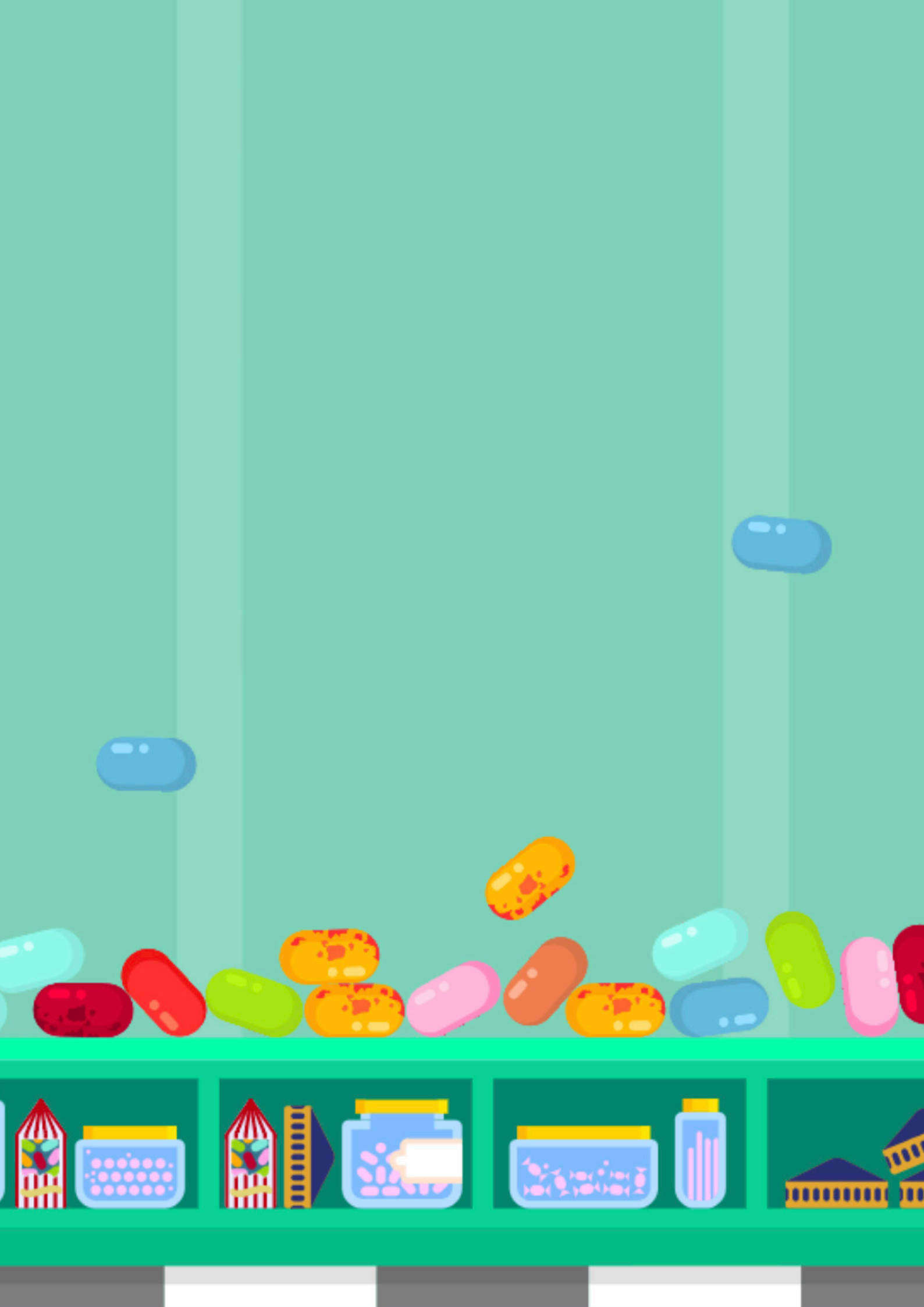
An Educators Guide

Challenge Walk-Through

Hour of Code
2018

KANO
anyone can make



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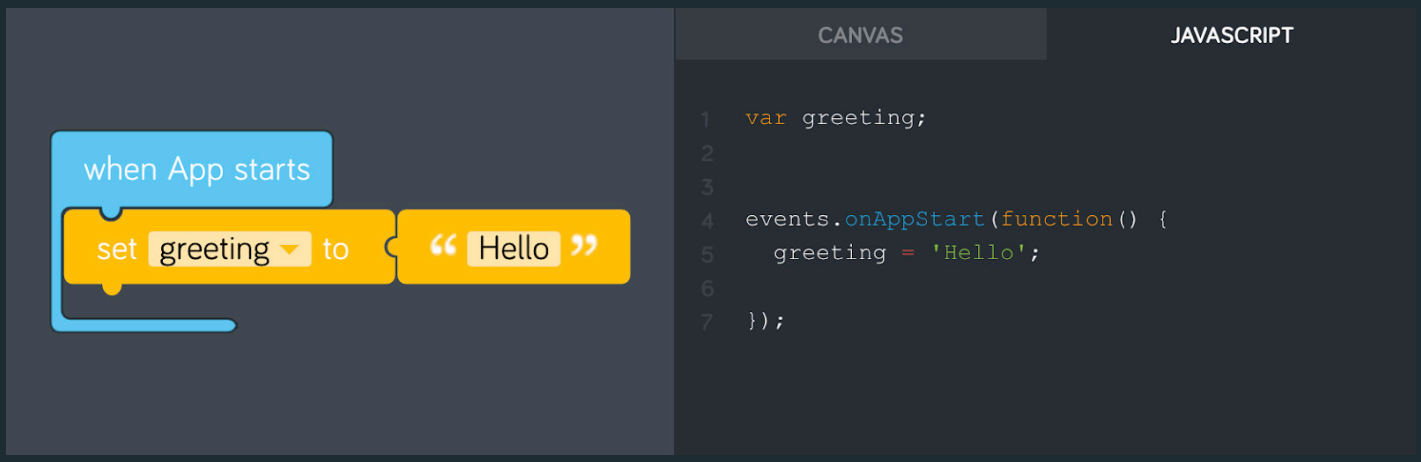
Introduction

