collection of numbers. If your algorithm is to do with splitting the group of numbers in half over and over, you're thinking like a computer scientist!

When computers have to search through lots and lots of information it's really helpful to have a set of instructions, or algorithm, that can do it the quickest way possible. Splitting sets of ordered numbers in half, over and over, is called **binary search**.

### Step 7

Are you surprised with how quickly you can guess a number between 1 and 1,000?





For teachers

## Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.

### Adapting this activity

For younger students, you can start this activity guessing a number between 1 and 10.

For older students, ask them to create a flowchart as well as a written set of instructions. This flowchart should show both **decisions** and **repetition**.

Ask students what they found hardest about this activity? It's quite intuitive to apply **binary search** when playing this game, but coming up with a general set of written instructions can be challenging - doing the activity with a partner ensures you follow the instructions precisely and see where they may need a tweak.

### Keep learning

Searching and sorting algorithms are crucial in computing. With datasets containing billions of items, finding the most efficient way to search or sort can save huge amounts of money and resources, not to mention customers - people will click away from shopping or entertainment websites if results take too long to show.

You can explore how more of these algorithms work at [www.sorting.at](http://www.sorting.at).

For more lesson plans and ideas for teaching sorting and searching algorithms look at the CS Unplugged website:

[csunplugged.org/en/topics/](http://csunplugged.org/en/topics/) - there is a collection of resources specifically on sorting algorithms.

### For teachers creating a portfolio of learning or considering this task for assessment

Ask students to submit the worksheet with their record of rounds played, results, and algorithm (and in the case of older students, flowchart).

### Linking it back to the Australian Curriculum: Digital Technologies



#### Algorithms

Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010 - see [cmp.ac/algorithms](http://cmp.ac/algorithms)) (Years 3-4)

Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019 - see [cmp.ac/algorithms](http://cmp.ac/algorithms)) (Years 5-6)

Refer to [aca.edu.au/curriculum](http://aca.edu.au/curriculum) for more curriculum information.



## Digital Technologies @ Home

Unplugged activities for students



Teachers

 Parents  
and carers

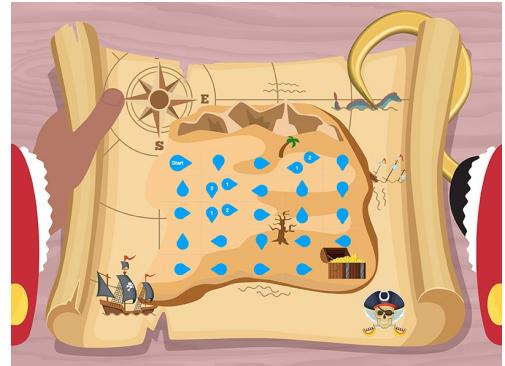
This activity is for: Years 3-4, 5-6

# Pirate Treasure Hunt

### This activity teaches...

Data representation, algorithms, decision making (branching) and iteration (loops).

This activity is a non-programming activity which introduces the key concepts of making decisions (using the IF...THEN...ELSE construct) and iteration (with simple loops).



We use algorithms to solve all sorts of problems around us. Algorithms are sequences of steps, or procedures, that lead us from a starting position to a goal. The data in the map represents instructions that students need to understand and interpret correctly in order to move to the correct next field.

This activity will take between **15-30 minutes**.

The activity is targeted towards primary school students. It consists of two parts. The first map is for students to get acquainted with the concept of the activity. The second map is an extension activity for students that have mastered the first activity and who are eager for a greater challenge.

### Getting started (read this with your child):

Your fellow pirates have found a map but can't quite figure out what it means. All they see are strange shapes that look like drops of water. You are the smartest pirate on the ship, so they come to you for help. Can you solve the puzzle and show them the way to the treasure?

Analysing the map very carefully, you found these instructions on the back of the map.

Symbol	Meaning
	Start here and follow the pointed end of the drop to the next square.
	Continue to the next square in the direction of the pointed end of the drop.
	When you reach this square the first time, follow the direction of the pointed end of the drop.
	When you reach this square for the second time, follow the direction of the pointed end of the drop.

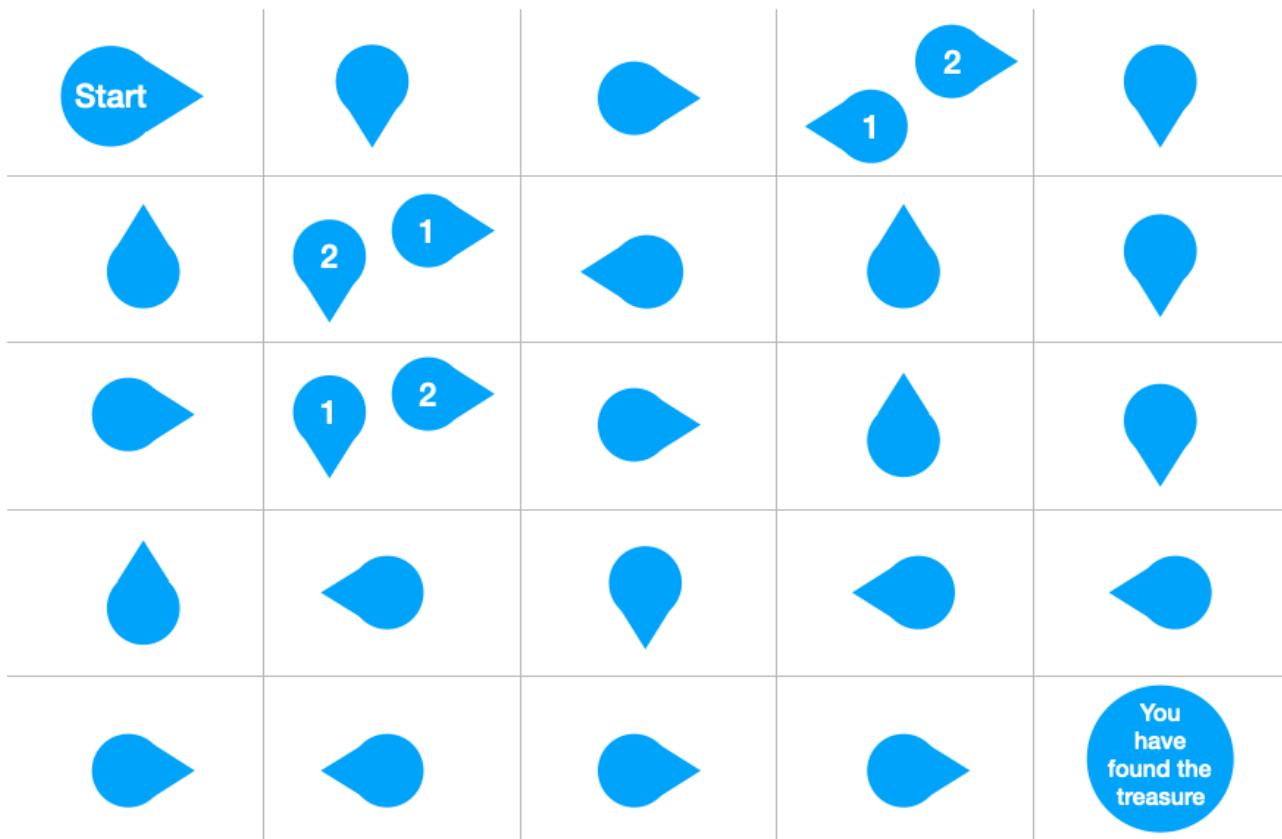


# Pirate Treasure Hunt

Solve the maze to get to the treasure.



Students



## Step 1

 Start at the **Start** drop and move to the next square in the direction of the point.

## Step 2

Use a pen to show your path from drop to drop.

## Step 3

When a square contains more than one drop, you need to decide if you have entered the square for the first or second time.

- If you enter the square the very first time, follow the pointed end of the drop with a .
- If you enter the same square a second time, follow the pointed end of the drop with a .





Students

**Step 4**

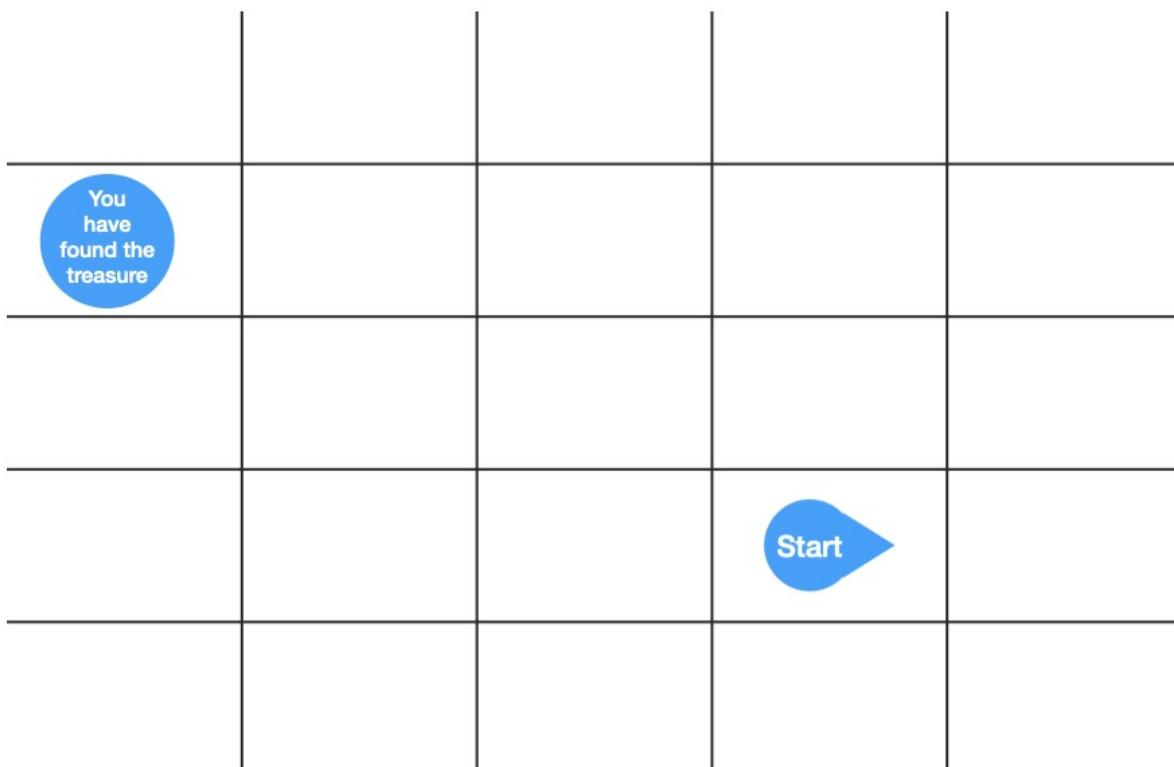
The game is finished when your path has led you to the treasure.

