How to build Doom on the Broom

Games usually have a theme. This spooky game starts with bats swooping in on the player, followed by scary ghouls and monsters. Get ready to bring these sprites to life with animation.

AIM OF THE GAME

The witch is out riding her broomstick in the woods when creatures of the night begin to advance on her from all sides. She must cast her fireball spell to dispose of the bats, ghosts, ghouls, and dragons that have taken a fancy to her for dinner.

◁ **Witch**
The witch sits in the centre of the screen. Spin her broomstick with the arrow keys and cast fireballs with the space bar.

◁ **Enemies**
Every enemy hit by a fireball is destroyed and a point is scored. As you win points, the game speeds up.

◁ **Lives**
The witch loses a life if she is touched by any of her enemies. But if a flying hippo touches her, she wins an extra life.

Black bats flap straight towards the witch.

To make the game last longer, you can increase the number of lives.

Fireballs are the witch's only weapon.

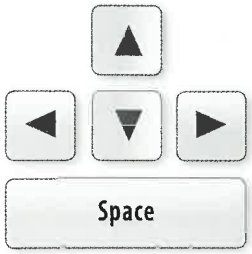
Fire-breathing dragons spiral in to catch the witch.

The witch stays in the centre of the stage.

Like dragons, ghouls spiral in towards the witch.

GAME CONTROLS

Use the arrow keys and the space bar on the keyboard as game controls.



◁ Staying alive

As the game progresses, more and more monsters fly towards the witch. The player must turn the broomstick quickly and pick off enemies one by one.

etting the scene

ɔom on the Broom has a spooky theme. The ırites, backdrop, and music are all chosen to eate a certain atmosphere that draws the ayer into the game world. Start by putting gether the Witch sprite, a dark wood, and ıme creepy music.

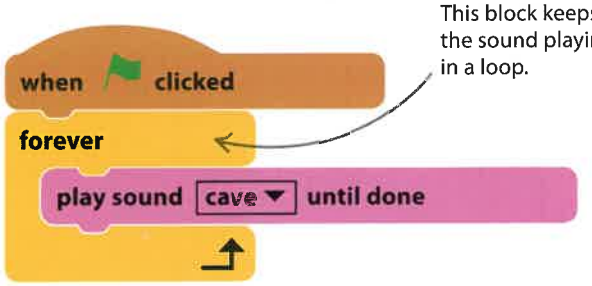
1 Start a new project and call it Doom on the Broom. Delete the Cat sprite. Click the sprite symbol in the sprites list and choose the Witch sprite from the library.

Click to open the sprite library.

The Witch sprite will appear in your sprites list.

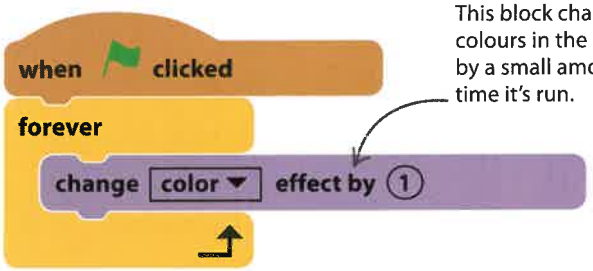
2 Click on the "Choose backdrop from library" symbol and add the backdrop "woods". This will lend an eerie setting to the game, which fits with the theme.

3 Load the sound "cave" from the sound library and add this script to the stage's scripts area. Run the project and admire the spooky atmosphere you've created.



This block keeps the sound playing in a loop.

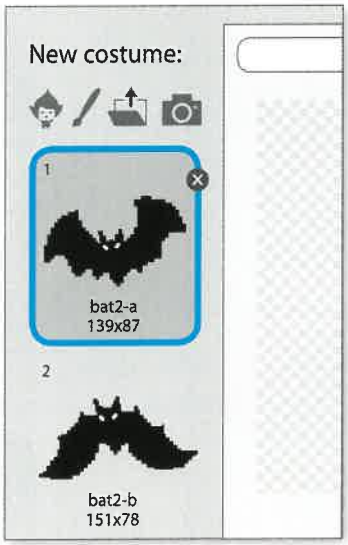
4 For extra creepiness, add another script to the stage to make it slowly but continually change colour while the game is playing.



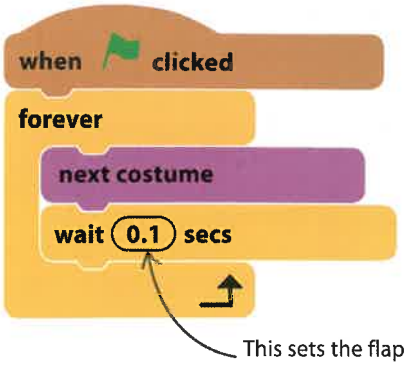
This block changes all the colours in the backdrop by a small amount each time it's run.

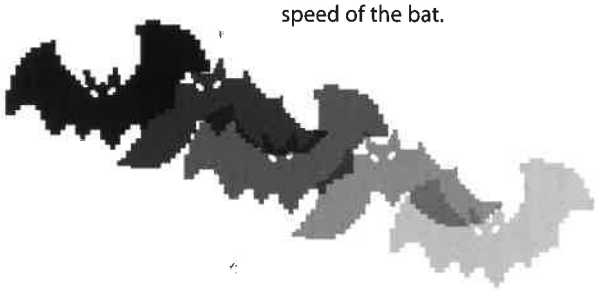
5 Now add the witch's first enemy: a sinister black bat. Open the sprite library, select Bat2, and click "OK".

6 The bat looks scary but it doesn't move. Click the Costumes tab and look in the middle – you'll notice the bat has two different costumes. These two costumes can be used to make the bat flap its wings.



7 Add this script to the bat to make the costumes swap back and forth. Now run the project to see the bat flapping its wings.

