PRIMO

Coding with Cubetto - Unit 3

Year 1, Ages 5 to 6, UK National Curriculum

Subjects covered:

English

PSHE

Maths

Art & Design

Science

Resources provided:

Mouse algorithm

Mouse maze

Algorithm examples

3D net templates 1-5

Board template

Materials required:

6x Cubettos

6x Boards

6x Sets of Blocks

6x Standard Maps

Introduction

The Cubetto Playset is a Montessori inspired coding toy that allows children ages 3 to 6 to program a friendly wooden robot without screens and is powered by a programming language you can touch.

New technology can sometimes be overwhelming to understand and adopt. The activities contained in this guide were created by educators for educators.

We want to make it simple for you to integrate the Cubetto Playset and its tangible programming language into your teaching.

Development and learning in other key areas

Beyond coding

The collaborative nature of Cubetto makes it an extremely versatile tool for the classroom. Cubetto fosters learning in key development areas that go beyond programming.

Communication

Children practice listening through a range of stories and narratives in relation to Cubetto, accurately anticipating key events and responding with comments, questions or actions. They also develop their own narratives and explanations.

Dexterity

Children develop coordination in large and small movements around the playset. They negotiate the placement of obstacles around the world map and place blocks on our tangible interface.

Social-Emotional

Children become confident by trying new, open-ended activities that remove “wrong” outcomes, and easily encourage group work. The open nature of the maps allows them to choose the resources they need for their play session.

Mathematics

Children add and subtract blocks to a sequence. They solve problems, including doubling and halving to get Cubetto from A to B. They discuss size, shapes and patterns, distance, position, and time to solve problems.

Logical reasoning

The blocks allow children to create and debug simple programs with their hands. They use technology purposefully to create, organise, store, manipulate and retrieve meaningful sequences.

Introducing the Playset

Introducing Cubetto

Introduce Cubetto as a friendly robot that children can program. Children should be told that Cubetto cannot think for himself, and can only move as programmed by the child, just like any other machine. If in a group setting, sit children in a circle, and allow them to pass Cubetto around to one another, saying hello or acknowledging the presence of the object.

Doing so forms a bond with Cubetto, in the same way they would with a stuffed animal, or a toy, and solving problems through narratives later on is more engaging.

Introducing the Board

Introduce the Board as a remote control that children can use to send instructions to Cubetto.

Without the Board, there is no way of sending Cubetto his instructions.

It is important for children to understand Cubetto is only able to move with a human's command. This is not only empowering, but also key to understanding computing.

Encourage children to also explain what other objects in their homes and lives function within a similar paradigm. A television needs a human to change its channels for example, or a washing machine needs a human to select its settings.

These examples, like Cubetto, are machines that need human programming to do their job.

Introducing the Blocks

Introduce the Instruction Blocks as the directions Cubetto follows when inserted in the Board and sent by pressing the action button.

Different Blocks represent different instructions, and an unambiguous, distinct command. These Blocks are what make up Cubetto's hands on coding language, and are key in the learning of computational thinking.

When each block is inserted in the Board, a child should be encouraged to predict what Cubetto will execute before pressing the "Go" button.

This is key in understanding concepts like program design, and it helps develop abstraction.

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Unit 3 Overview

Year 1

By the end of the unit pupils will be able to:

- Understand what an algorithm is, how it is implemented on devices, and that programs execute by precise instructions.

- Pupils will also be able to create and debug a simple algorithm.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4
NC Computing Objectives	To create a simple algorithm	To create a simple algorithm	To create a simple algorithm	To create a simple algorithm
Outcomes	• I can make Cubetto move • I can name 2D shapes	• I can move Cubetto to a specific place • I can identify 3D shapes	• I can create a simple algorithm • I can draw 2D shapes	• I can create a simple algorithm • I can identify two halves that make a 2D shape
Cross-curricular Subject	Maths	Maths	Maths	Maths
Computational Thinking	Algorithms, Creating	Algorithms, Creating	Algorithms, Creating	Algorithms, Creating
Main Activities	Cubetto the 2D shape detective 1. Collect as many shapes as you can! Take a card from a feely bag containing the name of a 2D shape. Create an algorithm to find the shape using Cubetto. 2. Play the Pelmanism game. Turn over two cards at random and see if they match. If they do, you get a point!	Cubetto the 3D shape detective 1. Order the events for making a pizza and recap algorithms. Work with a partner to collect as many 3D shapes as you can, matching the cards to the solid shapes. 2. Using an outside grid, program your 'robot partner' to collect as many bean bags as they can using directions.	Cubetto the artist 1. Compare Cubetto and a remote control car. Write algorithms to make Cubetto draw a square. Your partner draws a smaller or bigger one. 2. Cut 2D shapes in half and challenge a friend to go on a 2D shape hunt, matching one half of your 2D shape to the other.	Cubetto's halves 1. Discover how bikes and cars use computers, then turn Cubetto into a Shape Robot! Match halves of shapes and program Cubetto to find the other half. 2. Find the photo of your face and cut it in half. Stick it to paper and ask a partner to draw the other half.
Challenge	Put obstacles on the map. Can you collect a shape without touching any of the objects?	Draw your face, place it on the map and ask a friend to make Cubetto find you!	Use the random block to draw different shapes using Cubetto.	Collect cubes and order them from largest to smallest. Stack them on Cubetto!
Creative Play	Make Cubetto some 2D shape glasses to wear!	Role play Cubetto and the Board. The Board is in charge!	Make Cubetto a party hat using only 2D or 3D shapes.	Create a shelter for Cubetto to rest at night.
Resources	Board template, Maze picture, 2D shapes & cards, Feely bag & pens	3D shape cards, Various 3D shapes, Feely bag & chalk, Bean bags & bucket	Board template, 2D shapes & paper, Remote control car, Blank grids &	Pictures of tech, 2D shapes cut in ½, Children's faces, Paper & pencils.
Assessment	Shapes, Photos, Observation, Verbal statements	Shapes, Photos, Observation, Verbal statements	Grids, Photos, Observation, Verbal statements	Shapes, Photos, Observation, Verbal statements

	Lesson 5	Lesson 6	Lesson 7	Lesson 8
NC Computing Objectives	To create a simple algorithm	To create a simple algorithm	To create a simple algorithm	To create a simple algorithm
Outcomes	• I can create a simple algorithm • I can draw and correctly name 2D shapes	• I can create a simple algorithm • I can identify two halves that make a whole image	• I can create a simple algorithm • I can use the function line	• I can create a simple algorithm • I can correctly identify 3D shapes from a net
Cross-curricular Subject	Maths	Maths	Maths	Maths
Computational Thinking	Algorithms, Creating	Algorithms, Creating	Algorithms, Creating	Algorithms, Creating
Main Activities	Cubetto's lollies 1. Introduce Ada Lovelace as first computer programmer. Use the function block to move Cubetto around the map, collecting lollipop sticks that you use to make different 2D shapes – take photos and share with the class. 2. Re-order the mixed up algorithm to get the mouse to the cheese, avoiding all the obstacles!	Cubetto to the rescue! 1. The evil Pyramido has cut your favourite characters in half! Choose one half and use the opposite block to write an algorithm to find the other half, then stick into your story book. 2. Compete against the other team to put all the 2D tiles back together to form stepping stones across the playground!	Cubetto gets stuck! 1. Watch an aeroplane land and learn about how they're controlled by computers. Program Cubetto to get to safety from the water, using the function line. 2. Write a friend's name in different squares on a blank map and swap. Write an algorithm that spells out your name.	Cubetto's nets 1. Discover how bikes and cars use computers, then turn Cubetto into a Shape Robot! Match halves of shapes and program Cubetto to find the other half. 2. Find the photo of your face and cut it in half. Stick it to paper and ask a partner to draw the other half.
Challenge	Give Cubetto a sticky tail. Collect shapes and stick them to his tail!	Write an algorithm that makes Cubetto do the opposite of the function line?	Can you use someone else's ideas to make your algorithm better?	Can you deliver a toy on top of Cubetto to the boat, without it wobbling?
Creative Play	Make up a song about Cubetto. Use instruments!	Write a story about the character you put together.	Use 3D shapes to build Cubetto a boat.	Make a 3D model of a picture on the world map.
Resources	Lollipop sticks & sand timer, 2D shapes, Mini whiteboards	Character pics, Scissors & figurines, Blank story book, 2D shaped tiles	Board template, Example algorithm Blank maps, Whiteboard pens	3D shape nets, Coloured pens, Glue & masking tape, 3D shapes
Assessment	Shapes, Photos, Observation	Algorithms, Photos, Observation	Algorithms, Photos, Observation	Photos, Observation

Lesson 1: Cubetto the 2D Shape Detective (1 of 2)

Cross-curricular Area: Maths

NC Objectives
To create a simple algorithm

Outcomes
- I can make Cubetto move
- I can name 2D shapes

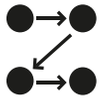
Resources Needed
- Maze picture with dog and ball
- 2D flat shapes
- Feely bag & 2D shape name cards
- Coloured whiteboard pens

Prep Needed
- Check batteries

Resources Provided
- N/A

Key Vocabulary
- Instructions
- Algorithm
- Program
- Sequence

Computational thinking concept



Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Show image of the maze and explain that the dog is really sad because it has lost his favourite ball in a maze! Tell the children that it's our job to help it find the ball.
2. Ask: How can the dog find its ball? Children take it in turns to share how the dog should move through the maze to find the ball.
3. Explain that this set of direction instructions (move forward one step, turn right, move forward again) is called an algorithm.
4. Explain that the pupils' goal is to program Cubetto by arranging sequences of instructions.
5. Show the map, blocks, Board and Cubetto. Recap how to place the blocks into the Board to program Cubetto to move around.
6. Ask the children to find a pair and decide who is A & B.
7. Explain that both will get a chance to do the activity! Partner A tells their partner how they want Cubetto to move (e.g. turn right) and Partner B chooses the correct block and places it in the Board.
8. Play the shape song: https://www.youtube.com/watch?v=qq-Ic7iAgPQ and ask: What shapes did we see? How many sides does a triangle have? Repeat for other 2D shape properties.
9. Explain that today we will be programming Cubetto to help us collect as many 2D shapes as we can on the map.