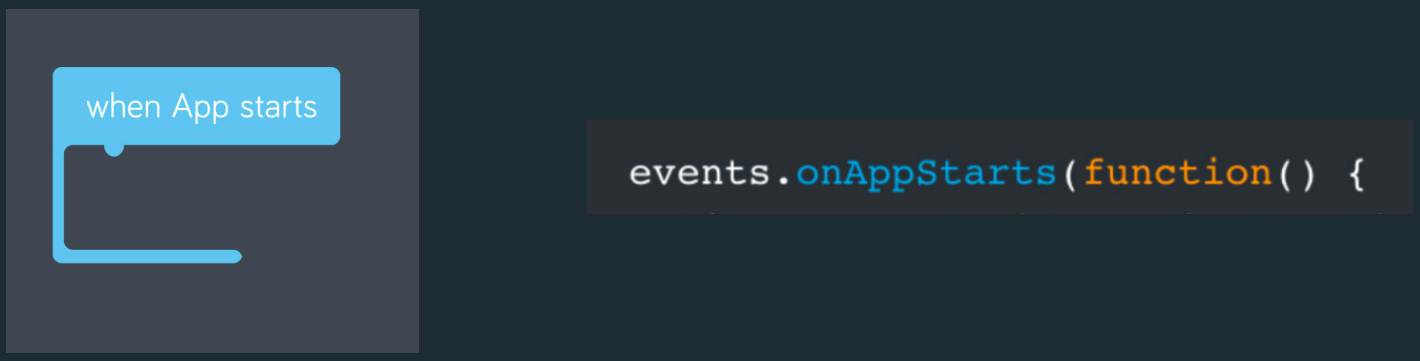
Programmers and wizards have much more in common than you think! With just a few words, both can make things appear from thin air and control them. Writing programs is a lot like casting a spell, as both use carefully chosen words in specific orders to work.



Hidden inside the coding blocks is a powerful programming language called Javascript. When a block is dropped on the coding space, it writes a line of Javascript. You can view this as it happens by clicking on the ‘Javascript’ tab and watch the magic happen for yourself! Javascript is commonly used to make websites interactive, powering things from buttons and forms to animations. Javascript is used everywhere, from Netflix to NASA!

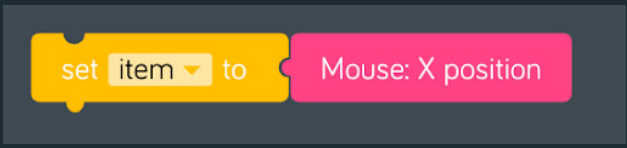
Each coding challenge covers key programming concepts:

Functions



Functions run whatever code is nested inside of them. For example, “When App Starts” is a function that runs the code inside of it when the App starts running.

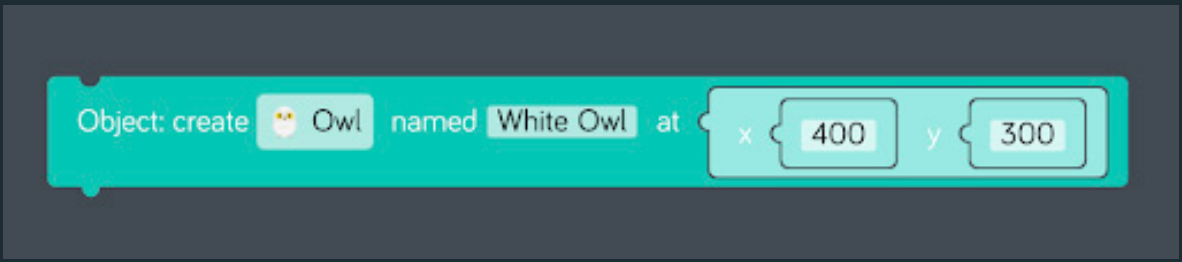
Variables




```
item = devices.get('mouse').getX();
```

Variables are also used in Kano code. A variable is like a container in which you can store a piece of information to use later in your code. The data stored in the variable can also change (or vary!) over time. You can give your variable any name you like - for example, the variable's name here is 'item' and the data stored inside of it is the X position of the mouse, which will change as the mouse is moved.