**Step 5**

Create your own set of instructions to get from start to the treasure on the map below.

Draw the drops. Include at least two squares that have more than one drop in them.

Ask a friend or family member to follow your instructions. Did they arrive at the treasure? If not, have another go.



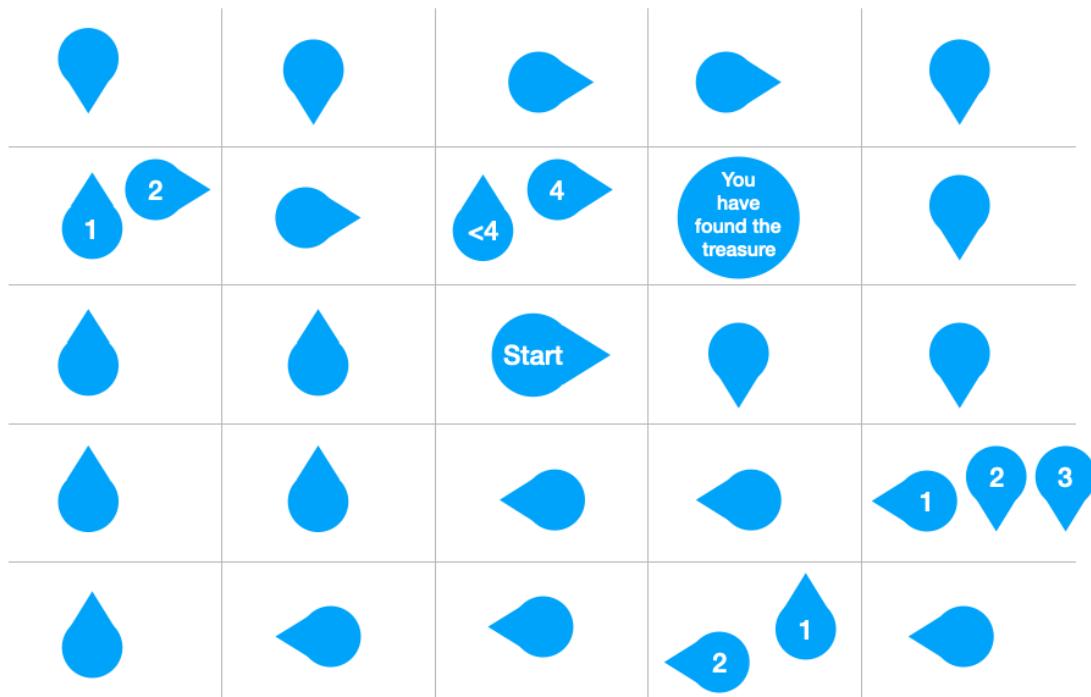
# Pirate Treasure Hunt

Map 2 - extension activity



The pirates are super-impressed with your problem-solving skills and ask you to solve another map for them. The same rules apply.

**Hint:** ' $<$ ' means less than



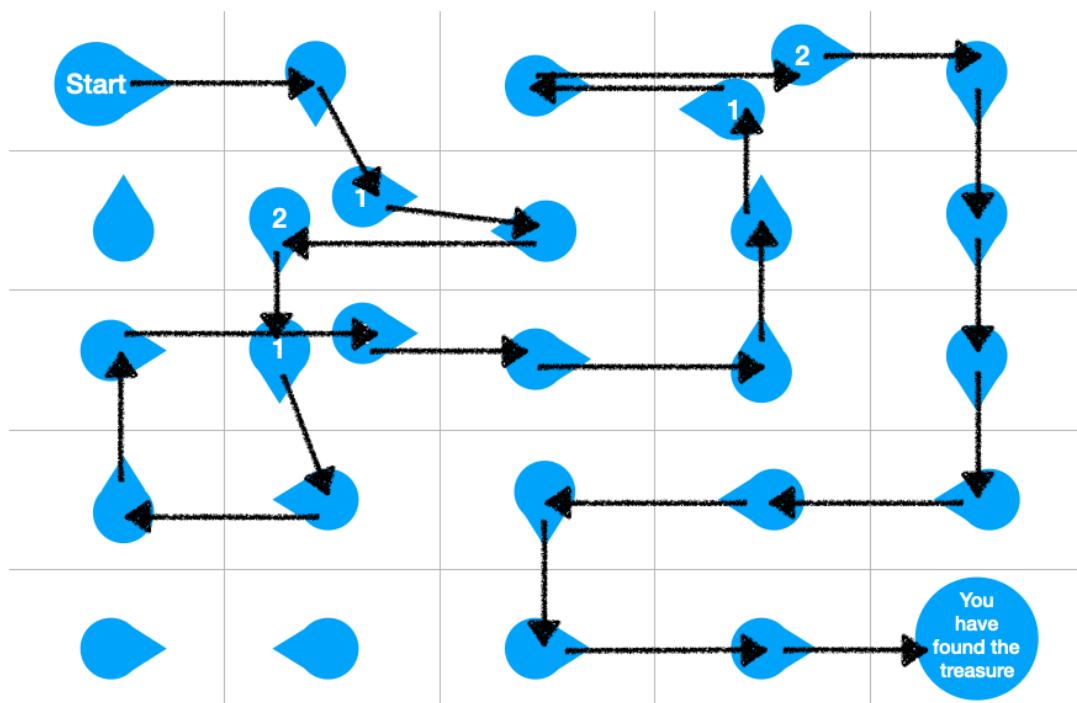
# Answer key

Choose if you want to print this for your kids or keep it to yourself!



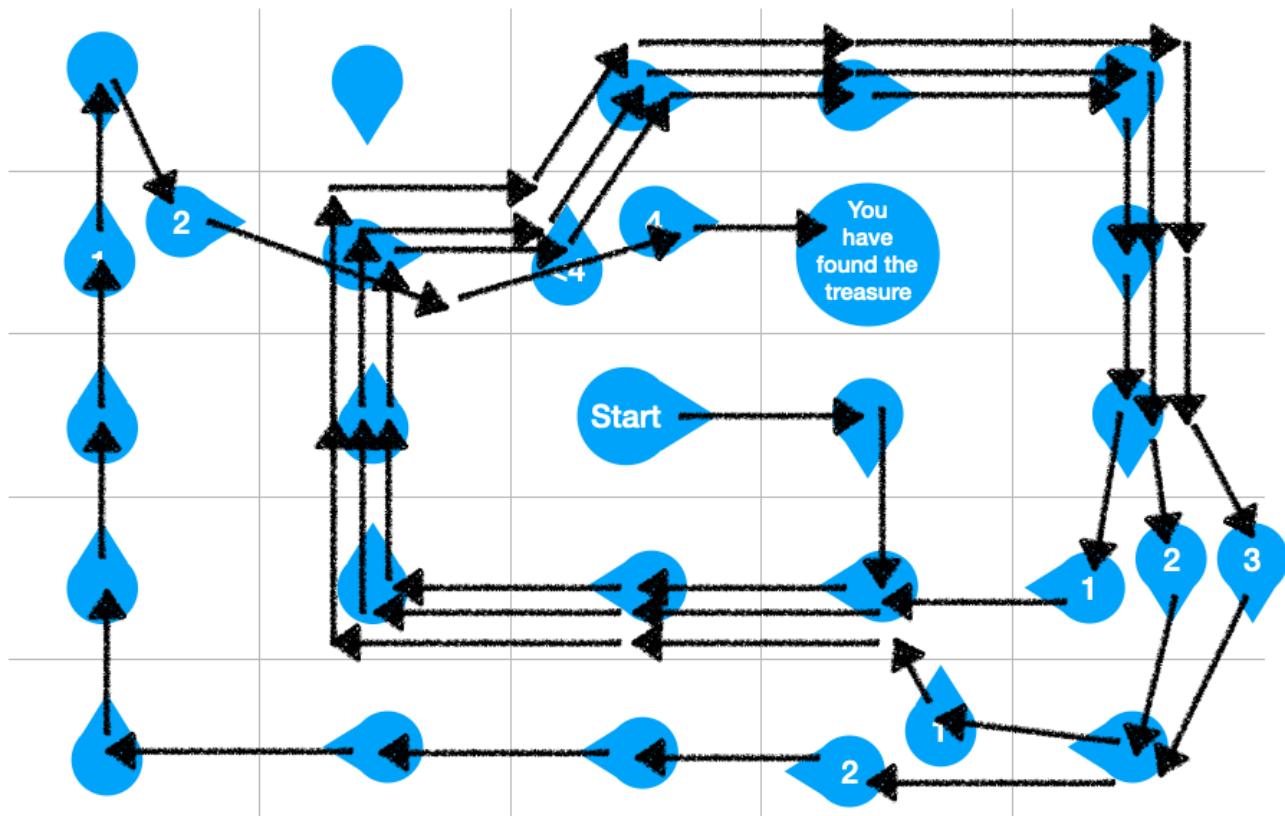
## Map 1

Here is the solution to this game. The main challenge is for students to decide which of the dots they should connect to first and second when they enter a square. To keep track, students can count the arrows that go into a square, or add a tally in the corner of the square.



## **Answer key for map 2**

Choose if you want to print this for your kids  
or keep it to yourself!



# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

If your students are keen to keep going with this activity, you could draw more drops and use them in an open space: perhaps draw a grid with chalk on the ground, or use masking tape.

Ask students to create some more symbols to create another treasure map: how would you tell the hunter to move two squares?

## Keep learning

Students can continue to learn about iteration and loops by learning to program using our DT Challenges - we suggest the chatbot activity [cmp.ac/chatbot](https://cmp.ac/chatbot) for students in year 5 and 6.

For year 3 and 4 students we recommend the wombot activity: [cmp.ac/blockly-wombot](https://cmp.ac/blockly-wombot)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to submit their completed treasure maps and the additional map they have created.

## Linking it back to the Australian Curriculum: Digital Technologies

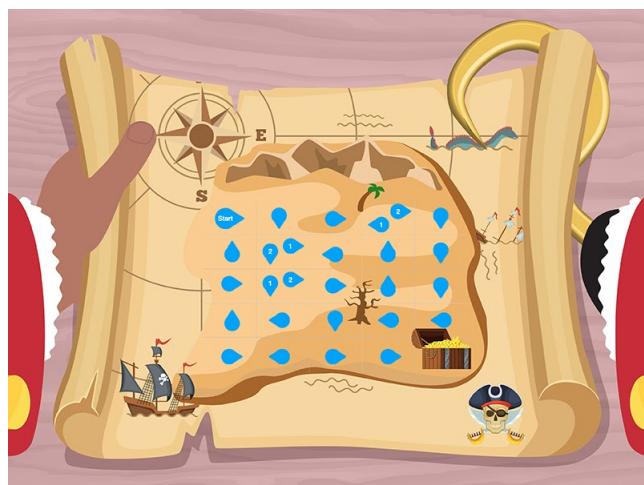


### Algorithms

Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them. (ACTDIP010 - see [cmp.ac/algorithms](https://cmp.ac/algorithms))

Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition). (ACTDIP019 - see [cmp.ac/algorithms](https://cmp.ac/algorithms))

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.





## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years 3-6

# Tech Collect

A fun find-a-word activity to improve students awareness of digital systems and their function

### This activity teaches...

Students in years 3 to 6 can improve their vocabulary and spelling as well as identifying digital systems.

This exercise improves students ability to scan for information, for example scanning a search engine or a piece of code.

### Getting started (read this with your child):

Can you name simple digital technologies e.g. computer, laptop etc that you see around you?

Digital systems are made up of parts - how many parts can you name (mouse, monitor, keyboard, etc). Read the list in the find-a-word - are there any words that you do not know? (This applies to parents too). Not all the items on the list are physical objects! Can you sort them into hardware (devices you can see) and software (computer programs?)

### Step by step

Ask your child to find the words in the list, if they get stuck they can move onto the next one and come back to it. They are written downwards, across, diagonally and some words are backwards.



### Keep learning: Classify animals using a decision tree algorithm

This lesson teaches students to use physical characteristics of different animals to develop an algorithm that allows you to easily group and identify each animal based on a series of simple questions.

For more information head to [cmp.ac/classifying](https://cmp.ac/classifying)

### Keep the conversation going

- Do you have these technologies in your house?
- Can you point them out? Can you already name these devices on sight?
- Do you know what each of them does? What purpose do they serve?
- How do these technologies make our lives easier?

### Linking it back to the Australian Curriculum: Digital Technologies



#### Digital Systems

- Recognise and explore digital systems (hardware and software components) for a purpose (ACTDIK001 - see [cmp.ac/systems](https://cmp.ac/systems))

- Identify and explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007 - see [cmp.ac/systems](https://cmp.ac/systems))

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.)

# Tech talk

Can you find the 18 technology words hidden below?  
Some are written backwards! Circle them and colour in  
the background when done.



Students

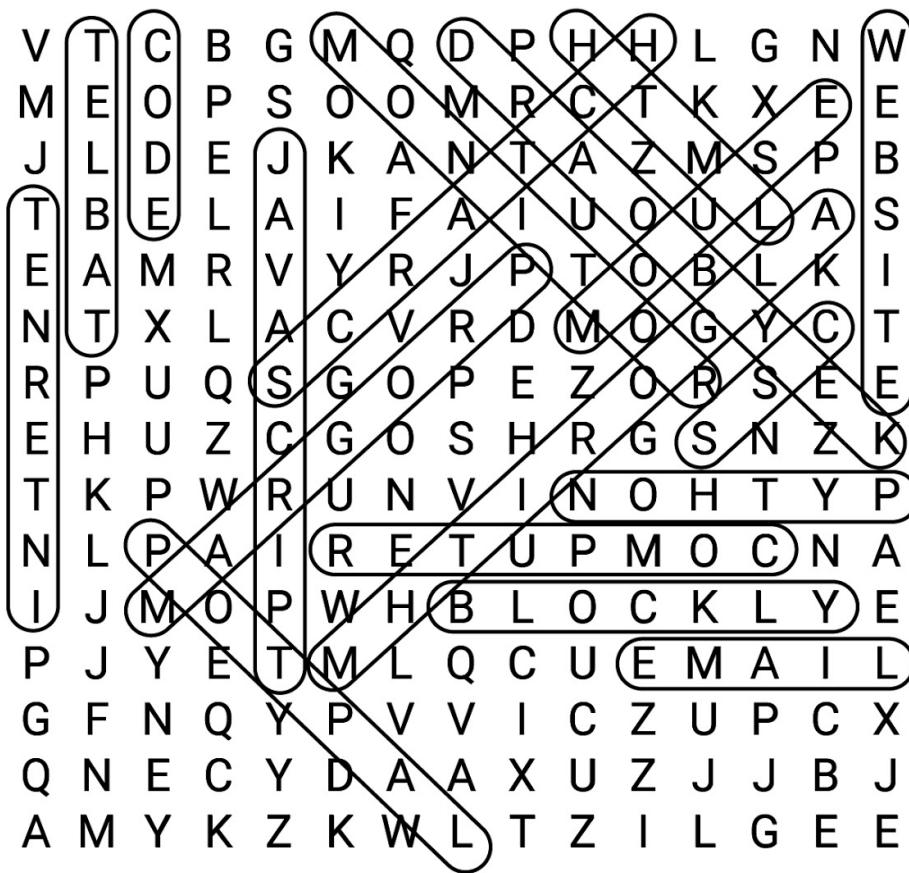
V	T	C	B	G	M	Q	D	P	H	H	L	G	N	W
M	E	O	P	S	O	O	M	R	C	T	K	X	E	E
J	L	D	E	J	K	A	N	T	A	Z	M	S	P	B
T	B	E	L	A	I	F	A	I	U	O	U	L	A	S
E	A	M	R	V	Y	R	J	P	T	O	B	L	K	I
N	T	X	L	A	C	V	R	D	M	O	G	Y	C	T
R	P	U	Q	S	G	O	P	E	Z	O	R	S	E	E
E	H	U	Z	C	G	O	S	H	R	G	S	N	Z	K
T	K	P	W	R	U	N	V	I	N	O	H	T	Y	P
N	L	P	A	I	R	E	T	U	P	M	O	C	N	A
I	J	M	O	P	W	H	B	L	O	C	K	L	Y	E
P	J	Y	E	T	M	L	Q	C	U	E	M	A	I	L
G	F	N	Q	Y	P	V	V	I	C	Z	U	P	C	X
Q	N	E	C	Y	D	A	A	X	U	Z	J	J	B	J
A	M	Y	K	Z	K	W	L	T	Z	I	L	G	E	E

Algorithm	HTML	Mouse
Blockly	Internet	Program
Code	JavaScript	Python
Computer	Keyboard	Scratch
CSS	Laptop	Tablet
Email	Monitor	Website

kostenkodesign/iStock.com

# Answer key

Do not show this to your child.  
Use this only to give your child a hint if they get stuck.


 Parents  
and carers

 Algorithm  
Blockly  
Code  
Computer  
CSS  
Email

 HTML  
Internet  
JavaScript  
Keyboard  
Laptop  
Monitor

 Mouse  
Program  
Python  
Scratch  
Tablet  
Website



Teachers


 Parents  
and carers

# Glossary

Something unfamiliar? Find it below for some more information.

Word	Simple Category*	Definition
<b>Algorithm</b>		An algorithm is a sequence of steps that you follow to solve a problem. When you cook using a recipe, do long division in maths, or put on your uniform in the morning you are following an algorithm!
<b>Blockly</b>	Programming Language	Blockly is a visual programming language. That means it is a 'drag and drop' style of programming with minimal typing. Here are some example blocks:  You can program in Blockly in some of the ACA Digital Technologies Challenges. Have a look here: <a href="https://aca.edu.au/resources/#blockly">https://aca.edu.au/resources/#blockly</a>
<b>Code</b>	Software	Code is what is used to give computers instructions. Computers can't understand English or any other human language! When you write code for computers, you write it in a programming language.
<b>Computer</b>		A computer is a machine that works with data. It can take data in as input, work with it and send back changed data as output. For example, a calculator is a computer. You give it a maths question as input data, it calculates it and it gives you the answer as output.
<b>CSS</b>	Programming Language	CSS is a text based programming language. CSS stands for "Cascading Style Sheet", it is a language specifically for programming how websites look. Without it, websites would look a lot more flat and boring.
<b>Email</b>	Software	Email is software that runs on a computer. It helps you to send a message by saving your message, transmitting it across the internet to a mail server (like a digital mailbox) of the person it is for.
<b>HTML</b>	Programming Language	HTML is a text based programming language. It is one of many languages used to program websites. If a website was a house, HTML would be the basic walls, doors and windows that make it work. Languages like CSS and Javascript add the furniture, paint and pictures that make it comfortable and nice to live in.
<b>Internet</b>		The internet is a connected network of computers. It is made up of millions and millions of them that can all talk to each other. It's a way of sharing information because you don't have to keep everything on your computer, you can ask others to show you information they are saving.

