Coding with Scratch: Learning Loops: Repeat until Loops

National Curriculum		Lesson Duration
National Curriculum		**Lesson Duration**
Use sequence, selection and repetition in programs; work with variables and various forms of input and output.		This lesson will last approximately 60 minutes. **60 mins**
Aim		
To use a repeat until loop to repeat actions until a certain condition is met.		

Success Criteria	Key Vocabulary
Success Criteria	**Key Vocabulary**
I can explain what happens in a repeat until loop, using the word until.	Algorithm, repeat until loop, condition, Operators blocks.
I know that a repeat until loop is a condition-controlled loop.	
I can add an Operators block into a repeat until loop.	
I can customise an Operators block to set a condition.	

Resources	Preparation
Resources	**Preparation**
Lesson Pack	Differentiated **Pop! Activity Sheet** - one per child.
PC devices, such as laptops, Chromebooks and/or tablets	Please access Lesson 5 (Shrink Teacher Example) and Lesson 5 (Dinosaur Teacher Example) Scratch files within the
Scratch Online version accessed via	

Prior Learning: From previous lessons, children will be familiar with the repeat loop and the forever loop and will have had the opportunity to apply these practically when creating algorithms in Scratch.

Learning Sequence

Remember It: Use the **Lesson Presentation** to remind children about the two types of loops in Scratch that they have already learnt about: the repeat loop and the forever loop. Children should know that these loop blocks can be accessed from the Control category in the Block Palette on the Scratch interface.

The Repeat until Block: Show children the third type of block in Scratch that can be used to create a loop: the repeat until block. Children should notice that this block has a hexagonal shape on it which allows other blocks to be added into it. At this point, children are introduced to a new category of blocks called Operators. They will find out more about them later in the lesson. **What does it mean to customise a block?** Explore how, by adding new blocks to the repeat until block the algorithm for a sprite can be customised to suit a specific task.

Repeat until Loops: Introduce children to the concept of repeat until loops. These loops repeat the instructions until a certain condition is met. Children may find the idea of a condition quite difficult to grasp. The **Lesson Presentation** uses the word 'until' in sentences to help them understand this concept fully. Children can follow the flow diagram to see what happens in a repeat until loop when the condition is met or when the condition is not met.

Repeat until Loops in Scratch: Children are introduced to a repeat until loop by Hassan who wants to produce a particular effect. **Why is a repeat until loop useful in an algorithm?** Children should be able to explain that you may not always know how many times code needs to be repeated and a repeat until loop will continue to run the code until a particular condition is met when it will automatically end. The **Lesson Presentation** then explains more about setting a condition using the Operators blocks in Scratch. Children are introduced to a limited number of Operators blocks and can see how they are combined with other blocks to provide very specific instructions for controlling the actions of a sprite

Access the Lesson 5 (Shrink Teacher Example) in the **Scratch Project Area**. Demonstrate how a repeat until loop works in Scratch, using Hassan's code.

Pop!: Use the **Lesson Presentation** to introduce children to the Pop! Scratch task. Provide each child with the appropriate differentiated **Pop! Activity Sheet**.

★	★★	★★★
Children will use the repeat until loop example to make a balloon grow to a specific size. They will use the hide block to make the balloon look like it has popped.	Children will create a repeat until loop to make a balloon grow to a specific size. They will use the hide block and a sound effect to make the balloon look and sound like it has popped.	Children will create repeat until loops to make balloons grow to specific sizes. They will use the hide block and a sound effect to make the balloon look and sound like it has popped. They will add wait blocks to make the balloons grow and pop at different times.

Explain It: Use the **Lesson Presentation** to share an algorithm that includes a repeat until loop. Ask the children to talk to their partners about what they think will happen. Watch **Lesson 5 (Dinosaur Teacher Example)** and compare children's answers. Encourage children to think creatively about what block they may like to add on to this algorithm. Options could include a say hello block or a hide block.

Exploreit

Countit: Provide children with the instruction: Count in steps of… until you reach or pass the number…

Provide children with a die and a pack of number cards to 100. Children roll the die to find out what size steps to count in. They take a random number card to find out what number they will need to reach or pass before they stop counting. A great way to use a repeat until loop to practise counting skills.

Codeit: Give children the opportunity to try out their own coding skills using repeat until blocks in Scratch. Can they make sprites move in a direction until they reach a certain distance? Can they make a sprite sing louder until a certain volume has been reached?

Assessment Notes:

Computing

Coding with Scratch: Learning Loops

Coding with Scratch

Repeat until Loops

repeat until

Question Marks

This is Quizby.

He is a question mark who loves to ask questions.

When you see a question mark icon like this in the **Lesson Presentation**, it can be clicked on to reveal one of Quizby's questions.

The questions that appear next to these question marks will help you to think about the key learning throughout the lesson.

Aim

To use a repeat until loop to repeat actions until a certain condition is met.

Success Criteria

I can explain what happens in a repeat until loop, using the word until.

I know that a repeat until loop is a condition-controlled loop.

I can add an Operators block into a repeat until loop.

I can customise an Operators block to set a condition.