Parameters



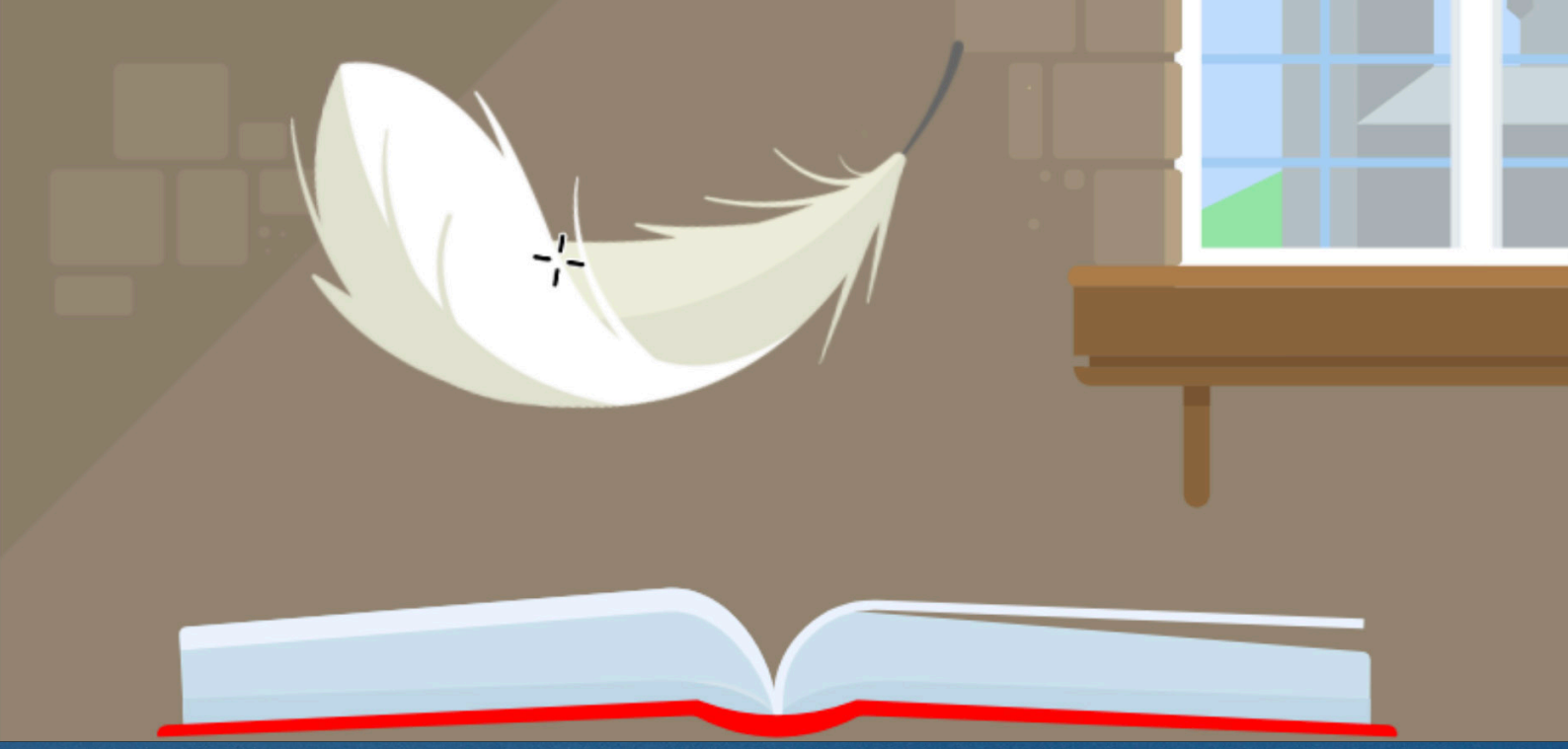

```
objects.add('Owl', 'White Owl', position.create(400, 300));
```

Parameters are what make functions powerful, they are values you can feed into your function which changes how it works. The parameters of the objects and function change which object is created and choose where on the canvas the object appears.

Conditionals

Another concept used in the Hour of Code are conditional statements, which are also known as 'if statements'. These only run the blocks of code inside them 'if' the specified condition is true. Conditionals are the foundation for what makes computers able to do more than a single task.


```
if (position.get('angle', objects.getRandom('Ford Anglia')) > 20)
  position.applySpin(objects.get('Ford Anglia'), -1);
```



Challenge 1

Levitate a Feather!

Beginner **15 min**

1. An event is fired when the app starts, which triggers the code in this block to run.

2. This block creates an object to appear on the canvas, in this case a feather.

3. We want the feather to not fall so we freeze it at its created location.

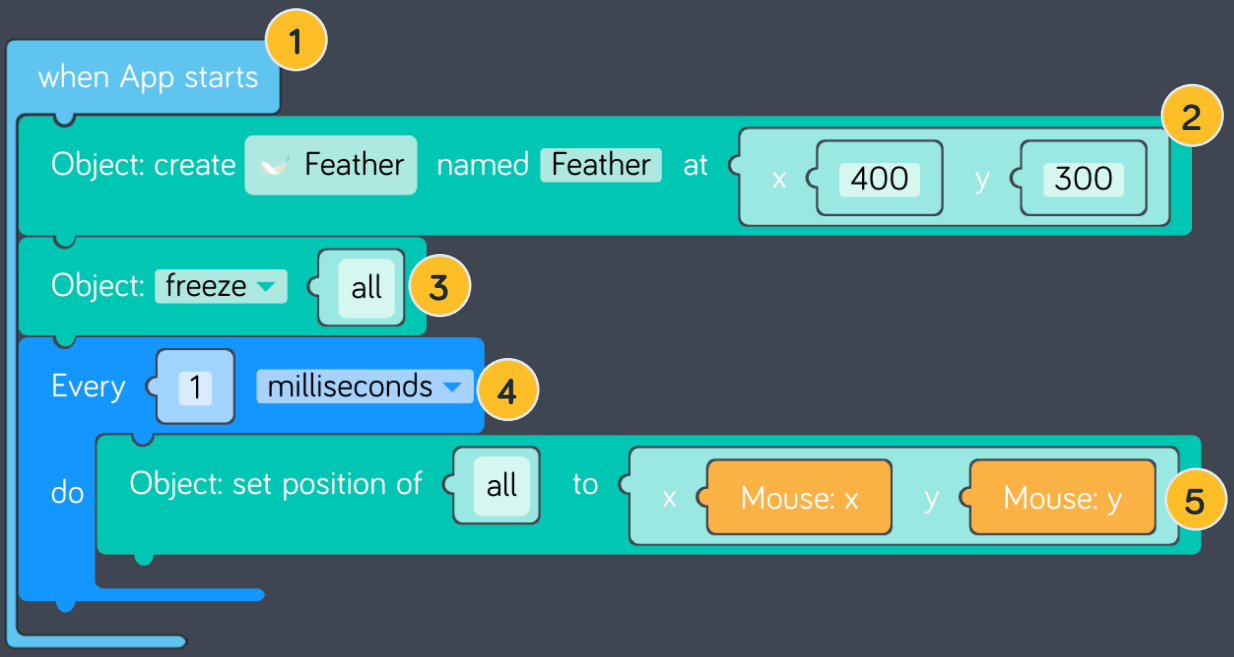
4. This block loops the code inside it. It can be set to run code every second, millisecond, or frame. The app calls for the code to run every millisecond so it will be very fast!