<b>JavaScript</b>	Programming Language	Javascript is a text based programming language. It is used to program interactivity on websites.
<b>Keyboard</b>	Hardware	A keyboard is a piece of hardware that helps you to interact with a computer. It has keys for all the letters of the alphabet as well as different punctuation marks and maths symbols.
<b>Monitor</b>	Hardware	A monitor is a piece of hardware that helps you interact with a computer. It is a screen that displays images. The computer has to run software to translate the data from 1's and 0's to images on the monitor that are easy for people to understand.
<b>Mouse</b>	Hardware	A mouse is a piece of hardware that helps you interact with a computer. It moves a mouse icon across a monitor screen so that you can interact with the computer without having to type.
<b>Program</b>	Software	A program is a collection of code that are instructions for a computer. When a program is run, the instructions are carried out by the computer. Programs can do all sorts of things!
<b>Python</b>	Programming Language	<p>Python is a text based programming language. You can use it to program computers. Unlike HTML, it is not just for one thing, it can be used for mathematics, websites, video editing, data processing, games... So much more!</p> <p>You can program in Scratch in some of the ACA Digital Technologies Challenges. Have a look here: <a href="https://aca.edu.au/resources/#python">https://aca.edu.au/resources/#python</a></p>
<b>Scratch</b>	Programming Language	<p>Scratch is a visual programming language. That means it is a 'drag and drop' style of programming with minimal typing. Here are some example blocks:</p> <p>You can program in Scratch in some of the ACA Digital Technologies Challenges. Have a look here: <a href="https://aca.edu.au/resources/#scratch">https://aca.edu.au/resources/#scratch</a></p> 
<b>Tablet</b>	Hardware	A tablet is a type of computer that has a touch screen as the primary way to interact with it. It can sometimes have a keyboard and mouse attached too.
<b>Website</b>		A website is a collection of files that are saved on a computer connected to the internet. When you visit a website with <b>your</b> device, it runs a program that can read those files and show you what is saved on that computer.
	<b>*categories</b>	Some of the words above don't fit easily into one category like 'Hardware' or 'Software'. Is it because they are both? What do you think they could be? Talk with your teacher or carer about what you think could be added as a category.





## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years 3-6

# Marble Run

### This activity teaches...

In computing, branching is making a decision that changes the flow, or outcome, of the program. A home computer makes decisions like this all the time, for example, *if a usb is plugged in, then it shows up in the file explorer*, or *if you click the chrome icon, the browser opens*.

But these decisions don't just exist in computers, they are in the physical world too. Trains switch to a different track *if a lever is pulled*, water flows through a dam *if the floodgate is opened*, electricity flows to your lights *if the switch is turned on*.

We're going to do a branching activity using a marble run, where changing a small element in the run, or flipping a switch, causes the marbles to change track.

This is a creative activity, designed to be made from simple materials lying around the house. It can be as complex, or as simple as you like.

It is targeted towards late primary students and will take a minimum of 30 minutes, maybe longer depending on the complexity of the marble run.

### You will need...

Materials to make a marble run!

- Paper
- Scissors
- Buckets/cups for marbles to fall into
- A wall or door that you can stick things too
- Floor space
- Lego
- A large tilted board to stick things to
- Hot wheels track

You could probably make this with just a wall, sticky tape, **marbles** and paper - but it's more fun to get creative with materials.

Some useful materials are:

- Toilet paper rolls
- Sticky tape

### Getting started (read this with your child):

We're going to make a marble run!



# Marble Run

Make your own marble run!



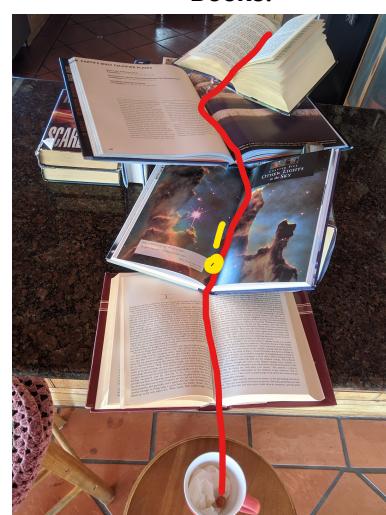
## Step 1: Simple marble run

Make a marble run.

Your marble run should be long enough that the marble travels for at least one second, and lands safely in a bucket at the end!

Don't make it too complicated just yet, we'll add extra stuff to it later.

Some example marble runs:



## Step 2: Add a decision

Add a *decision*, or *branch* to your marble run.

It should be something like a switch on a train track, where you can quickly change it back and forth.

It could be:

- A toilet paper roll with hole cut in it, and paper to easily put on top and seal it back up again
- A lego brick that can be added and removed
- An extra wire that diverts it off the track

## Step 3: A bigger marble run!

Make a new track that your marble takes if it branches off, so it ends up in a different bucket!

1. Paper run with two tracks!



There's a hole in one of the paper tubes that can be covered over - switching the marble to the new track.

2. Broken Guitar with an extra branch



A small cable twist tie diverts the marble off to the side.

## Step 4: If it's ok with your teacher, parent or carer, take a video of your marble run and ask them to share it on Twitter, Instagram or Facebook, tagging us (@auscompacademy)

See what other people have made!



# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

The basic concept of a marble run with decisions can be extended in a number of ways.

### Self sorting

If students have different sized marbles they could make a self sorting run. For example smaller marbles might fall through a hole, while larger marbles don't.

### Count the marbles

If you have access to a microcontroller, like a micro:bit or arduino, you could use a sensor to keep track of the number of marbles coming through. Is there an alternative way to do it without a digital system? What's the advantage of each?

## Keep the conversation going

- How is the branching decision that we make with marbles like computer branches?
- How is it different?

## Keep learning

For year 5/6 students interested in learning more about how computers make decisions, try this course: [cmp.ac/garden](https://cmp.ac/garden)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to take a video of their marble run, demonstrating the branching element.

## Linking it back to the Australian Curriculum: Digital Technologies



### Algorithms

Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition) (ACTDIP019 - see [cmp.ac/algorithms](https://cmp.ac/algorithms))

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.



## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers**This activity is for: Years 5-6**

# Wombot: Carrot Hunt

### This activity teaches...

We use algorithms to solve all sorts of problems around us. Algorithms are sequences of steps, or procedures, that lead us from a starting position to a goal. Some algorithms can be described easily (think about the recipe for making a cake), whilst others are harder to describe (think about a Sudoku puzzle).

The algorithm in this activity is somewhere between a cake recipe and a Sudoku puzzle: there are some procedural steps, and a bit of trial and error.

It is targeted towards students in years 5 to 6 and is expected to take up to **60 minutes**.

### You will need...

Printouts of the Wombot grid.

### Getting started (read this with your child):

Wombot is very upset: **five delicious carrots have gone missing!**

A bunch of Wombot's friends have joined in the carrot hunt — can you help?

Each Wombot is looking forwards and to each side to look for the carrots, and each of them can see some of the carrots, or none. Your job is to work out where the five carrots are!

### See a demonstration

[cmp.ac/carrothunvid](http://cmp.ac/carrothunvid)





Students

# Wombot: Carrot Hunt

Oh no! Wombot has lost five delicious carrots!

Wombot's friends have joined in the hunt, and they need help!

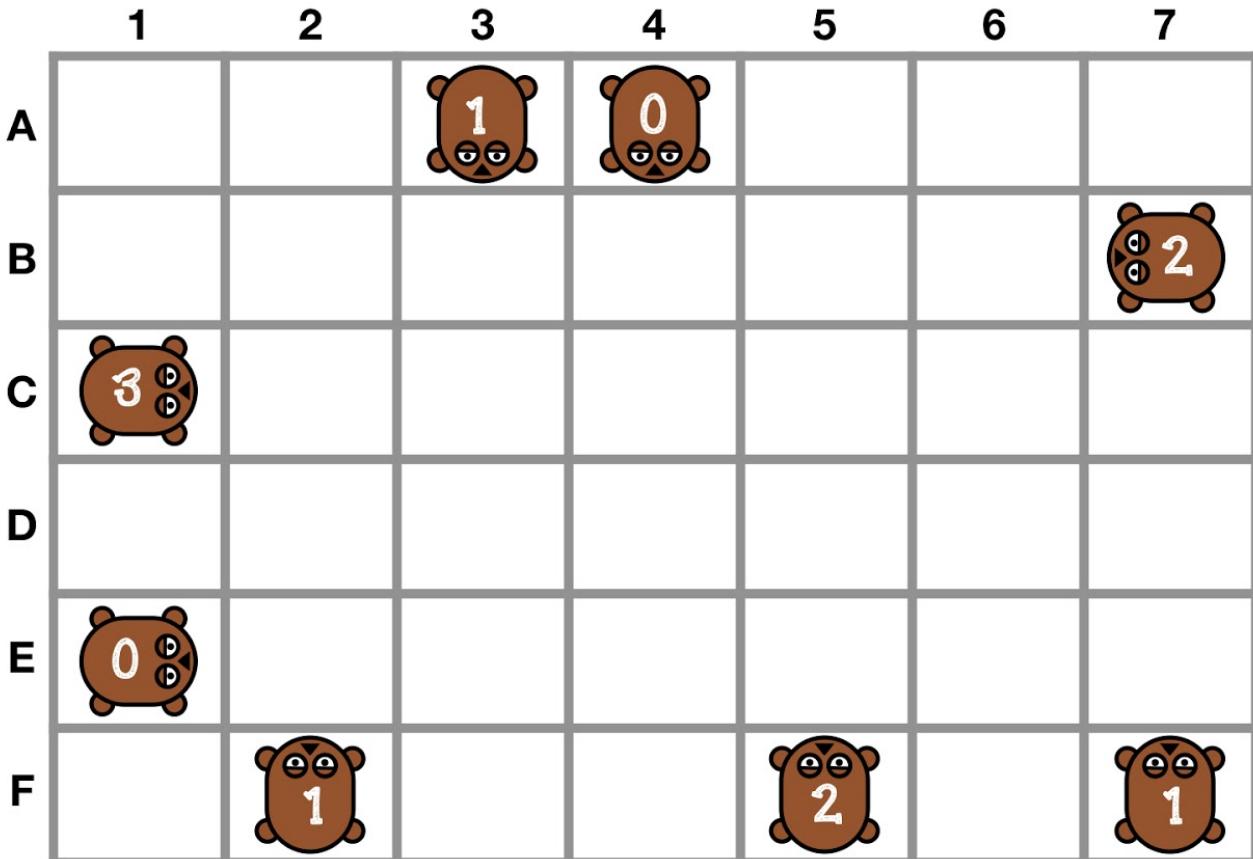


Image: Credit Grok Academy Limited (formerly the Australian Computing Academy, the University of Sydney)

# Wombot: Carrot Hunt

Oh no! Wombot has lost five delicious carrots!