Remember It

Talk About It: Can you remember the two types of loops in Scratch that you have already learnt about? Talk to your partner and see what you can remember about each loop.
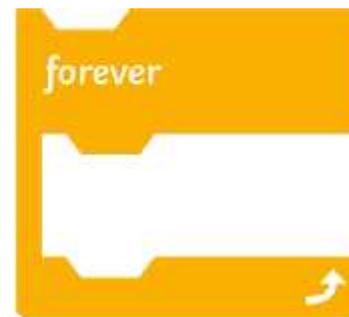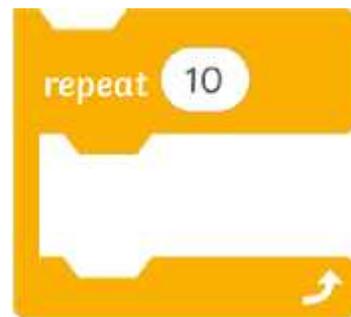
The **repeat** loop and the **forever** loop are made using specific blocks. These blocks can be found in the **Control** category in the **Block Palette** in Scratch. Click on each block to find out more about it.

Remember It

This is the **repeat** block. The **repeat** block can be used to make a count-controlled loop. This loop repeats the instructions inside the loop a specified number of times. How often will the instructions be repeated in this loop?

Back

Remember It

This is the **forever** block. The **forever** block can be used to make a **forever** loop. The instructions inside the loop will be repeated without end unless the loop is stopped. What is another name for a **forever** loop?

Back

The Repeat until Block

The third type of loop in Scratch is called a repeat until loop.
This loop can be created using the **repeat until** block from the **Control** category.
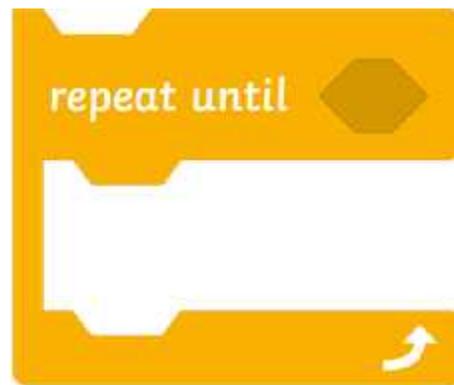
Think About It: What do you notice about the **repeat until** block?
How is it different from the other loop blocks you have looked at?

The Repeat until Block

You have probably noticed that there is a new hexagonal shape at the top of the **repeat until** block.
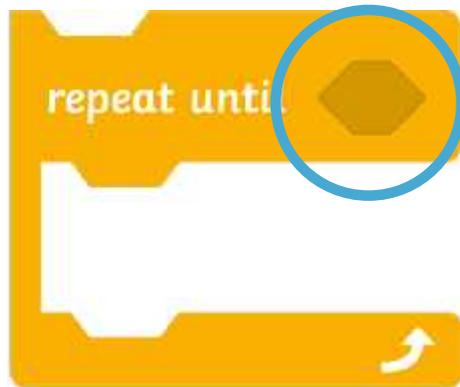
repeat until

This hexagonal shape allows you to customise the **repeat until** block by adding blocks from the **Operators** category.

You may not have used **Operators** blocks before but do not worry. You will find out more about them later in the lesson.

X   What does it mean to **customise** a block?

Repeat until Loops

Repeat until loops repeat the instructions inside the loop over and over again until a certain condition is met

That is a confusing sentence.
I don't think I understand.
What is a condition?

You are right Cat. Condition is a tricky new word. Let's see if we can explain things a bit more clearly for you.

Repeat until Loops

We use repeat until loops everyday in our sentences. Let's think about that word 'until'. It means 'up to the point of something happening'. Look at the sentence below.

John kept walking until he reached his friend's house.

The action repeats	until...	This condition is met.

Let's look at some more everyday repeat until loops.

Repeat until Loops

Look at these sentences. What action is being repeated?
Can you spot the condition that must be met for the action to stop?

The ac... until... until...

This condition is met. on is met.

The action repeats

Talk About It: Can you think of a sentence that uses the word until and share it with your partner?

Repeat until Loops

Repeat until loops in Scratch are **condition-controlled** loops. They keep repeating the instructions inside the loop and checking to see if the condition has been met. The loop will stop when the condition has been met.

The computer runs the actions inside the loop and checks to see if the condition has been met.

If yes

If no

The computer stops repeating the actions.