Lesson 1: Cubetto the 2D Shape Detective (2 of 2)

Creative Play

Make Cubetto some 2D shape glasses to wear!

Guided Activity

1. On the map, place a circle, triangle, square, rectangle, pentagon and hexagon. Place Cubetto on Green G.
2. Ask Partner A to take a 2D shape card from the feely bag. Ask: What does it say?
3. Explain that pairs must work together to write an algorithm to move Cubetto to find the matching shape, using the board template and coloured pens. Partner A tells Partner B which blocks to use and Partner B checks the algorithm is correct.
4. Partners swap roles and repeat.
5. Look at the two algorithms created and ask: Are they the same? Are they different? How? Did Partner A make a longer or shorter algorithm to retrieve their shape? Which algorithm uses the most blocks? How could you improve your algorithm?

Independent Activity

1. With your pair, play the Pelmanism Game!
2. Take a selection of 2D shapes and name cards and lay them face down on the table.
3. Take it in turns to select two cards, turning them face up.
4. If the two cards match (e.g you select an image of a square and the word ‘square’), you win a point for your team or a sticker.

Challenge

Put obstacles on the map. Can you collect a shape without touching any of the obstacles?

Plenary and Assessment

1. Ask children to share their algorithms. Ask: Can you explain what each block does?
2. Discuss the similarities and differences between the algorithms used to get to the same shape. Ask: Did you use the same number of blocks? What else is the same or different?
3. Ask: Why does Cubetto require a series of blocks? Would one block alone allow him to reach his destination? Why not?
4. Ask: How do you know if your algorithm has not worked? How can you amend it? What do you do when something goes wrong?

Lesson 2: Cubetto the 3D Shape Detective (1 of 2)

Cross-curricular Area: Maths

NC Objectives

To create a simple algorithm

Outcomes

- I can move Cubetto to a specific place
- I can identify 3D shapes I can move Cubetto to a specific place
- I can identify 3D shapes I can move Cubetto to a specific place
- I can identify 3D shapes

Resources Needed

- Pizza ingredients
- Class mascot
- 3D shapes
- Board template
- Feely bag
- Bean bags

Prep Needed

- Check batteries in both Cubetto and Board
- Pizza ingredients displayed on board (or in real life!).
- Draw 6x6 grid in playground using chalk and place bucket/ hoop in middle of playground.

Resources Provided

- Board template

Key Vocabulary

- Order
- Program
- Computer Programmer
- Blocks
- Steps

Computational thinking concept

Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Show on the board all of the ingredients to make a pizza: pizza base, tomato sauce, cheese, ham, mushrooms and an oven.
2. Tell the pupils that our mascot thinks this is how to make a pizza: “First of all put the tomato sauce in the oven, next put the cheese on the table and sprinkle the mushrooms on top. Finally put the pizza base on your head!” Discuss.
3. Ask: Has the class mascot got the right order of how and when things should happen?
4. Ask the children to talk in pairs about the correct order of events when making your very own pizza.
5. Share and write the correct order together on the board.
6. Explain that the order that we do things in is very important because otherwise we would make mistakes. Understanding which order things must go in helps us to program computers. We need to be able to do this to program Cubetto. You are becoming computer programmers – something many adults cannot do!
7. Explain that today the children are going to create algorithms (a series of steps/instructions) to find the correct 3D shapes on the maps. Their task is to match the shape cards to the correct 3D shape.
8. Play the 3D shape song: https://www.youtube.com/watch?v=2cg-Uc556-Q and recall the names of common 3D shapes.
9. Ask: What is a 3D shape? How is a 3D shape different from a 2D shape? 3D refers to solid shapes you can handle.

Lesson 2: Cubetto the 3D Shape Detective (2 of 2)

Creative Play

Draw a picture of your face, place it on the map and ask a friend to write an algorithm to make Cubetto find you!

Guided Activity

1. Tell children to work in pairs and decide who is Partner A and Partner B.
2. On the map, randomly place a cube, a cone, a cylinder and a sphere. Place Cubetto on Green G.
3. Tell Partner A to pull out a 3D shape card from the bag and use the board template to write an algorithm to move Cubetto to the corresponding 3D shape. Ask Partner B: How could you check the algorithm is correct?
4. Pairs swap roles: Partner B reaches into a feely bag and repeats exercise.
5. Look at the two algorithms created and ask: Are they the same? Are they different? How? Did partner A make a longer or shorter algorithm to retrieve their shape? Which algorithm uses the most blocks? How could you improve your algorithm?
6. Ask: What would happen if you added a 'random' block to your algorithm?

Independent Activity

1. Work in pairs and place coloured bean bags randomly on the 6x6 grid.
2. One person pretends to be Cubetto and the other verbally gives their partner instructions to move around the map to collect as many bean bags as possible.
3. When you collect a bean bag, run to the centre of the playground and throw it into the bucket! Swap roles and compete to collect them.

Challenge

Role play being Cubetto and Board. The Board is in charge and tells Cubetto what to do!

Plenary and Assessment

1. Ask the children to share what they have learned today. Ask: Can you explain how you used Cubetto today? What was difficult? What did you enjoy about today's Cubetto task?
2. Show one algorithm (e.g. forward, forward, turn right, forward) and ask: What would happen if we started with the red block – would Cubetto reach the same place?
3. Emphasise the importance of order - if one step is wrong or missing, the whole algorithm will change!

Lesson 3: Cubetto's Holiday (1 of 2)

Cross-curricular Area: Maths

NC Objectives

To understand that programs execute by precise instructions

Outcomes

- I can create a simple algorithm
- I can draw 2D shapes I can create a simple algorithm
- I can draw 2D shapes I can create a simple algorithm
- I can draw 2D shapes

Resources Needed

- 2D shapes & 2D shapes on paper
- A remote control car
- Large 6x6 grids - size of the map
- Thick marker pens & scissors

Prep Needed

- Check batteries
- Draw a simple path for the remote control to follow.
- Attach pen to Cubetto using tape.

Resources Provided

- N/A

Key Vocabulary

- Control
- Signal
- 2D shape
- Square
- Rectangle

Computational thinking concept

Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Show the pupils a small remote control car with its control box alongside. Ask: What is this and how does it work?
2. Display a simple path for the car to travel on which has a series of obstacles it must avoid (e.g. classroom chair, pencil pot).
3. Ask the pupils to talk to their partner about how they would tell the car to get from the start to the finish line avoiding these obstacles.
4. Ask: How is this remote control car similar/different to Cubetto? Which do you prefer and why?
5. Explain that the control sends a signal, such as a radio wave, to the car. The receiver, such as an antenna hidden inside the toy, takes the signal from the controller. When it gets the signal, the control makes the motors inside the toy move!
6. Show the Board, blocks, Cubetto and map. Ask: Which part is like the car? Which part is the control?
7. Explain that Cubetto's control is the Board and instruction blocks. Cubetto can't move without us! Our job is to place the instruction blocks into the Board in a set order to make Cubetto move, before pressing the Go button to set the robot in motion.

Lesson 3: Cubetto's Holiday (2 of 2)

Creative Play

Make Cubetto a party hat using only 2D or 3D shapes.

Guided Activity

1. Pupils work in pairs and decide who is Partner A and Partner B. Place Cubetto on any square on the blank map.
2. Explain that Partner A is going to help Cubetto draw his favourite 2D shape and Partner B will guess the shape before he finishes drawing!
3. On a board template, Partner A writes an algorithm to move Cubetto around the map so that he draws a square or a rectangle.
4. On a board template, Partner B writes an algorithm that allows Cubetto to draw the same 2D shape but bigger or smaller.
5. Look at the two algorithms created and ask: Are they different? Did Partner A make a longer or shorter algorithm to draw their shape?
6. Ask: What would happen if you added a 'random' block to your algorithm? What shape might be drawn then?
7. Once 2D shapes have been drawn, ask children to colour in exactly half of that shape.

Independent Activity

1. Look at the different paper 2D shapes. Can you name each shape?
2. Work in a pair and take two paper shapes. Carefully cut the shapes in half.
3. One person takes two halves of the shapes and covers their eyes (no cheating!).
4. The other hides half of each of the shapes around the playground.
5. Hunt to find the other halves and make whole shapes as quickly as possible.
6. Swap roles and find as many shapes as you can.

Challenge

Use the random block to draw different shapes using Cubetto.

Plenary and Assessment

1. Ask: What do you like and dislike about using Cubetto compared to a remote control car? Compare answers.
2. Ask the children to share the shapes that Cubetto has drawn. Compare two and ask: Which shape needs the simplest algorithm to draw?
3. Ask: What did you find easy or difficult today? What problems arose along the way?
4. Ask: Could Cubetto draw a triangle? Why/why not?
5. Explain that being able to think about how to do something in order is a very important life skill. Many jobs require this skill, for example a vet healing a sick dog: the vet must carry out a certain set of actions in a particular order to help the animal make a full recovery.

Lesson 4: Cubetto's Halves (1 of 2)

Cross-curricular Area: Maths

NC Objectives

To understand that programs execute by precise instructions

Outcomes

- I can create a simple algorithm
- I can identify two halves that make a 2D shape

Resources Needed

- Images of a car, autobike and streetlight
- Pre-cut 2D shapes in half & a feely bag
- Photographs of children's faces
- Plain paper and pencils, sticky tack

Prep Needed

- Check batteries.
- Check sound and video.
- Cut shapes in half.

Resources Provided

- N/A

Key Vocabulary

- Technology
- Automatic
- Algorithm
- Half

Computational thinking concept

Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Show images of a car, autobike and a streetlight and ask: Which one is the odd one out? Pupils discuss and share ideas.
2. Explain that none of them are odd! All three can be programmed to do something, just like Cubetto.
3. Explain that this bike is called an Autobike and using new technology to change the way people ride by attaching a computer to the bike. The computer changes the gears automatically, so you don't have to!
4. Ask: What do you think a car uses a computer for? When petrol is nearly empty, warm seats etc. Ask: How do streetlights use a computer? Programmed to change in different weather and in some places they flash red when an ambulance goes by, to tell drivers to pull over!
5. Show this Google bike video: https://www.youtube.com/watch?v=LSZPNwZex9s and ask: What is the computer doing?
6. Recap how Cubetto operates: you are in control. How and where Cubetto moves all depends on your special code – the blocks.
7. Hiding the Board, enter an algorithm that includes the random block and press the Go button. Ask: Which blocks do you think I used? Recap the effect of the random block.