Wombot's friends have joined in the hunt, and they need your help!



Students

## Preparation:

Cut out the five carrot markers and 30 no-carrot markers.

(You could also use a pencil to record whether or not there are carrots in squares on the grid.)

## Carrot markers



## No carrot markers





Students

## Step 1

All the Wombots are gathered around the garden looking for carrots.

Each Wombot has a **number** showing how many carrots it can see – in front, or to its left, or to its right.

	1	2	3	4	5	6	7	
A								
B							2	
C								
D								
E								
F								

Here is an example.

The Wombot at B7 has the number **2** on its back – so it can see two carrots.

The carrots must be *somewhere* on the orange lines.

## Step 2

If a wombot has zero on its back, then it doesn't see any carrots along its connected lines. Mark the places that are definitely free of carrots with an **X**.

	1	2	3	4	5	6	7	
A	X							
B	X							
C	X							
D	X							
E	0	X	X	X	X	X	X	
F	X							

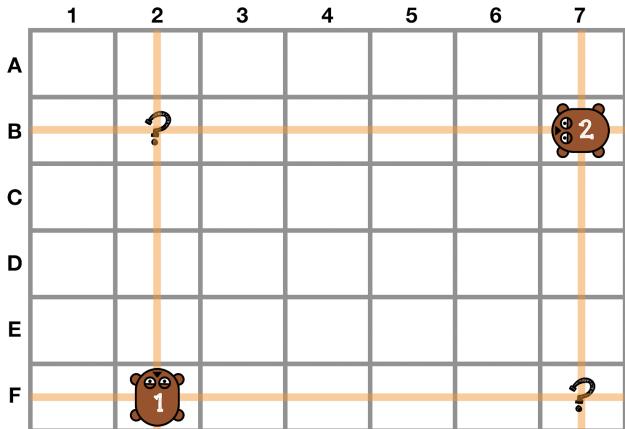
### Step 3

When two Wombots get together you can see clues to find the carrots. One place the carrots **could** be found is where the lines from the Wombots cross.

The Wombot at B7 can see **two** carrots, and the Wombot at F2 can see **one** carrot – maybe they are seeing one carrot together!

It could be that there is a carrot where the lines cross – **where the “?” is at B2 and F7!**

Now, a carrot might **not** be there – but it's a clue!



By looking at the numbers on the other Wombots you can combine the clues and work out where the carrots are hiding.

### Step 4

Follow the lines from each of the Wombots, and work out where the carrots must be!

Remember, each Wombot's number is the total number of carrots it can see, not more or less.

When you think you're sure of where a carrot is, mark the location with a **carrot marker**.

Mark all the places that you're sure **don't have carrots** with the **X** markers.

(Some of the Wombots **can't see any carrots** – that's a hint!)



When you have placed **all 5 carrot markers**, check if the numbers on each Wombot matches the number of carrots it can see. If you have made a mistake, place the carrot marker somewhere else – keep trying!

When you think you have it right, check the answers with your carer.

# Answer key

Choose if you want to print this for your kids or keep it to yourself!



A good place to start is with the Wombots that **can't see any carrots**.

You know that none of the carrots are on the lines drawn from those Wombots – so that's easy!

Put **X** markers on all of those spaces.

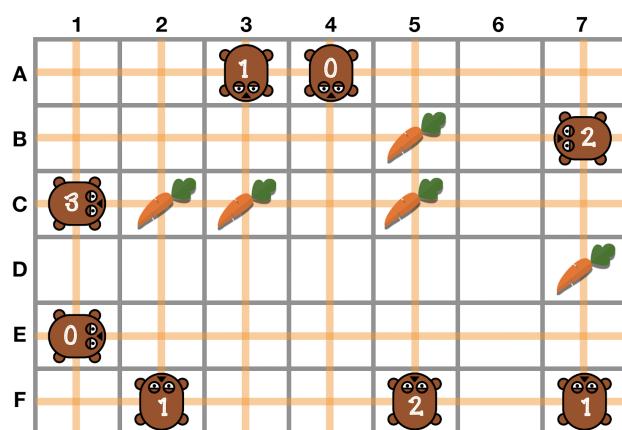
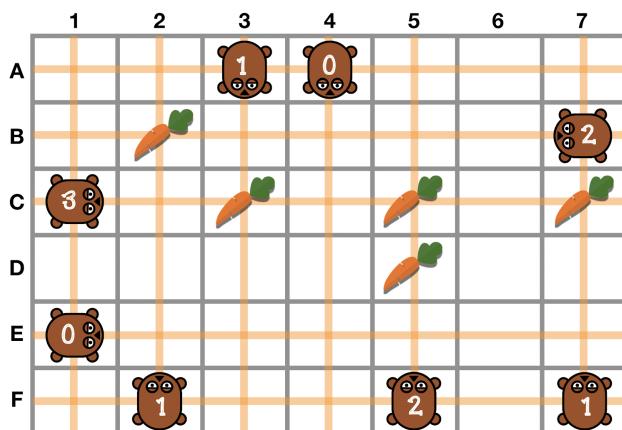
Then, you can start working out where the carrots might be. One Wombot can see three carrots – **and they all have to be across row C** (can you see why?). So you can try putting three carrots along row C, and then look at the other Wombots – do they see enough carrots? Or too many? Or too few?

## Some hints:

Some carrots can be seen by more than one Wombot.

One carrot can only be seen by one Wombot.

Here are two possible solutions:



Your student may have found another valid solution – there are at least three others!

# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Keep learning

Continue learning about algorithms with our friendly wombot by completing the Blockly Wombot DT Challenge: [cmp.ac/blockly-wombot](https://cmp.ac/blockly-wombot)

For a more challenging version of this activity take a look at Spaceship Rescue: [cmp.ac/spaceship](https://cmp.ac/spaceship)

## For teachers creating a portfolio of learning or considering this task for assessment:

Ask students to submit their solution recorded with a pen or pencil rather than markers.  
Students can design their own version of this activity by placing carrots and recording how many carrots each wombot can see, then asking a friend or family member to solve the new challenge.

## Linking it back to the Australian Curriculum: Digital Technologies



### Algorithms

Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition)  
(ACTDIP019 - see [cmp.ac/algorithms](https://cmp.ac/algorithms))

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.





## Digital Technologies @ Home

Unplugged activities for students



Teachers  
Parents  
and carers

This activity is for: Years 5-8

# Maze escape!

Many thanks to the Girls Programming Network who created this activity.

### This activity teaches...

In this activity students create an algorithm, or set of instructions, to navigate through a maze. To create the algorithm, students choose from a finite set of commands. We want students to create the **best** set of instructions to get through the maze - in this activity best means the fewest number of instructions.

Creating good sets of instructions is a very important concept in computing. Solving problems takes a computer's time and energy: as we ask computers to solve bigger and bigger problems (like climate modelling and searching for life beyond earth) it's important to find the most efficient solution available.

The commands students can use to get through the maze include two key programming ideas: **branching**: ie IF something is true THEN do something) and **iteration**: keep doing something a fixed number of times or until a specified condition is no longer true.

This activity is targeted towards students in years **5 to 8** and will take **1 to 2 hours**.

### Getting started (read this with your student):

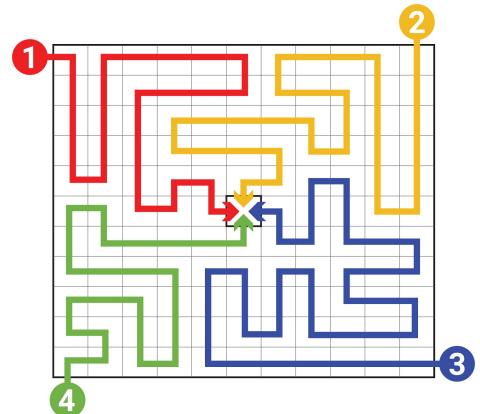
We're going to write a program to move a character to the center of the maze! Use the printed commands to create an algorithm, or set of instructions, to get to the centre of the maze, following one of the lines. Your goal is to use as few commands as possible.

You can do this activity in a few ways: you can use a printed copy of the maze, or you can use masking tape (if you have space) on the floor, creating a room-sized maze following the picture shown. You can either do this with a partner, taking turns coming up with instructions and then following them, or you can do it alone and just use a coin or other item on the print out to follow the instructions, making sure you follow them exactly.

You can print off and cut out all the commands for this activity, or you can write instructions out on a piece of paper.

### See a demonstration

[cmp.ac/mazevid](http://cmp.ac/mazevid)



# Maze escape!

Can you get to the centre of the maze with the fewest instructions?



Students

## Step 1

Either use the maze on the next page for this activity, or if you have space, you can create this maze on your floor using masking tape.

## Step 2

Cut out the commands on pages 4-9.

## Step 3

Using only the printed commands, create an algorithm to get you, a partner or a counter to the centre of the maze, following one of the lines.

## Step 4

With a partner, or alone, follow your Step 3 instructions exactly. Do they work? Do you need to change them a bit? Can you improve them at all?

## Step 5

If your first set of instructions gets you to the middle, work out how many points you earn (see step 6), then make a new set of instructions for the next path. Keep going until you have done all 4 paths.

