

Scratch

The Adventures of Mike

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2.0



Scratch script blocks:

- not [prevState = state] then
- [ultrasonic sensor Port3 distance v] when green flag clicked
- [set motor M1 speed 0 v] direction
- [turn 1 degrees v] direction
- [turn 6 degrees v] direction
- [turn 2 degrees v] direction
- [forever v]
- [state = 1 v]
- [when green flag clicked v]
- [turn 6 degrees v]
- [state = 3 v]
- [state = 8 v]
- [not prevState = state v]
- [set motor M1 speed 0 v]
- [set motor M1 speed 0 v]
- [set motor M1 speed 0 v]

1.1 Encounter a Spaceship

Intro

Mike, a student of Grade 5, is always looking forward to exploring the outer space. One day, he comes across a spaceship on his way back home. What does this spaceship look like? And what will happen to them?



Tasks

1. Get familiar with the interface of Scratch 2.0
2. Understand the features of each sprite and the backdrop
3. Learn to create a new sprite and backdrop.

Start Learning

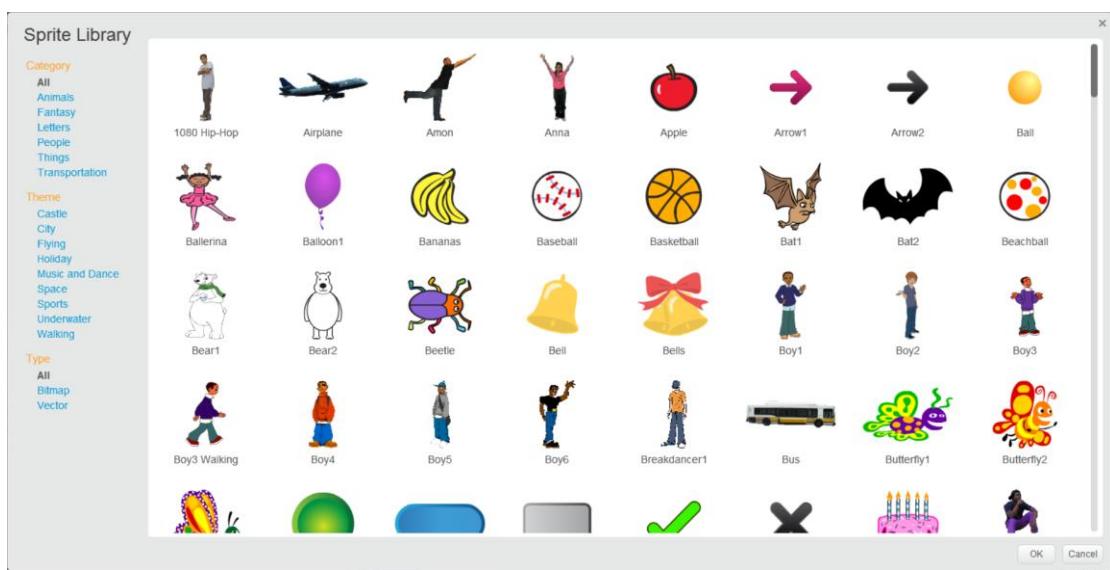
Sprite is the actor in one piece of work. Scratch provides multiple ways of creating sprites. Now, let's learn how to use Scratch!

1. Create Sprites

Tool	Explanation
	 Choose a sprite from the Sprite Library
New sprite:  /  	 Create a new sprite
	 Import (upload) a sprite from local file
	 Create a sprite via taking photo

2. Rich Sprite Library

Click  to choose a sprite from the Sprite Library. With the sprites being sorted into different types, you can choose the wanted sprite according to the actual story.



★ Practice:

Import sprites "Mike.png" and "Spaceship.png" from local files.



Spaceship.png



Mike.png

3. Adjust the Size

After importing the sprites into the stage, you can use the following icons to adjust the size of the sprite per needed.

Tool	Explanation
	Copy
	Delete
	Zoom In
	Zoom Out

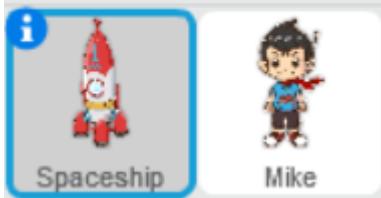
★ Practice:

Try to adjust size of the sprite you choose.

★ Explore

Right click the sprites to explore the other functions.

Sprites



4. Create Backdrop

Stage is the arena for sprites to move and act. You can add a backdrop on the stage to make your story more interesting and vivid. Meanwhile, adding backdrop will also expand the story to a further level. Now, let's try this out!

Tool	Explanation
Stage 1 backdrop New backdrop: 	<p>Four ways to create the backdrop:</p> <ul style="list-style-type: none">• Choose from the Backdrop Library;• Create a new backdrop;• Import backdrop from local files;• Take a photo as the backdrop
Backdrop tag page showing the 'Encounter' backdrop selected. The interface includes tabs for Scripts, Backdrops, Sounds, and a toolbar with various drawing and text tools.	<p>On the backdrop tag page, you can choose to add, delete and change backdrop.</p>

★ Practice:

Import the "Encounter.png" from the local file.

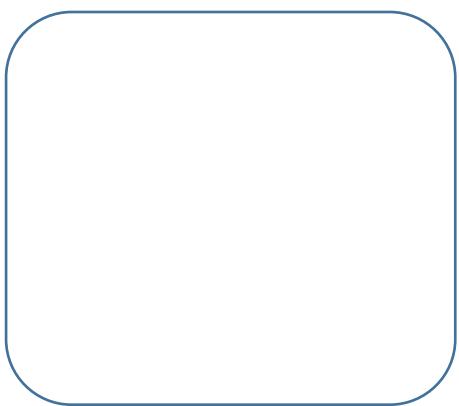


Encounter.png

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)



1.2 Locate the Coordinate

Intro

Mike is a fan for travel and exploration. To avoid losing the direction and continue his adventure safely while in the wild, Mike needs to learn how to locate his coordinate.

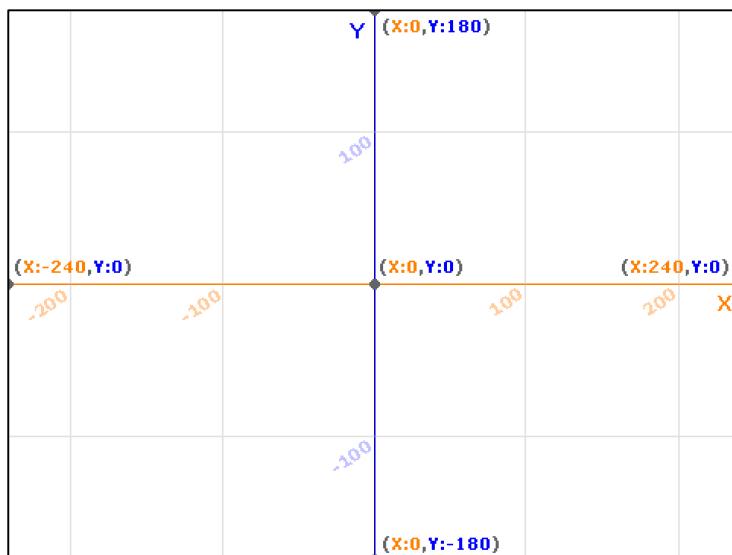
Task

1. Know the concept of coordinate
2. Learn how to move to the designated position

Start Learning

1. Coordinate System

Every sprite has its/her/his own position on the stage. To manage them well, we need to first get familiar with the coordinate system of the stage.



The central coordinate of the stage lies on (0,0), with the horizontal direction as X-axis and vertical direction as Y. Divided by the central coordinate, the right part of the X-axis is positive X-axis (+), left negative X-axis (-); the upper part of the Y-axis divided by the central coordinate is positive Y-axis and the lower part Negative Y-axis.

Knowing the coordinate systems is the essential step of operate the position of all sprites on the stage.

2. Move to A Designated Position

Blocks	Explanation	Example
	Control the operation of the whole program	

<code>go to x: 94 y: -16</code>	Make the sprite to move to a designated coordinate	<code>when green flag clicked</code> <code>go to x: 94 y: -16</code>
<code>glide 1 secs to x: -13 y: 18</code>	Make the sprite to move to a specified coordination in a certain period of time	<code>go to x: 0 y: 0</code> <code>glide 1 secs to x: 170 y: -120</code>

★ Practice:

Mike is not in a good mood today, so let's ask him to walk around the stage for some relaxation. The coordinates of the 4 corners on the stage are: (-240,180), (240,180), (240,-180), (-240,-180). Make sure Mike is not walking at a fast speed.

Achieve

Sprite	Program	Effect
	<code>when green flag clicked</code> <code>go to x: 155 y: 99</code> <code>glide 2 secs to x: 142 y: -68</code>	
	<code>when green flag clicked</code> <code>go to x: -182 y: -101</code> <code>glide 3 secs to x: 11 y: -95</code>	

Additional Training

Choose a backdrop, create a new sprite as Mike's friend and let them race with each other. Let's see who will win the race.

Tips

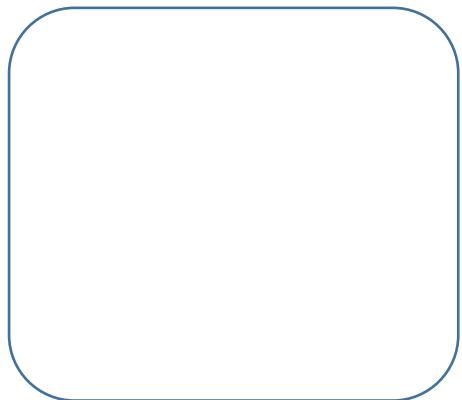
You can use the **Random Number Block** for a race to make it more intense and exciting. Come on and have a try! (Random Number Block: the block will randomly choose a number in the available range)

Homework

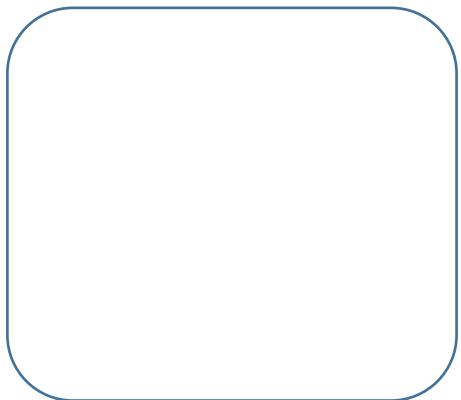
Choose one sprite that you like and make it move!

What You've Learnt?

Adventure Diary (Self-Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing a self-assessment entry.

Gas Station (Other's Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing an assessment entry for someone else.

1.3 Self Introduction

Intro

One day, Mike was examining his little spaceship carefully when suddenly he found that the spaceship can talk! Mike fixed the spaceship with the help of its voice prompt. Now, what on earth that spaceship is capable to do? Let's hear their conversation.

Tasks

1. Make the spaceship talk
2. Learn to change the appearance of the spaceship

Start Learning

1. Mike's Surprise

Communication via conversation between sprites is required in order to keep the story going. Now let's realize this goal using the blocks from **Scripts** Module.

Block	Explanation	Example
	Perform the next block after waiting for a designated period of time	
	Enable the sprite to speak	

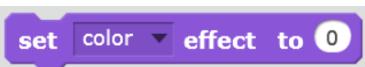
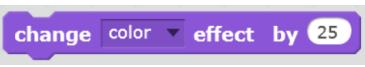
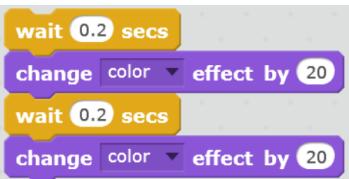
★ Practice

1. Make Mike to give a self-introduction
2. Let's name Mike's spaceship as "Mike No.1", how is it?

★ Explore

Do you have any questions about Mike No.1? Let's ask Mike to help ask for the answers!

2. Mike No.1

Block	Explanation	Example
	Change the sprite's color to the color number you set	
	Change the sprite's color based on its current color	

★ Practice

Mike No.1 is an extraordinary spaceship which can change its color. Come on and have a try.

1. Turn Mike No.1 into blue
2. Set the color No. of Mike No.1 to 60
3. Let Mike No.1 change its color randomly.

Achieve

Now that we know how to make Mike and Mike No.1 talk, how can we set them to talk with each other? Remember, there will be a sequencing during the conversation. Try to use "**wait..secs**" block to make it happen!