Lesson 4: Cubetto's Halves (2 of 2)

Creative Play

Create a shelter for Cubetto to rest at night.

Guided Activity

1. Tell pupils to work in pairs and decide who is Partner A and Partner B. They will be making Cubetto into a shape robot!
2. Show the different pre-cut shapes and identify each shape's name. Ask: Can you find any of these shapes in the pictures on Cubetto's map?
3. Take half of each shape and place on different squares around the map, then put the other halves in a feely bag.
4. Tell Partner A to choose half of a shape from the feely bag, look at the map and find the corresponding half.
5. Ask Partner B to write an algorithm to collect the other half of the chosen shape for his/her partner.
6. When the two halves are matched, model sticking the two together to make a whole shape and attaching it to Cubetto the Shape Robot.

Independent Activity

1. Find the photo of your face!
2. Carefully cut your face in half and stick that half to a plain piece of paper.
3. Ask your partner to carefully draw the other half of your face to make a whole.
4. Make sure your partner is including all of your features – nostrils, eye brows, freckles etc.
5. How did they begin drawing you? Could they have started with the details such as freckles? Did they begin with the outline first?
6. Explain we have to draw a face in a particular order to make it look like the real thing: first the outline, then the larger features (eyes, lips, nose) followed by the smaller more personal details (dimples, freckles, lines). If the order was different, it might not be accurate. The same principle applies to writing code: the order in which we enter the steps is very important.

Challenge

Collect different sized cubes and order them from largest to smallest. Stack them on Cubetto!

Plenary and Assessment

1. Ask: How did Cubetto support your learning today? When you had half a shape, how did you know which shape it was?
2. Ask: Did you have any difficulties today using Cubetto?
3. Ask: Why do you think writing algorithms is a useful skill to have? Can you think of other real life examples of things that require programming?
4. Brainstorm reasons for and against robots doing the jobs that humans do today, for example a doctor, a teacher or a pilot!

Lesson 5: Cubetto's Lollies (1 of 2)

Cross-curricular Area: Maths

NC Objectives

To create a simple algorithm

Outcomes

- I can create a simple algorithm
- I can create and correctly name 2D shapes

Resources Needed

- Big dice
- Craft materials and scissors
- Masking tape

Prep Needed

- Image of Ada Lovelace & mini whiteboards
- Coloured lollipop sticks & 10 min sand timer
- 2D shapes for reference
- Digital camera / tablet

Resources Provided

- Mouse algorithm
- Mouse maze

Key Vocabulary

- Computer Programmer
- Sequence
- Function
- 2D shape

Computational thinking concept

Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Show image of Ada Lovelace and ask: What do you think this person's job was?
2. Allow time for children to share ideas and discuss their answers, giving reasons.
3. Explain that Ada Lovelace was the world's first computer programmer. She wrote the first ever algorithm (recap definition).
4. Explain that Ada predicted that one day computers would be able to do far greater things than simply work out numbers like a calculator.
5. Make a list of things that computers can do. Ask: How do they help us? What everyday jobs do we use computers for?
6. Explain that the children's challenge is to pick a task, for example making a cup of tea, and to write a sequence of instructions.
7. Hand out mini whiteboards and allow time for children to think about and write their algorithm in pictures or words.
8. Choose three algorithms without saying what the instructions are for and ask: Can you guess what the task is?
9. Explain that we can carry out a similar game with Cubetto. Enter an algorithm in the Board, including the function block, and ask pupils to guess where it will end up.
10. Recap that the function block is like a rucksack: it can 'carry' up to four blocks inside it, on the Board's function line.

Lesson 5: Cubetto's Lollies (2 of 2)

Creative Play

Make up a song about Cubetto. You can use instruments!

Guided Activity [two Cubettos and boards will be needed per game]

1. With your partner, find another pair to play the game with.
2. Choose where on the map the game will finish (this should be no higher than row 3).
3. Start on the bottom left square (A6).
4. Decide which pair starts first and roll the di.
5. With your partner, program Cubetto to move the number on the die.
6. Pairs take it in turn to roll the die and write the algorithm to program Cubetto (support may be needed with which way to move at the end of a line).
7. When you land on a snake, program Cubetto to move down one square. On a ladder, program Cubetto to move up one square.

Independent Activity

1. Work in a pair and look at the mouse story. What does the mouse need to do to get to the cheese?
2. Look at the algorithm the mouse has written to reach the cheese. Do you think it will work? Why? Why not?
3. Cut up the algorithm into pieces and work with your partner to put it in the right order. If part of the algorithm is incorrect or if something is missing, you can change or add parts accordingly.

Challenge

Give Cubetto a sticky tail made from tape. Collect different shapes by programming Cubetto and sticking them to the tail. Longer, the better!

Plenary and Assessment

1. Ask: How was Cubetto used today? What did you enjoy/not enjoy about today's challenge?
2. Ask: What is Ada Lovelace is famous for?
3. Compare and discuss the photos taken of 2D shapes. Compare two triangles and ask: How are they different?
4. Ask: What would the world be like if all computers vanished overnight? Today we have talked about all of the wonderful ways computers help us on a day to day basis, but what about communities and cultures where computers aren't used – how are their lives different to ours? Would you like to live in a society were computers did not exist? Explain your answer.

Lesson 6: Cubetto to the Rescue! (1 of 2)

Cross-curricular Area: Maths

NC Objectives

To understand that programs execute by precise instructions

Outcomes

- I can create a simple algorithm
- I can identify two halves that make a whole image

Resources Needed

- Pac Man game on IWB
- Images of favourite story characters
- Glue & story book template
- Carpet tiles in 2D shapes

Prep Needed

- Check batteries
- Copy storybook template.
- Cut storybook characters in half.
- Cut 2D tiles in half and put into two buckets with the same number of whole shapes in each.

Resources Provided

- N/A

Key Vocabulary

- Character
- Opposite
- Problem solve
- Algorithms

Computational thinking concept

Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Play Pac Man game on IWB with the class: http://www.knowledgeadventure.com/games/pac-man/. Explain that the aim of the game is to move the yellow character around a maze, eating fruit, avoiding ghosts and sometimes eating them!
2. Ask: Is Pac Man similar to Cubetto? How? Brainstorm similarities and differences.
3. Ask: What can Cubetto do that Pac Man can't? Which would you rather play with/explore and why?
4. Ask: Which directions can Pac Man move in? Can Cubetto move in any different ways to Pac Man?
5. Re-introduce the opposite block and ask: What does this block do? It makes Cubetto do the opposite of the block after. Can you tell Pac Man do the opposite of its 'blocks'? Emphasise that this is special to Cubetto.
6. Explain that Pac Man is fun but only one person can play at a time. Cubetto can be used in a group where you can problem solve together! Ask: Why is it important to learn problem solving skills? What kind of problems might you need to solve today?
7. Explain that we all need to make decisions and solve problems, such as what we would like to eat for breakfast, what we would like to wear, which colour pen we would like to use to write our name etc.
8. Introduce today's problem: The evil Pyramido wants to ruin their favourite stories so he has chopped the story characters in half and scattered them over the map! Pupils must use the opposite block in their algorithms to rescue the characters and put them back together.

Lesson 6: Cubetto's Quest (2 of 2)

Creative Play

Write a story in your blank storybook about the character you put back together again.

Guided Activity

1. Show the character halves to the children and remind them of Pyramido's nasty plan: to ruin their favourite stories! Show the blank story book that they need to fill with whole characters.
2. Explain that he doesn't understand the opposite block so won't be able to decode their algorithms if they use this block.
3. Recap what opposite means: if the children place it before the right turn block, it will make Cubetto turn left etc.
4. Ask group to pick a character each. Explain that they must work together to each write an algorithm to find the other half and when they retrieve it on the map, pupils stick it in their story book.
5. Allow time for children to write each algorithm, reminding them to use the opposite block or Pyramido will discover them.

Independent Activity

1. Get into two teams: the diamonds and the stars, and take one bucket/sack each (don't look inside!) and stand on one side of the playground.
2. Your challenge is to compete against the other team to match the correct halves to make whole shapes. When you have made a whole shape, use it as a stepping stone to reach the other side of the playground.
3. The aim is to be the team who finishes putting all their shapes together the quickest and makes the longest path!

Challenge

Can you write an algorithm that makes Cubetto do the opposite of the function line?

Plenary and Assessment

1. Ask: Which do you think is more intelligent, Cubetto or Pac Man? Explain your answer.
2. Ask: Can you think of everyday things that need to be cut into half? Pizza, quiche, big chocolate bar, wrapping paper.
3. Children share how they worked as a team and what they enjoyed/didn't enjoy.
4. Ask volunteers to share which character they put back together again and how they did it using Cubetto. Ask: How did you use the opposite block? Encourage children to use the images on the world map to invent stories about how they rescued the characters.

Lesson 7: Cubetto Gets Stuck! (1 of 2)

Cross-curricular Area: Maths

NC Objectives	Outcomes	Resources Needed	Prep Needed	Resources Provided	Key Vocabulary
To create a simple algorithm	• I can create a simple algorithm • I can use the function block	• Blank A4 6x6 grids • Coloured whiteboard pens	• Check batteries. • Prepared algorithms using the function line.	• Algorithm examples	• Aeroplane • Computer • Function

Computational thinking concept

Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Show first minute of the aeroplane landing video: https://www.youtube.com/watch?v=9WKssy9US0c
2. Ask: How do you think the plane landed? What/who made it land and how? Discuss answers.
3. Explain that aeroplanes are mainly controlled by computers that pilots use. Pilots can simply press a button and the plane will land!
4. Share the '10 steps for how to land a plane' article: http://www.mirror.co.uk/news/weird-news/how-land-plane-top-10-2352626.
5. Ask: Would you like to land a plane by remembering to do all of these things or would you rather press one button that would do it all?
6. Ask: Can you think of other activities that you wish could be completed with just one button being pressed?
7. Remind the children that Cubetto is operated by pressing just one button! One button is pressed and many things happen!
8. Explain that Cubetto needs the children's help today because he's only just learning to swim and is stuck in the water! Point to F6.
9. Explain that Cubetto needs to get from the bottom right to the tree (B2). Show the algorithm and ask: Will this work? Why?
10. Discuss how the function line helps when you want to repeat steps, and because there are a limited number of blocks (only 4 green!).