5. We want the mouse to control the position of the block so we will make the feather follow the x and y coordinates of the mouse!

   Move your mouse around the canvas and you will see the x and y coordinates change and the feather now moves to those coordinates.

Remix Challenge:

Can you change the object?
What happens when you unfreeze?




```
events.onAppStarts(function() {  1
  objects.add('Feather', 'Feather',  2
position.create(400, 300));  3
  objects.stick('freeze', objects.get('all'));
  time.every(1, 'milliseconds', function() {  4
    position.set(objects.get('all'),
position.create(mouse.x, mouse.y));  5
  });

});
```

Challenge 2

Summon Bertie Bott's Every-Flavour Beans!

Beginner **15 min**

1. An event is fired when the mouse is clicked, which triggers the code in this block to run.

2. This block loops, and in this app it calls for the code to run the code inside it 5 times!

3. The code creates a Bertie Bott's Bean 5 times where the mouse's x and y coordinates are on the canvas.

4. This block will apply a force that will need a direction and strength. In this block direction is a number between 0 to 360 (degree measurement) and strength means how strong you want the action to be on the object.

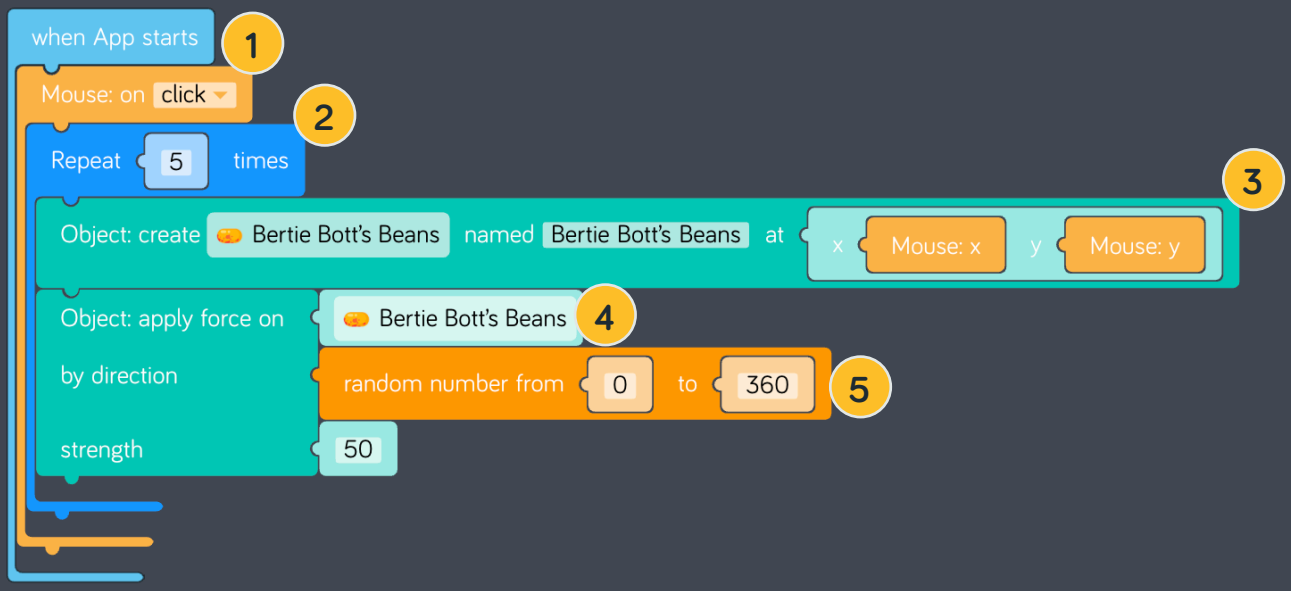
5. Each bean will have a direction that will be a random number between 0 - 360.

Remix Challenge:

What happens when you change the strength to a lower number? What about a higher number?

What happens when you remove the random number block and you change it to a specific number?