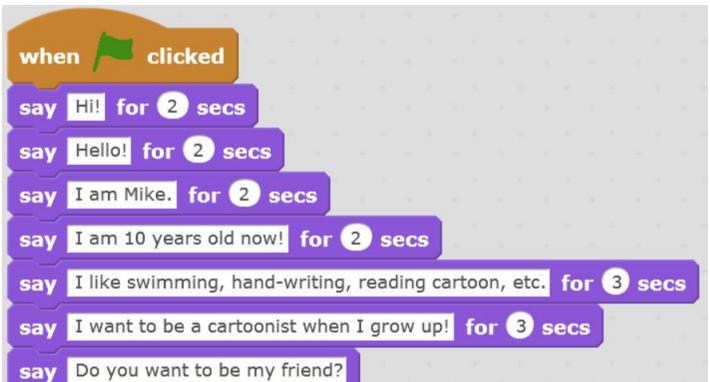
Sprite	Program	Effect
Mike	<pre>when green flag clicked go to x: -165 y: -108 say Wow, what is this cool thing? for 2 secs move 200 steps say Let me see. for 2 secs wait 5 secs say Sure, what should I do? for 2 secs wait 2.5 secs say No problem. for 2 secs go to x: 143 y: 19 wait 1 secs glide 1 secs to x: 41 y: -118 say It looks fine. Nothing is wrong here. for 2 secs wait 2.5 secs say Let's go for an adventure together! I am Mike, can I call you "Mike No.1"? for 4 secs</pre>	
Space ship	<pre>when green flag clicked go to x: 145 y: -64 wait 5 secs change color effect by 20 wait 0.2 secs set color effect to 0 say Hi, I am a spaceship! for 2 secs say But something is wrong with me. Can you help me fix it? for 2 secs wait 2.5 secs say Can you climb to my top and check whether there's anything wrong there? for 2 secs wait 6 secs say Great! Now I can fly again! for 2 secs</pre>	

Tips

The conversation time and waiting time can be calculated roughly. After finishing the program, you can also re-adjust the time accordingly to make the conversation go smoothly.

Additional Training

While Mike has already known much about his spaceship, the latter hasn't got familiar with Mike yet! Now, import "Mike's side face.png" and introduce yourself to Mike No.1.

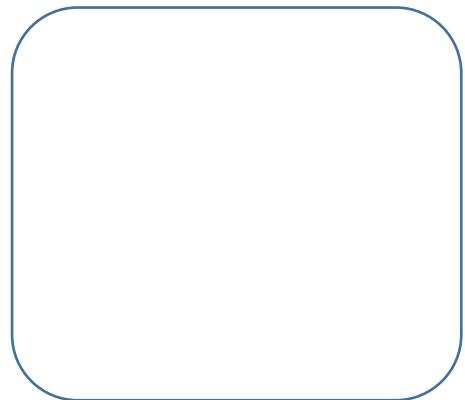
Sprite	Program	Effect
Mike's side face	 <pre>when green flag clicked say [Hi! v] for [2] secs say [Hello! v] for [2] secs say [I am Mike. v] for [2] secs say [I am 10 years old now! v] for [2] secs say [I like swimming, hand-writing, reading cartoon, etc. v] for [3] secs say [I want to be a cartoonist when I grow up!] for [3] secs say [Do you want to be my friend?] for [3] secs</pre>	

Homework

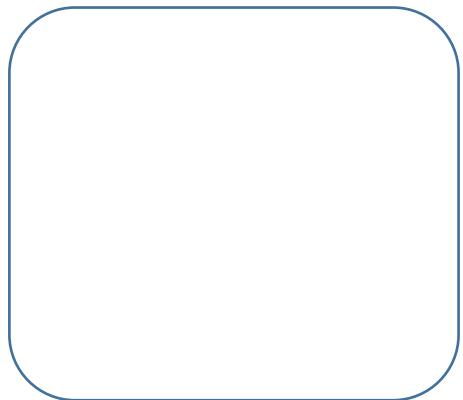
Mike is a very hardworking boy who always has lots of questions. Today, he has another new question: Why the spaceship can fly so fast? Can you help him to figure out the answer? Share your achievements with your friends, won't you?

What You've Learnt?

Adventure Diary (Self-Assessment)



Gas Station (Other's Assessment)



2.1 First Exploration

Intro

Mike is now good friends with Mike No.1, hence they want to start their first exploration now! However, before setting out, it's necessary for Mike to learn the basic driving skills as preparation. See, Mike is invited to the interior of Mike No.1 for better understanding.

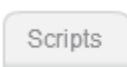
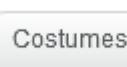
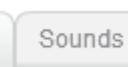
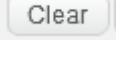
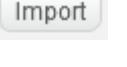
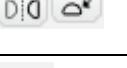
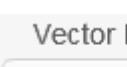
Task

1. Try to change the costume of the sprite using Paint editor.

Start Learning

1. Edit the Costume

Each sprite owns various costumes to enrich its forms while presenting on the stage. First, let's learn the tools for creating costumes.

Tool	Explanation
 Scripts  Costumes  Sounds	Choose "Costumes" to enter costume editing mode.
 pico-a	Edit the name of different costumes to avoid confusion.
	Undo & Redo. You can undo the previous step or redo the one which you has undone.
 Clear	Clear all
 Add	Add material from the Sprite Library. After that, you can modify, combine or perform other operation to diversify the sprite.
 Import	Import material from local files.
	Flip left-right & flip up-down.
	Set the costume center. After setting the costume center, the sprite will rotate around this center every time it needs to rotate or flip.
 Vector Mode  Convert to bitmap	Convert the photo from bitmap to vector diagram or vice versa.



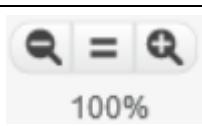
Edit tool box for bitmap and vector diagram.



Set the value of line



Choose color or pick up color you want.



Adjust the display of current costume

★ Practice

Use **Import** tool to import "Mike in Spaceship 1.png" and "Mike in Spaceship 2.png" to the costumes.



Mike in Spaceship 1.png



Mike in Spaceship 2.png

2. Add a Backdrop

Backdrop is where multiple sprites take actions. One **Stage** can consist multiple backdrops. Different backdrop defines the time, the location, and other info of each sprite to make the whole piece of work clear and complete.

Tool	Explanation
 Stage 1 backdrop	Click Stage , choose the current object as the stage.
 Backdrops	Choose "Backdrops"



★ Practice

Add 2 backdrops for current stage:

1. local file "Take-off.png"
2. "stars" from the Backdrop Library

Additional Training

Try to use materials from the Costume Library to create the following 3 costumes:



What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)

2.2 Auto Fly

Intro

After careful study, Mike has already gained some knowledge about the interior of Mike No.1. Today, Mike No.1 plans to show its new skill of auto fly to Mike. Why not joining them?

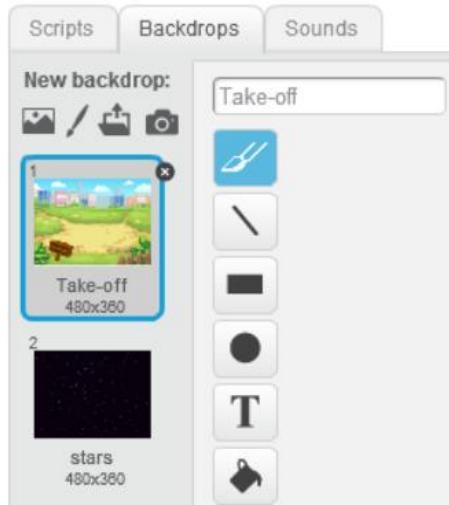
Tasks

1. Auto-fly of Mike No.1
2. Let the spaceship fly to the outer space

Start Learning

1. Switch the Backdrops

In the previous section, we've imported 2 backdrops:



Switching the backdrops when the sprites enter into different scene will improve the vitality of the work.

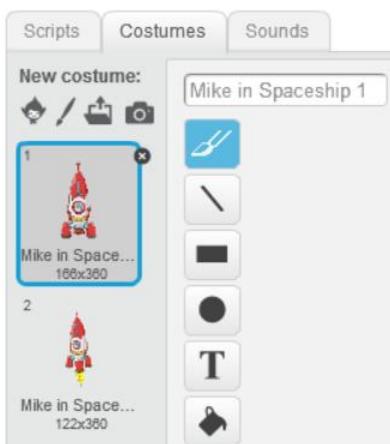
Block	Explanation	Example
<code>switch backdrop to [stars v]</code>	Use this block to switch backdrops when multiple backdrops are included on the stage.	A screenshot of a Scratch script. It starts with a yellow 'wait 5 secs' block, followed by a purple 'switch backdrop to [stars v]' block.

★ Practice

Import another 2 backdrops, and switch over those 4 backdrops randomly

2. Switch Costumes

In the previous section, we've imported 2 costumes:



One sprite can only present one costume every time. However, you can achieve switching among different costumes to realize various effects.

Block	Explanation	Example
	Switch among different costumes.	
	Use this block to set the rotation mode of the sprite. E.g. if the sprite is set to rotate randomly while flying, it will be more real and natural. Set the sprite to flip left and right while walking can pretend it from reversing.	
	The sprite will bounce back when on edge.	

★ Practice

Try to switch costume using blocks mentioned above.

Achieve

Sprite	Program	Effect
Stage	<pre> when green flag clicked switch backdrop to [Take-off v] wait (5) secs switch backdrop to [stars v] </pre>	



Mike in Spaceship

```

when green flag clicked
  go to x: -1 y: -75
  point in direction 90
  set rotation style left-right
  switch costume to Mike in Spaceship 1
  say [Mike No.1, let's go!] for 2 secs
  switch costume to Mike in Spaceship 2
  turn 15 degrees
forever
  move 2 steps
  if on edge, bounce

```



Additional Training

Make a bird that can fly. Import "Parrot" (with 2 costumes) from the Sprite Library.

Sprite	Program	Effect
 Parrot	<pre> when green flag clicked forever next costume wait 0.1 secs when green flag clicked set rotation style left-right forever move 10 steps if on edge, bounce </pre>	

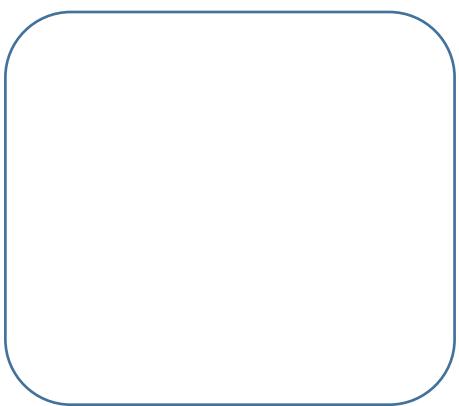
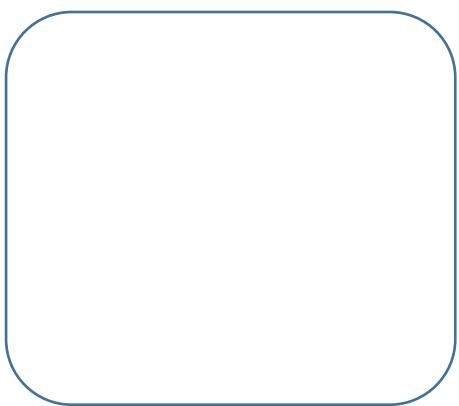
Homework

Replace  with , see what you will find by this action.

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)



2.3 Successful Flying

Intro

In the previous section, Mike No.1 took Mike to the outer space via auto driving. Now Mike needs to learn to fly the spaceship himself, do you want to know how?

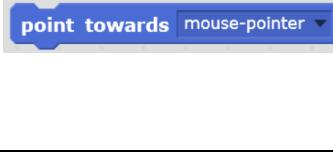
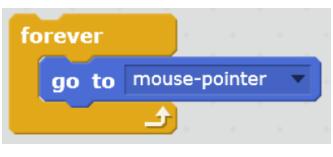
Task

1. Enable Mike to control the spaceship via keyboard and mouse

Start Learning

1. Control with Mouse

Make your work fun and interactive controlling the coordinate and movement with mouse. Let's get started now!

Block	Explanation	Example
	You can enable the sprite to face towards the cursor or towards other sprites.	
	Make the sprite to move to where the cursor is.	

2. Control with Keyboard

Mike wants to control the flying of the spaceship with the arrow keys on the keyboard. Use "when..key pressed" from Event Module to achieve this function.

Block	Explanation	Example
	Choose the corresponding keys to control the program.	
	Adjusting the value here will enable the sprite to face different direction.	

★ Practice

Mike has just learnt some new skills of flying the spaceship. Let's practice: make the spaceship fly 200 meters in the direction of value 90.

☆ Explore

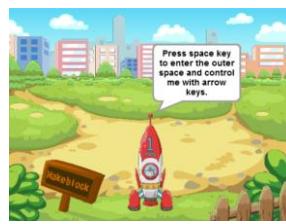
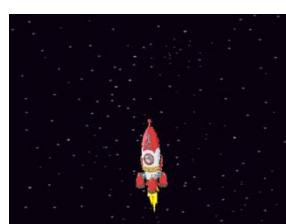
- 1) Use arrow keys to control the spaceship to fly upwards, downwards, leftwards, and rightwards.
- 2) Can you figure out how to control the flying speed?

Achieve

1. Control the Spaceship with Mouse

Sprite	Program	Effect
 Mike in Spaceship	<pre> when green flag clicked go to x: -1 y: -75 point in direction 90 set rotation style all around switch costume to Mike in Spaceship 1 say [Mike No.1, let's go!] for 2 secs switch costume to Mike in Spaceship 2 forever move 2 steps point towards mouse-pointer </pre>	

2. Control the Spaceship with Keyboard

Sprite	Program	Effect
 Mike in Spaceship	<pre> when green flag clicked go to x: -1 y: -75 point in direction 90 set rotation style left-right switch costume to Mike in Spaceship 1 say [Mike No.1, let's go!] for 2 secs say [Press space key to enter the outer space and control me with arrow keys.] for 2 secs switch costume to Mike in Spaceship 2 when up arrow key pressed point in direction 0 move 10 steps when left arrow key pressed point in direction -90 move 10 steps when right arrow key pressed point in direction 90 move 10 steps when down arrow key pressed point in direction 180 move 10 steps </pre>	
 Stage	<pre> when green flag clicked switch backdrop to Take-off when space key pressed switch backdrop to stars </pre>	

Additional Training

Let's play the game of "Catch Me If You Can"!