The computer goes back to the start of the loop.
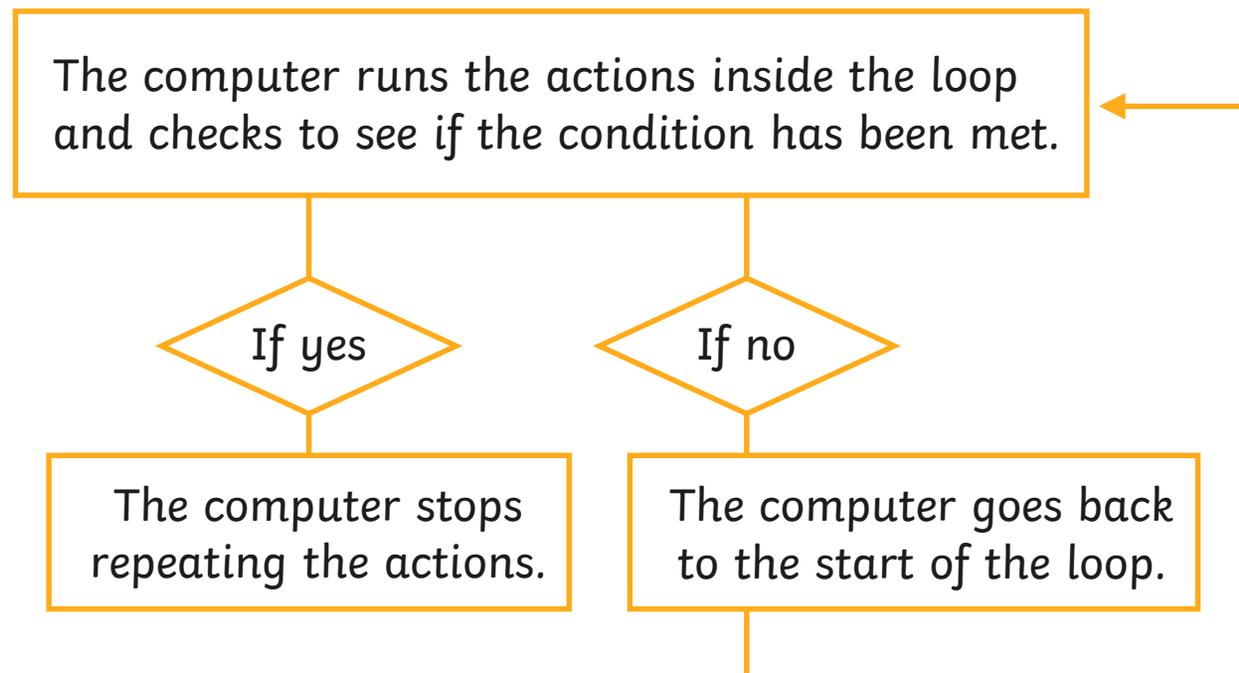
Repeat until Loops in Scratch

Hassan wants to write an algorithm to make a sprite get smaller until it reaches a certain size.
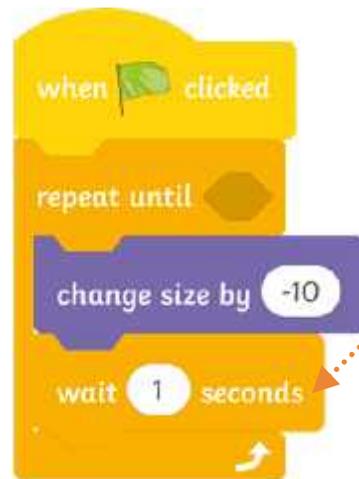
Have you spotted the key word in the sentence that will help Hassan pick the correct loop to use in his algorithm?

The key word is **until**. Hassan will need to use a **repeat until** loop in his algorithm.

Repeat until Loops in Scratch

Hassan has started writing his algorithm. He has used the **repeat until** block and has placed some instructions inside the block.


These instructions will be repeated because they are inside the loop.

Can you explain what is going to happen to the sprite?

Oops! Hassan has forgotten something in his algorithm.
Can you spot what is missing?

Repeat until Loops in Scratch

Did you notice the empty hexagonal space on the **repeat until** block? Hassan will need to add some more information into this space so that the loop knows when to stop running. This information is called a condition.
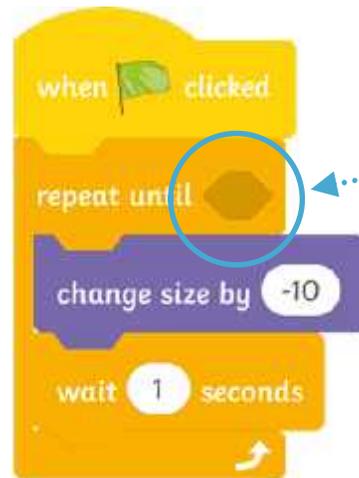
Hassan can add a condition to the loop by using an **Operators** block. What shape do you think the **Operators** block will be?

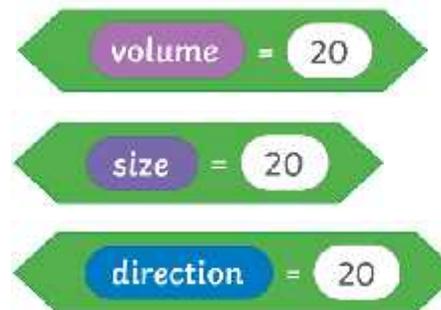# Repeat until Loops in Scratch

Did you think that the **Operators** block would be hexagonal?
If you did, you are right!
The **Operators** blocks are shaped to fit into the hexagonal shape on the **repeat until** block. (Some **Operators** blocks are oval in shape but they won't be u...... ......son today.)

Which of these **Operators** blocks would make a good condition for Hassan's algorithm?

Repeat until Loops in Scratch

Hassan wants his sprite to get smaller in size so it would be sensible to add a condition that tells the sprite to get smaller until it reaches a certain size.

This block tells the computer to repeat the instructions in the loop until the sprite size equals 20. When the sprite is size 20, the loop will stop.