## Step 6

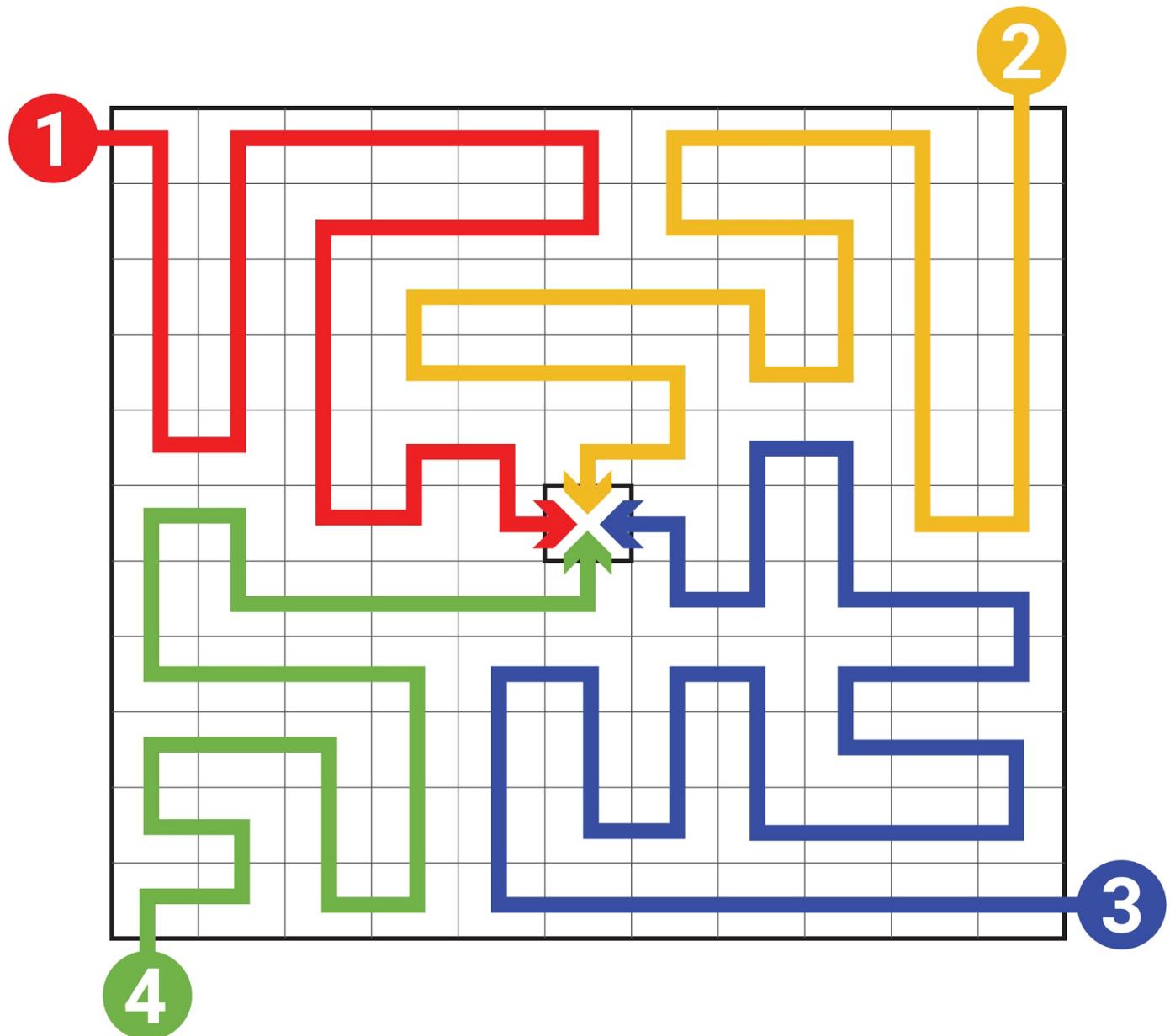
You earn points for each set of instructions. There are 4 paths to the centre of the maze. For each path, the less commands you use the more points you get!

- You get 10 points per path if your instructions have less than 12 commands.
- You get 8 points per path if your instructions have between 12 and 20 commands.
- You get 5 points per path if your code has more than 20 commands.

If you write a program that works on any of the paths and will get you (or your partner) to the centre, you get a **bonus 10 points**. Get **another bonus 10 points** if your instructions solve all the puzzles in **less than 7 lines**.

# Maze escape!

Can you get to the centre of the maze with the fewest instructions?



## Maze escape!

Can you get to the centre of the maze with the fewest instructions?



### Print off these commands

For \_\_\_\_ counts:



For \_\_\_\_ counts:



For \_\_\_\_ counts:



For \_\_\_\_ counts:



## Maze escape!

Can you get to the centre of the maze with the fewest instructions?



### Code snippets - while loop

While not at the end of maze:



While not at the end of maze:



While not at the end of maze:



While not at the end of maze:



## Maze escape!

Can you get to the centre of the maze with the fewest instructions?



### Code snippets - while loop

While there is path ahead:



While there is path ahead:



While there is path ahead:



While there is path ahead:



## Maze escape!

Can you get to the centre of the maze with the fewest instructions?



### Code snippets - if

If there is a path to the left:



If there is a path to the left:



If there is a path to the right:



If there is a path to the right:



## Maze escape!

Can you get to the centre of the maze with the fewest instructions?



### Code snippets

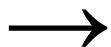
If there is a path in front:



If there is a path in front:



If there is a path in front:



If there is a path in front:



## Maze escape!

Can you get to the centre of the maze with the fewest instructions?

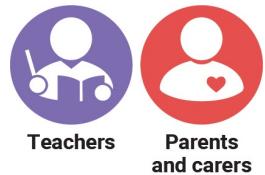


Turn to the right	Turn to the left
Turn to the right	Turn to the left
Turn to the right	Turn to the left
Turn to the right	Turn to the left
Turn to the right	Turn to the left
Step forward	Step forward



# Answer key

Choose if you want to print this for your kids or keep it to yourself!



There are many possible solutions to this problem. The most efficient solution uses **6 commands** that solves all mazes:

While not at the end of maze:  
→ If there is a path to the left:  
    → Turn to the left  
    If there is a path to the right:  
        → Turn to the right  
    Step forward

The reason we don't need the "If there is a path in front" before stepping forward - is because we've checked if the line turns already, it will always be forward.

**Here is an example to follow line 1 that would only earn 5 points:**

Step forward  
Turn to the right  
For 4 counts:  
→ Step forward  
Turn to the left  
Step forward  
Turn to the left  
For 4 counts:  
→ Step forward  
Turn to the right  
For 4 counts:  
→ Step forward  
Turn to the right  
Step forward  
Turn to the right

(continued):  
For 3 counts:  
→ Step forward  
Turn to the left  
For 4 counts:  
→ Step forward  
Turn to the left  
Step forward  
Turn to the left  
Step forward  
Turn to the right  
Step forward  
Turn to the right  
Step forward  
Turn to the left  
Step forward

There are many possible solutions! The best way is to run through someone's program to see if it gets you to the end!



# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

Once students understand how to complete this activity, ask them to perform similar steps using a map - or the steps to get to their bedroom.

## Keep the conversation going

- What were some strategies that you used to solve the problem?
- How does it relate to other types of instructions like directions or navigation?
- Did you see any repeated patterns within the solution? In programming we have functions that could repeat a certain pattern - even if they don't come directly after each other.

## Keep learning

To move this type of thinking into the computer, students can write their own programs that follow these types of steps! We recommend trying the Blockly Turtle course:

[cmp.ac/blocklyturtle](https://cmp.ac/blocklyturtle)

For younger students who would like to create a maze using the Scratch programming language, there is a printable step by step guide available here:  
[cmp.ac/scratchmaze](https://cmp.ac/scratchmaze)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to submit their best algorithm for the 4 paths in this worksheet.  
You could also ask them to design their own maze and best algorithm.

## Linking it back to the Australian Curriculum: Digital Technologies



### Algorithms

Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition)  
(ACTDIP019 - see [cmp.ac/algorithms](https://cmp.ac/algorithms))

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.





## Digital Technologies @ Home

Unplugged activities for students



Teachers



Parents  
and carers

This activity is for: Years 4-6

# Cracking a code – give your passwords superpowers

## This activity teaches...

How many guesses will it take to crack the code set by your partner?

Students do this activity with a parent / carer / sibling. Player 1 chooses a three digit code using only numbers between 1 and 6 (for example 235 or 532 or 625 but not 743). Player 2 has 10 chances to guess the number. After each guess Player 1 gives Player 2 information to help them improve their guess.

Students and their families use passwords every day to secure information as basic as their order for a favourite pizza or as important as their bank account or school exam results. It's really important to keep this information secure.

It's fairly simple to guess a 3 digit code created using 6 numbers within 10 guesses. Short passwords can be easily cracked too. Maths tells us that in our game there are  $6 \times 6 \times 6$ , or 216 possible combinations. Adding an extra digit to the code would make it **much** harder to guess: there would now be 1,296 combinations. If we used eight digits in our password there would be 1,679,616 possible passwords (sticking to six numbers only). If we include all 10 digits and twenty six letters in the alphabet (upper case or lower case), we also make passwords much harder to crack: a 3 digit or letter password now has 238,328 combinations. Length matters with passwords, and at the end of the activity students will have a strategy to choose their own strong passwords.

This activity is expected to take 30 to 60 minutes.

## Getting started (read this with your child):

Can you crack the code? Imagine that all that stands between you and a vault full of cash is a combination lock with 3 digits. All the numbers are between 1 and 6. Use your logic powers to crack the code! Once you have cracked the code, use your new skills to create passwords with super powers!

## See a demonstration

[cmp.ac/codecrackervid](http://cmp.ac/codecrackervid)



# Crack the code

How many guesses do you need to crack open the vault?



## Step 1

Player 1: choose a 3 digit number using only numbers between 1 and 6. Write it down to remember it, but keep it secret from player 2. You can use the same number more than once.