Sprite	Program	Effect



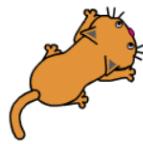
Cat

```
when green flag clicked
  go to x: -168 y: -106
  forever
    point towards Mouse
    move 5 steps
```



Mouse

```
when green flag clicked
  forever
    go to mouse-pointer
```



What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)

3.1 Magical Pen

Intro

Mike wants to draw some graphic codes. However, he doesn't even know how to use a pen!

Tasks

1. Teach Mike to learn how to use the pen, adjust the pen size, and adjust the color.
2. Create a rainbow lamp-pole.

Start Learning

1. Draw Lines

Use "Pen Down" block to draw lines

Block	Explanation	Example
	Start using pen	
	Stop the pen	
	Clear all drawings	

★ Practice

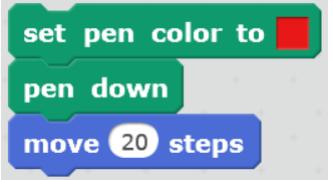
Draw a line with the length of 100 steps

★ Explore

Try to draw a dotted line



2. Change Pen Size and Color

Block	Explanation	Example
	Click the color square on this block, click on any color from the stage you want, then the pen will be set to the color you pick.	

set pen size to 1	Set the size of the pen.	set pen size to 8 pen down move 20 steps
--------------------------	--------------------------	---

★ Practice

Try to draw a line with 2 colors.



☆ Explore

Draw a rainbow line.



Achieve

Sprite	Program	Effect
 Sprite1	when green flag clicked <ul style="list-style-type: none"> go to x: 0 y: -130 point in direction 0 set pen size to 30 clear repeat (15) <ul style="list-style-type: none"> pen down move 20 steps change pen color by 10 change pen size by -2 	

Additional Training

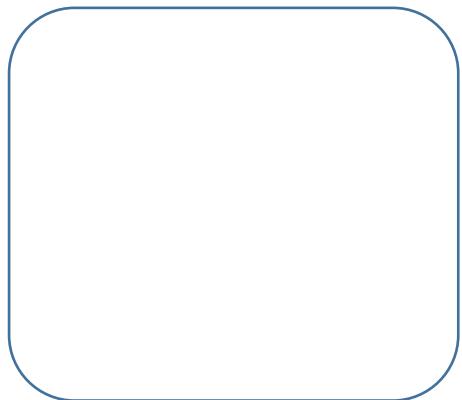
Sprite	Program	Effect
 Sprite1	when green flag clicked <ul style="list-style-type: none"> go to x: 0 y: 0 set pen color to blue pen down clear when space key pressed <ul style="list-style-type: none"> go to mouse-pointer 	

Homework

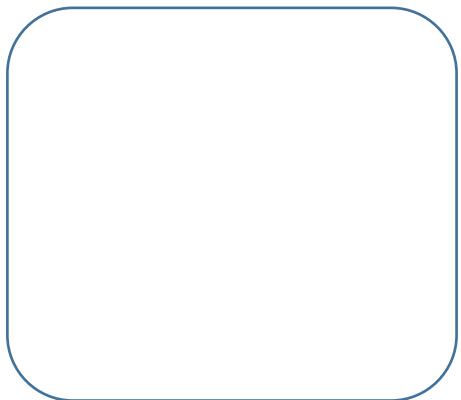
1. Use a plane as your sprite and draw a colorful path.
2. Try to find out how to use **Stamp**

What You've Learnt?

Adventure Diary (Self-Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing a self-assessment entry.

Gas Station (Other's Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing an assessment entry for someone else.

3.2 Polygon with Fun

Intro

Mike No.1 has transformed to a car which is going to enter into the Time Portal. However, before it enters, it needs a code. Now, let's help Mike No.1 to enter the portal!



Task

1. Get Mike familiar with all pen blocks. Use blocks like "Operators" to draw a polygon in order to get ready for the opening of the Time Portal.

Start Learning

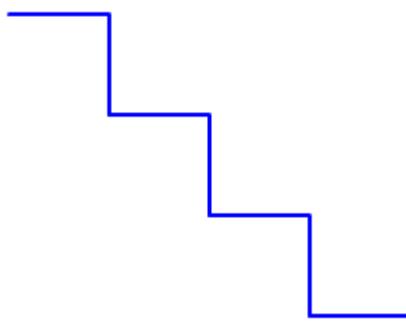
1. Draw a Square

Use pen with "Turn..degrees" block under Motion Module to draw interesting figures.

Block	Explanation	Example
turn 90 degrees	Rotate the sprite 90 degrees to the right. Or you can input any value of rotation.	move 100 steps turn 90 degrees move 100 steps
turn 15 degrees	Turn the sprite 15 degrees to the left.	move 50 steps turn 90 degrees move 50 steps turn 50 degrees move 50 steps
repeat 10	Repeat script contained for 10 times. Or you can input the times of repeating you want.	repeat 4 move 100 steps turn 90 degrees

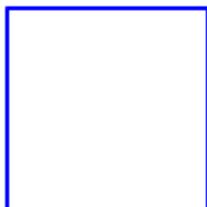
★ Practice

Set the size of the pen to 3, then draw a ladder.



★ Explore

Try to draw a square which is 100 steps on a side.

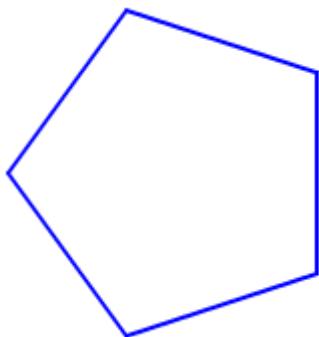


2. Draw a Regular Polygon

Block	Explanation	Example
	Division. You can input the equation directly into the numeric boxes.	
	Subtraction	
	Mixed calculations	

★ Practice

Draw a regular pentagon.

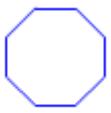


★ Explore

Set the pen size to 5 and draw a red regular dodecagon which is 20 steps on a side.

Achieve

Sprite	Program	Effect

 Sprite1	<pre> when green flag clicked go to x: 0 y: 0 clear set pen color to red set pen size to 5 pen down repeat (1) move (10) steps turn (360 / (1)) degrees end </pre>	  
--	--	--

Tips

- Repeat time equals to the sides of the regular polygon.
- The length of the sides represents the moving steps.
- With the sum of exterior angles of a polygon being 360 degrees, you can calculate the rotation angle of your sprite by dividing 360 by the number of sides.

Additional Training

Let's draw the following colorful circle!

Sprite	Program	Effect
 Sprite1	<pre> pen down repeat (36) move (10) steps turn (360 / (36)) degrees change pen shade by 10 end </pre>	

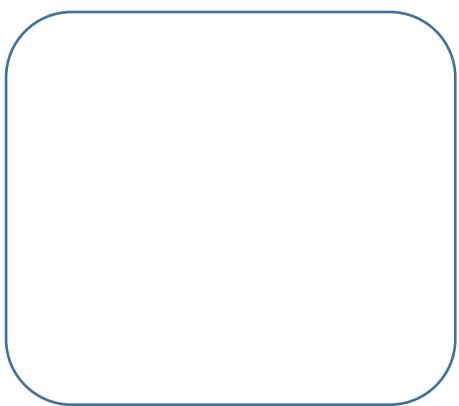
Homework

Now you've learnt how to draw a circle, but do you know how to draw a semi-circle?
Come on and have a try!

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)



3.3 Open the Time Portal

Intro

So far, Mike has already mastered the method of drawing. Today, he needs to challenge himself to open the Time Portal.



Task

1. The code of passing the Time Portal is an arch made up of 18 five-pointed stars. Mike needs to draw the arch using the knowledge he has. Let's cheer for him!

Start Learning

1. Draw a Five-Pointed Star

Draw a five-pointed star using Pen and Operator blocks.

Block	Explanation	Example
	Subtraction	
	Mixed Calculations	

★ Practice

Try to draw a five-pointed star which is 150 steps on a side.

2. Make a Block

Make a Block is the new function in Scratch 2.0. You can make and name a block which consists often-used script of a sprite.

Block	Explanation	Example
	Choose "More Blocks" under Scripts Module. Click on "Make a Block" and enter the name "Five-Pointed Star".	

★ Practice:

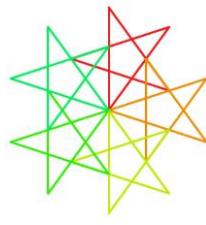
Import the "Time Portal.png" from the local file.

Achieve

Sprite	Program	Effect
 Mike	<pre>when green flag clicked go to x: -157 y: -80 clear set pen size to 3 point in direction 0 repeat (18) move (30) steps turn ((360 / 36) degrees Five-Pointed Star end point in direction 90 pen up go to x: -13 y: -25</pre>	

Additional Training

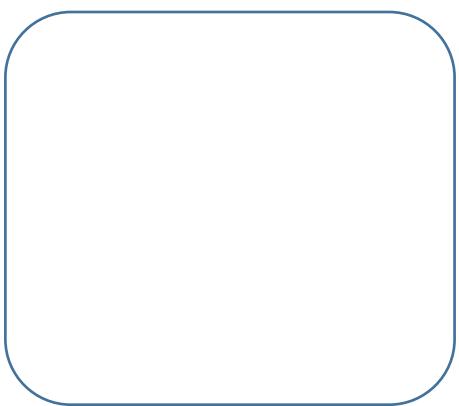
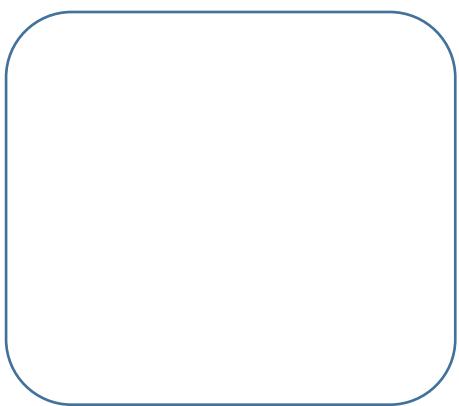
Try to draw a colorful multi-pointed star and a diagram made up of 5 five-pointed stars in 5 different colors.

Sprite	Program	Effect
 Sprite1	<pre>repeat (13) move (150) steps turn ((180 - 180 / 13) degrees change pen color by (10)</pre>	
	<pre>repeat (5) Five-Pointed Star turn ((360 / 5) degrees</pre>	

Tips

The formula of counting the rotation angle while drawing a multi-pointed star is: $180 - (180/\text{angle number of the multi-pointed star})$. And the number should be always an odd.

What You've Learnt?



4.1 Fly Mike No.1

Intro

Mike entered the Time Portal flying Mike No.1. In the portal, he saw a giant maze which contained lots of obstacles that might stop Mike No.1 from passing through. What we need to do now is help Mike No.1 avoid those obstacles.

Task

- Manually control Mike No.1 and make it through the maze.

Start Learning

Use direction keys to control the flying of Mike No.1 in the maze.

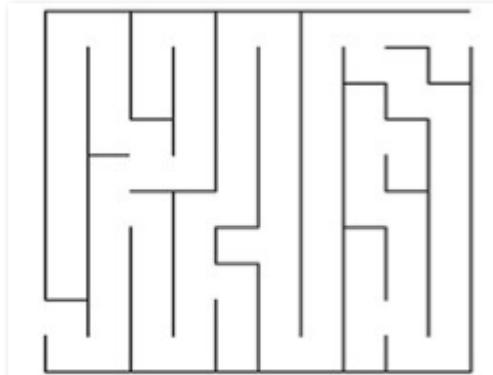
Block	Explanation	Example
	When "Up Arrow" is pressed	
	The sprite will face upwards	

★ Practice

Make this happen: When the space key is pressed, Mike will talk to us.

☆ Explore

Import 2 photos: "Maze.png" and "Transformation.png"

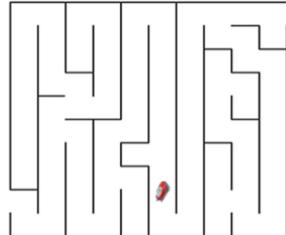


Maze.png



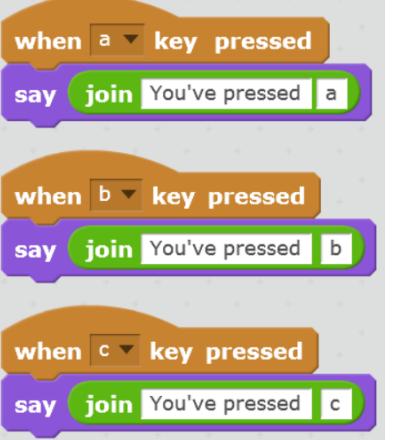
Transformation.png

Achieve

Sprite	Program	Effect
		

Additional Training

Create a "Keyboard Response Program": when **a** is pressed, the sprite will say "You've pressed a", when **b** is pressed, the sprite will say "you've pressed b", and so on.