Lesson 7: Cubetto Gets Stuck! (2 of 2)

Creative Play

Use 3D shapes to build Cubetto a boat.

Guided Activity

1. Ask: Can you remember which blocks I used to get Cubetto to safety? Show one example and discuss the function line.
2. Tell children that they need to make a different algorithm that gets Cubetto to dry land (the tree) but using different blocks.
3. Allow time for children to experiment with different combinations in the function line, then build up the function blocks to repeat.
4. Ask: How is your algorithm different? How many blocks did you use?

Independent Activity

1. Work with a friend and each take a blank 6x6 square map.
2. Write each letter of your friend's name in squares next to each other on the map. Children may need to shorten their name if longer than 6 letters.
3. Swap maps with your friend.
4. Find your starting point (the first letter) and the end point (the last letter).
5. Use the board template and whiteboard pens to write an algorithm to get Cubetto to move around the map to spell out your name in order.

Challenge

Challenge

Can you get Cubetto to cross the whole map?

Plenary and Assessment

1. Remind the children that they have learnt about how aeroplanes are landed by computers. Ask: Why can this be a good thing to have computers instead of humans control the plane?
2. Ask: How did we control Cubetto today? Ask for volunteers to share their algorithm for getting Cubetto to safety. Show against the prepared example and ask: What is different about your algorithm? Which do you think is better? Why?
3. Ask pupils to share their maps with a friend's name written on and explain how they made Cubetto move to trace their name.
4. Discuss how the function line helped when crossing the map and recap its purpose.

Lesson 8: Cubetto's Nets (1 of 2)

Cross-curricular Area: Maths

NC Objectives

To understand that programs execute by precise instructions

Outcomes

- I can create a simple algorithm
- I can correctly identify 3D shapes by looking at their net

Resources Needed

- Coloured pens/ pencils
- Glue and masking tape
- Plastic 3D shapes
- Stickers/prizes

Prep Needed

- Check batteries
- Write up evaluation questions on the board
- (see teacher-led introduction)

Resources Provided

- 3D net templates

Key Vocabulary

- Switches
- Instructions
- 3D shapes
- Net

Computational thinking concept

Algorithms

Computational thinking approach

Creating

Teacher-led Introduction

1. Show video (first 3 mins) of Bill Nye the Science Guy talking about how computers work: http://www.dailymotion.com/video/x3jyuze .
2. Ask: What was Bill using to open the doors? Explain that computer switches send instructions to do things. Ask: What sends instructions to Cubetto? The Board and blocks. Explain that when we press the Go button, Cubetto receives these instructions and follows them.
3. Explain that by using Cubetto, we are beginning to write computer code – we can program a computer to move which many adults can't!
4. Explain that the children will be using programming to find 3D shapes that have been flattened by Cubetto's wheels!
5. Show an example net and ask: What shape do you think this used to be before Cubetto rolled over it?
6. Model folding along the lines to begin to give it shape and see if pupils can guess. Show pupils how to glue along tabs to stick it together.
7. Recap names of 3D shapes by asking children to find a 'real' example in the classroom (e.g. rubber, cupboard, ball, tent etc).

Lesson 8: Cubetto's Nets (2 of 2)

Creative Play

Make a 3D model of a picture on the Primo map.

Guided Activity

1. Place the 3D nets across the world maps and discuss with the group which shapes they think they will make.
2. Divide into groups of two or three and introduce competition by explaining that the group with the most nets at the end will get a sticker!
3. Model folding one net along its lines and then using glue on tabs to fold it into a 3D shape. Ask: What 3D shape have I made?
4. Choose a starting point and allow time for children to program Cubetto to get to the net.
5. When a net is collected, children work together to fold and glue the tabs to build the net.
6. Tell pupils to use coloured marker pens to write the name of the 3D shape on its side. Change colour and write the 2D shapes they can find.

Independent Activity

1. Find a partner and decide who will start first (you'll both have a go).
2. One person is the Guesser and closes their eyes.
3. The other is the 3D Expert who takes a 3D shape and hides it under the table.
4. The 3D Expert describes the 3D shape they are hiding to the Guesser, without giving away its name (e.g. my 3D shape has six sides, and is like a die).
5. The Guesser must guess the shape. If they are correct, swap roles. If they're wrong, continue to guess.