## Step 2

Player 2: write your first guess in line 1 of the table.

## Step 3

Player 1: in the smaller boxes on line 1, let Player 2 know how good their guess was:

If they have a number that's the right number in the right place, draw a .

If they have the right number in the wrong place, draw a ?

If they guess a number that isn't in your number at all, draw a X

For example: If Player 1 is thinking of 653 and Player guesses 321, they would get a result of   X : one number (3) is the right number in the wrong place, and two numbers (2 and 1) aren't in the code at all.

1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

## Step 4

Repeat steps 2 and 3 in the next rows of the table as many times as you need until Player 2 guesses Player 1's number.

Code:	6	5	3	
1	3	2	1	?
2	4	5	6	✗ ✗ ?
3	6	2	4	✓ ✗ ✗
4	6	5	1	✓ ✓ ✗
5	6	5	2	✓ ✓ ✗
6	6	5	3	✓ ✓ ✓ ✓

Here's how a game looks if the code is  
'653'



Students

## Step 5

Play the game again but instead of **numbers** this time agree with your partner on six items in a group: say, favourite foods (chocolate, donut, apple, cherry, salami, tomato) or superheros (Spiderman, Iron Man, Black Widow, Black Panther, Captain Marvel, Thor). Write the list down so you can both see it.

Play the game again - so Player 1 might choose **Thor - Iron Man - Spiderman**. If Player 2 guesses **Black Panther-Iron Man-Thor** - the feedback would be **X ✓ ?**.

## Step 6

You can use this game to make really strong passwords. If your password is only 3 characters long, computers can guess your password **almost instantly**. If you use a password with 20 characters it will take much longer. So next time you need to choose a password think about your three favourite things in a group - foods, superheros, TV shows. This will make a nice long password that you can remember easily but computers can't crack easily. For example the password

**ThorIronManSpiderMan** would take **607 million years** for a computer to guess with today's technology! Always remember to use long passwords. You can check your password here:

[www.howsecureismypassword.net](http://www.howsecureismypassword.net)

1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

**Write down the six item here (eg Spiderman, Iron Man, Black Widow, Black Panther, Captain Marvel, Thor):**

## Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers

## Adapting this activity

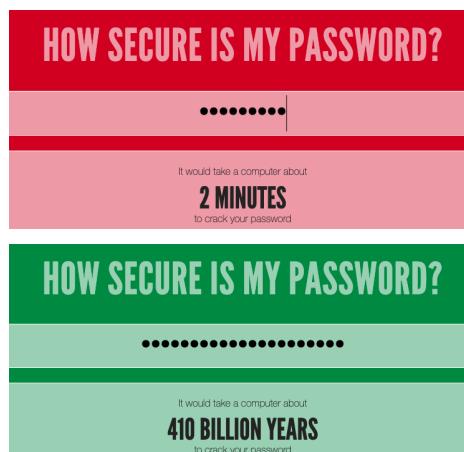
This activity could be adapted for learners of many ages by: using colours instead of numbers (for example, guess a three colour code made of green, red, blue and yellow), using all digits between 0 and 9 in the first game, or beginning with a four digit code.

## Keep learning

To explore password security, and other key issues around information privacy, enrol students in the Information Privacy and Security Schools Cyber Security Challenge:

[cmp.ac/infosec](http://cmp.ac/infosec)

To see in real time how secure different lengths of passwords are, look at:  
[www.howsecureismypassword.net](http://www.howsecureismypassword.net) (also good to view on a mobile device.)



## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to suggest tips for creating a secure password.

Students can create their own code-cracking game using the principles in this game.

## Linking it back to the Australian Curriculum: General ICT Capabilities

### Apply personal security protocols

identify and value the rights to identity, privacy and emotional safety for themselves and others when using ICT and apply generally accepted social protocols when using ICT to collaborate with local and global communities.

Refer to [aca.edu.au/curriculum](http://aca.edu.au/curriculum) for more curriculum information.



## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years 5-8

# Unscrambling a secret message

### This activity teaches...

We can make a message secret by changing the letters to create an *encrypted message*. This change process is called a *cipher*. Anyone who knows the cipher can reverse it, *decrypting* the secret message to get the original back. The message is still there, but hidden, because we've changed how we *represent* it.

Simple ciphers, such as Pig Latin<sup>1</sup> or Caesar Cipher<sup>2</sup>, can be cracked to find the original message and the cipher.

We use *secure* ciphers (that are extremely hard to crack) to protect communication on the Internet, e.g. to stop hackers getting our credit card details when we shop online. Without encryption, every message we send is at risk.

In this activity, the message is encrypted by swapping letters (a *substitution cipher*). There is no pattern to how they are swapped, except that each letter always swaps to the same one. Here, the cipher encrypts every G by swapping it to an A, so to decrypt the message, we must swap every A back to an G.

You can crack the substitution cipher to find the original message by looking for familiar words and letter patterns in the encrypted message. Good luck!

This activity will take up to **60 minutes**. Print pages **2** for students. The answer appears on page **3**. If you are a teacher, read through page **4** for further information.

### Getting started (read this with your child):

We're going to unscramble a hidden message, using our understanding of English and commonly used words, and learn about one way to send hidden messages. We're going to crack a cipher!

<sup>1</sup> [https://en.wikipedia.org/wiki/Pig\\_Latin](https://en.wikipedia.org/wiki/Pig_Latin)

<sup>2</sup> <https://cryptii.com/pipes/caesar-cipher>



# Can you unscramble the message?



The letters have been jumbled up. Use the grid at the bottom to write down your answer for each letter. Use your knowledge of words to figure out what the message says.

The first word has only one letter. How many one letter words do you know? It can't be **A** because the answer grid shows us that when you see a **G** in the scrambled message, this becomes **A** in the unscrambled message (the top line). So it must be **I**. Go ahead and find all the other letters **Y** in the scrambled message and write **I** above them. Also write **I** above **Y** in the answer grid at the bottom of the page.

Look for other parts of words that you recognize.  
On the third line the letters **BCGJ** are unscrambled to be **\_HAT**. Think of a word that ends in **HAT**. It might be **THAT**, but we already know that **J** in the scrambled message becomes **T**, and this scrambled word starts with **B**. Once you have figured out what to change letter **B** to, write it above **B** everywhere you see it in the message and also in the answer grid, then look for other parts of words you recognise.

## Unscramble this message

									<i>T</i>				<i>A</i>	<i>T</i>		<i>M</i>	<i>Y</i>
<i>Y</i>		<i>Z</i>	<i>Y</i>	<i>P</i>	<i>W</i>		<i>J</i>	<i>H</i>		<i>W</i>	<i>G</i>	<i>J</i>		<i>A</i>	<i>L</i>		
						<i>T</i>	<i>B</i>							<i>T</i>	<i>H</i>		
	<i>B</i>	<i>W</i>	<i>W</i>	<i>J</i>	<i>R</i>	<i>Y</i>	<i>N</i>		<i>B</i>	<i>Y</i>	<i>J</i>	<i>C</i>					
				<i>H</i>				.			<i>H</i>	<i>A</i>	<i>T</i>				
<i>E</i>	<i>C</i>	<i>W</i>	<i>W</i>	<i>V</i>	<i>W</i>	.		<i>B</i>	<i>C</i>	<i>G</i>	<i>J</i>		<i>Y</i>	<i>V</i>			
<i>T</i>	<i>H</i>			<i>B</i>			<i>T</i>		<i>B</i>		<i>A</i>		-				
<i>J</i>	<i>C</i>	<i>W</i>		<i>R</i>	<i>W</i>	<i>V</i>	<i>J</i>		<i>R</i>	<i>D</i>	<i>W</i>	<i>G</i>	<i>P</i>	-			
		<i>A</i>		<i>T</i>							<i>U</i>	?					
<i>I</i>	<i>G</i>	<i>V</i>	<i>J</i>		<i>I</i>	<i>H</i>	<i>D</i>		<i>L</i>	<i>H</i>	<i>M</i>	?					

## Write your answers here

<i>M</i>		<i>H</i>				<i>A</i>			<i>T</i>			<i>U</i>					
<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>	<i>K</i>	<i>L</i>	<i>M</i>					
						<i>B</i>											
<i>N</i>	<i>O</i>	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>	<i>T</i>	<i>U</i>	<i>V</i>	<i>W</i>	<i>X</i>	<i>Y</i>	<i>Z</i>					





Teachers


 Parents  
and carers

# Answer key

Print this for yourself to check your child's answers.

## The unscrambled message

I		C	I	K	E		T	O		E	A	T		M	Y
Y		Z	Y	P	W		J	H		W	G	J		A	L

	W	E	E	T	B	I	X		W	I	T	H			
	B	W	W	J	R	Y	N		B	Y	J	C			

C	H	E	E	S	E	.		W	H	A	T		I	S
E	C	W	W	V	W	.		B	C	G	J		Y	V

T	H	E		B	E	S	T		B	R	E	A	K	-
J	C	W		R	W	V	J		R	D	W	G	P	-

F	A	S	T		F	O	R		Y	O	U	?		
I	G	V	J		I	H	D		L	H	M	?		

## The completed answer key

M	W	H	R	C	J	A	N	F	T	P	Y	U
A	B	C	D	E	F	G	H	I	J	K	L	M

X	Q	K	D	B	Z	O	G	S	E	V	I	L
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

# More information

Here are some further activities, online resources, assessment ideas and curriculum references.



## Adapting this activity

Once students understand how to complete this activity, ask them to prepare a hidden message for a family member, or in an online class, for a classmate. It helps to have short words in the message if you want to crack them.

## Keep learning

For year 7 to 10 students interested in learning more about how computers communicate with encrypted messages, try this course:

[cmp.ac/crypt0](https://cmp.ac/crypt0)

An additional hands-on lesson plan further exploring cryptography is available to download at  
[cmp.ac/cipherwheels](https://cmp.ac/cipherwheels)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to create their own scrambled message using a substitution cipher that they create.