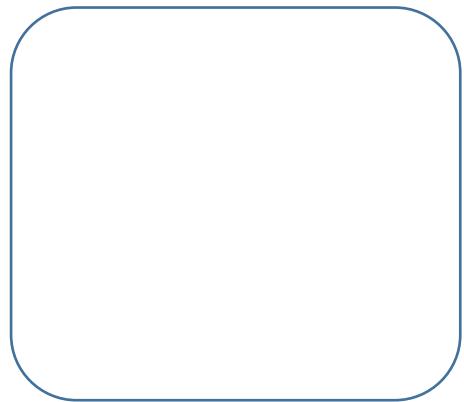
Sprite	Program	Effect
 Sprite1		

Homework

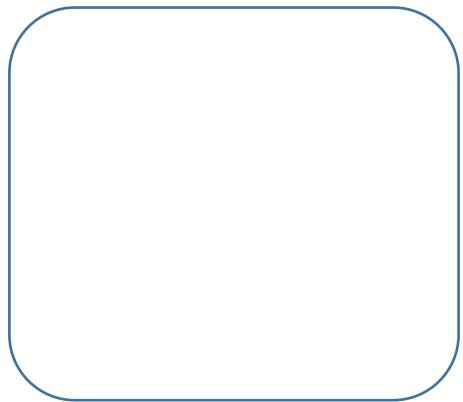
Create 2 sprites on the same stage, one being controlled by direction keys and the other one controlled by ASDW keys.

What You've Learnt?

Adventure Diary (Self-Assessment)



Gas Station (Other's Assessment)



4.2 Pass Through the Maze with Tactics.

Intro

Mike No.1 is in the maze now. However, it requires carefulness and tactics to pass through since it's an ultra complicated maze.

Task

1. Never touch the walls of the maze
2. Avoid the bat-guardians in the maze
3. Don't get struck by the lightning
4. Any issue mentioned above happens, Mike No.1 needs to get back to the starting point.

Start Learning

1. Single Branch

It's required that Mike No.1 shouldn't touch any walls of the maze, but how do we know whether Mike No.1 has touched the wall or not?

Block	Explanation	Example
	Single Branch Conditional-Block. If it matches the condition, then the script contained will be activated.	
	Condition	
	If the sprite touches purple, it will say a set sentence.	

★ Practice

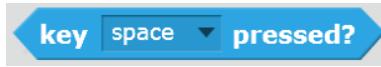
If Mike touches black lines, he will say "It's black".

☆ Explore

When Mike No.1 is on the edge of the stage, it will say "There's no place to go."

2. Dual Branch

Block	Explanation	Example
	Dual Branch Conditional Block. If it matches the condition, then the script contained will	

	be activated. Otherwise, the script in the "Else" block will be activated.
	Condition: Whether the space key has been pressed.

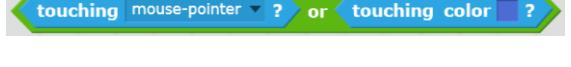
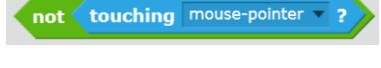
★ Practice

Check whether the Up Key has been pressed.

☆ Explore

Press the Right Arrow key to draw a straight line.

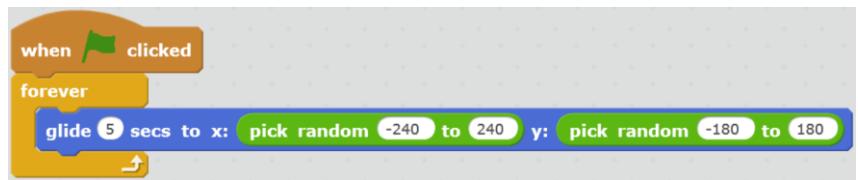
3. Operators

Block	Explanation	Example
	"..and.." block means both of the two requirements must be met.	
	"..or.." block means either of the 2 requirements must be met.	
	"not.." block means the condition it contains should not be met.	

Achieve

While Mike No.1 is moving in the maze, if it touches a black wall, a bat, or a lightning, it will have to get back to its starting point.

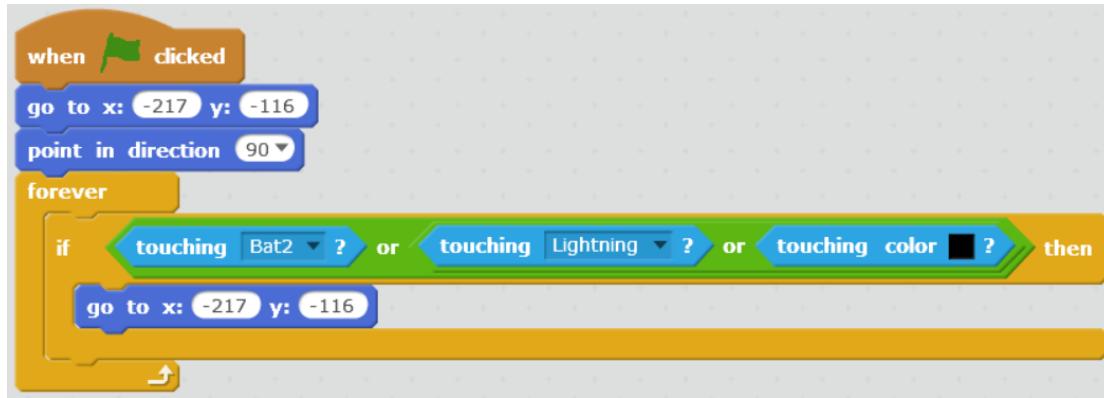
Import "Bat2" and "Lightning" from the Sprite Library. (Lightning needs to be adjusted to be in horizontal direction)

Sprite	Program	Effect
Bat2		

	<pre> when green flag clicked forever next costume wait 0.1 secs </pre>	
 Lightning	<pre> when green flag clicked go to x: 80 y: 20 point in direction 90 set rotation style left-right forever move 8 steps if on edge, bounce </pre>	
 Transformation	<pre> when green flag clicked go to x: -217 y: -116 point in direction 90 forever if touching Bat2 ? then go to x: -217 y: -116 if touching Lightning ? then go to x: -217 y: -116 if touching color black ? then go to x: -217 y: -116 </pre>	

Tips

Regarding the "touch or not" condition, we can use another simple way:



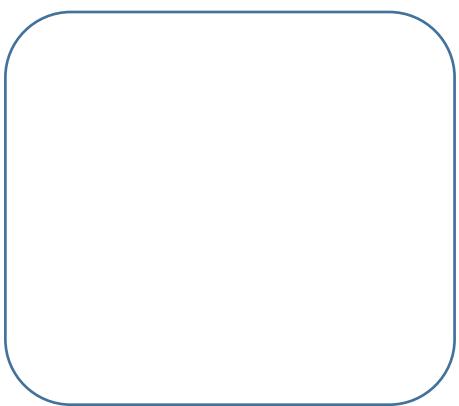
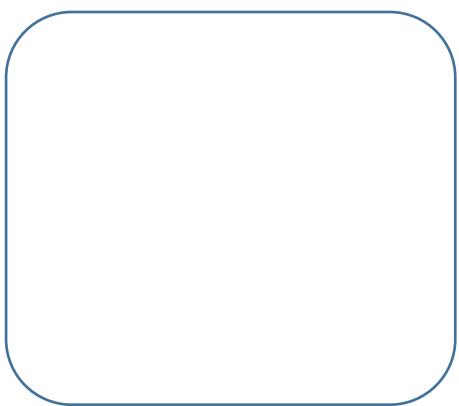
Homework

Challenge yourself to make an even more complicated maze with more obstacles.

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)



4.3 Successful Escape

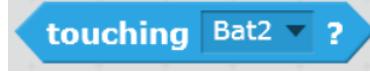
Intro

Mike is going to escape successfully soon with Mike No.1. What's waiting for them? Challenges? Or more danger?

Task

1. Stop the program when Mike No.1 reaches the destination.

Start Learning

Block	Explanation	Example
	Stop the whole program	
	Condition	

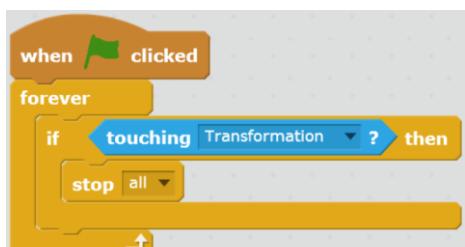
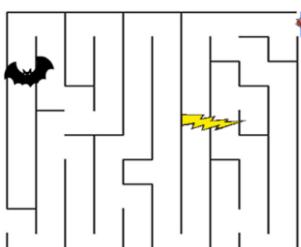
☆ Explore

Explore the function of every option by yourself.



Achieve

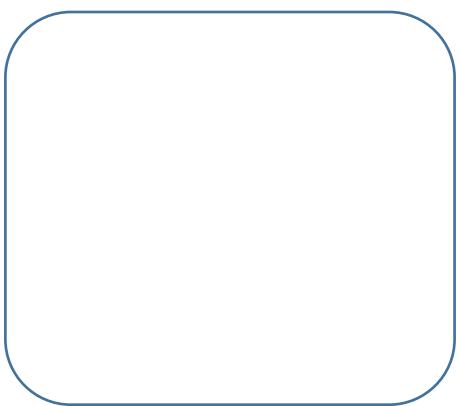
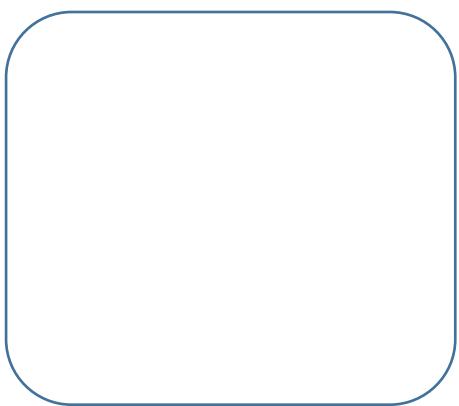
Let's create a sprite which represents the destination of the maze, and use it to decide whether Mike No.1 has reached the destination.

Sprite	Program	Effect
 End		

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)



5.1 The Forest of Change

Intro

After leaving the maze, Mike with Mike No.1 ventured into a forest. It's a magical forest which kept changing itself into a wave, a desert, or a forest with beasts.



Task

1. Realize the effect of changing forest via switching different backdrops.

Start Learning

The goal of changing forest can be achieved by switching backdrops. Import local file "forest.png", and import "desert" and "wave" from the Backdrop Library.

Block	Explanation	Example
	Switch to different backdrop.	

★ Practice

1. Make the backdrop change once every 1 second.
2. Import "Forest.png" from local file.
3. Import "desert" and "Wave" from Backdrop Library.

★ Explore

Challenge yourself to make this happen: switch to different backdrop according to the corresponding different key.

Achieve

Switch to a different backdrop once every 5 seconds.

Block	Program	Effect
	<pre>when green flag clicked forever switch backdrop to Forest wait 5 secs switch backdrop to desert wait 5 secs switch backdrop to wave wait 5 secs</pre>	  

Additional Training

Design a program which can switch the backdrop using different keys.

Block	Program	Effect
	<pre>when [a key pressed] switch backdrop to Forest when [b key pressed] switch backdrop to desert when [c key pressed] switch backdrop to wave</pre>	 

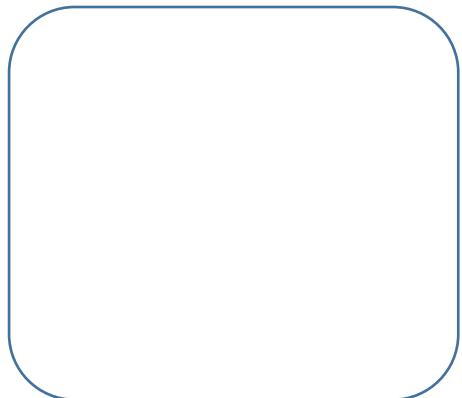
Homework

In addition to using keys, try to use other methods of changing backdrops, e.g.

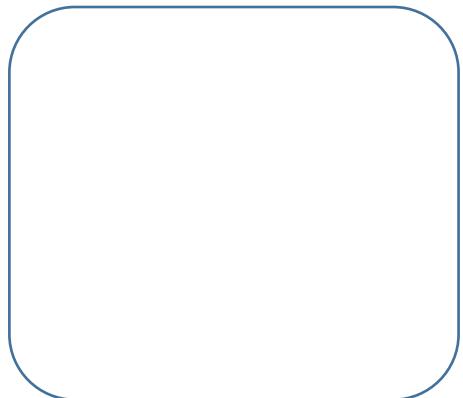
 when this sprite clicked

What You've Learnt?

Adventure Diary (Self-Assessment)



Gas Station (Other's Assessment)



5.2 Smart Mike No.1

Intro

Mike No.1 is actually a smart spaceship which can transform into a ship when gets flooded and transform to a magical carpet when in desert.

Task

1. Design a program to realize the goal of switching backdrops, and broadcasting messages.

Start Learning

Broadcast function is to coordinate the interaction among multiple sprites. This function requires both broadcast blocks and receive blocks.