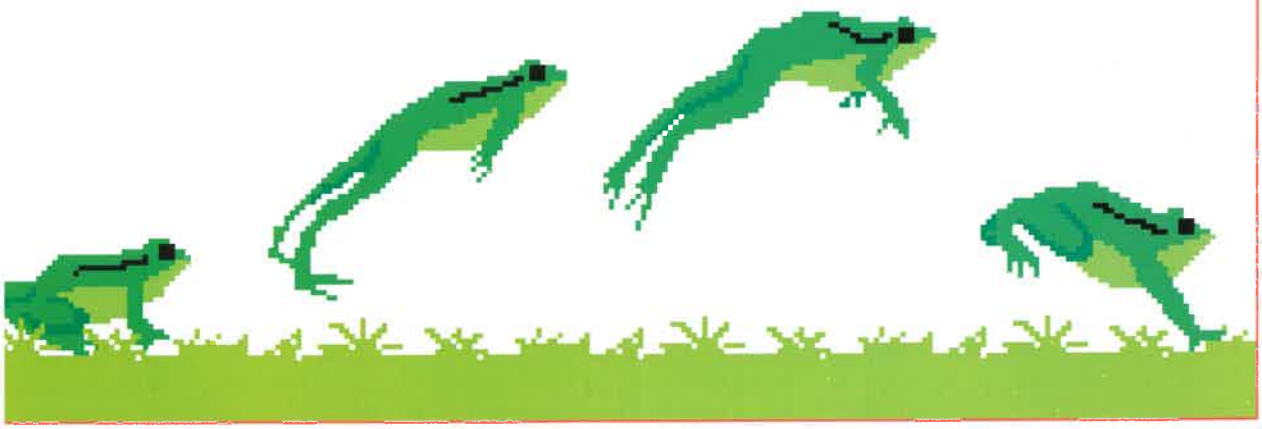




GAME DESIGN

Animation

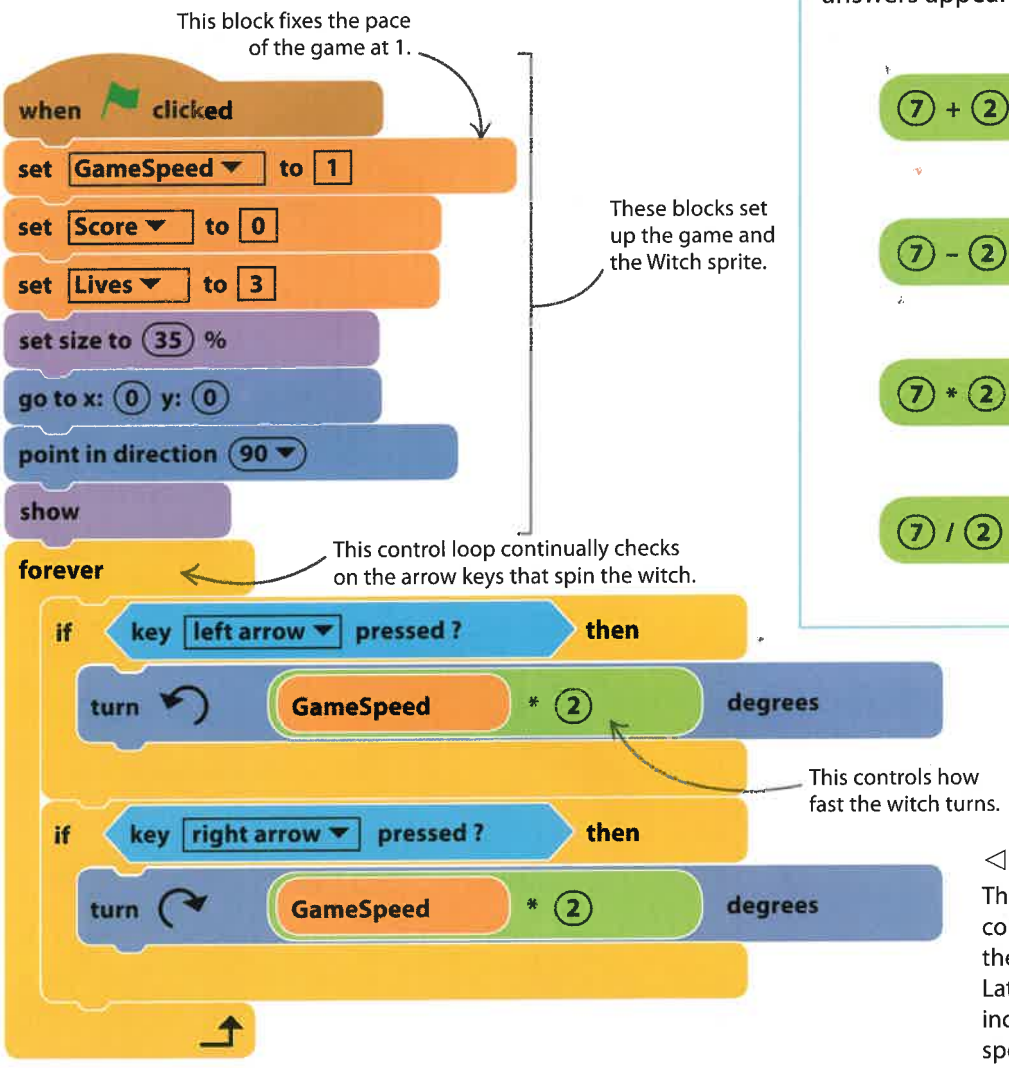
You can make pictures appear to move by showing slightly different versions of the same picture one after another. This fools the brain into thinking that it is a single moving image. This is called animation, and it is how all cartoons work. Scratch lets you animate a sprite by rapidly changing costumes that show it in different poses. When these costumes appear one after the other, you can see flapping bats, walking cats, and jumping frogs.



Controlling the witch

Your spooky game is now starting to take shape, but you'll need to add some more scripts to get things working. The next script lets the player take control of the witch.

8 Go to Data in the blocks palette and then click "Make a Variable". Create the variables "Score", "Lives", and "GameSpeed", making sure that the "For all sprites" option is selected. Show the variable "Score" and "Lives" on the stage. Add the following script to the witch to set things up and to control her with the arrow keys. Read the script carefully and test it to see if it works.

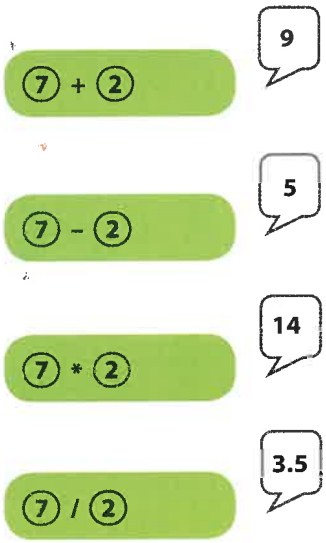


◁ Controlling the pace
The variable "GameSpeed" controls the overall pace of the game. For now fix it at 1. Later, you'll find out how to increase it as the score rises, speeding up the game.

EXPERT TIPS

Arithmetic operators

Computer programmers have to use special symbols to do maths. Almost every computer language uses * for multiply and / for divide because the usual symbols aren't on a computer keyboard. Look in the green Operators section for the arithmetic operators. Click on the blocks in the scripts area to see the answers appear in a speech bubble.



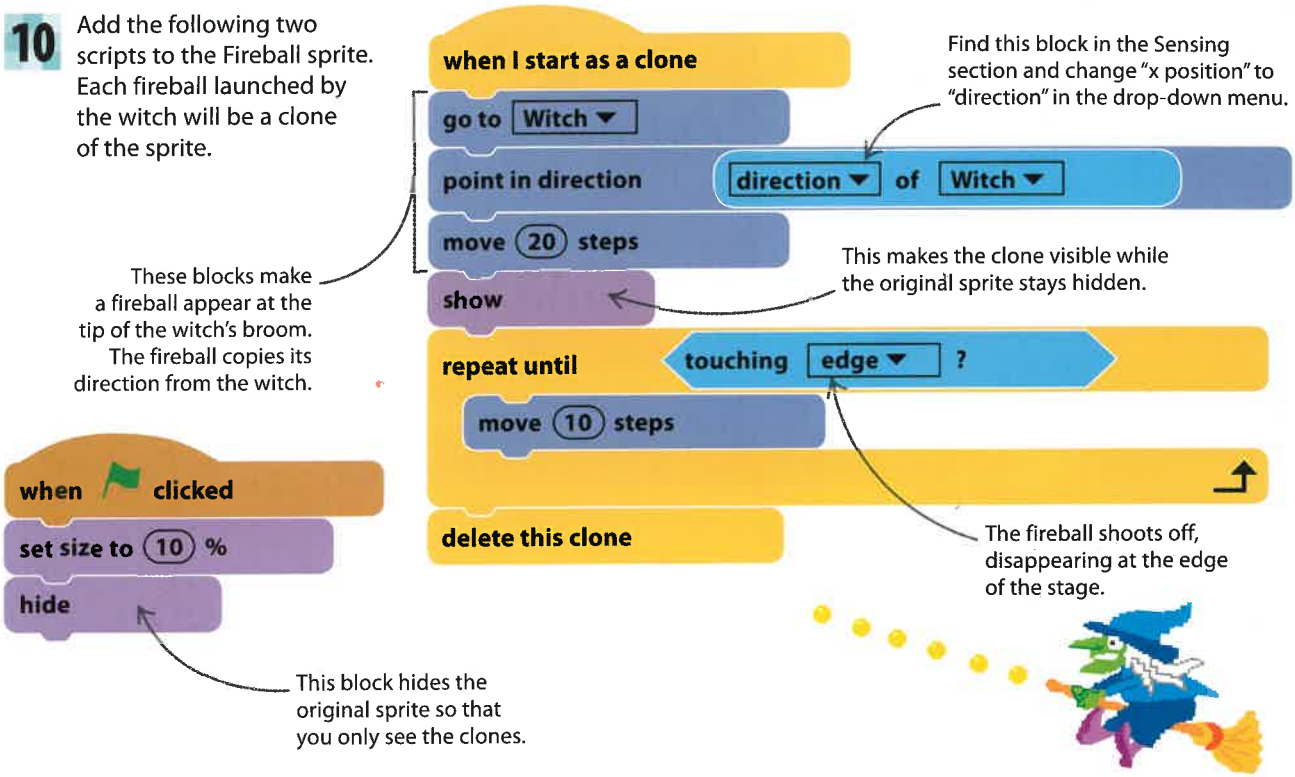
Casting fireballs

The witch's only defence against the rampaging spooks will be her fireball spell. The next script will make a fireball shoot from her broomstick when the player presses the space bar.

9 Add the Ball sprite from the library and rename it "Fireball". It's currently too big, but you'll shrink it down in a moment.

Click the blue "i" button to open the information panel and rename the sprite.

10 Add the following two scripts to the Fireball sprite. Each fireball launched by the witch will be a clone of the sprite.



Find this block in the Sensing section and change "x position" to "direction" in the drop-down menu.

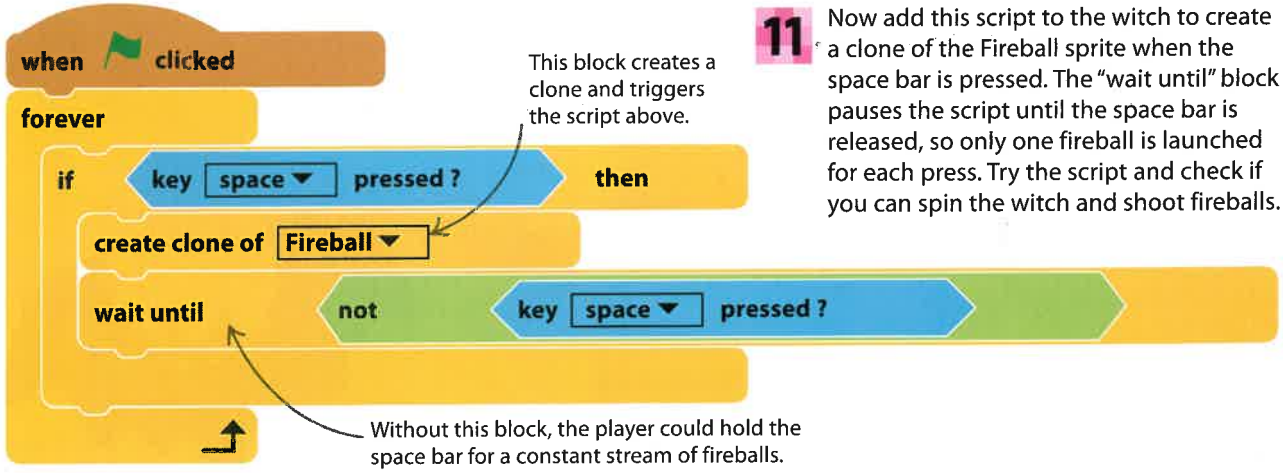
These blocks make a fireball appear at the tip of the witch's broom. The fireball copies its direction from the witch.