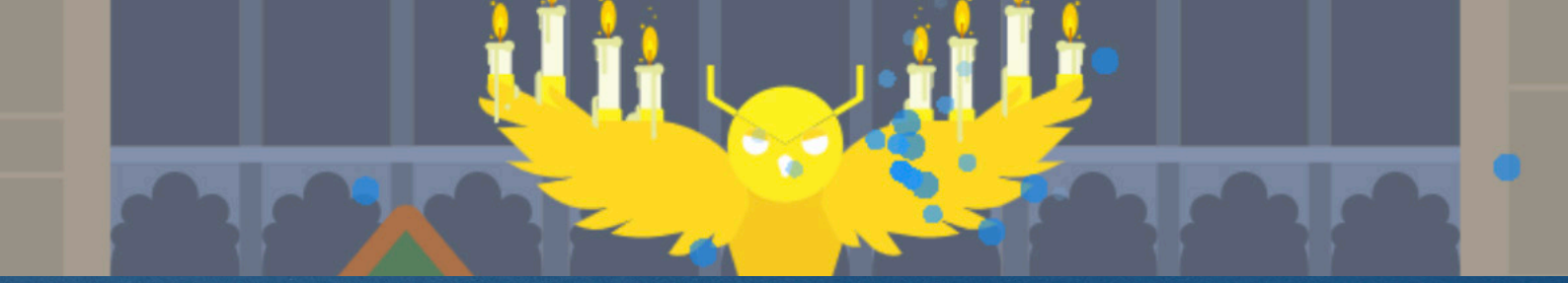
Make it your own! Try changing the object.




```
events.onAppStarts(function() {
  mouse.on('down', function() {
    for (var i = 0; i < 5; i++) {
      objects.add('Bertie Bott's Beans', 'Bertie Bott's Beans',
position.create(mouse.x, mouse.y));
      position.applyForce(objects.get('Bertie Bott's Beans'), math.random(0,
360), 50);
    }

  });

});
```



Challenge 3

Create Fireworks that Fizz and Bang

Beginner 15 min

1. This block will create particles at the x and y coordinates of the mouse.
2. We want to apply a force to the particles that will have a random direction and a strength of 3 (very small).
3. Particles will start as one color then change to another color.
4. These two lines will create particles that will start as one color and size and as they begin to disappear (end) they will change to another color and size.
5. The particles will stay on the screen for a set amount of milliseconds. If you want them to disappear quickly you have a smaller number. If you want them to stay longer, you can have a larger number.
6. Every second we will create a particle that will create a bang!
7. The particle will appear where your mouse's x and y coordinates are on the canvas with a strength of 10 and will be a blue color.

Remix Challenge:

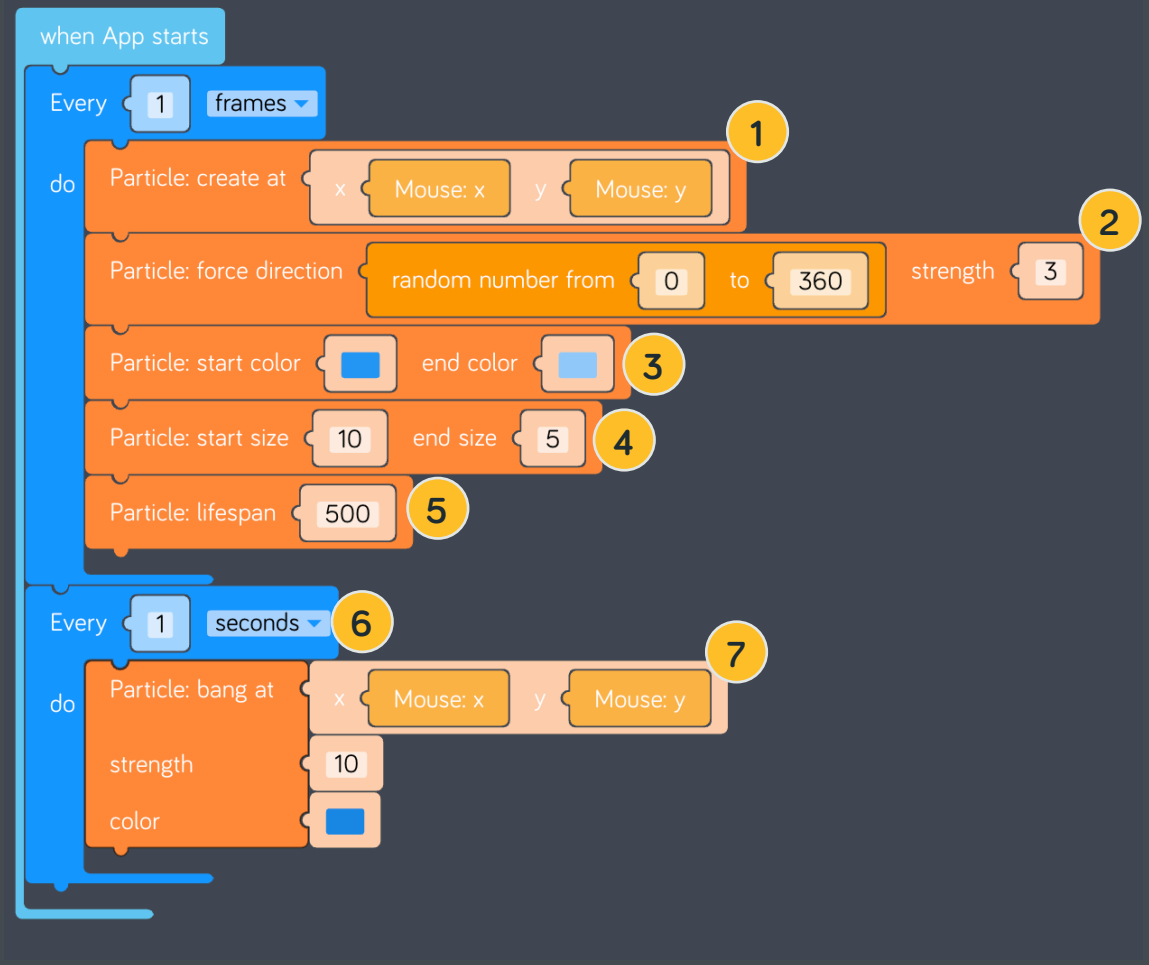
What happens when you change force direction? Try 45, 90, 180, 270, and 360.

What happens when you change the strength or the size of the particles?

What can you do to make the particles stay on your screen for a long time?