Students could also explore when cryptography is necessary for securing data by making a list of data they frequently send online: examples include messages, searches eg, for netflix, bus timetables, recipes, banking transactions, purchase of movie tickets, submitting school work. Students can then sort these transmissions into activities where encryption is (i) necessary (ii) a good idea (iii) unnecessary.

## Linking it back to the Australian Curriculum: Digital Technologies



### Digital systems

Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance (ACTDIK023 - see [cmp.ac/systems](https://cmp.ac/systems))

Cryptography is an important part of investigating the transmission of data.

### Cryptography

**Cryptography allows a message to be securely stored and transmitted.**

Students explain why cryptography is necessary for securing data (e.g. transmitting credit card details over the web) and explore simple encryption and decryption algorithms (e.g. rot13 and XOR).

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.



## Digital Technologies @ Home

Unplugged activities for students



Teachers

Parents  
and carers

This activity is for: Years 3-4

# Flat Pack LEGO

LEGO is a trademark of the LEGO Group

### This activity teaches...

This activity teaches an introduction to Algorithms using LEGO construction bricks. The students will be required to represent different blocks using only words (Data representation) and deliver explicit instructions (algorithms) to another student to help them to build a LEGO figure.

It is targeted towards primary students and is expected to take between 30 minutes and 1 hour. Print page 2 for your student and pages 4+ for yourself.

### You will need...

LEGO

Pen and paper

### See a demonstration

[cmp.ac/legovid](http://cmp.ac/legovid)

### Getting started (read this with your child):

When you buy “flat pack furniture”, it comes as parts in a box with instructions to help you build it correctly. You might have helped to build some! We’re going to make a LEGO creation and see if we can write the best instructions possible to help someone else build it without you there to help them. Just like a flat pack LEGO creation!

### Step by step

Give the student 10-15 minutes to create something from LEGO using 10 pieces or less. Encourage simplicity: it doesn’t have to be amazing, it just has to contain 10 pieces. The student should keep their final product a secret so they can accurately test their instructions.

Once built, give them another 10 or so minutes to write instructions that someone will need in order to replicate their creation. The instructions should include the name of what they are building in the title, for example “a washing machine”, “my friend Kelly”, “an alligator”.

Once the instructions are written, the student gives the instructions and the LEGO pieces to someone else, ideally in exchange for the other person’s pieces and instructions. Give the students 10 minutes to try and build each others’ creations. (We recommend 10 minutes as 5 is often too short but 15 can make a frustrating creation become discouraging.)

After the time is up, come together and see how you did. Discussions will naturally start about what worked and what didn’t. Try and guide them to what improvements they can make to their block names and directional instructions. After a few repeats consider integrating diagram or photographic instructions. They will likely increase the success rate and lower the time taken to build.



# Flat Pack LEGO

Help someone else to recreate your LEGO creations by writing the best instructions possible!



LEGO is a trademark of the LEGO group

## Step 1

Build a LEGO creation in 10 pieces or less. It can be an animal, a person or an object. Whatever you can build in 10 pieces is great! Keep the finished creation a secret for now.

## Step 2

Once you have designed and built your creation, write instructions on how to build it. They can be as long or as short as you like, but try to make them as clear and easy to follow as possible.

## Step 3

Break your creation back into pieces. Now, give the pieces and your instructions to someone and see if they can build your creation. They might give you instructions and LEGO to build too, follow their instructions carefully.

## Step 4

When they are finished or time is up, check and see. How did they do? Did they make exactly the same thing? If they didn't, talk to them about what was confusing in your instructions, how can you make them clearer?

## Step 5

Rewrite your instructions until the builder makes it perfectly. If the builder already knows how to build it, you might have to come up with a new creation for them. What else can you add to your instructions to make it easier to understand?



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Developed by the Grok Academy Limited (formerly the Australian Computing Academy, the University of Sydney). Find out more: [grokacademy.org](http://grokacademy.org), get help: [help@grokacademy.org](mailto:help@grokacademy.org)

# Answer key

Choose if you want to print this for your kids or keep it to yourself!



Teachers


 Parents  
and carers

## The ideal instructions

The overall solution to this activity are instructions that provide enough information for the builder so that they can successfully build your creation. The instructions can take many forms but the key factors are:

- Clear definitions
- Clear context

Let's unpack those a bit more.

### Clear definitions

Ideal instructions will define a few things before you get started. You need to make sure that the builder knows without a doubt which blocks are which, or they're going to build off the plan.

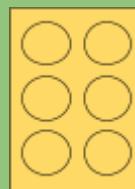
You should also define your rotations, this is important for terms like "left, right top" etc. Should left mean 30 degrees left? 90 degrees? Starting from where? This brings us to the second major part, context.

### Clear context

The position of the pieces needs to be contextualised so that you know what edge is the left, the top etc. Consider a block that is 2x3 circles big. Which is the left hand edge?



This is the same block, which is the left hand edge now?



It all depends on the context which you can give your builder by having a chat beforehand, or by including extra details about how to place pieces when they are setting up to build.

**There's no official LEGO terminology for parts (aside from their part numbers) so it's completely up to you! Just make sure that you give the names clear context and definition.**



Teachers


 Parents  
and carers

## Diagrammatic or Photographic Instructions

Visual instructions can be just as good, if not better. But why?

If your student has struggled to contextualise spatial instructions (e.g. 'up, down, the top, turn left, rotate upward'), they're not alone!

It's really hard to define all the spatial aspects necessary for clear 3D instruction.

A photo or diagram has a lot of this information implicitly\* present. The spatial position of the block is already communicated so instructions to "flip it over" can be taken in the content of that image and interpreted more easily. This is why so many building instructions contain very few words but many images.

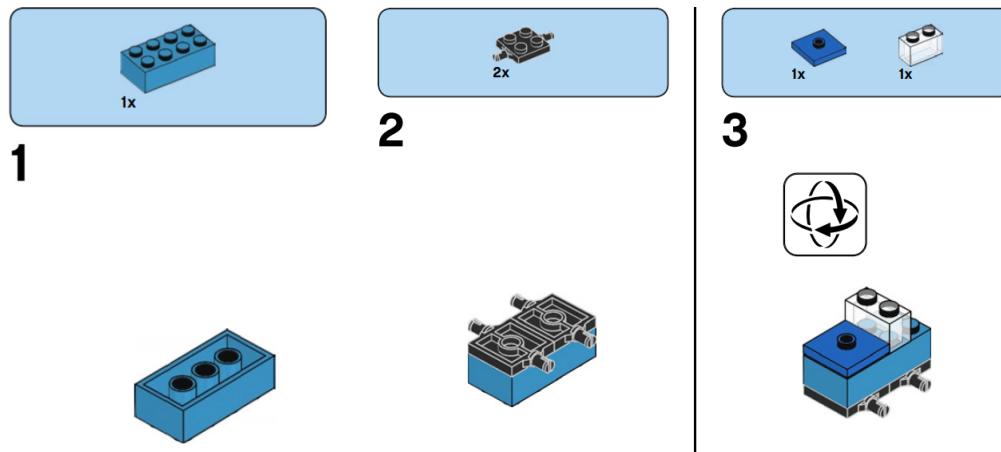
The LEGO website has all of its kits instructions available for download, the link is here:

<https://www.lego.com/en-us/service/buildinginstructions>

They have helped people build creations for decades and most of that is done with pictures (though partly because they are catering to children who may not be able to read yet).

Another alternative is IKEA building instructions which are also primarily visual.

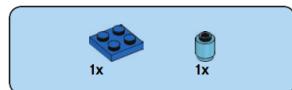
Here's an example from LEGO kit number 11006.



\*Definition of "implicitly": in a way that is suggested but not communicated directly (Cambridge Dictionary)



Teachers


 Parents  
and carers


4



5



6

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There's still some **context** and **definition** needed, even with these instructions. Can you see the symbols that need defining? The arrow and the 'rotate' symbol. Both of these are contextualised by the images before and after them. Before the rotate symbol, the LEGO in 2 is upside down, in 3 the rotate symbol is present and the image of the piece is flipped.

Similarly, the image where the arrow first appears and the one after it show that the piece has started at the blunt end of the arrow and been placed where the point is. It's telling your brain where to put the block without you even knowing it!

# Want more?

Here are some further activities, online resources, assessment ideas and curriculum references.



Teachers


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## Adapting this activity

If students really want a challenge, they can sit back to back with each other. The student that designed the creation has to explain how to build it to the other student. They are not allowed to look at what the other student is doing. It adds complexity but also increases the obviousness of where language might fail in their instructions.

With some careful planning, this activity can be run over a video conferencing setup. However you must make sure that students have access to the same LEGO pieces.

## Keep the conversation going

- Is it easier to build the creation if you know what it is supposed to be?
- Is it easier to write instructions in words or in pictures?
- Is it easier to read instructions in words or in pictures?
- What if the person who was building your creation was colourblind? How could you help them find the right blocks? How important are colours to your creation?
- What were some strategies that you used?
- What do you need to tell the person building your LEGO so that the instructions work?
- If you could design your own LEGO piece, what would it look like? Where could you use it?

## Keep learning

Try drawing using Blockly code blocks here:

[cmp.ac/blocklytree](https://cmp.ac/blocklytree)

## For teachers creating a portfolio of learning or considering this task for assessment

Ask students to run this activity with a member of their family. Have them report on the success/failure of their build as well as feedback from their 'builder'.

Based on the feedback from the builder and observations of their own they should update the instructions to be clearer. They should then run another build trial and record the results.

They could also conduct research on building instructions (provided by you or found independently, suggestions are LEGO, IKEA) and write what findings they draw from the examples.

## Linking it back to the Australian Curriculum: Digital Technologies



### Algorithms

Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them ([ACTDIP010](#) - see [cmp.ac/algorithms](#)) (3-4)



### Specification

Define problems in terms of data and functional requirements drawing on previously solved problems ([ACTDIP017](#) - see [cmp.ac/specification](#)) (5-6)

Refer to [aca.edu.au/curriculum](https://aca.edu.au/curriculum) for more curriculum information.