Block	Explanation	Example
	Broadcast a message to all sprites.	Create a new message  when I receive message1 message1 new message...
	Receive a message. This is also the initiative block of the script.	Sprite A broadcast the message of "Success".  broadcast Success Sprite B will perform the corresponding script after receiving "Success"  when I receive Success

★ Practice

- 1) Import 2 sprites, one of which is in charge of broadcasting and the other one receiving.

- 2) Explore to find out the difference between  and .

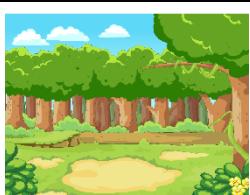
☆ Explore

- 1) Import 3 sprites and enable them to pass messages in turn.
- 2) Think: Can the sprite which broadcasts the message receive its own message?

Achieve

When the backdrop is switched, inform Mike No.1 to change its costume. Create a new sprite with 3 costumes: "Mike in Spaceship 1.png" (from local file), "sail-boat", and "magiccarpet" from the library.

Sprite	Program	Effect
--------	---------	--------



Forest

```

when green flag clicked
forever
  switch backdrop to Forest
  broadcast Forest
  wait [5 secs]
  switch backdrop to desert
  broadcast desert
  wait [5 secs]
  switch backdrop to wave
  broadcast wave
  wait [5 secs]

```



Mike in Spaceship 1

```

when green flag clicked
  go to x: -10 y: -30
  when I receive Forest
    switch costume to Mike in Spaceship 1
  when I receive desert
    switch costume to magiccarpet
  when I receive wave
    switch costume to sail-boat

```



Tips

```

when backdrop switches to Forest
  switch costume to Mike in Spaceship 1

```

In addition to broadcast blocks, you can also use `when backdrop switches to Forest` to achieve the same effect.

Homework

Use broadcast blocks to make the spaceship take off and land on.

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)

5.3 Transformation of Mike No.1

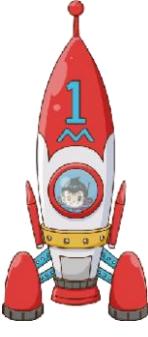
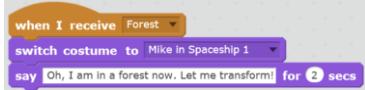
Intro

Mike No.1 has encountered various trouble and harsh situations in the forest, what should Mike do to deal with the problems?

Task

1. Write a program which enables Mike No.1 to receive messages and transform its costume accordingly.

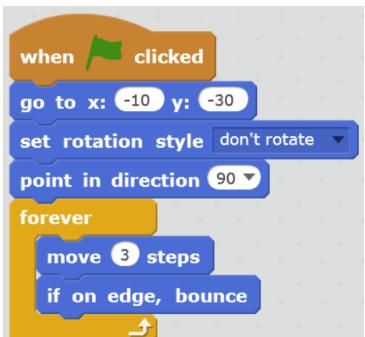
Start Learning

Sprite	Program	Effect
 Mike in Spaceship		

★ Practice

Program to achieve the goal of switching backdrops. Broadcast a message of "Desert" and make Mike speak and transform after receiving the message.

Achieve

Sprite	Program	Effect
 Mike in Spaceship		

```

when I receive Forest
switch costume to Mike in Spaceship 1
say Oh, I am in a forest now. Let me transform! for 2 secs

when I receive desert
switch costume to magiccarpet
say Oh, I am in a desert now. Let me transform! for 2 secs

when I receive wave
switch costume to sail-boat
say Here comes the flood. Transform! for 2 secs

```

Additional Training

Program to realize the goal of switching backdrops via user's input. (Tips: Use "ask..and wait" block)

Sprite	Program	Effect
 Mike in Spaceship	ask What's the next backdrop? and wait switch backdrop to answer	

Homework

Add more backdrops and bring more changes to Mike No.1

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)

6.1 Dancing Indians

Intro

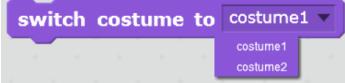
After arriving at the forest, Mike came across a bunch of friendly aborigine who were celebrating a local festival. Mike was invited and became friends with them. Look, Mike was dancing!



Task

1. Import the costumes of an aborigine and program him to dance.

Start Learning

Block	Explanation	Example
	Switch costume to costume...	
	Switch to the next costume. (Note: If the sprite's current costume is its last costume, the program will switch the costume to the first one automatically)	

★ Practice

Upload multiple costumes and program a script which enables the costumes to switch randomly.

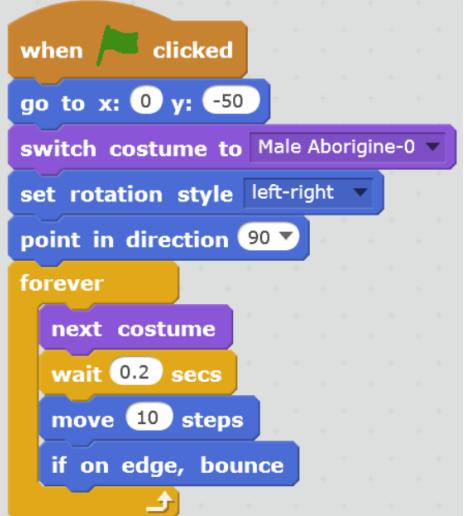
Achieve

Program the aborigine to dance and walk simultaneously. Upload the sprite "Male

Aborigine.gif" and import "Tribe.png" from local file.

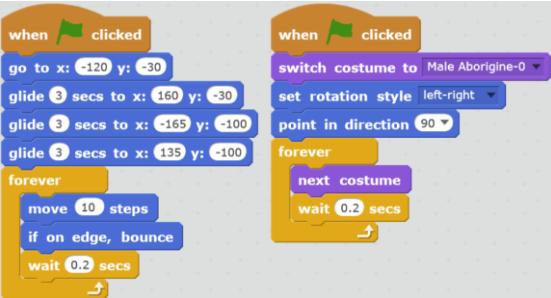
Note: the first costume of the male aborigine comes with white background. Use

"Fill with Color"  to fill the background with "Transparent" .

Sprite	Program	Effect
Male Aborigine	 <pre>when green flag clicked go to x: 0 y: -50 switch costume to Male Aborigine-0 set rotation style left-right point in direction 90 forever next costume wait 0.2 secs move 10 steps if on edge, bounce end</pre>	

Additional Training

Design a "Z" dance as the opening and then enable the aborigine to dance and walk simultaneously.

Sprite	Program	Effect
Male Aborigine	 <pre>when green flag clicked go to x: -120 y: -30 glide (3 secs) to x: 160 y: -30 glide (3 secs) to x: -165 y: -100 glide (3 secs) to x: 135 y: -100 forever move (10 steps) if on edge, bounce wait (0.2 secs) end when green flag clicked switch costume to Male Aborigine-0 set rotation style left-right point in direction 90 forever next costume wait 0.2 secs end end</pre>	 <p>(the red line represents his path)</p>

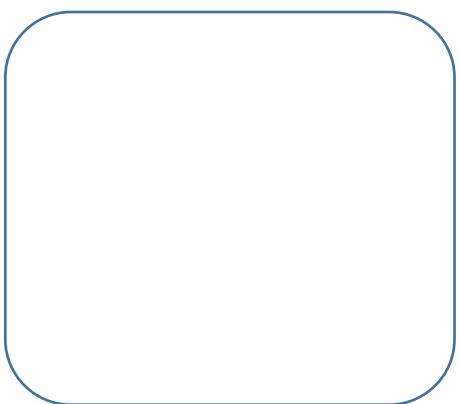
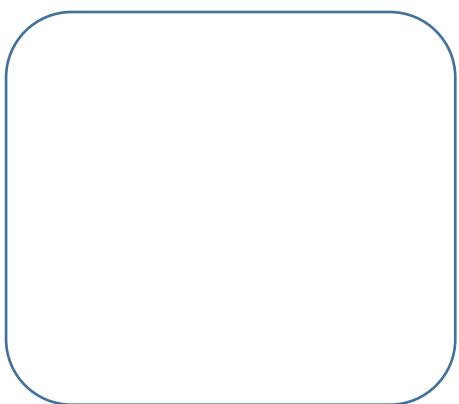
Homework

1. Design more opening dances, such as M shape, H shape, and add the subsequent dance after the opening.
2. Upload "Female Aborigine.gif" and replicate more sprites to create a group dance!

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)



6.2 Happy Performer

Intro

Having seen the gorgeous dance of those aborigines, Mike really wants to accompany them. Now, let's learn how to play music!

Task

1. Teach Mike how to play music, both manually and automatically, and how to import/export a list.

Start Learning

1. Scratch 2.0 Sound Module

Scratch 2.0 comes with sound module which enables us to play beautiful music.

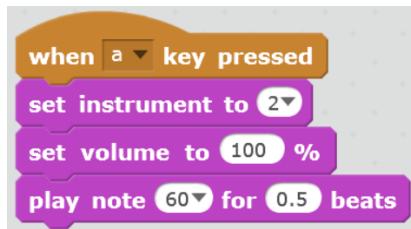
Block	Explanation	Example
	Scratch2.0 provides 21 types of instruments, including piano, violin, etc.	
	Set the beats	
	Set the volume	

★ Practice

Choose one instrument you like and use to play 1, 2, 3, 4, 5, 6, 7 (do, re, mi, fa, so, la, ti).

☆ Explore

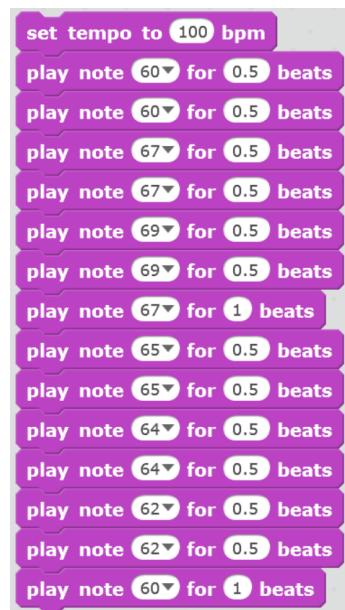
Program to control the playing via keyboard. See the below diagram which plays "do".



2. Auto Play

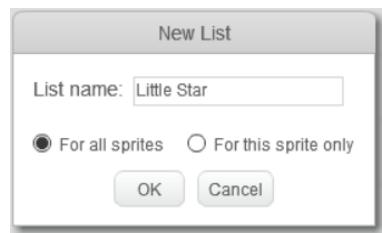
Mike has known how to play a single note, but will him be able to auto play a song? Let's first practice how to play the notes of "Twinkle, twinkle, little star, how I wonder what you are". There are 2 ways:

- 1) Pile up single note



2) Make a List

List can store a great deal of data, thus we can save the consecutive notes into a list. See the below diagram: Click "Data" - "Make a List" - name it as "Little Star", and "Ok" to save.



Then you will see a list on the stage. Click "+" to add a note.



Block	Explanation	Example
add [thing] to [Little Star v] insert [thing] at [1 ▾] of [Little Star v]	Add data to the list.	
delete [1 ▾] of [Little Star v]	Delete .. from the list.	
replace item [1 ▾] of [Little Star v] with [thing]	Replace one item from the list.	
item [1 ▾] of [Little Star v] length of [Little Star v] Little Star v contains [thing] ?	Read one specific item from the list; Get the length of the list; Determine whether the list	

	contains a specific item.
--	---------------------------

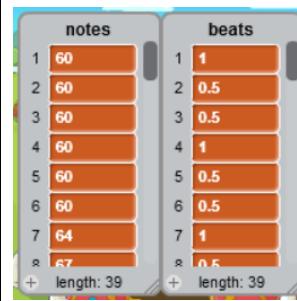
★ Practice

Upload "Mike.png".