Can you change color of bang so you can see it more easily?

What do you think will happen to the particles if you change your look blocks?




```
events.onAppStarts(function() {
  time.every(1, 'frames', function() {
    particle.generate(position.create(mouse.x, mouse.y)) 1
    particle.setForce(math.random(0, 360), 3); 2
    particle.setColor('#2196F4', '#90CAF9') 3
    particle.setSize(10, 5); 4
    particle.setLifespan(500); 5
  });
  time.every(1, 'seconds', function() 6
    particle.bang(position.create(mouse.x, mouse.y), 10, '#1E88E5'); 7
  });

});
```

Challenge 4

Control Music

Intermediate 20 min

1. When the app starts we will have 4 sound loops playing: brass, woodwind, string, and percussion.

2. Inside the 'every 1 millisecond loop (which runs 1000 times a second), we will create two variables XPercentage and YPercentage. The XPercentage is the number position of the x coordinate divided by 8 (the canvas is 800 pixels wide, so we will have values 0 - 100). The YPercentage is the number position of the y coordinate divided by 6 (the canvas is 600 pixels tall, so we will have values from 0 - 100). These values will give us a number that will make the volume of the music loops become high or low based on the mouse position.

3. This block will set the speaker volume (brass loop) to be a number from 0 to 100 based on the XPercentage variable. As you move the mouse to the right (have a higher XPercentage) this sound becomes louder!

4. This block will set the speaker2 volume (woodwind loop) to be a number from 100 to 0 based on the XPercentage variable. When you start at a lower x coordinate you have a loud sound (you started at 100) and as you move the mouse to the right (have a higher XPercentage) this sound becomes fainter (you are moving backwards)!

5. This block will set the speaker3 volume (string loop) to be a number from 0 to 100 based on the YPercentage variable. When you start at a lower y coordinate you have a loud sound (you started at 100) and as you move the mouse down (have a higher YPercentage) this sound becomes fainter (you are moving backwards)!

Remix Challenge:

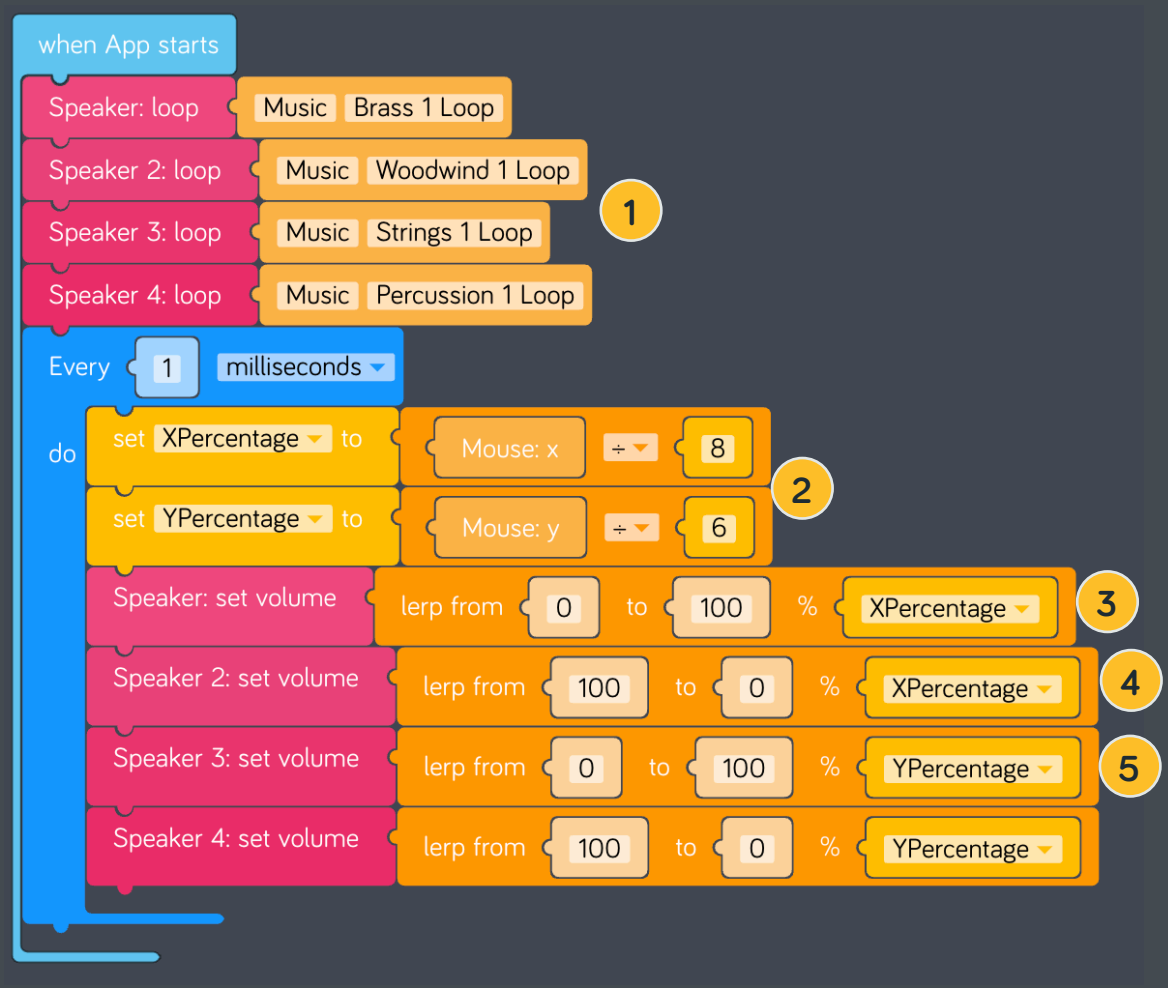
Where do you need to move on the canvas to hear each instrument the best?