Repeat until Loops in Scratch

Operators blocks contain areas that can be customised by dragging other blocks into them. Can you see the areas that can be customised on these **Operators** blocks?
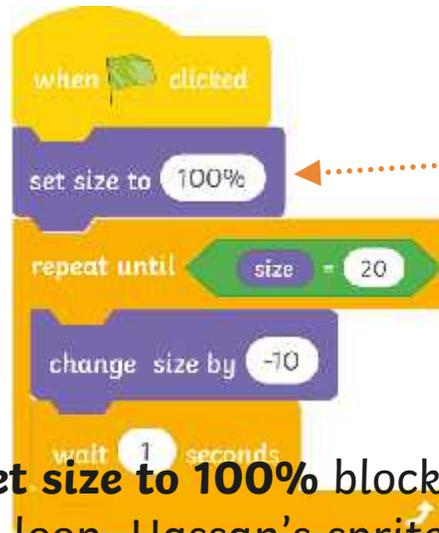
Hassan's **Operators** block has been customised by adding the **size** block into the white area. In Scratch, the number is set to 50 but Hassan has changed the number to 20.

Repeat until Loops in Scratch

Hassan can now finish his algorithm. Watch **Lesson 5 (Shrink Teacher Example)** to see if Hassan's algorithm works.

Hassan has added this block above the **repeat until** loop. Why do you think that he has this block?

By adding the **set size to 100%** block at the beginning of the loop, Hassan's sprite will always return to its original size before shrinking. Great idea Hassan. Without that block your sprite would shrink so much it would disappear altogether.

Pop!

Now it is your turn. Hassan was making sprites get smaller but your task is to blow up balloons and make them bigger, until they POP! Have a look at the challenges on your **Pop! Activity Sheet** and see if you can write the algorithms to complete them.

Pop!

To use a repeat until loop to repeat actions until a certain condition is met.

Getting Started

- Choose **Balloon1** from the sprite library.
- Position **Balloon1** in the middle of the **Stage**.
- Reduce the size of **Balloon1** to 50% of its original size.

Top Tip:
To resize a sprite, you can use the **set size** to block. Increasing or decreasing the number in the block will change the size of the sprite.

Useful Blocks

Task 1:
Can you use a **repeat until** loop to make the balloon grow in steps of 10 until it reaches size 300?

Task 2:
Can you make **Balloon1** disappear when it reaches size 300 so that it looks like it has popped?

Challenge:
Can you add a sound effect?

Balloon1 comes with a **Pop** sound. You can find it by clicking on the **Sounds** tab above the **Block Pallette**. If you click on the **Choose a Sound** button at the bottom of the **Sounds** tab, you can choose a different sound **for Balloon1**.

Explain It

Here is loop, **Dinosaur2** with keeps moving 20 steps loop. Can you explain is touching **Dinosaur1**. will happen. Use these words to help you.

Watch **Lesson 5 (Dinosaur Teacher Example)** to see the algorithm in action. What could you add after the loop?

In this loop, **Dinosaur2** will keep ..... until ....
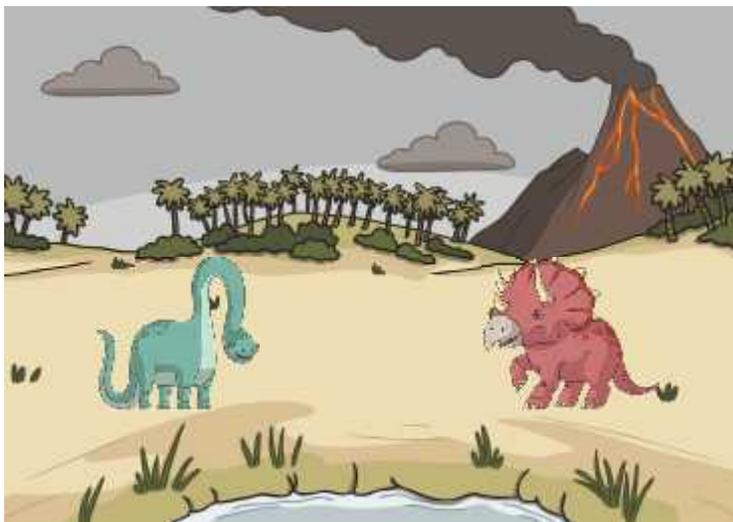
Aim

To use a repeat until loop to repeat actions until a certain condition is met.

Success Criteria

I can explain what happens in a repeat until loop, using the word until.

I know that a repeat until loop is a condition-controlled loop.

I can add an Operators block into a repeat until loop.

I can customise an Operators block to set a condition.

Coding
with Scratch

Pop!

To use a repeat until loop to repeat actions until a certain condition is met.

Getting Started

- Delete the Scratch **Cat** sprite.

- Choose **Balloon1** from the sprite library.

- Position **Balloon1** in the middle of the **Stage**.

- Reduce the size of **Balloon1** to 50% of its original size.

Top Tip:

To resize a sprite, you can use the **set size** to block. Increasing or decreasing the number in the block will change the size of the sprite.

Add the useful blocks shown on the right to the **Code Area**.