This makes the clone visible while the original sprite stays hidden.

The fireball shoots off, disappearing at the edge of the stage.

This block hides the original sprite so that you only see the clones.

11 Now add this script to the witch to create a clone of the Fireball sprite when the space bar is pressed. The "wait until" block pauses the script until the space bar is released, so only one fireball is launched for each press. Try the script and check if you can spin the witch and shoot fireballs.

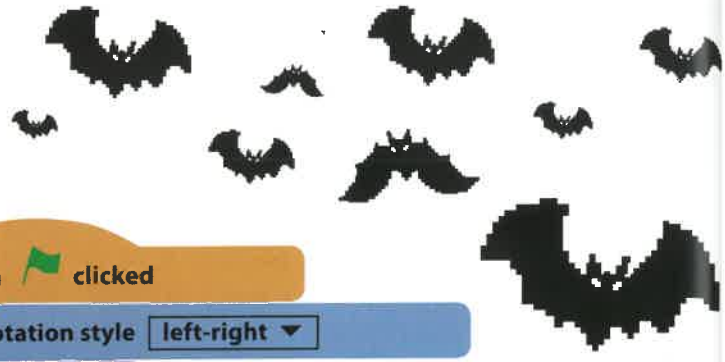


This block creates a clone and triggers the script above.

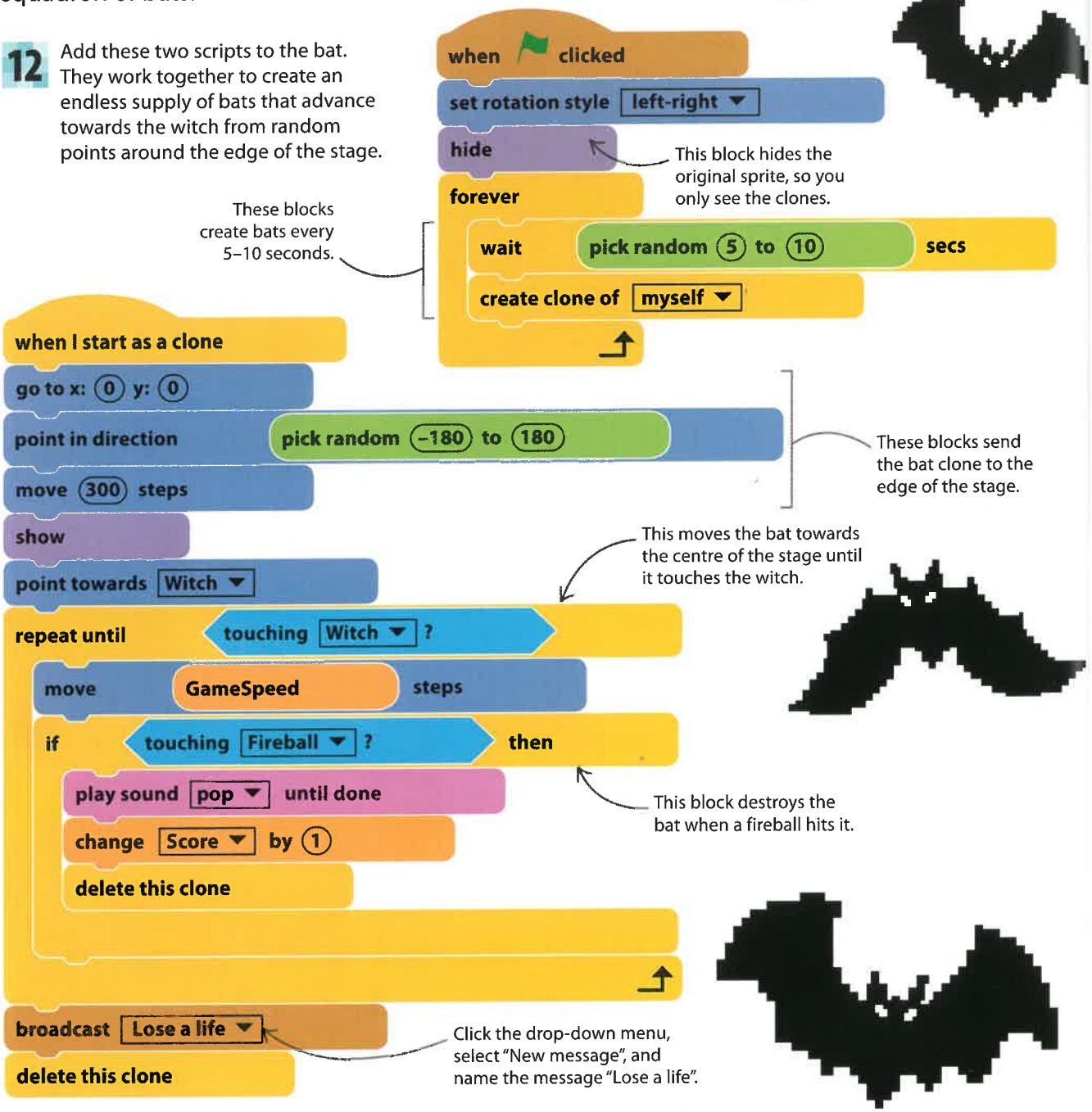
Without this block, the player could hold the space bar for a constant stream of fireballs.

Bat attack

One flapping bat isn't going to scare a powerful spellcaster like the witch, but you can add clones to make a whole squadron of bats.

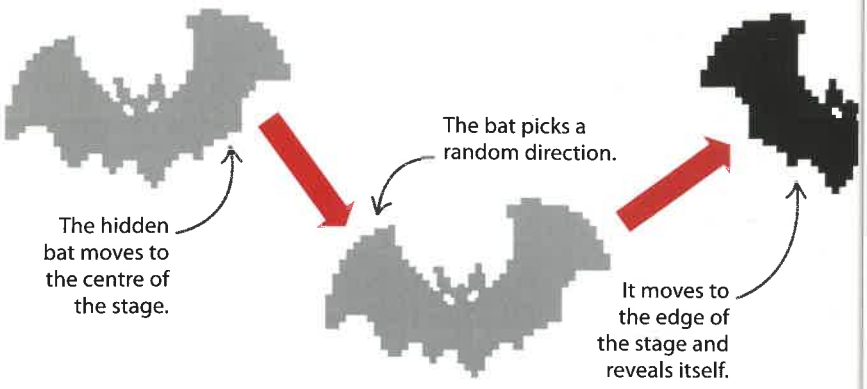


12 Add these two scripts to the bat. They work together to create an endless supply of bats that advance towards the witch from random points around the edge of the stage.



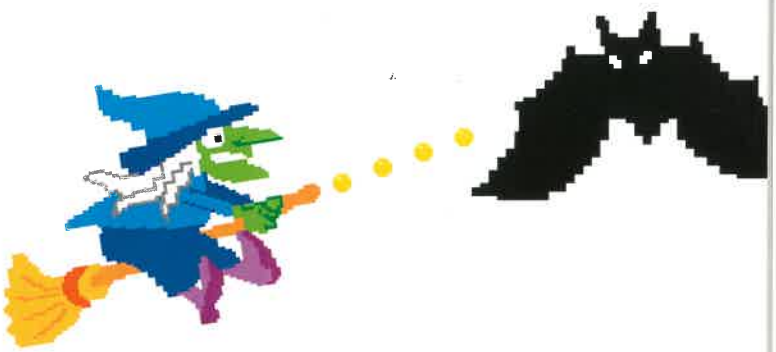
low does it work?

three blue Motion blocks at the start
ne bat clone's script move the clone to a
lom point at the edge of the stage. The
len clone first moves to the centre and
s a random direction. Then it moves
steps – far enough to reach the edge
ny direction. This way, bat clones will
ck from every direction with equal
nce. The witch doesn't touch the bat
n it first moves to the centre, because
can't touch a hidden sprite.

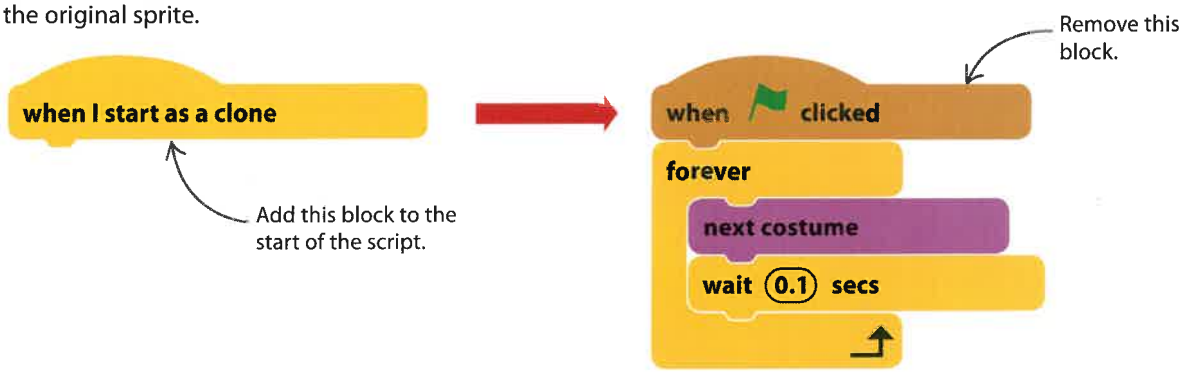


It's a good idea to remove all the bats whenever the witch loses a life. This gives her a chance to recover before the next wave of attackers. Add this script to the bat to do the job. When the message "Lose a life" is received, every clone runs the script and all the bats disappear.