What happens if you remove the lerp block to just the x and y position of the mouse?

Make the code your own! Try changing the four speaker sounds.

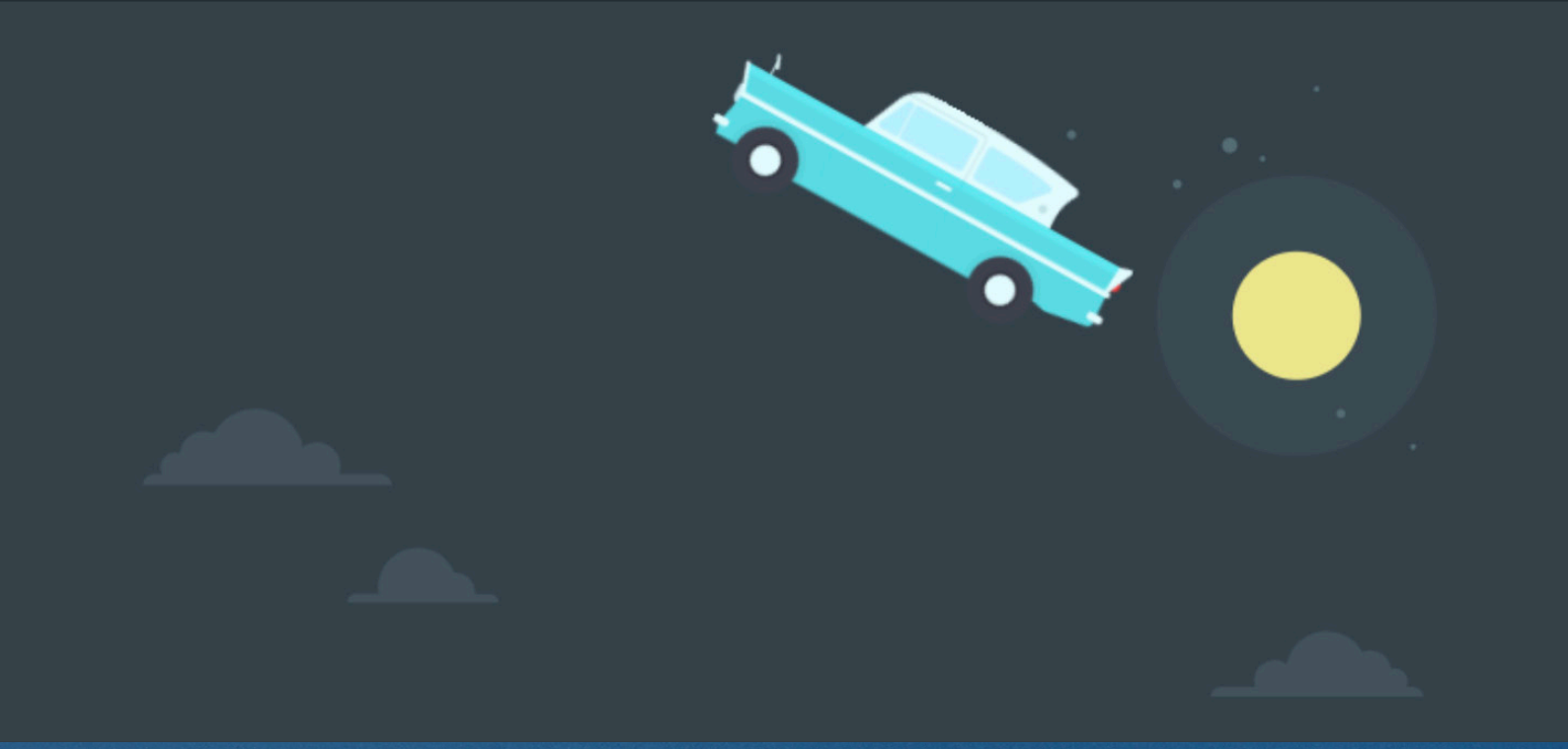
What happens if you change your loop blocks?

Change the loop.




```
events.onAppStarts(function() {
  speaker.loop('music/brass-1-loop.mp3');
  speaker2.loop('music/woodwind-1-loop.mp3');
  speaker3.loop('music/strings-1-loop.mp3');
  speaker4.loop('music/percussion-1-loop.mp3');
  time.every(1, 'milliseconds', function() {
    XPercentage = mouse.x / 8;
    YPercentage = mouse.y / 6;
    speaker.setVolume(math.lerp(0, 100, XPercentage));
    speaker2.setVolume(math.lerp(100, 0, XPercentage));
    speaker3.setVolume(math.lerp(0, 100, YPercentage));
    speaker4.setVolume(math.lerp(100, 0, YPercentage));
  });

});
```



Challenge 5

Control the Flying Car

Intermediate 20 min

1. This object block will let you scale the size of the object, so we will make it 50% of what it was originally.

2. Inside the 'every 1 frame loop' , we will apply a force to Ford Anglia that is the direction of the mouse's x and y coordinates at a strength of 70.