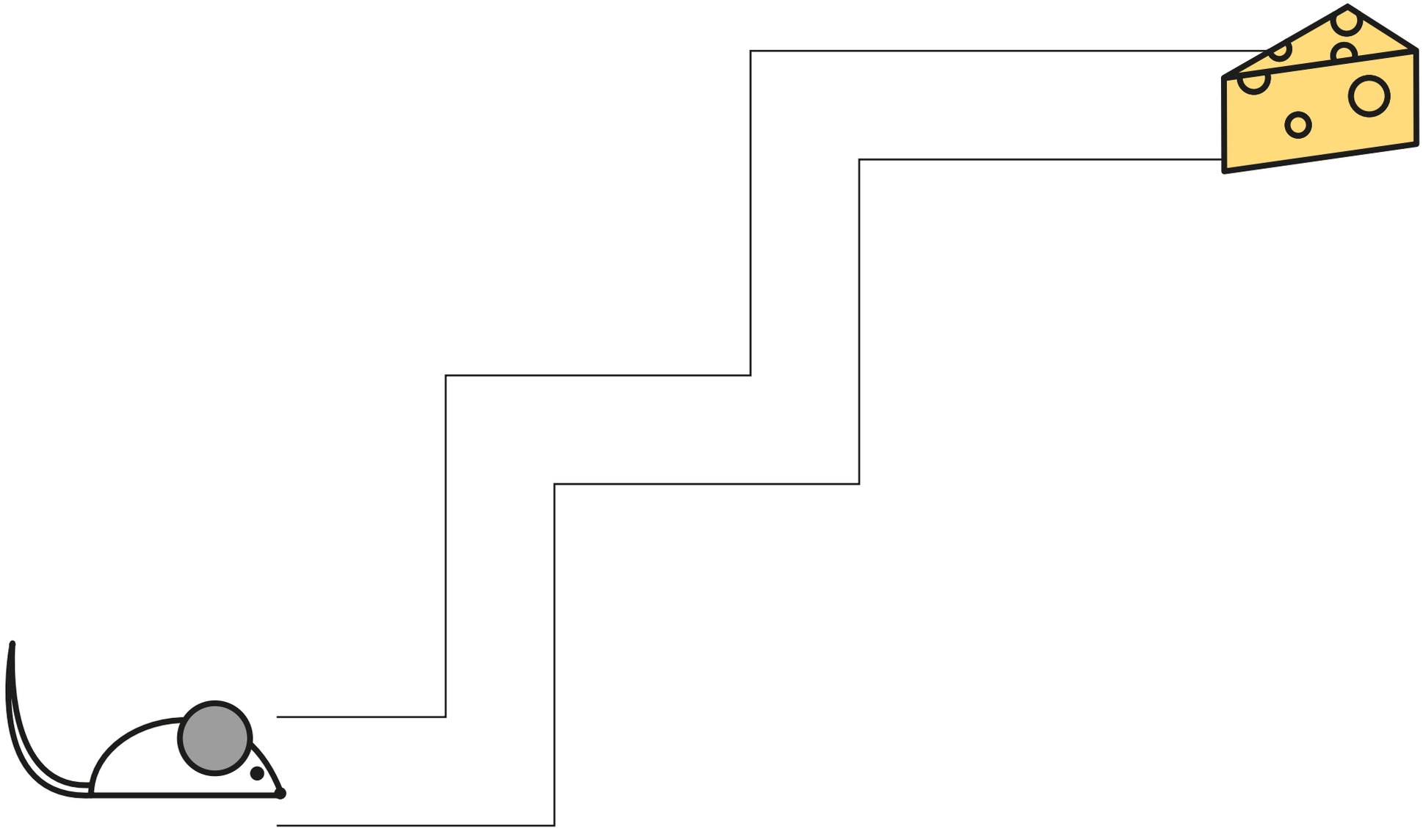
Challenge

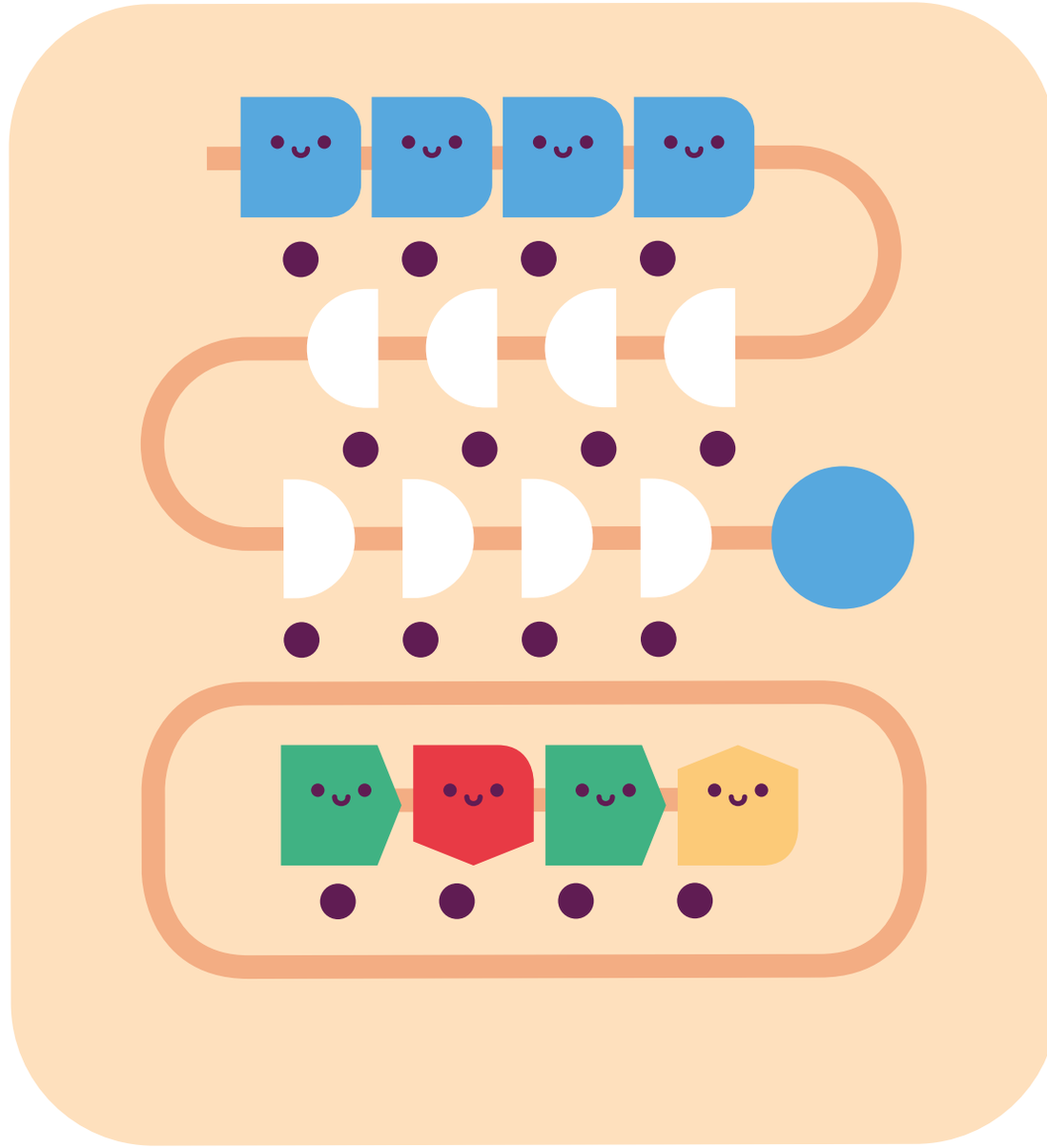
Can you deliver a toy on top of Cubetto to the boat, without it wobbling?

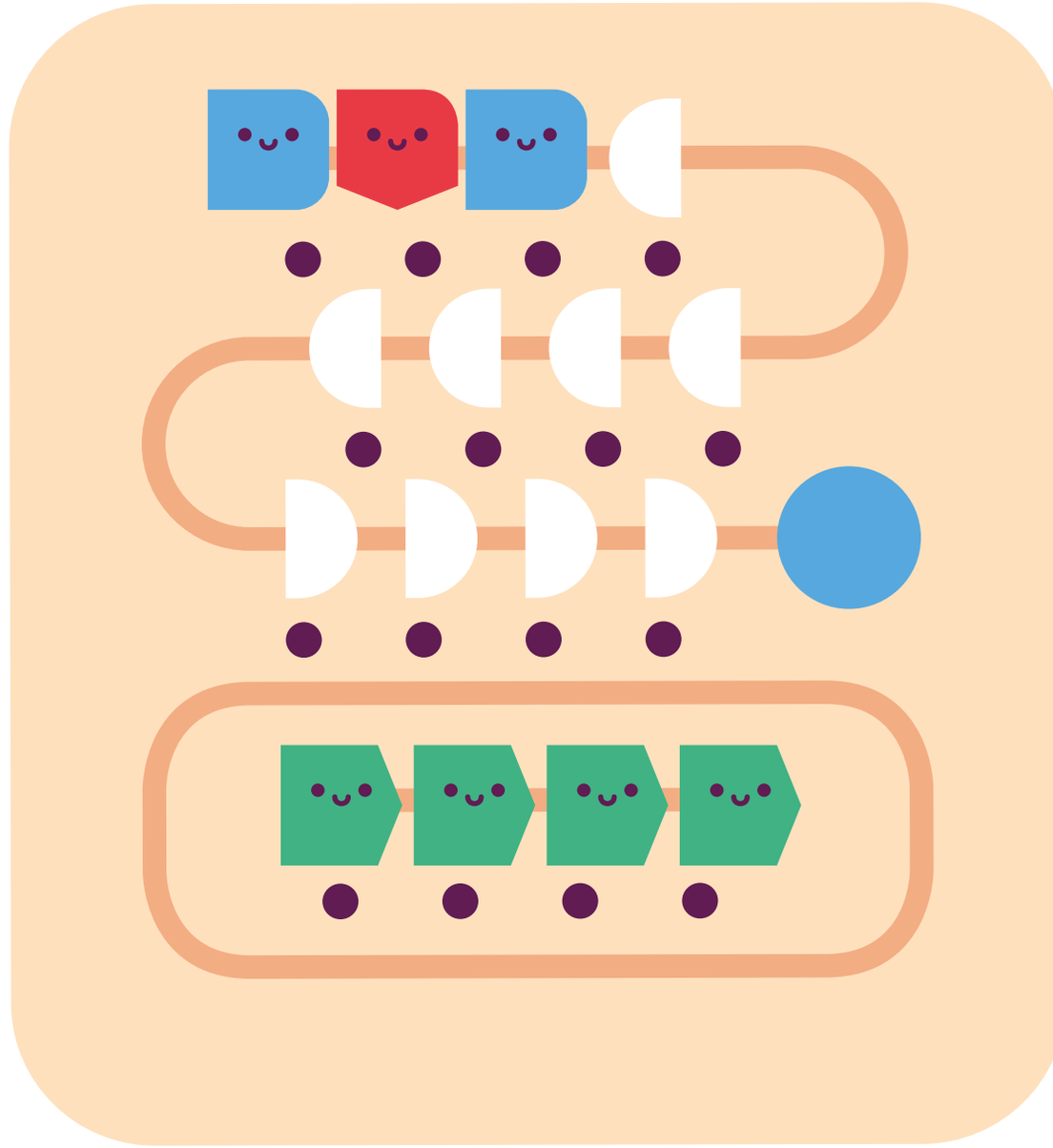
Plenary and Assessment

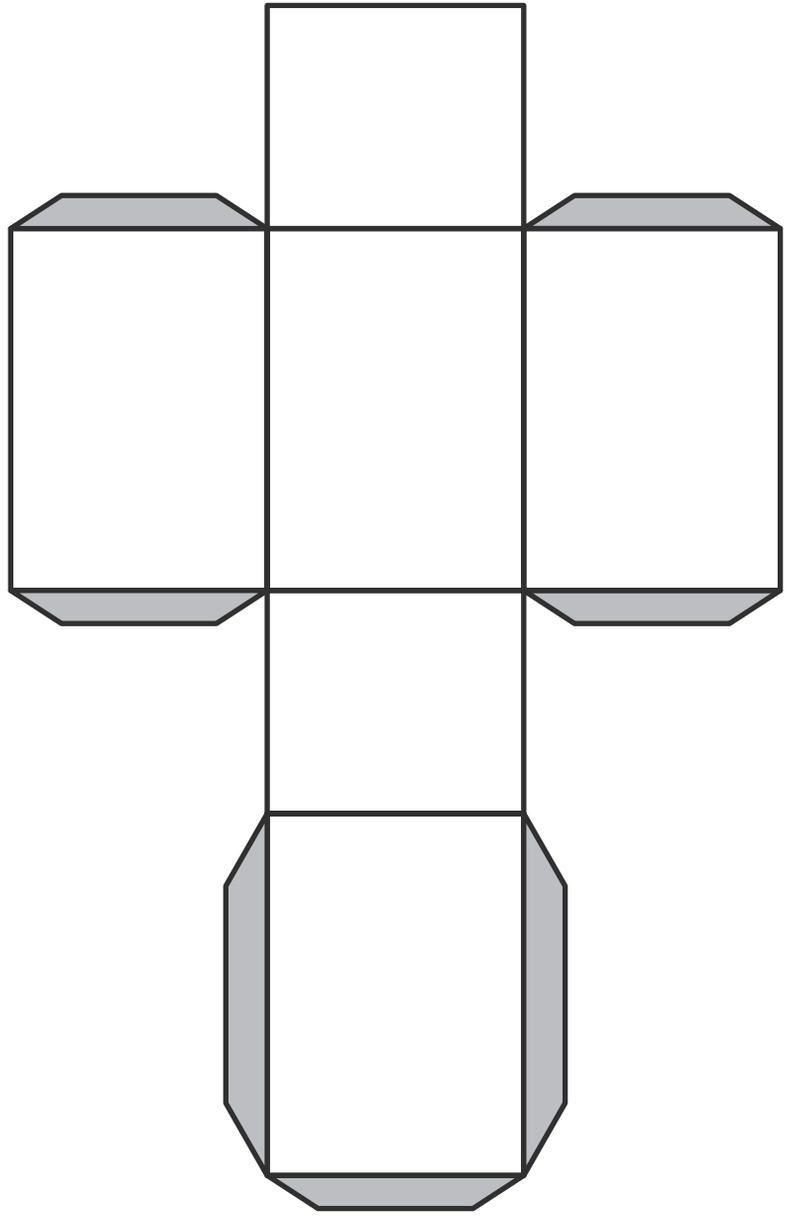
1. Ask: What shapes did we make today that Cubetto had rolled over?
2. Show the children a 3D net and ask them to discuss in pairs which shape it is. Ask: How do you know?
3. Place four 3D shapes around the room and ask for four volunteers.
4. Explain that when you show a net of a shape, they shout out the 3D shape it makes. If they're right, they run to find the shape in the room.
5. Ask: If we flattened out Cubetto, what would his net look like? Could you draw Cubetto's net?
6. Ask: Can you think of which 3D shape does not have a net and why? A sphere.
7. Ask children to share all of the things they have learnt about Cubetto, and what Cubetto has helped them do over the unit.
8. Ask: Who can be a computer programmer? What is an algorithm and what is important to remember about them?