14 Run the project to see if it works. A bat should appear after a few seconds and will move towards the witch. Soon more will appear. The witch should be able to use her fireballs to destroy them. All the bats will disappear when one finally reaches the witch.



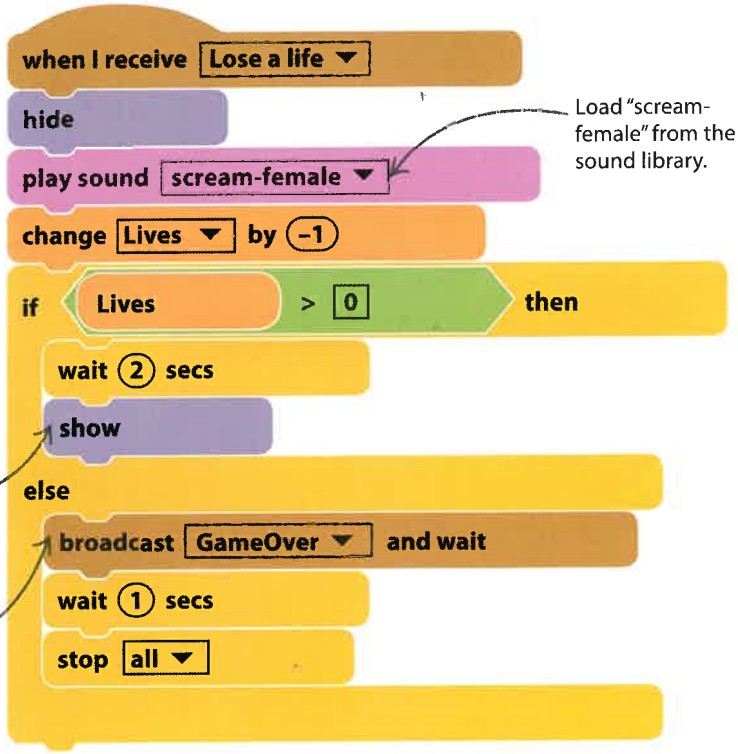
You might notice that the bats aren't flapping any more. To fix this, adjust the script below so that it runs for each clone rather than just the original sprite.



Adding explosions

Not much happens when the witch loses a life. Fix this to make the witch go out with a bang by creating some fireworks, adding a scream, and updating the counter that shows how many lives she has left.

16 Add this script to the witch to make her react to losing a life. If she still has lives left, she will disappear for two seconds before returning to battle. If she's out of lives, then it's game over. Add a new message, "GameOver", which you'll need later in the project. Now try the game again. The witch should lose lives and stop completely when the "Lives" variable has a value of 0.

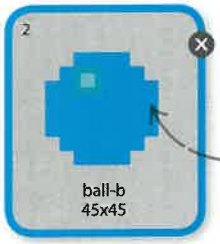


Load "scream-female" from the sound library.

This makes the witch reappear after a pause if she has any lives left.

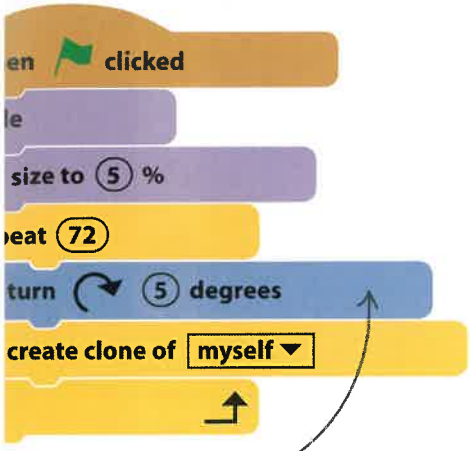
The "GameOver" message will trigger a sign that you'll create later.

17 To create fireworks you need a new sprite. Load another Ball sprite from the sprite library rather than copying the Fireball sprite. Rename this new sprite "Explosion" and then click on the Costumes tab. Select the second costume so that the ball turns blue.

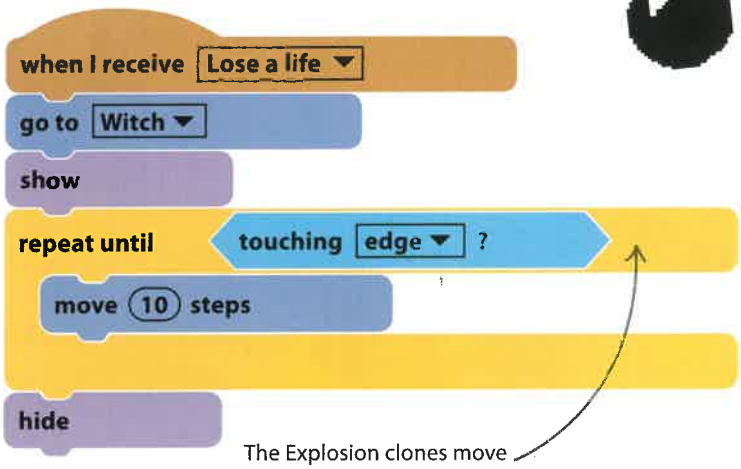


Select the second costume for the Ball sprite.

Now add these two scripts to the Explosion sprite. The first script creates 72 tiny, hidden blue ball clones, all pointing in different directions. The second script makes them fly out in a circle from the witch's location. Read the scripts carefully and try to work out what triggers the explosion.

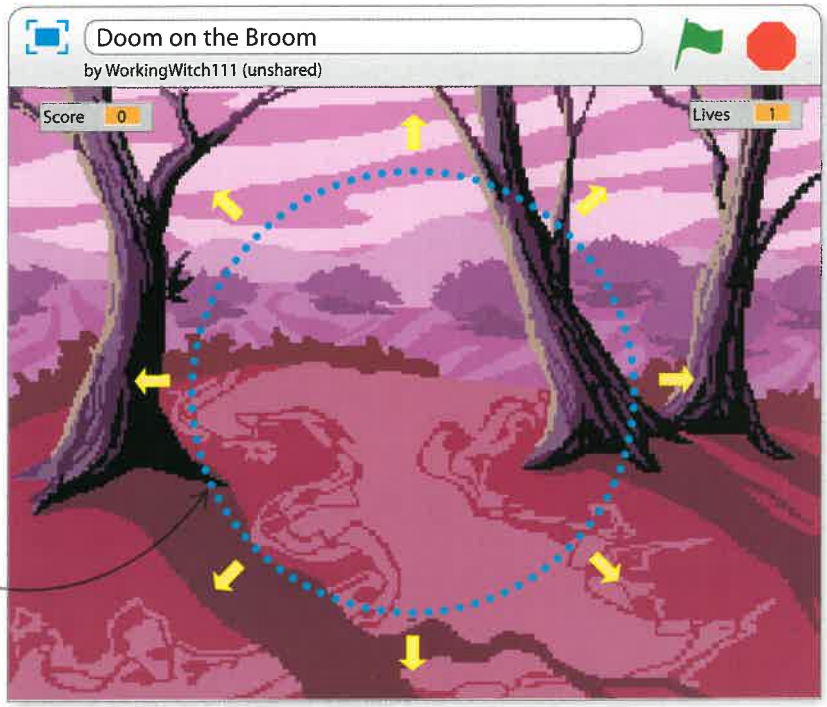


s makes each clone point in a different direction.



The Explosion clones move outwards, disappearing at the edge of the stage.

When the Explosion sprite receives the message "Lose a life", all the blue ball clones appear at the witch's location and explode out to the edge of the stage before hiding once again. Run the game and let a bat reach the witch to check how it works.

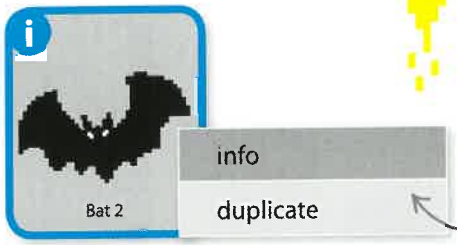


When a bat touches the witch, she explodes into a circle of flying blue balls.