Sprite	Program	Effect
Mike	 <pre> when green flag clicked go back 1 layers forever play note item 1 of Little Star for 0.5 beats play note item 2 of Little Star for 0.5 beats play note item 3 of Little Star for 0.5 beats play note item 4 of Little Star for 0.5 beats play note item 5 of Little Star for 0.5 beats play note item 6 of Little Star for 0.5 beats play note item 7 of Little Star for 1 beats play note item 8 of Little Star for 0.5 beats play note item 9 of Little Star for 0.5 beats play note item 10 of Little Star for 0.5 beats play note item 11 of Little Star for 0.5 beats play note item 12 of Little Star for 0.5 beats play note item 13 of Little Star for 0.5 beats play note item 14 of Little Star for 1 beats end </pre>	

Additional Training

We may find out that we are actually using the same blocks repeatedly except the numbers may be different from each other. Can we find a way to eliminate these reduplications by looping? Can we add a beat-list to make the playing smooth? (Tips: create a new variable)

Sprite	Program	Effect																				
Mike	 <pre> when green flag clicked set instrument to 18 set tempo to 150 bpm set order to 1 repeat length of notes play note item order of notes for item order of beats beats change order by 1 end </pre>	 <table border="1"> <tr> <td>notes</td> <td>beats</td> </tr> <tr> <td>1 60</td> <td>1 1</td> </tr> <tr> <td>2 60</td> <td>2 0.5</td> </tr> <tr> <td>3 60</td> <td>3 0.5</td> </tr> <tr> <td>4 60</td> <td>4 1</td> </tr> <tr> <td>5 60</td> <td>5 0.5</td> </tr> <tr> <td>6 60</td> <td>6 0.5</td> </tr> <tr> <td>7 64</td> <td>7 1</td> </tr> <tr> <td>8 67</td> <td>8 0.5</td> </tr> <tr> <td>length: 39</td> <td>length: 39</td> </tr> </table>	notes	beats	1 60	1 1	2 60	2 0.5	3 60	3 0.5	4 60	4 1	5 60	5 0.5	6 60	6 0.5	7 64	7 1	8 67	8 0.5	length: 39	length: 39
notes	beats																					
1 60	1 1																					
2 60	2 0.5																					
3 60	3 0.5																					
4 60	4 1																					
5 60	5 0.5																					
6 60	6 0.5																					
7 64	7 1																					
8 67	8 0.5																					
length: 39	length: 39																					

Tips

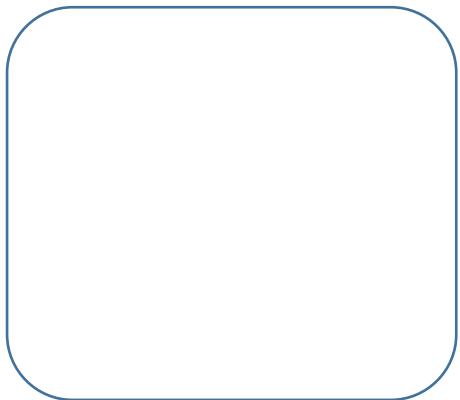
Click  and  to hide variable and list on the stage.

Homework

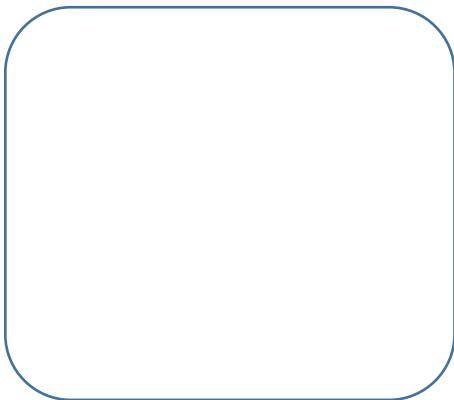
Program to play the whole song of *Twinkle Twinkle Little Star*.

What You've Learnt?

Adventure Diary (Self-Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing responses to the self-assessment question.

Gas Station (Other's Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing responses to the other-assessment question.

6.3 Carnival in the Forest

Intro

Exciting dance from the aborigines and the beautiful music played by Mike, how wonderful it is! Let's make it happen in Scratch 2.0 now!

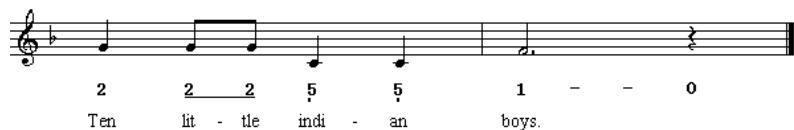
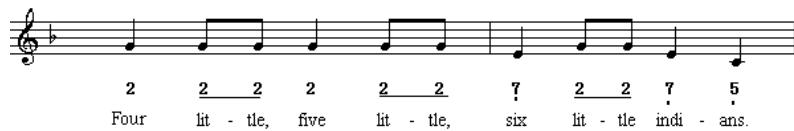
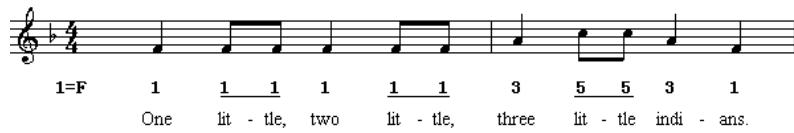
Tasks

1. Achieve auto-play via importing external txt file into the list
2. Use "ask.. and wait" block to achieve interaction between man and the computer.

Start Learning

Here's the numbered musical notation of a cute song *Ten Little Indians*

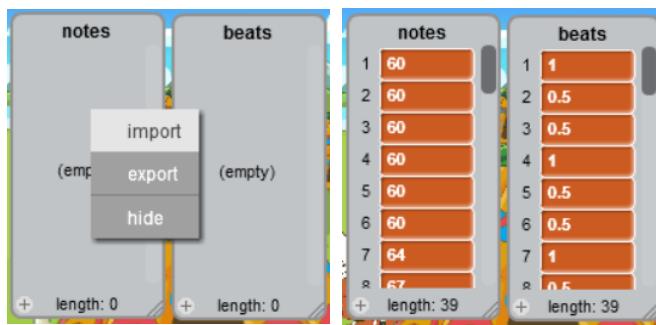
Ten little Indians



Then let's create 2 txt files for notes and beats.

	6.3-beats.txt	6.3-notes.txt
1		60
0.5		60
0.5		60
1		60
0.5		60
0.5		60

Import the 2 texts into the list.



★ Practice

Use what you've learnt from the last section to create an auto-play program.

Achieve

Sprite	Program	Program Concept
Mike	<pre> when green flag clicked set instrument to 18 set tempo to 150 bpm set order to 1 repeat (length of notes) play note [item] [order] of [notes] for [item] [order] of [beats] [beats] change order by 1 end </pre>	<p>The concept shows a Scratch stage with a wooden sign that says 'Tribe'. A character is standing under the sign. On the right side, there are two lists: 'notes' and 'beats'. The 'notes' list has 8 items with values 60, 60, 60, 60, 60, 60, 64, and 67. The 'beats' list has 8 items with values 1, 0.5, 0.5, 1, 0.5, 0.5, 1, and 0.5. Both lists have a length of 39.</p>

Tips

Use `set volume to 150 %` to adjust the tempo, and use `set instrument to 1` to change the instrument.

Additional Training

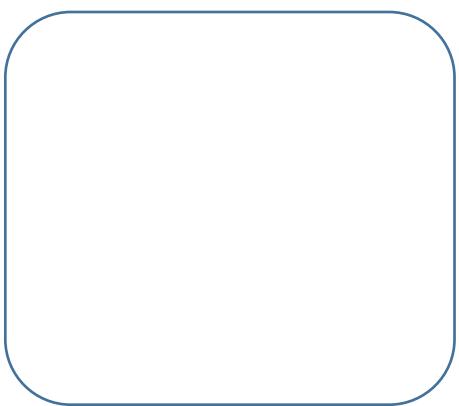
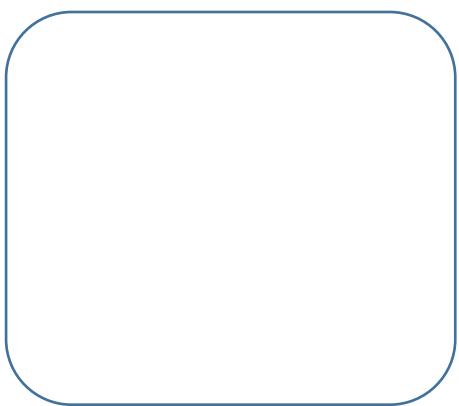
Use "ask... and wait" block to create an interactive program between man and the computer.

Sprite	Program	Effect
Mike	<pre> ask [What instrument should I choose? (1. Piano; 2. Electronic keyboard.)] and wait set instrument to [answer] </pre>	<p>The effect shows a Scratch stage with a character and a teepee. A speech bubble above the character asks 'What instrument should I choose? (1. Piano; 2. Electronic keyboard.)'.</p>

Homework

Play another song using the list. You can also compose your own song!

What You've Learnt?



7.1 Volcano of Candies

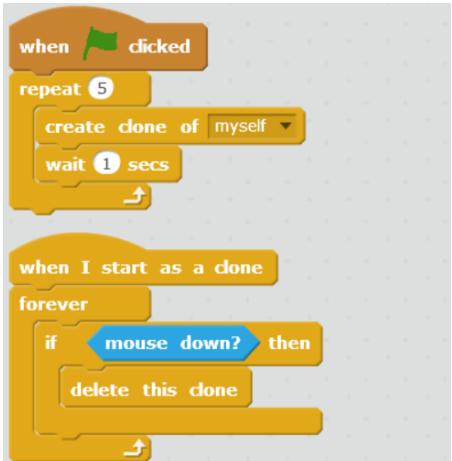
Intro

It's the harvest season for the aborigines when Mike arrived their land. There's a dangerous volcano which kept spraying candies. Mike was asked by the aborigines to help them collect those candies from the volcano. Of course, Mike said yes and decided to go to the candy volcano flying Mike No.1.

Task

1. Design a volcano which can spray candies.

Start Learning

Block	Explanation	Example
	Create clone for the sprite you choose. The cloned sprite is called "Clone", which inherits all the attribute and script of the original sprite.	
	The Clone will start operating from this block. Each Clone can possess various of this block.	
	Delete the Clone when it is not needed.	

Achieve

Firstly, import backdrop "Candy Volcano.png" and then five sprites "Candy 1.png", "Candy 2.png", "Candy 3.png", "Candy 4.png" and "Candy 5.png".

1. Let's use broadcast function to achieve the effect of volcano spraying candies.

Sprite	Program	Effect

 Candy 1	<pre> when I receive [5] show go to x: -90 y: 100 glide 0.5 secs to x: pick random [-200] to [200] y: 150 glide 1 secs to x: pick random [-200] to [200] y: -150 hide broadcast [1] when green flag clicked broadcast [5] </pre>	
 Candy 2	<pre> when I receive [1] show go to x: -90 y: 100 glide 0.5 secs to x: pick random [-200] to [200] y: 150 glide 1 secs to x: pick random [-200] to [200] y: -150 hide broadcast [2] when green flag clicked hide </pre>	
 Candy 3	<pre> when I receive [2] show go to x: -90 y: 100 glide 0.5 secs to x: pick random [-200] to [200] y: 150 glide 1 secs to x: pick random [-200] to [200] y: -150 hide broadcast [3] when green flag clicked hide </pre>	
 Candy 4	<pre> when I receive [3] show go to x: -90 y: 100 glide 0.5 secs to x: pick random [-200] to [200] y: 150 glide 1 secs to x: pick random [-200] to [200] y: -150 hide broadcast [4] when green flag clicked hide </pre>	
 Candy 5	<pre> when I receive [4] show go to x: -90 y: 100 glide 0.5 secs to x: pick random [-200] to [200] y: 150 glide 1 secs to x: pick random [-200] to [200] y: -150 hide broadcast [5] when green flag clicked hide </pre>	

2. Now we've achieve the effect of candies spurt one by one, but it's not quite smooth and natural. For instance, the time interval between candy and candy is the

same; only one candy is spurted; or the order of candies always remains the same. Meanwhile, we can find out that the logic behind all the 5 candies are basically the same. To solve this issue, we need to use clone block. This time, we will use the 5 candies as the 5 costumes of a sprite, naming them as 1 to 5.

Sprite	Program	Effect
Candy	<pre> when green flag clicked hide go to x: -90 y: 100 forever switch costume to [pick random 1 to 5] create clone of [myself] wait [pick random 0.5 to 1] secs when I start as a clone show glide [0.5] secs to x: [pick random -200 to 200] y: 150 glide [1] secs to x: [pick random -200 to 200] y: -150 delete this clone </pre>	

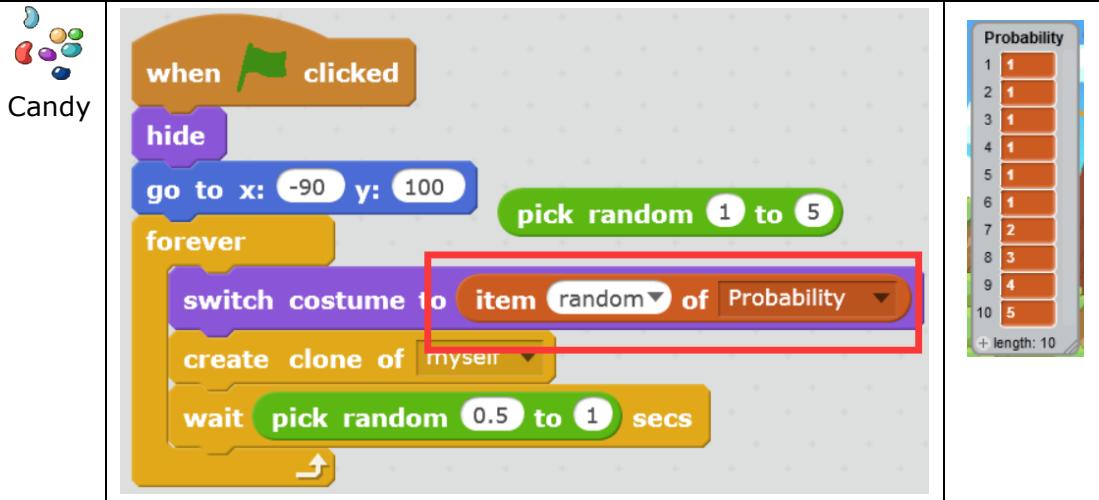
Tips

`pick random 0 to 1` is different from `pick random 0.0 to 1`. The former refers to random number between 0 and 1 while the latter refers to a random number (including decimal) between 0 and 1.

Additional Training

How to make one specified candy appears more times than the others? We can use a list to change the frequency set by the "pick random..to..".