Useful Blocks

when space key pressed

show

set size to 50%

wait 0.5 seconds

repeat until size = 300

change size by 10

Task:

Sequence the useful blocks to create an algorithm that makes **Balloon1** increase in size. Use the **repeat until** loop to make the balloon grow in steps of 10 until it reaches size 300.

Challenge:

Can you make the balloon disappear as though it has popped?

This block may be useful:

hide

Pop!

To use a repeat until loop to repeat actions until a certain condition is met.

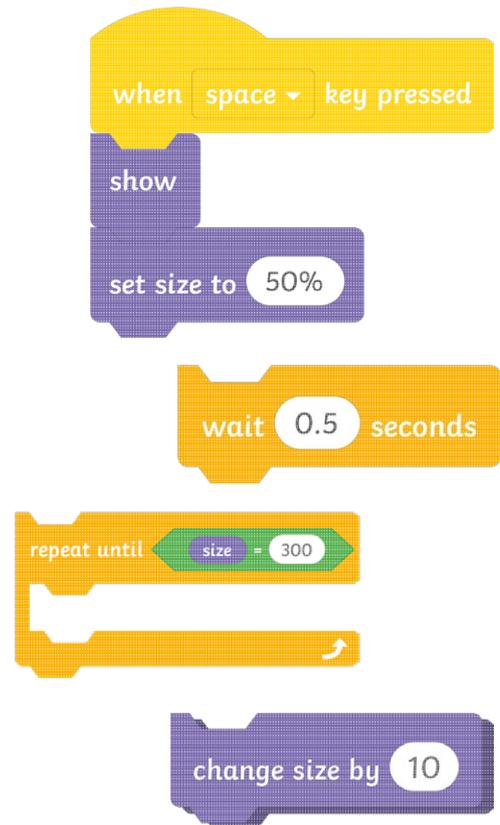## Getting Started

- Choose **Balloon1** from the sprite library.

- Position **Balloon1** in the middle of the **Stage**.

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Top Tip:

To resize a sprite, you can use the **set size** to block. Increasing or decreasing the number in the block will change the size of the sprite.
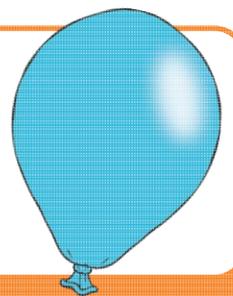
Task 1:

Can you use a **repeat until** loop to make the balloon grow in steps of 10 until it reaches size 300?

Task 2:

Can you make **Balloon1** disappear when it reaches size 300 so that it looks like it has popped?

Useful Blocks

when space ▾ key pressed

show

set size to 50%

wait ◯ seconds

◯ - ◯

size

hide

repeat until ⬡

change size by 10

Challenge:

Can you add a sound effect?

Balloon1 comes with a **Pop** sound. You can find it by clicking on the **Sounds** tab above the **Block Pallette**. If you click on the **Choose a Sound** button at the bottom of the **Sounds** tab, you can choose a different sound **for Balloon1**.

Pop!

To use a repeat until loop to repeat actions until a certain condition is met.

Getting Started

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- Position **Balloon1** in the middle of the **Stage**.

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Top Tip:
To resize a sprite,you can use the **set size** to block. Increasing or decreasing the number in the block will change the size of the sprite.
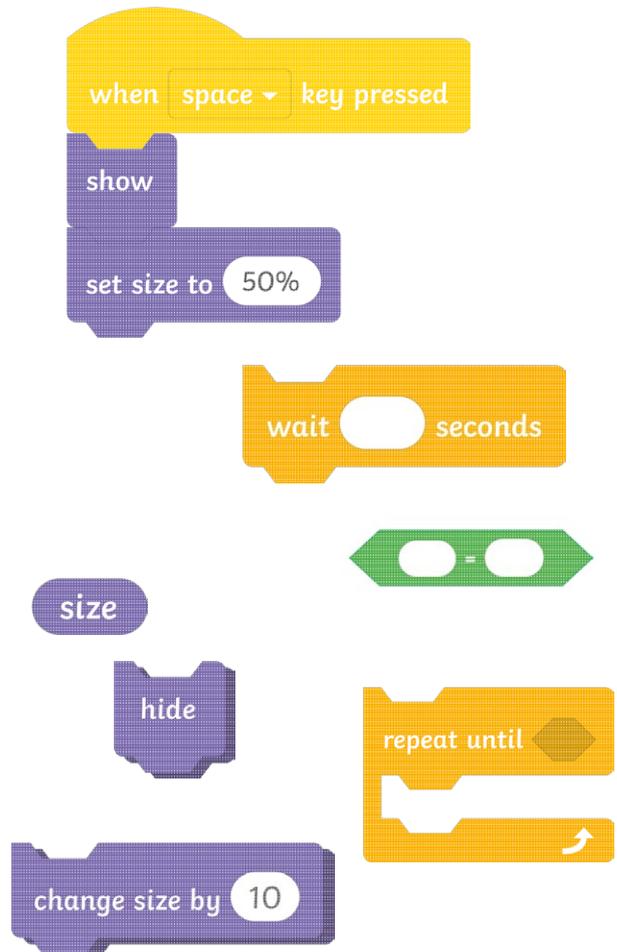
Task:

Can you use a **repeat until** loop to make the balloon grow in steps of 10 until it reaches size 300?
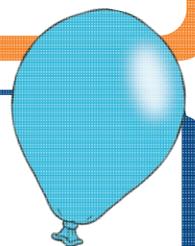
Task 2:

Can you make **Balloon1** disappear when it reaches size 300 so that it looks like it has popped?