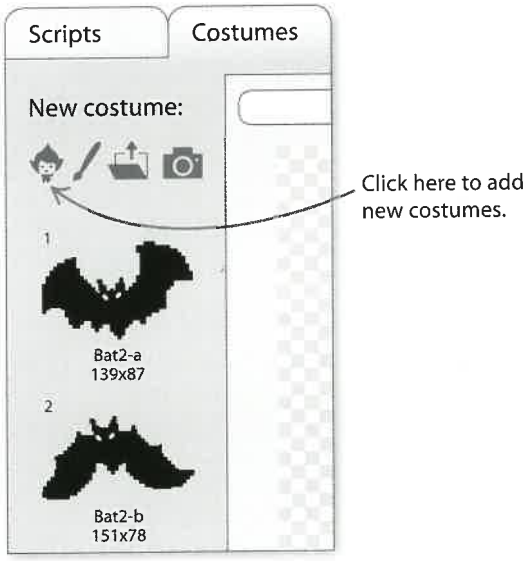
Speedy spectre

t's now time to increase the fear factor and add a different type of bat to the game. You can copy the existing black bat, and add new costumes and alter the scripts to create a superfast brown bat.

20 To avoid having to rebuild every script from the black bat, simply right-click it and create a copy by selecting "duplicate". A sprite named Bat3 will appear in the sprites list. Rename it "Fast bat".

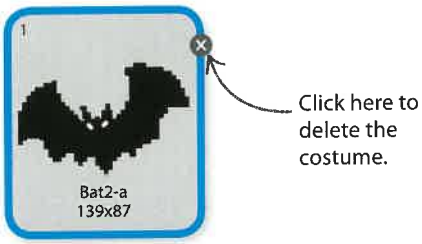


21 Click on Fast bat's Costumes tab – you'll see the copied black bat's two costumes. To make Fast bat look different from the black bat, you need to load some new costumes. Click on the symbol at the top to choose a new costume from the library.

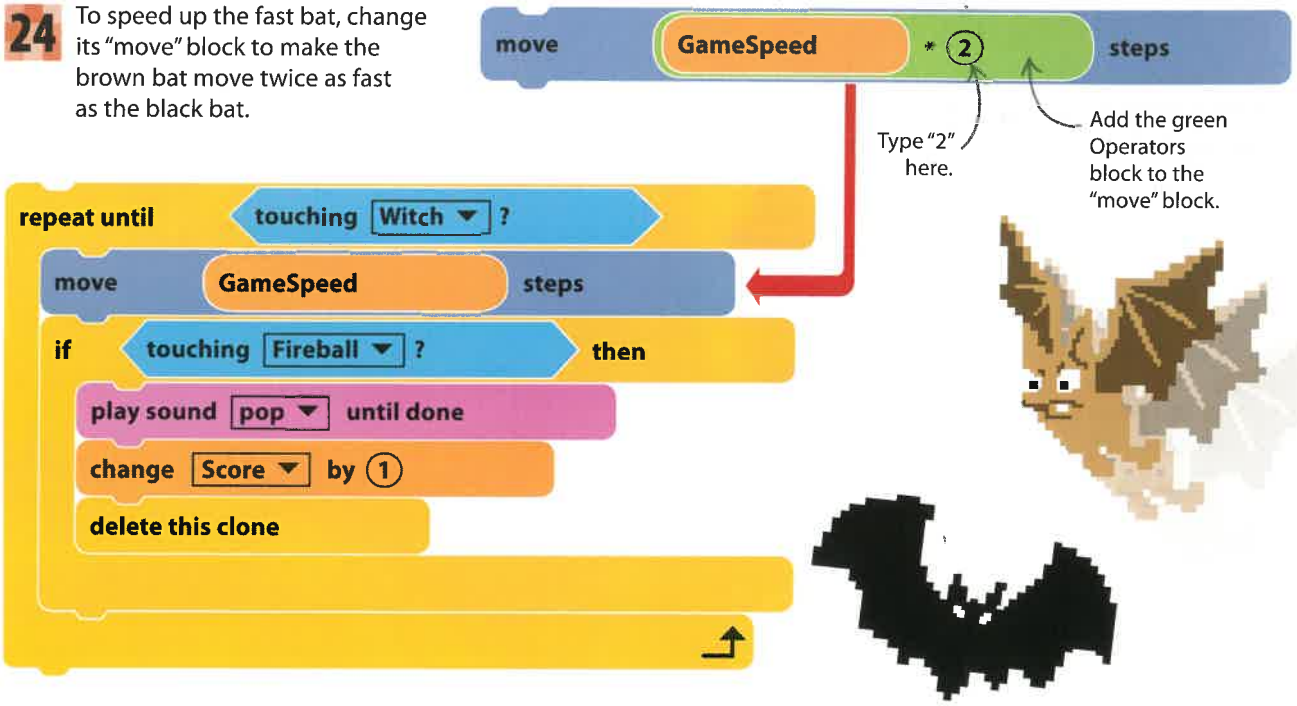


22 Add the two new costumes, "bat1-a" and "bat1-b". They show a brown bat with wings in two different positions.

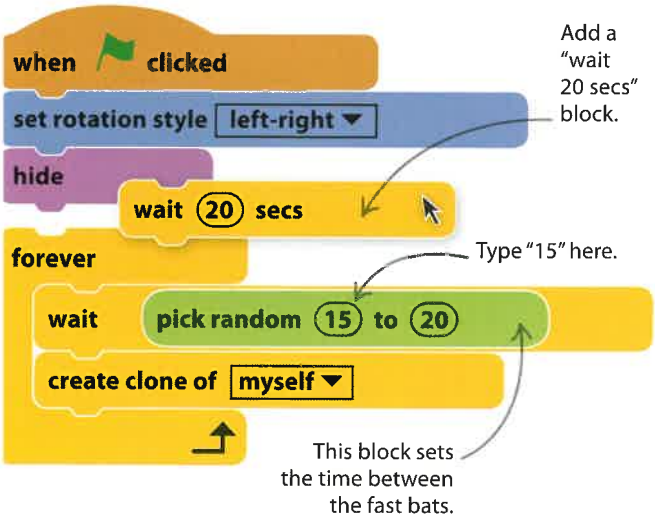
23 Now delete the unnecessary black bat costumes in this sprite. To do this, select the costume you want to delete and then click the small "x" in the top right.



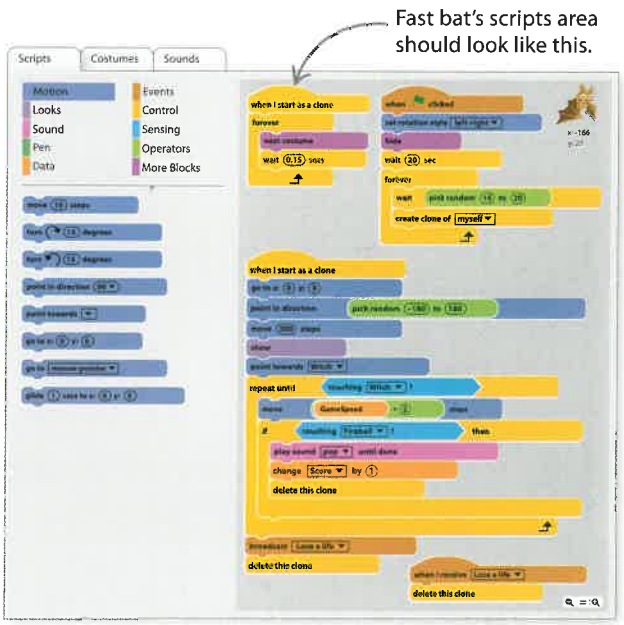
24 To speed up the fast bat, change its "move" block to make the brown bat move twice as fast as the black bat.



25 The game would be too hard with lots of fast bats, so make the following changes to the existing script to make them appear later in the game and less frequently.



26 Check you have four scripts in Fast bat's scripts area, just like in Bat2. Run the game. After a few black bats have attacked, a faster, much more dangerous one will appear, flapping away.

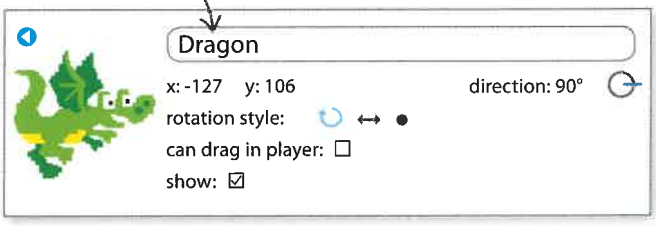


Fire-breathing dragon

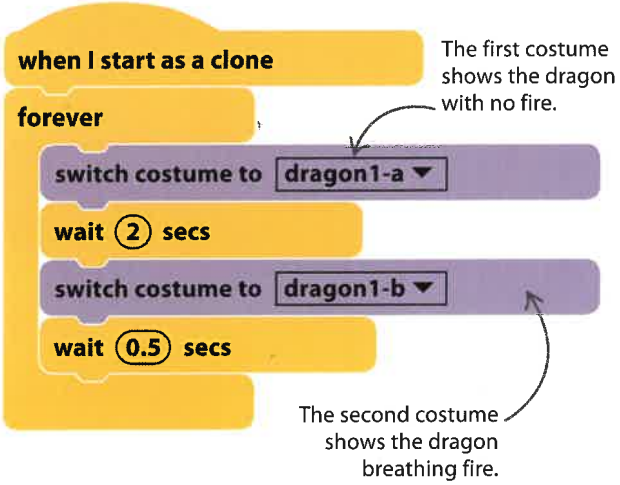
The witch's next enemy is a fire-breathing dragon. Instead of flapping straight towards the witch as the bats do, it will spiral in slowly, giving her more time to defend herself.