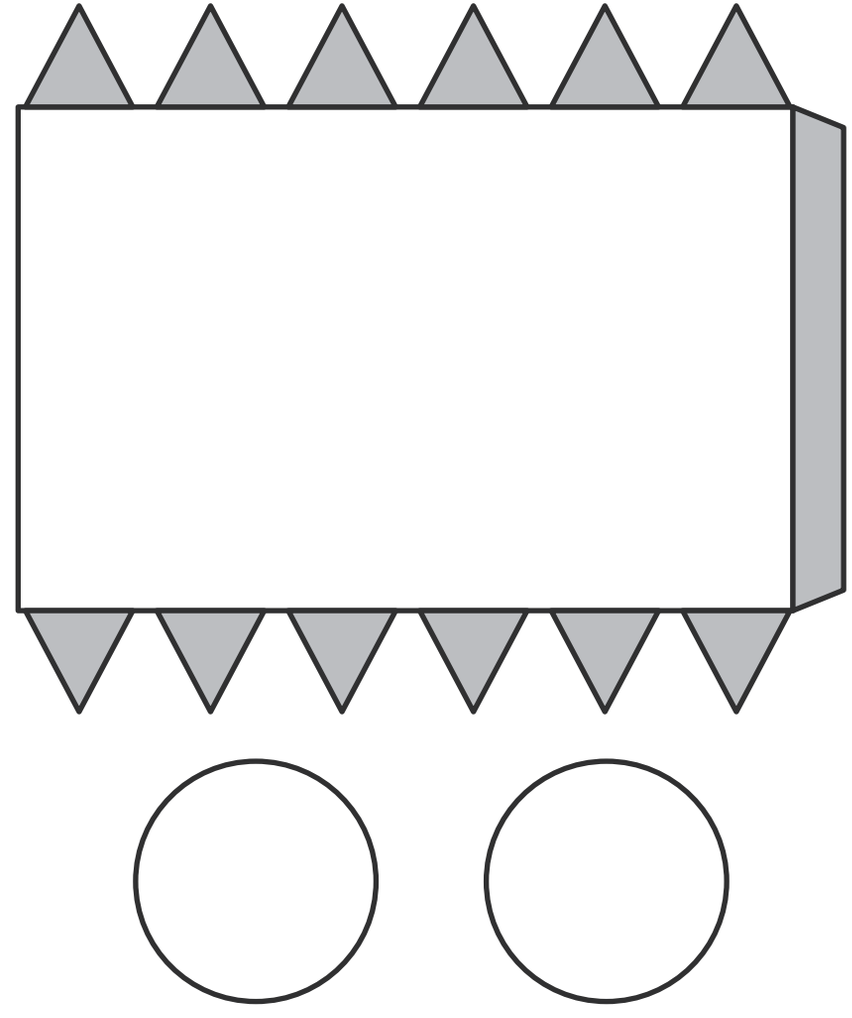
- Move forward 1 step
- Turn left
- Move forward 3 steps
- Turn right
- Move forward 2 steps
- Turn left
- Move forward 4 steps
- Turn right
- Move forward 5 steps
- Arrive at the tasty cheese