Sprite	Program	Effect
--------	---------	--------



Homework

1. How to make the eruption of the volcano more frequent?
2. How to program the volcano to spray not only candies but also some other items?

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)

7.2 Catch the Candies

Intro

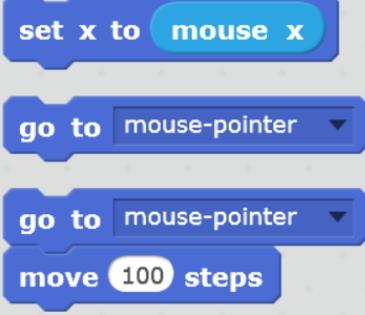
Mike has arrived beside the volcano already and he wants to catch the candies by controlling Mike No.1 with mouse.

Task

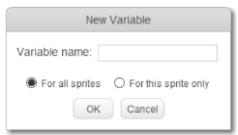
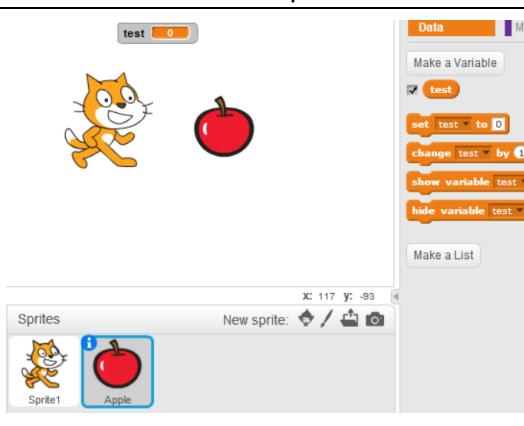
1. Design a program that enables the mouse to control Mike No.1 to catch candies. Meanwhile, add scoring function.

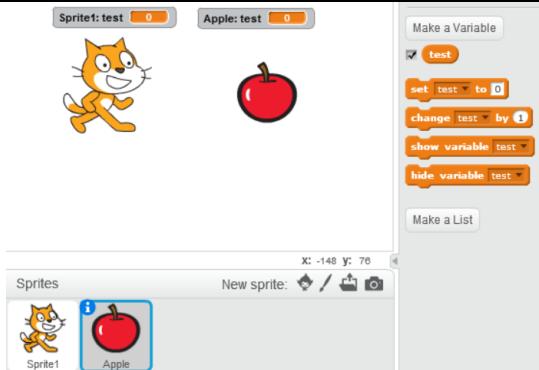
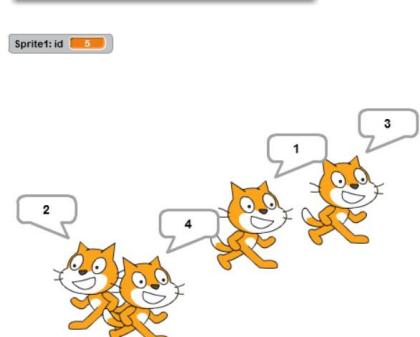
Start Learning

1. Make the sprite move with the mouse

Sprite	Explanation	Example
	<p>There are total 3 ways to control a sprite with mouse. Compare the similarities and differences among the 3 methods.</p>	

2. Private Variable of a Clone

Block	Explanation	Example
	<p>While creating a new variable, "For all sprites" refers to the variable that can be visited and modified by all sprites in this program. Thus no duplication of names is allowed.</p>	

	<p>"For this sprite only" refers to the internal variable of one sprite that can be only visited but not modified by the other sprites. Thus the name can be duplicated. Pay attention to the changes of the name of the variables on the stage.</p>	
	<p>When variable "for the sprite only" is used with clone block, every clone will possess the variable. In this case, we call it "the private variable" of the Clone. The initial value of the private variable equals to the then-value of the Clone when the Clone is created.</p>	  <pre> when green flag clicked hide set id to 1 repeat (4) create clone of myself change id by 1 end when I start as a clone point in direction pick random 0 to 360 set rotation style to left-right show say id forever move (10) steps if on edge, bounce end </pre>

Achieve

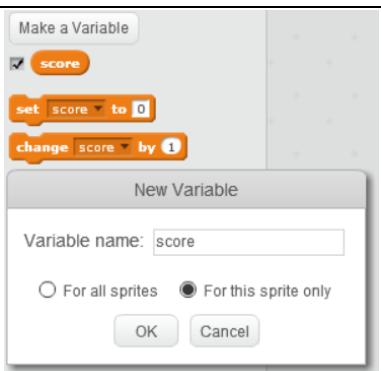
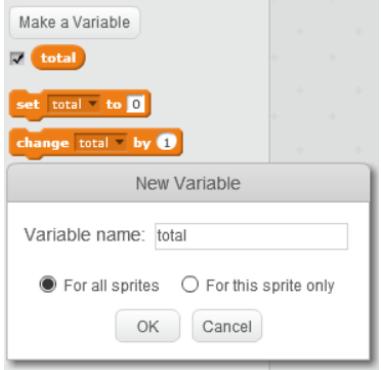
1. Control the Spaceship with mouse

Import "Mike in Spaceship 2.png".

Sprite	Program	Effect
 Mike in Spaceship 2	<pre> when green flag clicked set rotation style to [left-right v] forever move (10) steps point towards mouse-pointer </pre>	

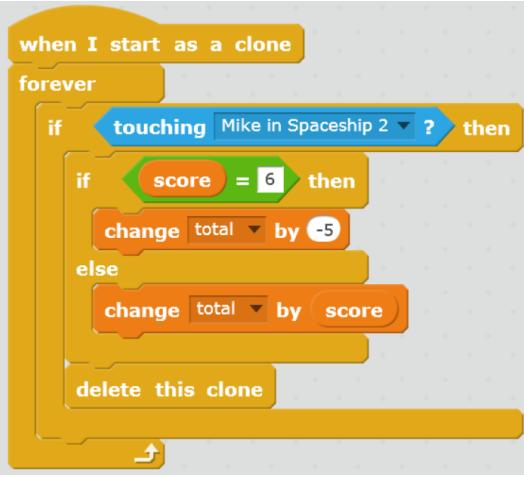
2. Achieve the Functionality of Scoring

Assume every candy stands for different scores, 1 point for Candy 1, 2 points for Candy 2, and so on. Then each clone of the candy requires a private variable to represent its score. In the meantime, we also need an overall variable "for all sprites".

Sprite	Program	Effect
 Candy	<pre> when green flag clicked hide go to x: (-90) y: (100) forever set [score v] to [pick random (1) to (5)] switch costume to [score v] create clone of [myself v] wait [pick random (0.5) to (1) secs] </pre> <pre> when I start as a clone show glide (0.5) secs to x: [pick random (-200) to (200)] y: (150) glide (1) secs to x: [pick random (-200) to (200)] y: (-150) delete this clone </pre> <pre> when I start as a clone forever if [touching] [Mike in Spaceship 2] then change [total v] by [score v] delete this clone </pre>	 
 Mike in Spaceship 2	<pre> when green flag clicked set [total v] to (0) </pre>	

Additional Training

To get a point-deduction sprite, all we need is to do some modifications on the program.

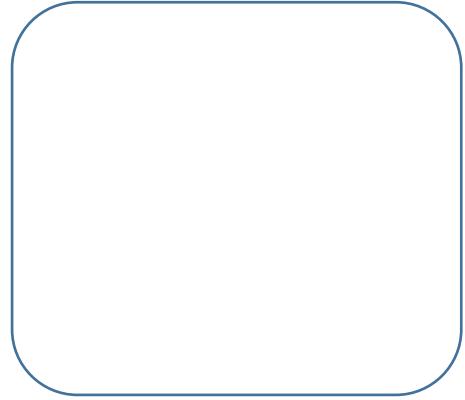
Sprite	Program	Effect
 Candy	<p>when I start as a clone</p> <pre> forever if touching [Mike in Spaceship 2 v ?] then if score = 6 then change total by -5 else change total by score delete this clone end end </pre> <p>when green flag clicked</p> <pre> hide go to x: -90 y: 100 forever set score to pick random 1 to 6 switch costume to score create clone of myself wait pick random 0.5 to 1 secs end </pre>	 

Homework

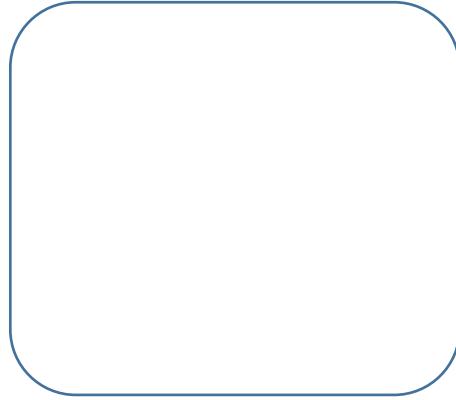
1. Achieve the effect of candies falling down and rotating simultaneously.
2. Utter a sound every time one candy is collected.

What You've Learnt?

Adventure Diary (Self-Assessment)



Gas Station (Other's Assessment)



7.3 Harvest!

Intro

The eruption of the volcano will only last for 30 seconds. Mike needs to catch 20 candies in 30 seconds and bring them back to the camp of the aborigines, otherwise he will fail his mission.

Task

1. Use Timer and Variable to control the program. Switch the backdrop when the mission accomplished or failed.

Start Learning

Block	Explanation	Example
	Timer is a variable for counting time. The unit here is second.	
	Rest the timer and start counting again.	

Achieve

Sprite	Program	Effect

	<pre> when I start as a clone forever if touching Mike in Spaceship 2 ? then change total by score change counter by 1 delete this clone </pre>	
 Stage	<pre> when I receive game over stop all when I receive win stop all </pre>	

Tips

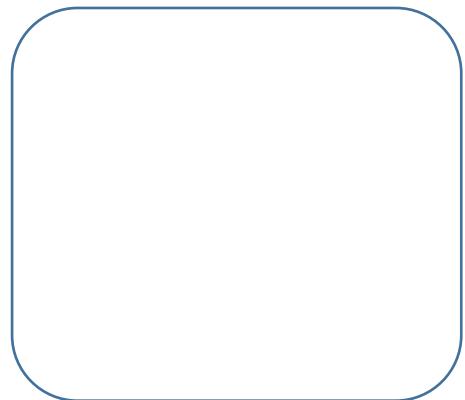
Tick before **timer** to turn on the timer on the stage.

Homework

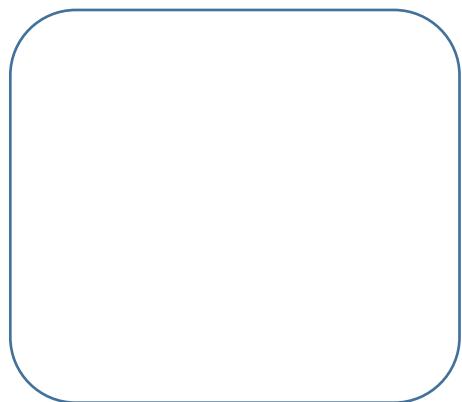
Please design the animation after the stage receive the message of "Game Over" or "Win". For instance, you can design like this: If the mission is accomplished, Mike will go straight back to the camp; if he fails, there will be a text prompt on the screen.

What You've Learnt?

Adventure Diary (Self-Assessment)



Gas Station (Other's Assessment)



8.1 Magical Camera

Intro

Just now Mike saw a display screen inside of the Mike No.1. And now he wants to talk to Mike No.1 thru it, do you know how?

Task

1. Realize the goal of video interaction

Start Learning

1. Video Interaction

Mike turned on the video and communicated with Mike No.1 through the display. Let's first get familiar with the blocks we will use in this section.

Block	Explanation	Example
	Turn on the camera	
	Set the transparency of the camera from 0 to 100. 0 for non-transparent and 100 stands for completely transparent.	
	The motion of the item on the video.	

★ Practice

Turn on your camera, and compare the effect when the transparency is set at 0, 50, and 100.

☆ Explore

Can you find other methods to turn on the camera in Scratch 2.0?

2. Interact with Mike No.1

Sprite	Animation	Scratch Script
Space ship	Click the green flag to turn on the camera; Set the transparency; When the motion value of the item/sprite on the video is detected to be over 10, say "Hi, I am Mike No.1". My plan:	Events: When Green Flag is clicked Looks: Say Control: Repeat, if...then Sensing: Turn video on, Set video transparency to.., Video motion on sprite Operator: ..>.. My Script: _____

★ Explore

Write the script according to the designed animation scene.

Tips

The motion detection function of the video can detect the moving speed and direction of the user. It can be applied to the script of the stage or the sprite. This function is realized by the principle of "optical flow". If you are interested in this, use a searching engine to get more info.

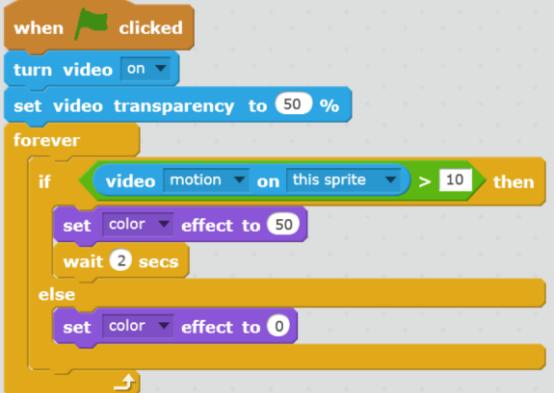
Achieve

Import "Mike's side face.png", "Spaceship.png" and the backdrop "Encounter.png".