27 Copy the Bat2 sprite again, but rename it "Dragon". Load the two new costumes "dragon1-a" and "dragon1-b", then delete the two bat costumes.

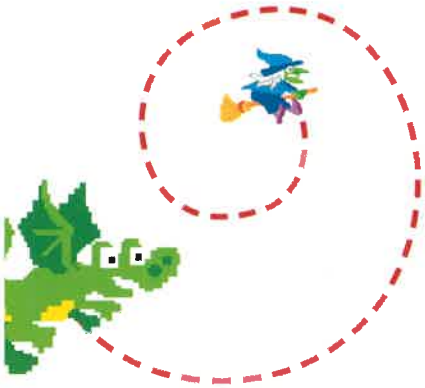
Type the new sprite's name here.

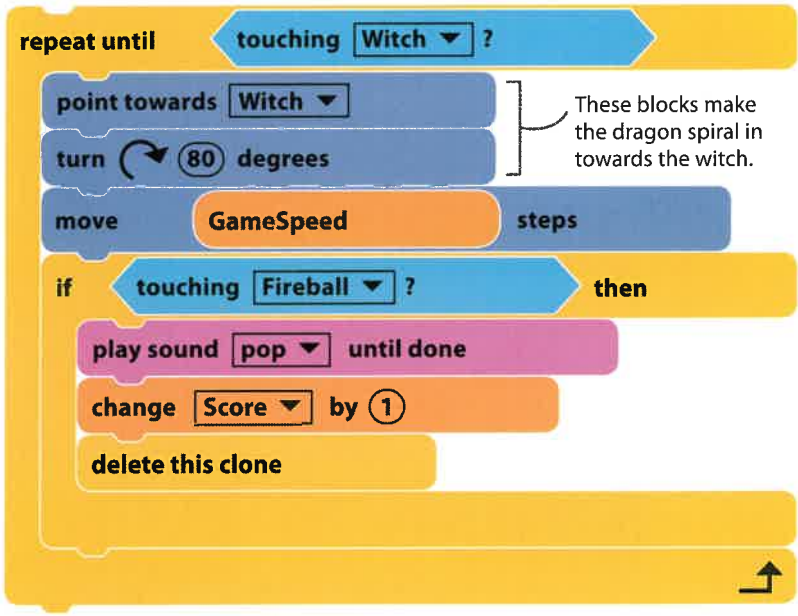


28 Now make a few changes to the scripts in the copied sprite. First, change the costume script to make the dragon breathe fire in short bursts.

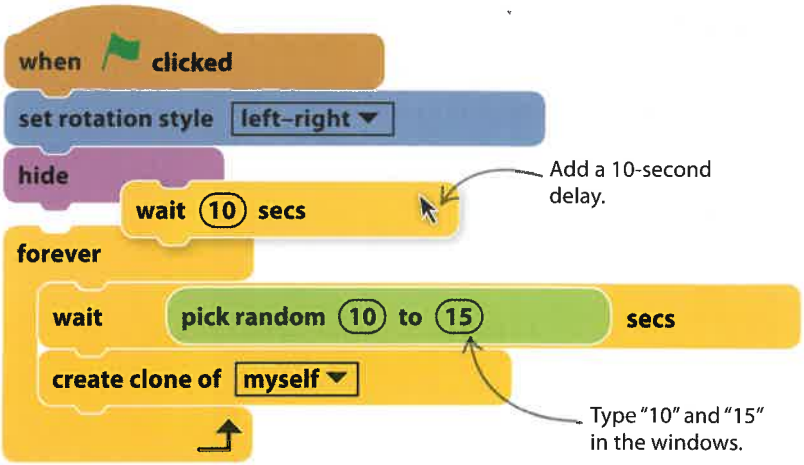


29 Next, modify the dragon's movement to make it fly in a spiral path by moving the "point towards Witch" block into the "repeat until" loop and adding a "turn right 80 degrees" block.





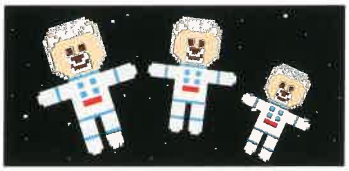
Add a "wait 10 secs" block to the main script to delay the dragon's arrival on the stage. Then change the numbers in the "pick random" block to "10" and "15". This will make a clone of the dragon appear every 10–15 seconds. Once you've made all the changes, test the game to see if it works.



GAME DESIGN

Working with themes

In Doom on the Broom, spooky scenery and supernatural characters work together to give the game a theme. A strong theme that ties together the elements of a game can make it feel polished and professional. Working with themes is also great fun as you can let your imagination run wild.



Story

A background story or quest helps give a game a theme. Perhaps the player is trying to escape a haunted house, search for underwater treasure, or explore an alien planet. Instead of inventing a story, you can use a well-known one, but give it a twist, such as putting Goldilocks and the three bears in space.

△ **Music and sound effects**

Sounds in a game have a big influence on how the player feels. Spooky music makes the player nervous, but jolly music makes a game feel cheerful, even if the pictures are spooky. Choose sound effects carefully so they match the sprite or situation that triggers them.

Scenery

If you choose the right backdrop, sprites in the game will look like they are really there rather than stuck on top. You can create your own backdrops in Scratch's paint editor, but you can also upload images you've found or created elsewhere.

△ **Sprites**

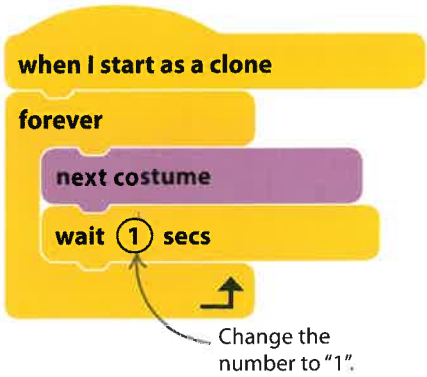
The player is usually the hero in a game, so choose a likable sprite. The enemies don't have to look scary – even cute sprites can seem scary when they attack. If players have to collect objects, make them look valuable, such as coins or gems.

Ghost

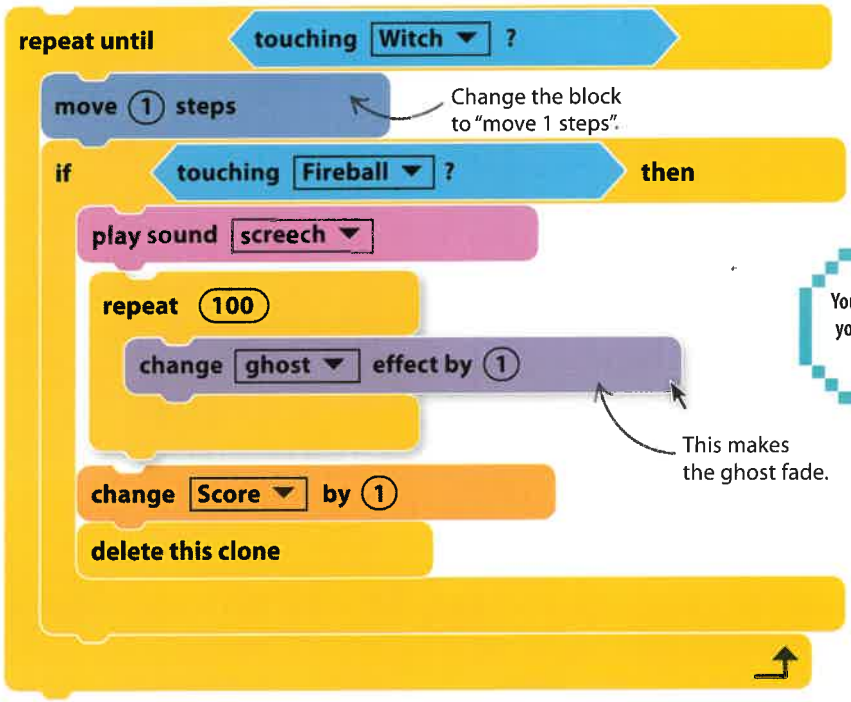
Supernatural heroes should have supernatural enemies, so add some ghosts and ghouls to chase the witch. Instead of vanishing when fireballs hit them, the ghosts will fade away.

31 To create the ghost, make a copy of the Bat2 sprite again. Rename the new sprite "Ghost" and replace the Bat2 costumes with "ghost2-a" and "ghost2-b".

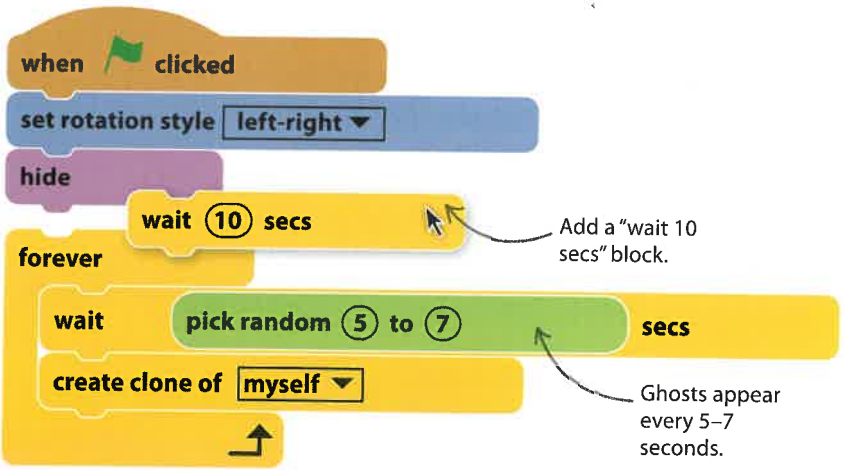
32 Modify the script below so the costumes change every second.