Task 3:

Can you add a sound effect?
Balloon1 comes with a **Pop** sound. You can find it by clicking on the **Sounds tab** above the **Block Pallette**. If you click on the **Choose a Sound** button at the bottom of the Sounds tab, you can choose a different sound for **Balloon1**.

Useful Blocks

when space ▾ key pressed

show

set size to 50%

wait ◯ seconds

size

◯ = ◯

hide

repeat until ◇

change size by 10

Challenge:

Can you add more balloons? Duplicate and edit the algorithm from the first balloon to save time. How will you make the balloons grow and pop at different times?

Top Tip:
Right-click on the algorithm to duplicate it. Remember to delete any code you do not want for each sprite.

Pop! **Possible Solutions**

These tasks are very open-ended and children will solve them in different ways. The following solutions provide children with example algorithms but some areas have been left blank as children will add their own wait time and positions.

★

Solution 1 (left):
```
when space key pressed
show
set size to 50%
repeat until (size = 300)
  change size by 10
  wait 0.5 seconds
```

Solution 2 (right):
```
when space key pressed
show
set size to 50%
repeat until (size = 300)
  change size by 10
  wait 0.5 seconds
hide
```

★ ★

Solution 3 (left):
```
when space key pressed
show
set size to 50%
repeat until (size = 300)
  change size by 10
  wait __ seconds
hide
```

Solution 4 (right):
```
when space key pressed
show
set size to 50%
repeat until (size = 300)
  change size by 10
  wait __ seconds
Play sound Pop until done
hide
```

sound effect may change

Pop! **Possible Solutions**

These tasks are very open-ended and children will solve them in different ways. The following solutions provide children with example algorithms but some areas have been left blank as children will add their own wait time and positions.

★ ★ ★

when [space ▾] key pressed
show
set size to (50%)
repeat until ⟨ size = 300 ⟩
  change size by (10)
  wait ( ) seconds
Play sound [Pop ▾] until done
hide

← sound effect may change

when [space ▾] key pressed
wait ( ) seconds
show
set size to (50%)
repeat until ⟨ size = 300 ⟩
  change size by (10)
  wait (0.5) seconds
wait (1) seconds
Play sound [Pop ▾] until done
hide

Adding different wait times to the other balloons will make them grow and pop at different times. Children should experiment with wait times to find out which ones work best.

Pop!

To use a repeat until loop to repeat actions until a certain condition is met.
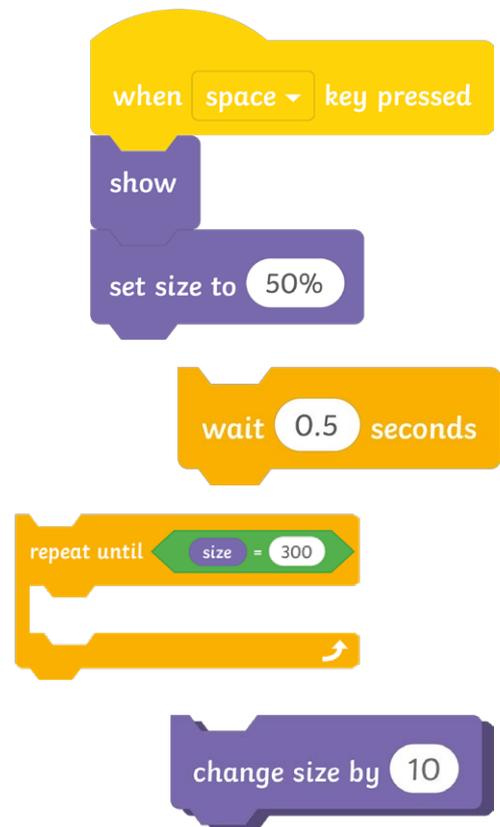
Getting Started

- Delete the Scratch **Cat** sprite.

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- Reduce the size of **Balloon1** to 50% of its original size.

Top Tip:

To resize a sprite, you can use the **set size** to block. Increasing or decreasing the number in the block will change the size of the sprite.

Add the useful blocks shown on the right to the **Code Area**.

Useful Blocks

when space key pressed
show
set size to 50%

wait 0.5 seconds

repeat until size = 300

change size by 10

Task:

Sequence the useful blocks to create an algorithm that makes **Balloon1** increase in size. Use the **repeat until** loop to make the balloon grow in steps of 10 until it reaches size 300.

Challenge:

Can you make the balloon disappear as though it has popped?

This block may be useful:

hide

Pop!

To use a repeat until loop to repeat actions until a certain condition is met.

Getting Started

- Choose **Balloon1** from the sprite library.
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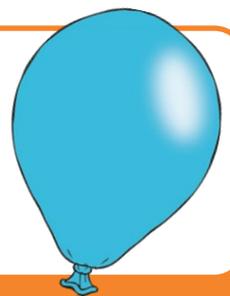
Useful Blocks

when space key pressed

show

set size to 50%

wait _ seconds

size

hide

repeat until

change size by 10

Task 1:
Can you use a **repeat until** loop to make the balloon grow in steps of 10 until it reaches size 300?