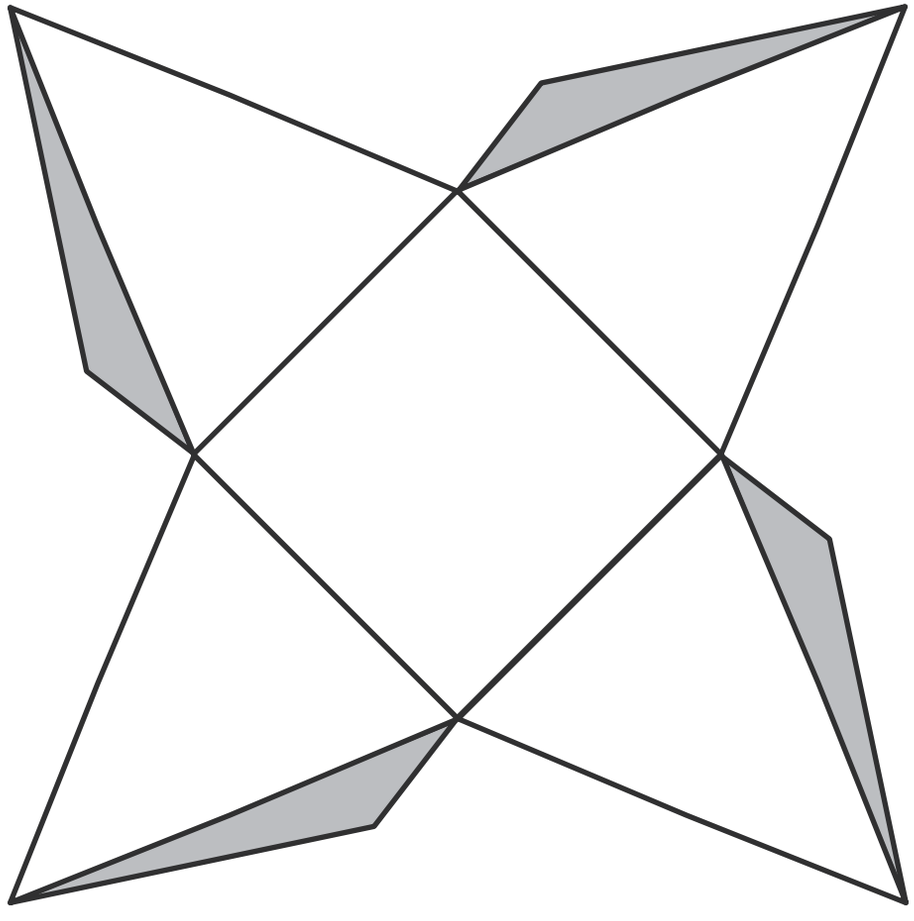


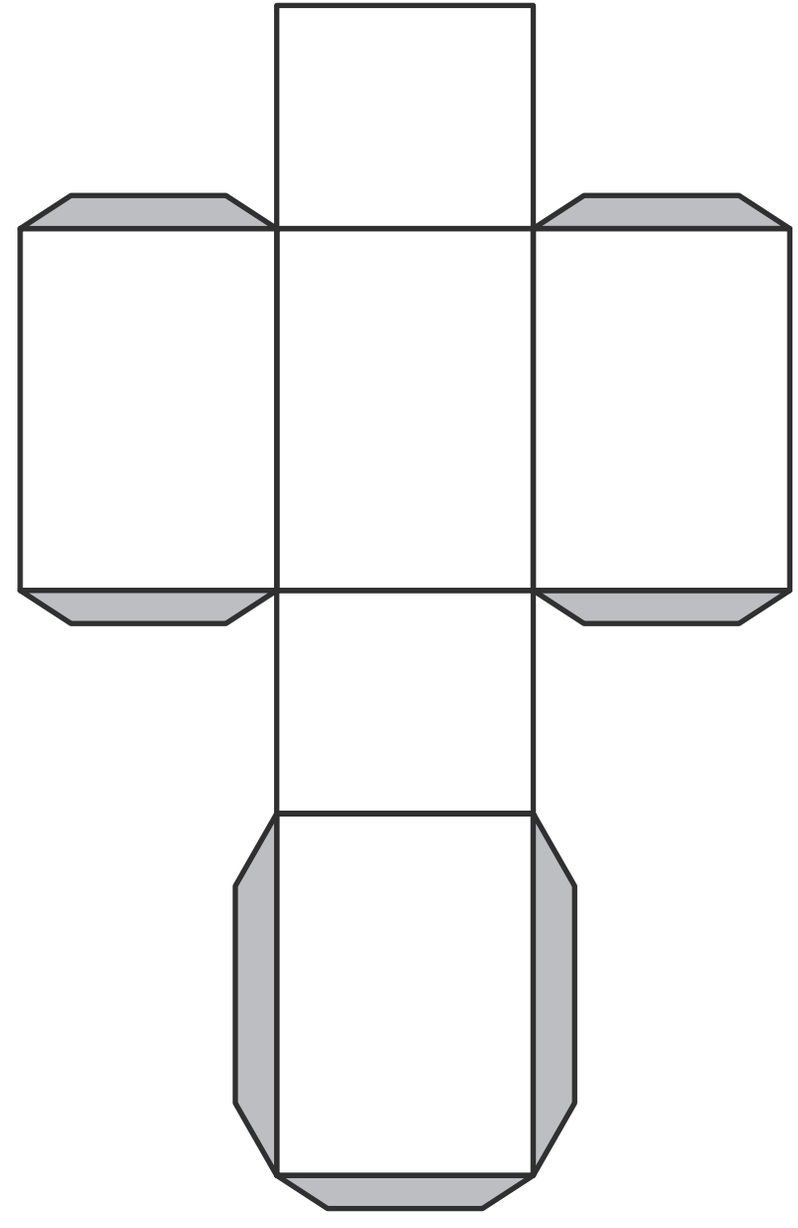




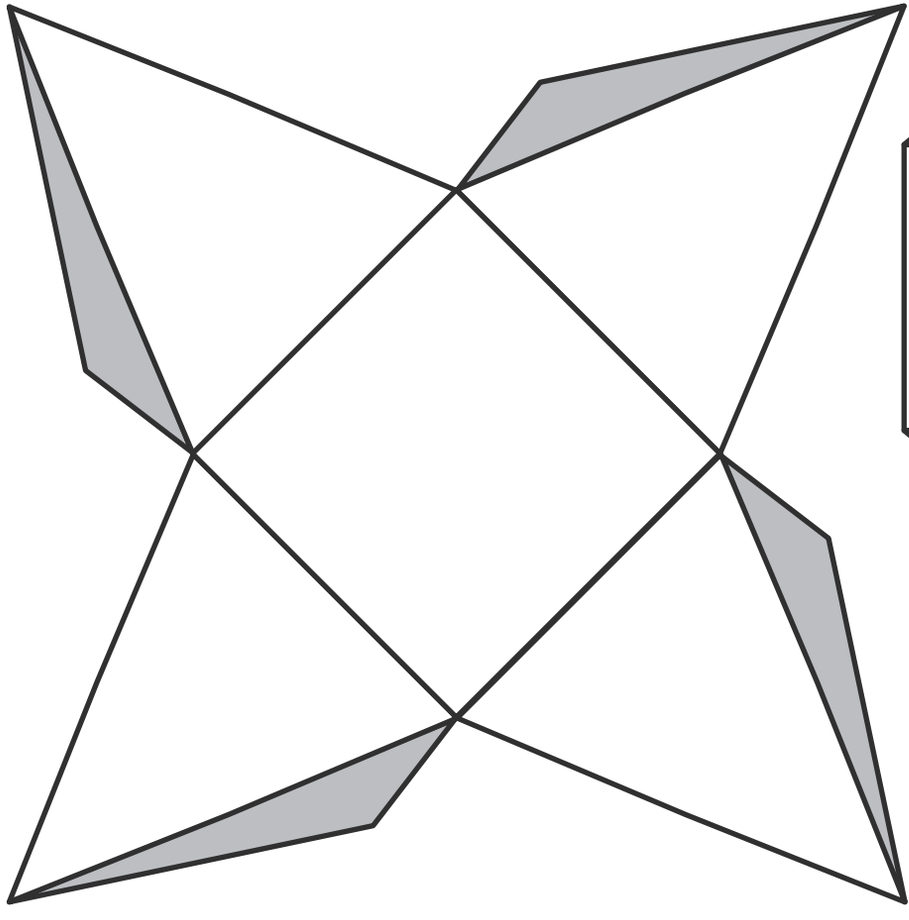


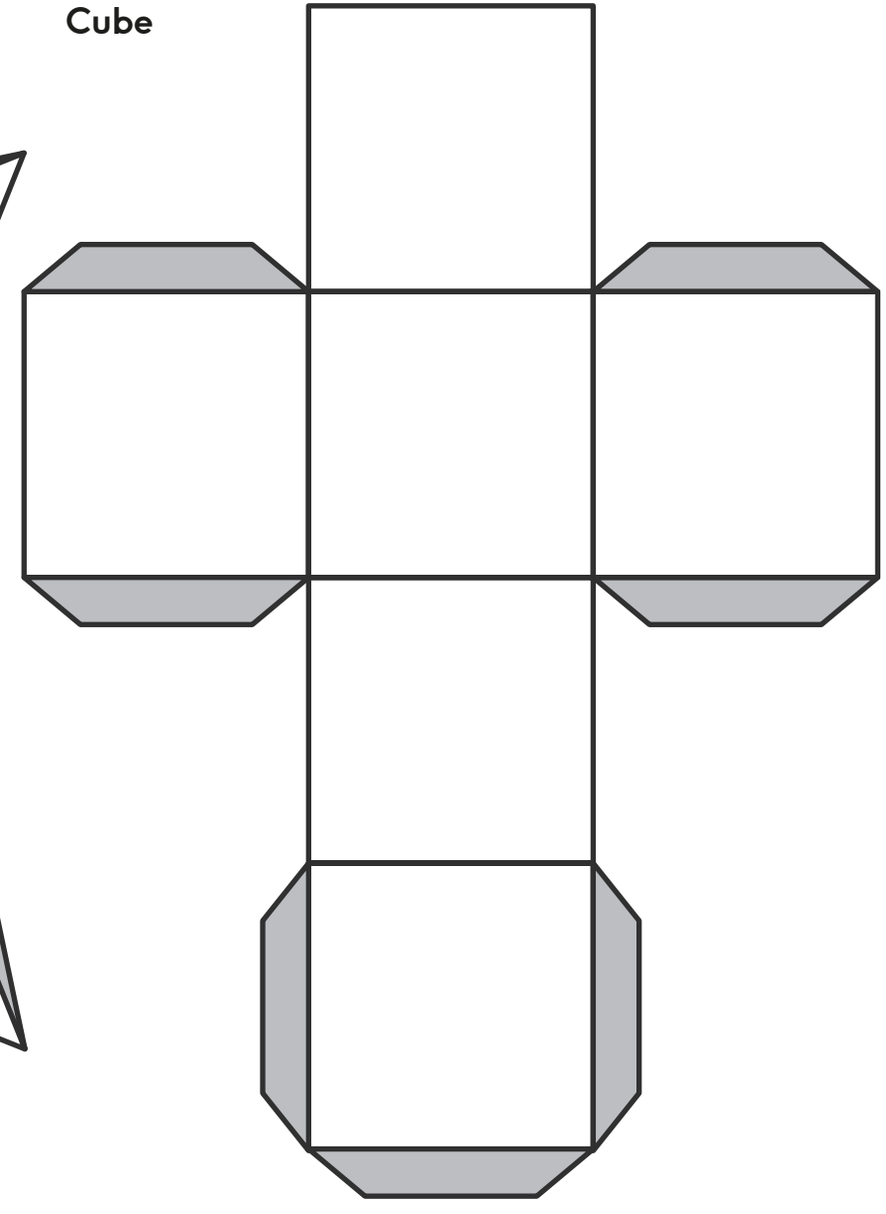


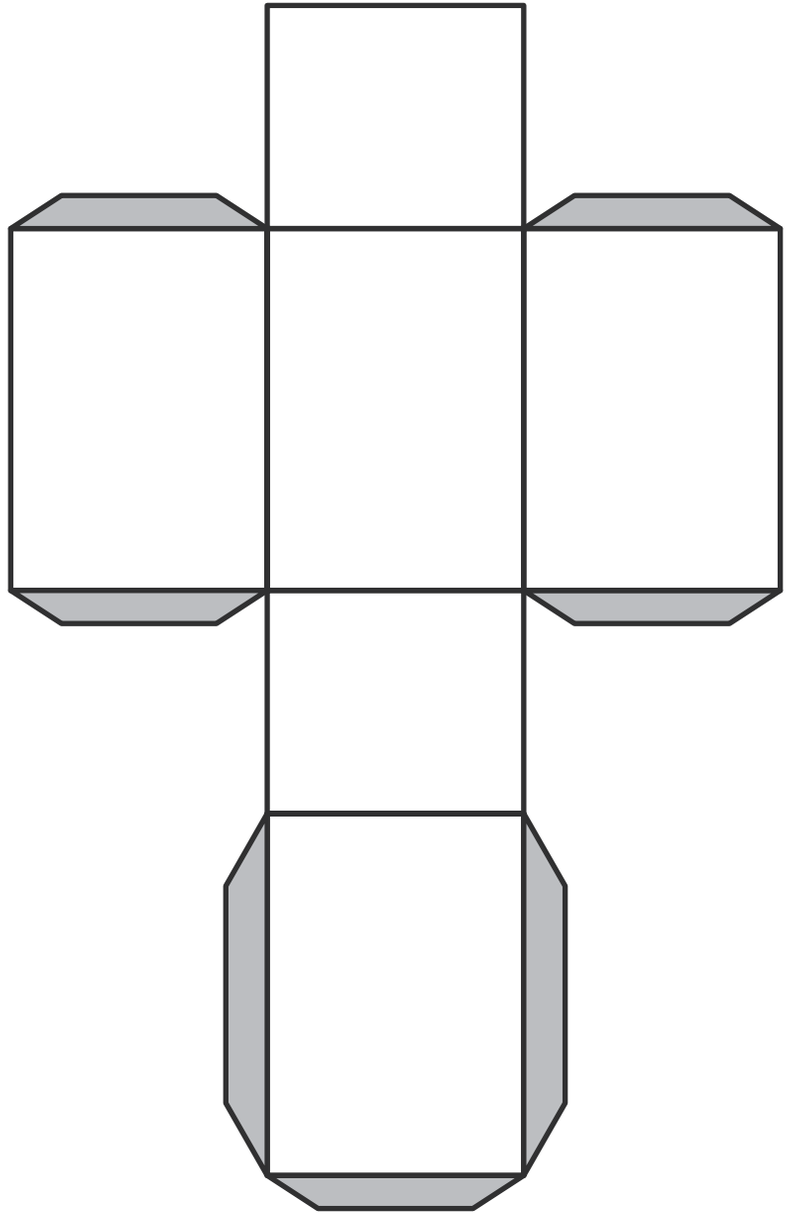