33 Change the ghost's script so that it moves slowly and fades out when hit by a fireball. Click the Sounds tab above the blocks palette and load the "screech" sound from the sound library. Then change the selection in the "play sound" block to "screech" to make the ghost scream when it vanishes.

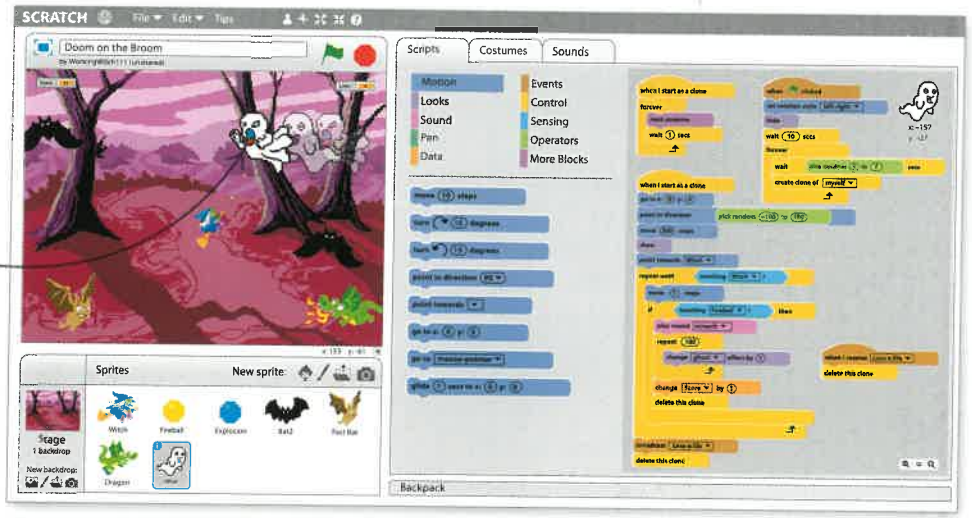


Now add a "wait 10 secs" block to the main script to delay the ghost's first appearance. Change the numbers in the "pick random" block to make ghosts appear more often than bats.



Once all of your changes are complete, test the game. Try fireballing each enemy to make sure the code works.

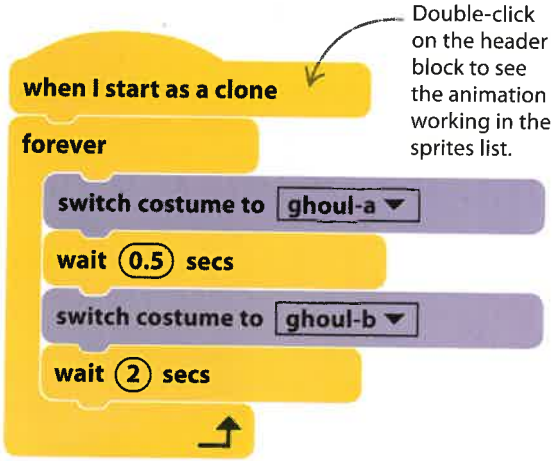
The ghost should slowly fade when hit with a fireball.



The Scratch library has two ghoul costumes that you can use to make another animated enemy. Copy the Dragon sprite and rename the copy "Ghoul". Click the Costumes tab, load the two ghoul costumes – "ghoul-a" and "ghoul-b" – and then delete the dragon's costumes. Update the ghoul's script to use the new costumes and adjust the timings.


ghoul-a

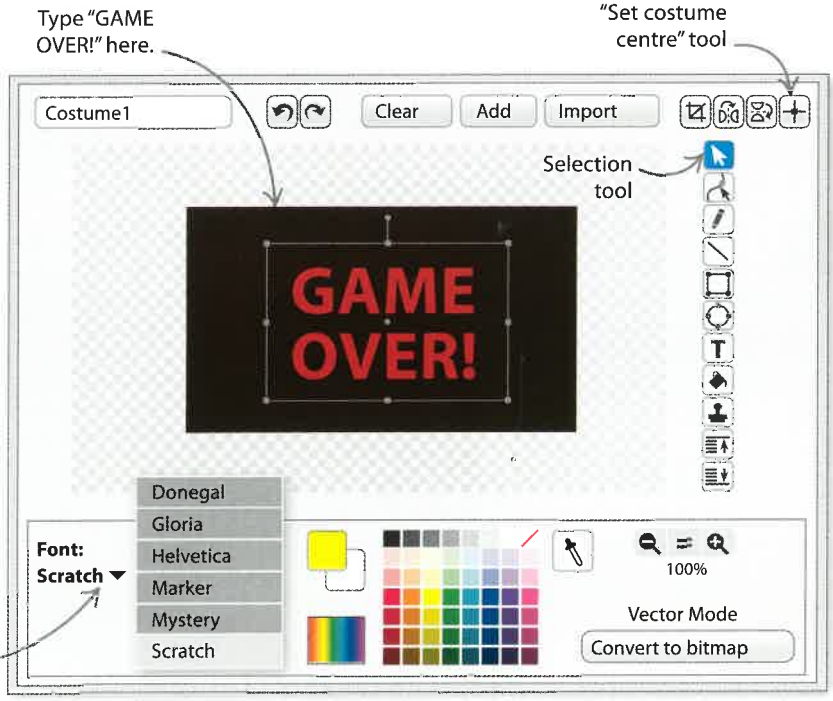

ghoul-b



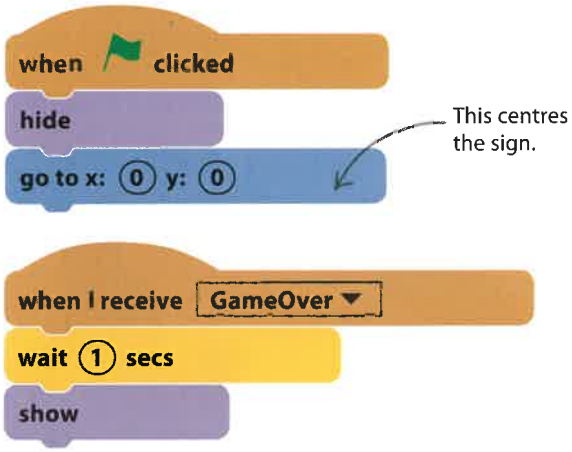
inishing touches

's time to add some finishing touches to the ame. To make it look more professional, add game-over screen that appears when the itch runs out of lives. You can also program ne witch to give instructions to the players t the start of the game.

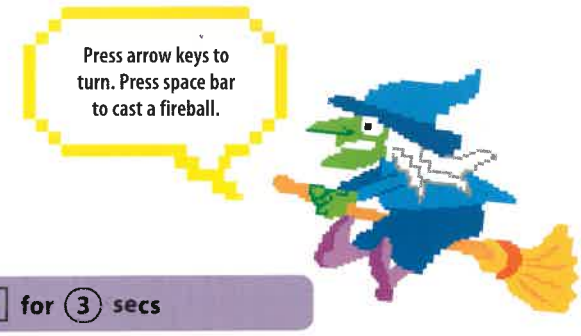
7 Click on the paintbrush symbol in the sprites list to create a new sprite in the paint editor. Using "Bitmap Mode", draw a rectangle and fill it with a dark colour. Now switch to "Vector Mode". Click on the text tool, choose a font you like, and select red for the text colour. Click in the rectangle and type "GAME OVER!" and use the selection tool to make the text large. Remember to fix the centre of the sprite with the "Set costume centre" tool.

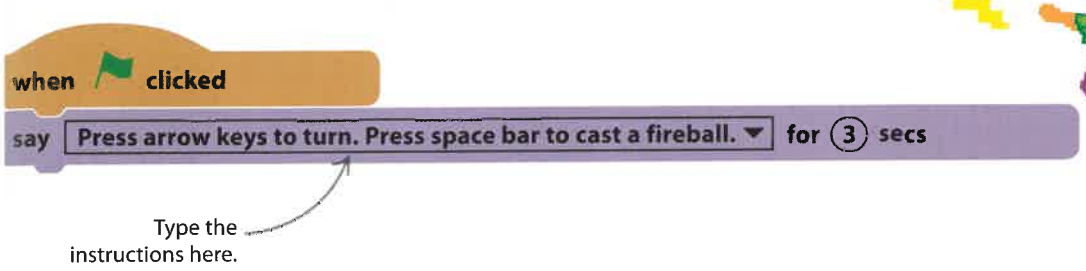


8 Now add these scripts to the new sprite to hide it at the start and show it only at the end when the witch loses all her lives. Run the game. Once the witch loses all her lives, the message will be displayed on the stage.