Sprite	Program	Effect
Space ship	 <pre>when green flag clicked turn video on set video transparency to 50 % forever if video motion on this sprite > 10 then say Hi, I am Mike No.1! for 2 secs</pre>	

Additional Training

Achieve a more marvelous effect combining other blocks, e.g. If the motion is over 10, the spaceship will change its color.

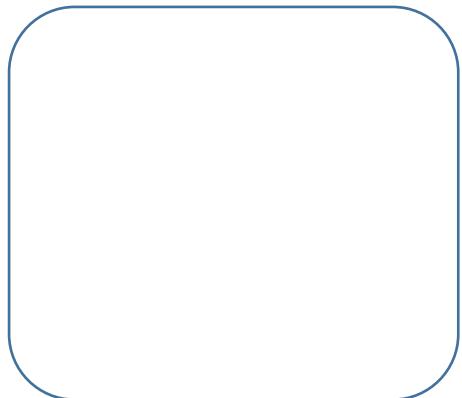
Sprite	Program	Effect
Space ship	 <pre>when green flag clicked turn video on set video transparency to 50 % forever if video motion on this sprite > 10 then set color effect to 50 wait 2 secs else set color effect to 0</pre>	

Homework

1. Use the interaction function of video to create an electronic reading machine which can read the pronunciation when a letter is touched.
2. Upload your work to the official website of Scratch, and share with others from all over the world!

What You've Learnt?

Adventure Diary (Self-Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing a self-assessment entry.

Gas Station (Other's Assessment)

A large, empty, rounded rectangular box with a thin blue border, designed for writing an assessment entry for someone else.

8.2 Catch the Candies

Intro

Mike's so happy that he finally learnt how to control Mike No.1 via video. Now he wants to catch the rest of the candies by using this function.

Task

1. Enable Mike to control Mike No.1 by video, hence to realize the goal of catching candies.

Start Learning

Design the script for the scenario of catching candies by hands in the video.

Sprite	Animation Scene	Scratch Script
Candy	The number of the candy is 0 when the green flag is clicked; Turn on the video and set the transparency at 50; When the motion value of the sprite on the video is detected to be over 30, hide itself and increase the candy number to 1. After 1 to 2 seconds, the sprite will re-appear on the stage and repeat the same process.	Events: When Green Flag is Clicked Data: Variable Looks: Hide, Show Control: Repeat, If... then Motion: Coordinate Operator: Pick random ... to .. , ..>.. Sensing: Turn video on, Set video transparency to.., Video motion on sprite

- Share

Tell me, what's your most satisfied work?

- ☆ Explore

Try to create a game of catching candies by hand in video.

Achieve

Import "Candy 5.png"

Sprite	Program	Effect

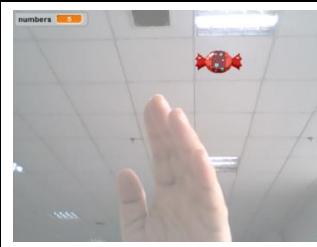


Candy 5

```

when green flag clicked
set numbers to 0
turn video on
set video transparency to 50 %
forever
  if video motion on this sprite > 30 then
    hide
    change numbers by 1
    wait pick random 1 to 2 secs
    show
    go to x: pick random -240 to 240 y: pick random -180 to 180

```



If any candy is not collected within 2 seconds, it will disappear and one point will be deducted.

Sprite	Program	Effect
Candy 5	<pre> when green flag clicked set numbers to 0 turn video on set video transparency to 50 % reset timer forever go to x: pick random -240 to 240 y: pick random -180 to 180 show set current to timer wait until touched = 1 or timer - current > 2 if touched = 1 then change numbers by 1 hide wait pick random 1 to 2 secs else change numbers by -1 set touched to 0 </pre>	 <pre> numbers -7 touched 0 current 55.379 </pre>
	<pre> when green flag clicked show set touched to 0 forever if video motion on this sprite > 50 then set touched to 1 </pre>	

Tips

The lower the motion value of the video is, the more sensitive the image is. Factors including illumination, posture, obstacle will affect the value of the motion detection from the video. Therefore our head portrait should stay away from the video area and stay put while catching candies with hands.

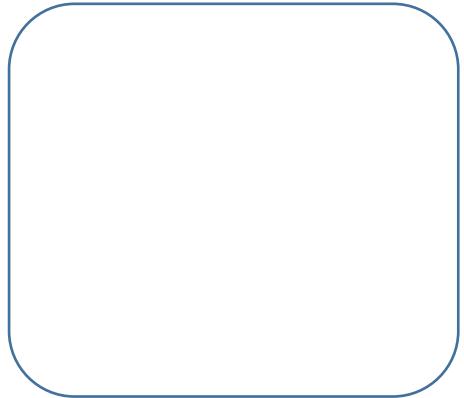
Homework

1. Create more candies on the stage using the clone function
2. Program like this: Variety types of candies will appear on the stage and

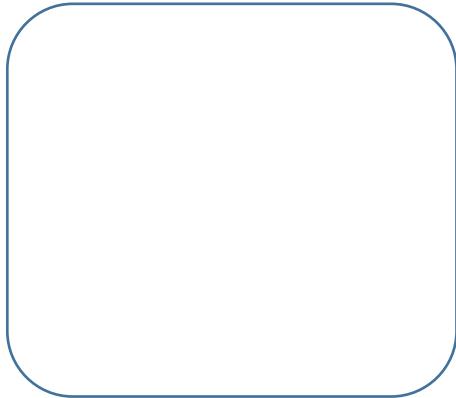
corresponding points will be deducted if a "bad candy" is touched.

What You've Learnt?

Adventure Diary (Self-Assessment)



Gas Station (Other's Assessment)



8.3 Avoid the Aliens

Intro

While Mike's collecting candies, the aliens showed up and attacked the tribe of the aborigines. Mike now needs to avoid the UFO and flies Mike No.1 to the tribe.

Task

1. Enable Mike control the moving of Mike No.1 via video.

Start Learning

1. Video Interaction

Block	Explanation	Example
	When the direction of the sprite in the video is Up and Right, then positive value; Down and Left, negative.	

2. Mike No.1 Moves According to the Direction in the Video

Sprite	Animation Scene	Scratch Script
Mike No.1	The spaceship will move to the starting point and appear on the stage when the green flag is clicked; Turn on the video, set the transparency at 50; When the motion direction value is > 0 , change x by 3; When the motion direction value is < 0 , change x by -3 Repeat; My plan _____	Event: When the Green Flag is Clicked Looks: Show Motion: Coordinate Sensing: Turn video on, Set transparency, Video direction on the sprite Operator: $>$, $<$ Control: If...then.., Repeat My _____ script

☆ Explore

Create a script according to the designed animation scene.

Achieve

Import backdrop "attack.png", and sprite "UFO.png", "Mike in Spaceship 2.png".

Sprite	Program	Effect



Mike in
Spaceship 2

```

when green flag clicked
go to x: 0 y: -120
turn video on
set video transparency to 60 %
forever
  if video direction on this sprite > 0 then
    change x by 3
  else
    change x by -3

```



UFO

```

when I start as a clone
show
go to x: pick random -200 to 200 y: 140
forever
  change y by pick random -3 to -10
  if touching edge ? then
    delete this clone
when I start as a clone
forever
  if touching Mike in Spaceship 2 ? then
    stop all
when green flag clicked
hide
forever
  wait pick random 1 to 4 secs
  create clone of myself

```

Tips

Edges refer to the 4 sides of the stage. If the UFO touches the top edge, it will hide directly instead of moving downwards. Thus we should not put the aliens close to the top edge at the beginning of the script.

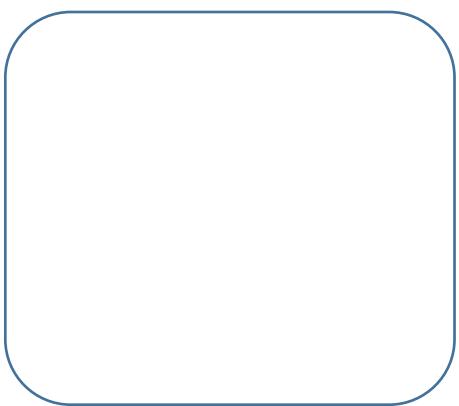
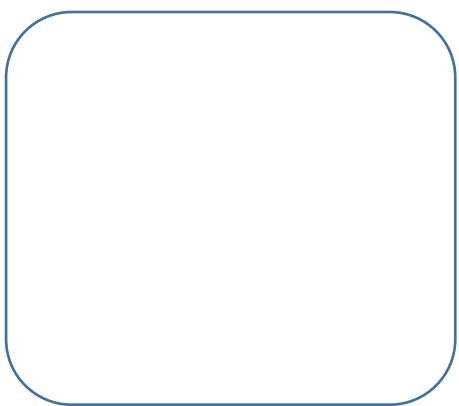
Homework

1. Increase the frequency of the UFO.
2. Try other script (effect) for scene of the Spaceship bumping into the UFO.

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)



9. Final Battle

Intro

After the perfect teamwork of Mike and all the aborigines, they finally drove those aliens away with bombs and saved the whole tribe. To memorize the contribution of Mike, they changed the name of their tribe to "Mike Tribe".



Task

1. Create the script according to the animation scene.

Process

- 1) Work out the theme of the game, and then decide the interaction way
- 2) Decide the backdrop and the sprite(s), and work out the design flow
- 3) Write the script according to the game flow
- 4) Repeatedly test to fix any errors or inadequacies
- 5) Publish your work piece and share with others.

Achieve

Before designing the program, we need to make a clear plan of the animation scene for each sprite and the relevant script. Let's start with the animation scene!

1. Animation Scene

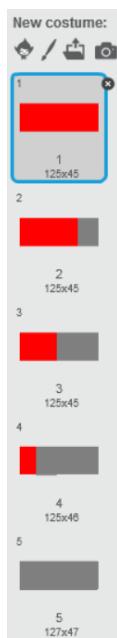
Scene 1 - In the tribe: Mike and the aborigines decide to fight against the aliens.

Scene 2 - Fighting: Mike flies Mike No.1 to fight against the aliens

Scene 3 - In the tribe: A big celebration!

2. Program Script

Import backdrop "Final Battle.png" and "Victor.png"; upload "Bomb.png", 2 "UFO.png", "Aborigine.png", "Mike.png", "Mike in Spaceship 2.png" from local file; import 2 "Ball" from the Sprite Library; and draw a "Blood bar" manually:



For easy operation, we've already made 2 aliens.

Sprite	Program	Effect
 Backdrop	<pre> when green flag clicked switch backdrop to [Victor v] when I receive [attack v] switch backdrop to [Final Battle v] when I receive [victor v] switch backdrop to [Victor v] </pre>	
 Mike in Spaceship 2	<pre> when green flag clicked set y to -110 forever if [key right arrow v pressed?] then point in direction 90 move 10 steps else if [key left arrow v pressed?] then point in direction -90 move 10 steps end </pre>	

	<pre> when green flag clicked hide forever if touching ball-a ? or touching ball-b ? then broadcast attacked hide wait 1 secs show </pre> <pre> when I receive attack show when I receive victor hide when I receive game over stop other scripts in sprite </pre>	
 Bomb	<pre> when I receive hit change counter by 1 if counter = 10 then broadcast victor </pre> <pre> when up arrow key pressed show go to Mike in Spaceship 2 repeat until touching edge ? point in direction 0 move 10 steps </pre> <pre> when green flag clicked hide set counter to 0 </pre>	
 UFO UFO2	<pre> when green flag clicked forever if touching Bomb ? then broadcast hit hide wait 2 secs </pre> <pre> when I receive victor show glide 3 secs to x: pick random -194 to 194 y: 135 </pre> <pre> when I receive game over stop other scripts in sprite </pre>	
 ball-a ball-b (Note: ball-b will be moving to the UFO2)	<pre> when I receive attack show forever go to UFO repeat until touching Mike in Spaceship 2 ? or touching edge ? point in direction 180 move 5 steps </pre> <pre> when I receive victor when green flag clicked when I receive game over stop other scripts in sprite </pre>	
 Mike	<pre> when green flag clicked show go to x: 85 y: -95 say The aliens are coming. Let's attack them! for 3 secs hide broadcast attack </pre> <pre> when I receive game over show say I will be back! for 2 secs </pre> <pre> when I receive victor show say Yeah, we won! for 5 secs stop all </pre>	

Blood bar	<pre> when I receive attacked next costume if costume # = 5 then broadcast game over and wait stop all when green flag clicked show switch costume to 1 </pre>	
The Aborigine	<pre> when I receive victor go to x: -10 y: -90 show wait 1 secs say Thank you, Mike. for 2 secs say We will call our tribe as "Mike Tribe". for 5 secs when green flag clicked hide </pre>	 Mike Tribe

Homework

Try to complete this game using clone function.

What You've Learnt?

Adventure Diary (Self-Assessment)

Gas Station (Other's Assessment)