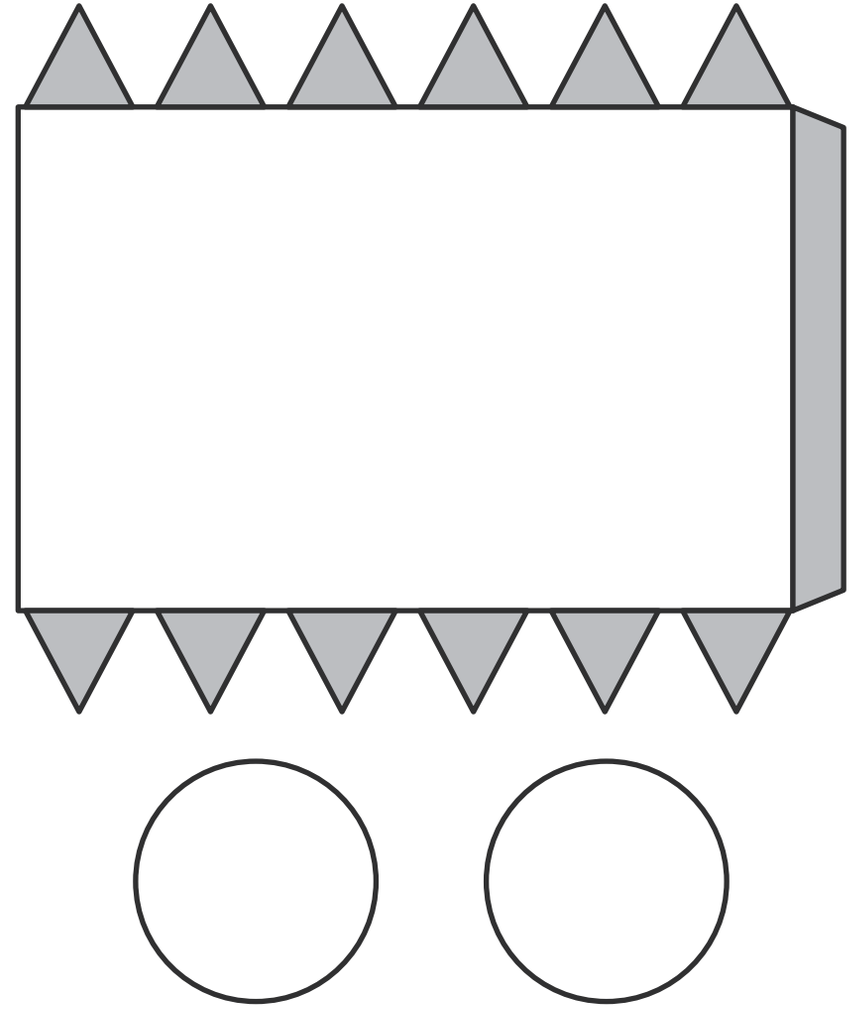


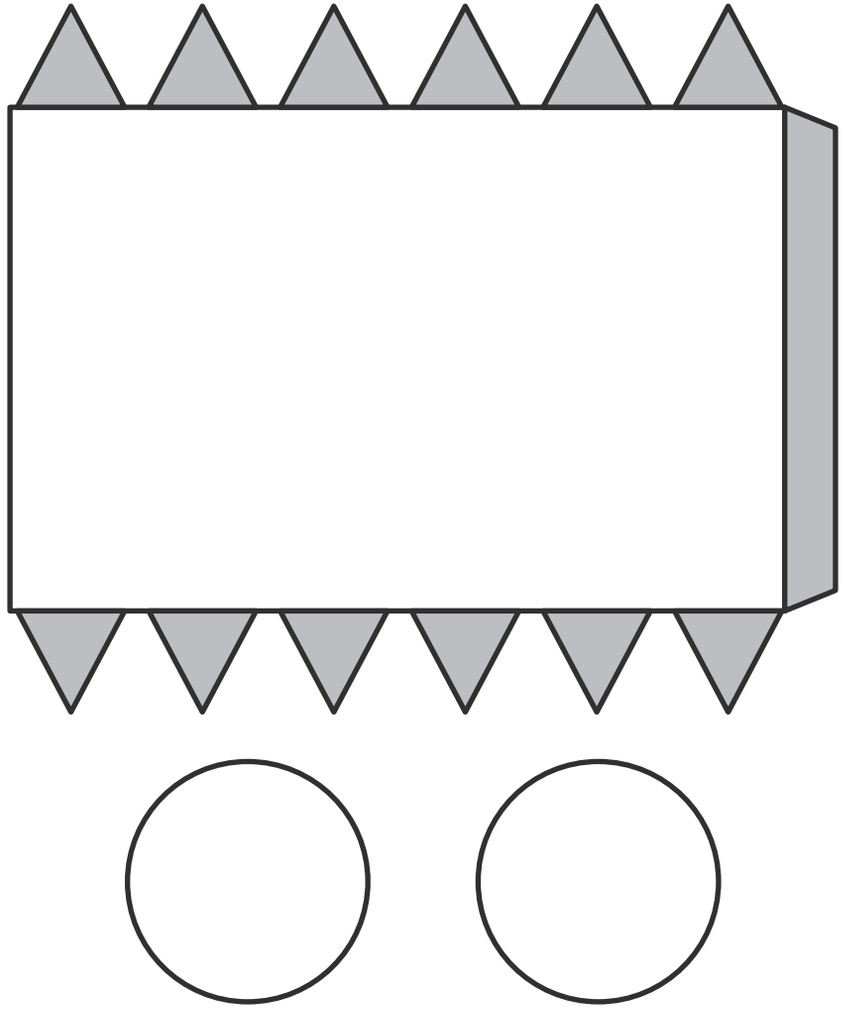
Cube

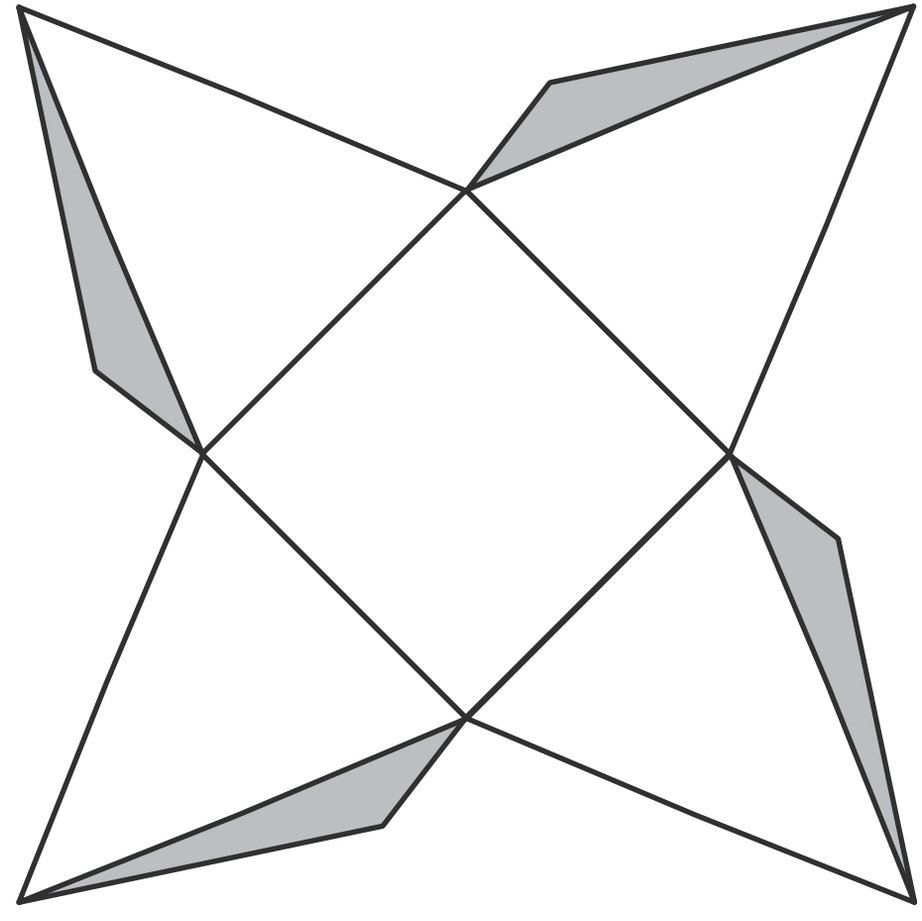


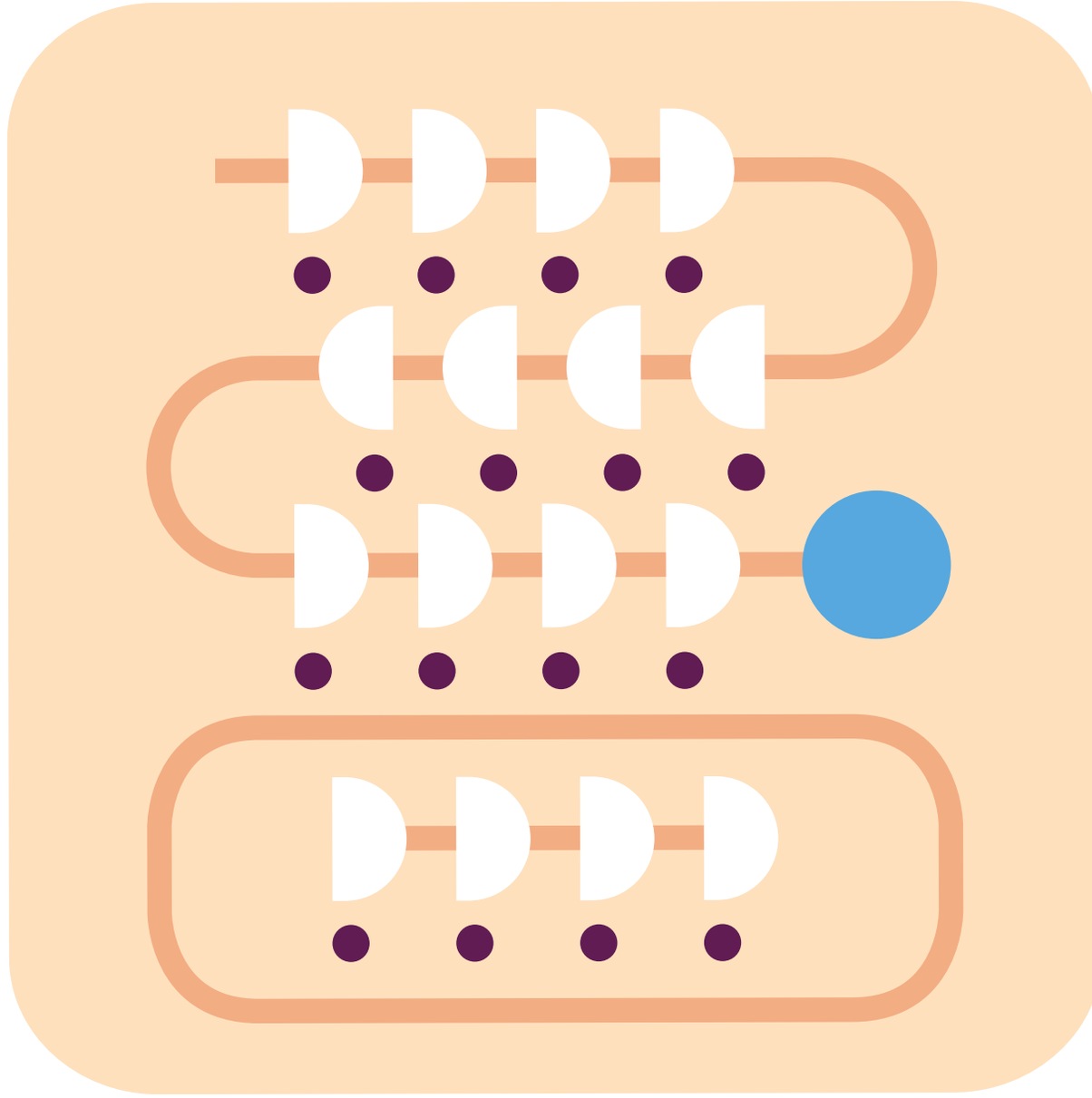












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