39 Add a script to the witch so that she gives instructions to the player at the start of the game. You can change the three seconds in the "say" block if it's too quick, but not for too long – those bats won't wait.



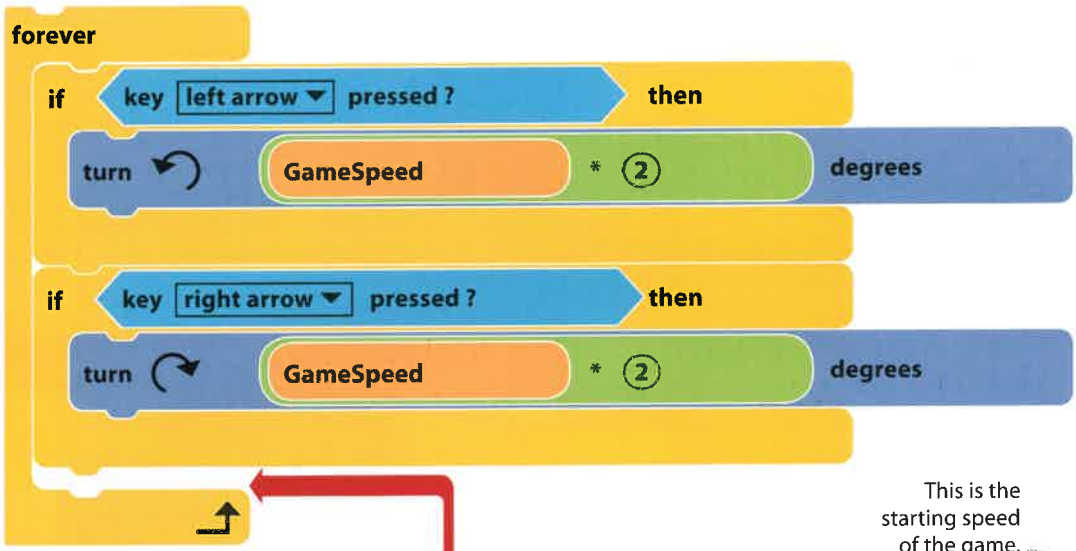


Type the instructions here.

Challenger mode

As players become more skilled and score more points, they may start to get bored with the game. You can prevent this by making the game faster as it progresses.

40 To make the game speed up as the player scores points, add a block inside the witch's movement loop that sets the "GameSpeed" variable using the variable "Score".



This is the starting speed of the game.

Lower this value to make the game speed up sooner.

> How does it work?

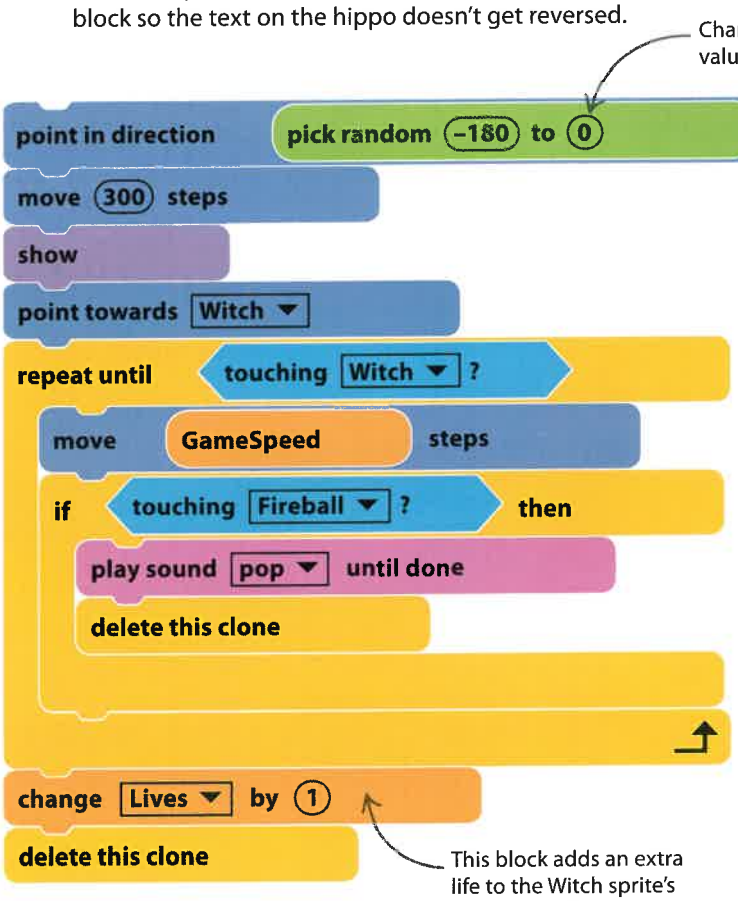
The GameSpeed setting increases with the score. For every 100 points, the speed increases by 1. When the score is 0, GameSpeed is 1. When the score is 50, GameSpeed is 1.5, and after 100 points the game runs at double speed.

Extra lives hippo

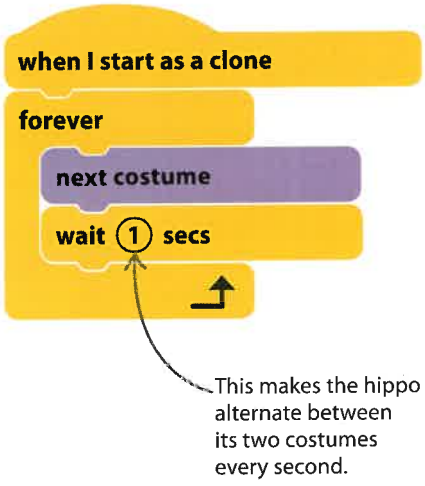
So far you've mainly added enemies. To help the player, add a friendly flying hippo that gives the witch extra lives if it reaches her without getting hit by a fireball.

41 Copy the Bat2 sprite, but replace its costumes with two copies of hippo1. Use the paint editor to write the messages "EXTRA LIFE" and "DON'T FIREBALL ME!" on the costumes so the player knows it isn't an enemy. Rename the sprite "Hippo".

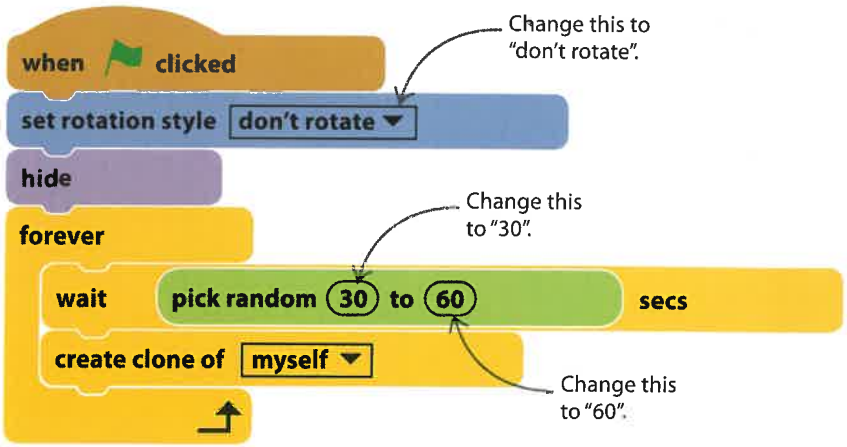
42 Amend the scripts so that instead of gaining a point when you fireball the hippo, you earn an extra life when it touches you. Change the value in the "point in direction" block so the text on the hippo doesn't get reversed.



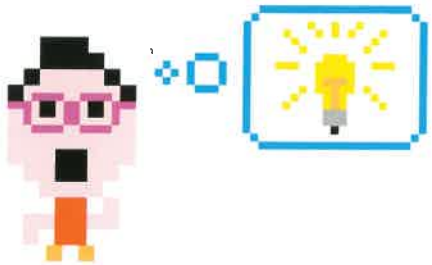
43 Change the wait time in the costume script so that the hippo swaps costumes once a second, giving players time to read the signs.



44 To avoid making the game too easy, make the extra lives hippos rare. Change this script so they appear only every 30–60 seconds.



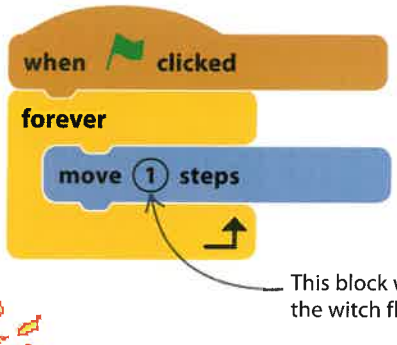
Hacks and tweaks



Now that you've got your game to work, you can experiment and make it your own by changing and adding elements. Try these suggestions to get started.

> Flying Witch

You can make the witch fly instead of rotating on the spot by adding the script shown here. To make her turn faster while flying, increase the numbers in her "turn" blocks.



Spell binder

Can you think of another spell that the witch can cast? Tweak her script and costumes so she strikes her enemies with lightning, or make her cast some other fancy spells.

▷ Mouse control

Use this script to let the player spin the witch with a mouse rather than the keyboard. If the game is too easy, increase the GameSpeed value. You can also try changing the code so the computer mouse casts the fireballs.