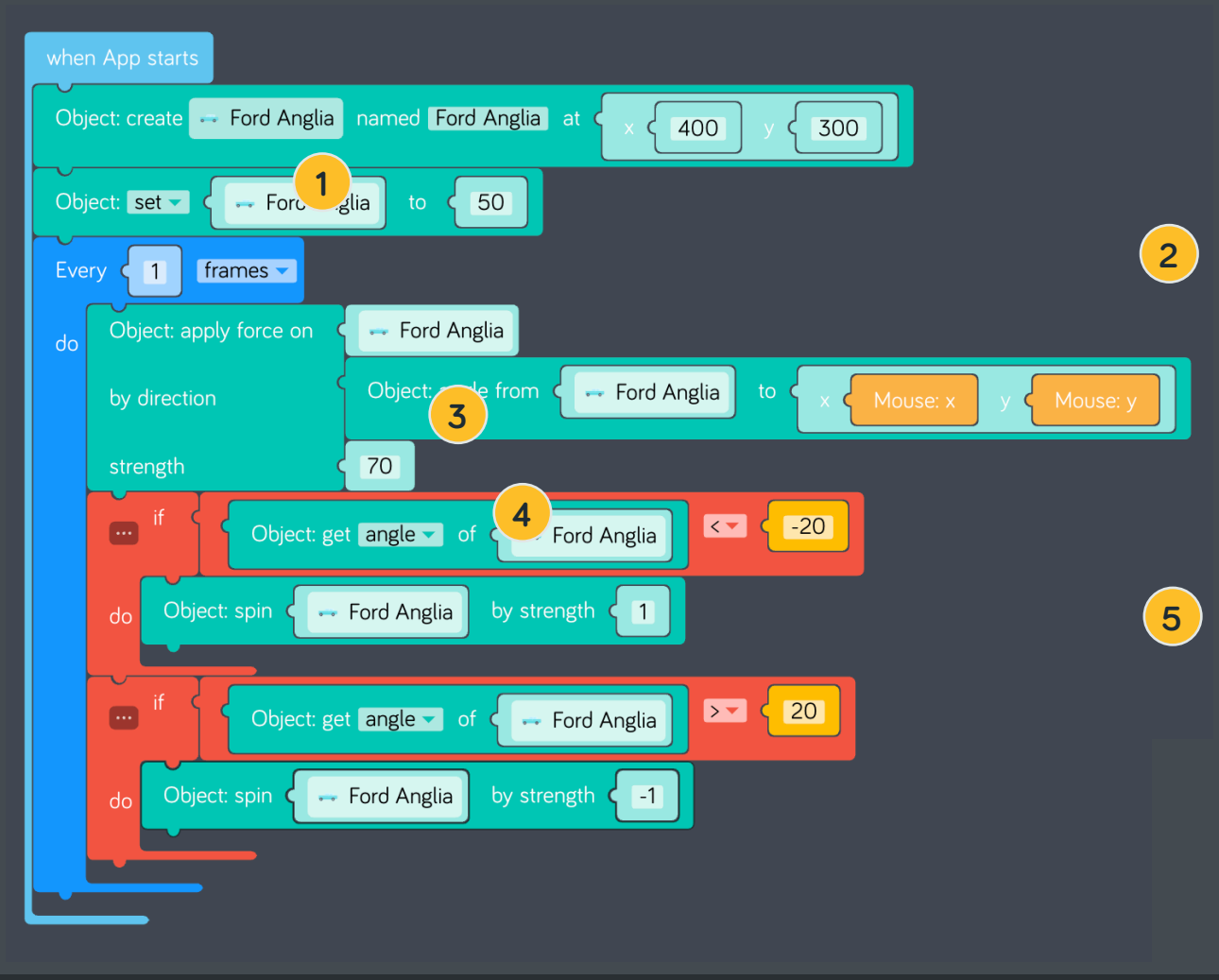
3. These conditional blocks will help us make sure the car doesn't turn upside down.

4. If the angle of the car is less than -20 then spin the car in the opposite direction to keep it upright (spin the car by a strength of 1).

5. If the angle of the car is greater than 20 then spin the car by a strength of -1.

Remix Challenge:

Try to change the following and see what happens (strength, angle).
Make the creation your own, and change the object.




```
events.onAppStarts(function() {
  objects.add('Ford Anglia', 'Ford Anglia', position.create(400, 300))
  objects.scale('set', objects.get('Ford Anglia'), 'to', 50);
  time.every(1, 'frames', function() {
    position.applyForce(objects.get('Ford Anglia'),
objects.positionAngle(objects.getRandom('Ford Anglia'),
position.create(mouse.x, mouse.y)), 70);
    if (position.get('angle', objects.getRandom('Ford Anglia')) < -20)
      position.applySpin(objects.get('Ford Anglia'), 1);
    }
    if (position.get('angle', objects.getRandom('Ford Anglia')) > 20)
      position.applySpin(objects.get('Ford Anglia'), -1);
    }
  });

});
```

We coded our projects, but can we make them our own? Before moving onto the next challenge try changing something. We have some recommendations you can try. On the right hand side, draw what your code did once you changed it!

Remix Challenge	Draw what your code looked like
Can you change the object? What happens when you unfreeze?	
What happens when you change the strength to a lower number? What about a higher number? What happens when you remove the random number block and you change it to a specific number? What direction are the objects moving? Make it your own! Try changing the object.	
What happens when you change force direction? Try 45, 90, 180, 270, 360. What happens when you change the strength or the size of the particles? What can you do to make the particles stay on your screen for a long time? Can you change color of bang so you can see it more easily? What do you think will happen to the particles if you change your look blocks?	

Where do you need to move on the canvas to hear each instrument the best? What happens if you remove the lerp block to just the the x and y position of the mouse?	
Can you change the object? What happens when you unfreeze?	
What happens if you change your loop blocks? Make the code your own! Try changing the four speaker sounds. Change the loop	
Try to change the following and see what happens! (strength, angle) Make the creation your own, and change the object.	
Where do you need to move on the canvas to hear each instrument the best? What happens if you remove the lerp block to just the the x and y position of the mouse? You will see it isn't a gradual change.	

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