Task 2:
Can you make **Balloon1** disappear when it reaches size 300 so that it looks like it has popped?

Challenge:
Can you add a sound effect?

Balloon1 comes with a **Pop** sound. You can find it by clicking on the **Sounds** tab above the **Block Pallette**. If you click on the **Choose a Sound** button at the bottom of the **Sounds** tab, you can choose a different sound **for Balloon1**.

Pop!

To use a repeat until loop to repeat actions until a certain condition is met.

Getting Started

- Choose **Balloon1** from the sprite library.

- Position **Balloon1** in the middle of the **Stage**.

- Reduce the size of **Balloon1** to 50% of its original size.

Top Tip:
To resize a sprite, you can use the **set size to** block. Increasing or decreasing the number in the block will change the size of the sprite.

Useful Blocks

when space key pressed
show
set size to 50%

wait ( ) seconds

size

( ) = ( )
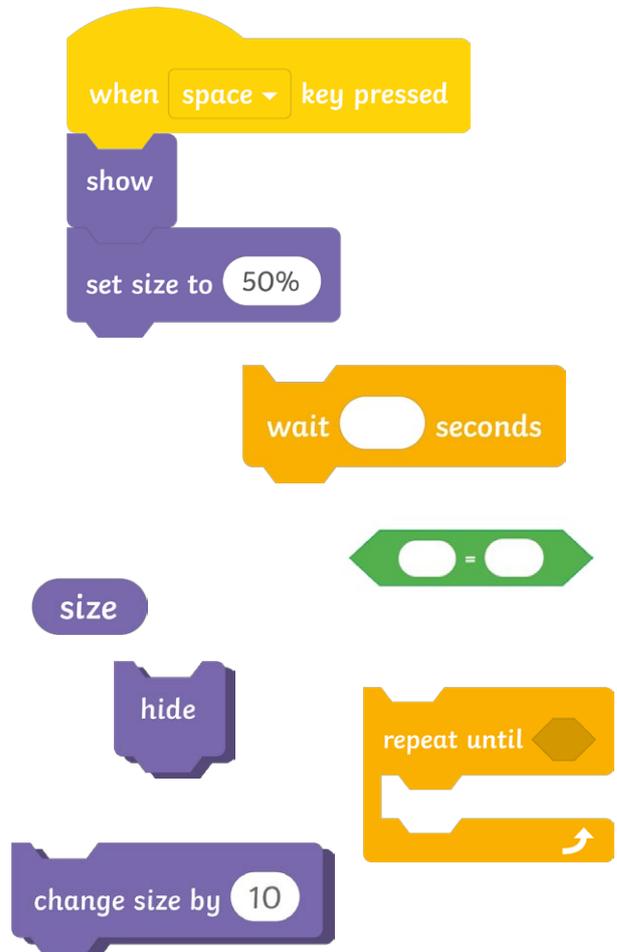
hide

repeat until ⬡

change size by 10

Task:

Can you use a **repeat until** loop to make the balloon grow in steps of 10 until it reaches size 300?

Task 2:

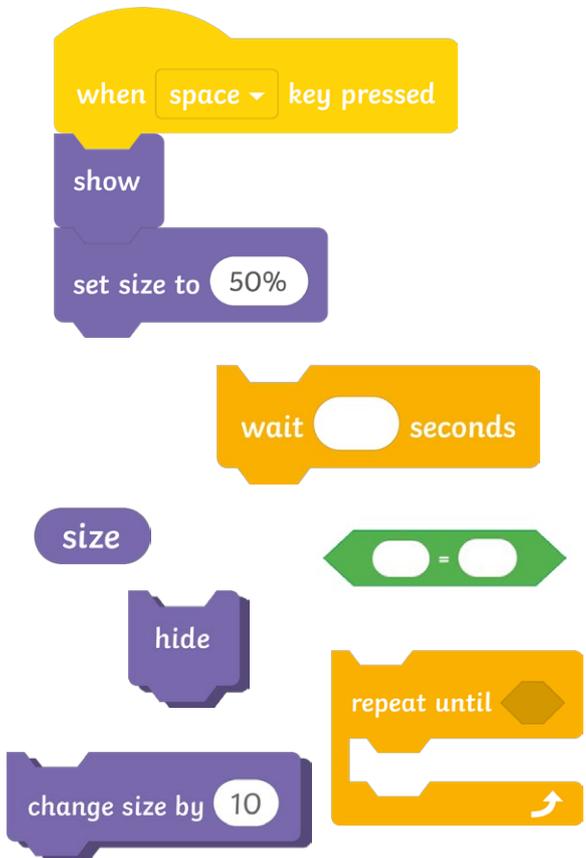Can you make **Balloon1** disappear when it reaches size 300 so that it looks like it has popped?

Task 3:

Can you add a sound effect? **Balloon1** comes with a **Pop** sound. You can find it by clicking on the **Sounds tab** above the **Block Pallette**. If you click on the **Choose a Sound** button at the bottom of the Sounds tab, you can choose a different sound for **Balloon1**.

Challenge:

Can you add more balloons? Duplicate and edit the algorithm from the first balloon to save time. How will you make the balloons grow and pop at different times?

Top Tip:
Right-click on the algorithm to duplicate it. Remember to delete any code you do not want for each sprite.

Pop! **Possible Solutions**

These tasks are very open-ended and children will solve them in different ways. The following solutions provide children with example algorithms but some areas have been left blank as children will add their own wait time and positions.

★

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when space key pressed
show
set size to 50%
repeat until  size = 300
    change size by 10
    wait 0.5 seconds
```

```
when space key pressed
show
set size to 50%
repeat until  size = 300
    change size by 10
    wait 0.5 seconds
hide
```
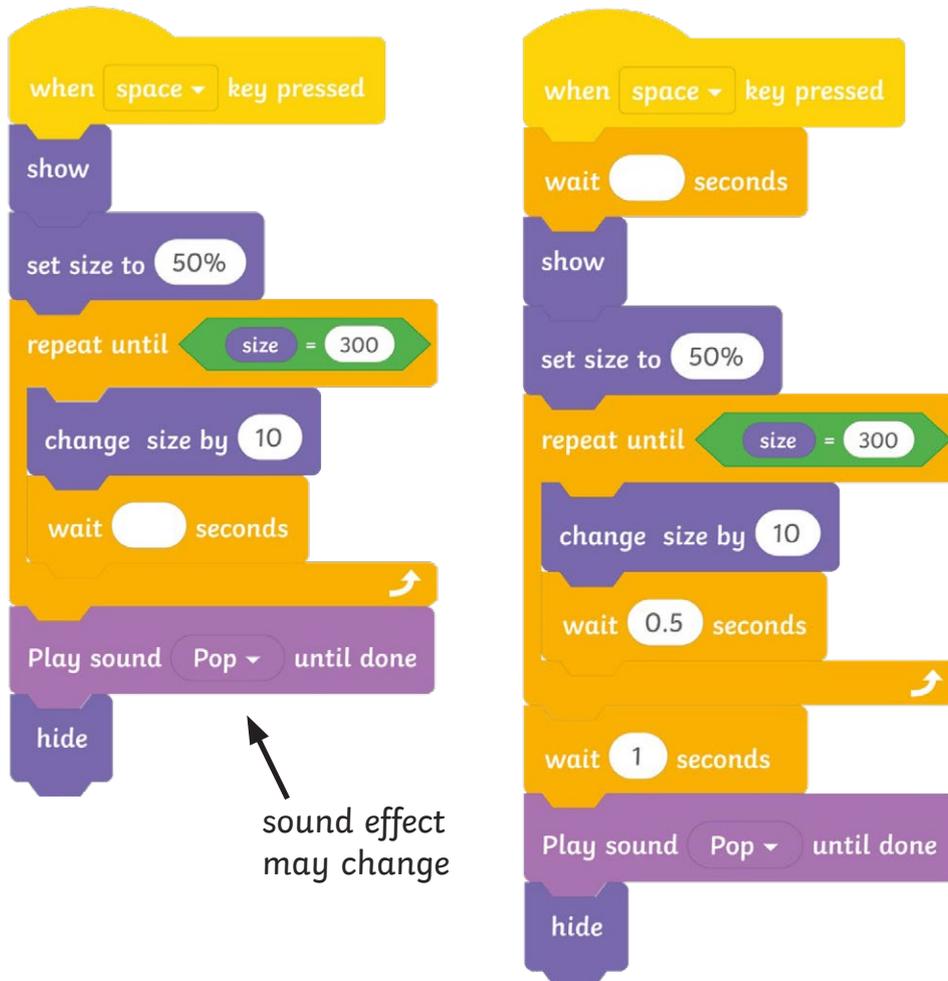
★★

```
when space key pressed
show
set size to 50%
repeat until  size = 300
    change size by 10
    wait    seconds
hide
```

```
when space key pressed
show
set size to 50%
repeat until  size = 300
    change size by 10
    wait    seconds
Play sound  Pop  until done
hide
```

sound effect
may change

Pop! **Possible Solutions**

These tasks are very open-ended and children will solve them in different ways. The following solutions provide children with example algorithms but some areas have been left blank as children will add their own wait time and positions.

★ ★ ★

Left algorithm:

when space key pressed
show
set size to 50%
repeat until size = 300
  change size by 10
  wait ___ seconds
Play sound Pop until done
hide

sound effect may change

Right algorithm:

when space key pressed
wait ___ seconds
show
set size to 50%
repeat until size = 300
  change size by 10
  wait 0.5 seconds
wait 1 seconds
Play sound Pop until done
hide

Adding different wait times to the other balloons will make them grow and pop at different times. Children should experiment with wait times to find out which ones work best.

To use a repeat until loop to repeat actions until a certain condition is met.		
I can explain what happens in a repeat until loop, using the word until.		
I know that a repeat until loop is a condition-controlled loop.		
I can add an Operators block into a repeat until loop.		
I can customise an Operators block to set a condition.		

To use a repeat until loop to repeat actions until a certain condition is met.		
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