Unit 4 Be a designer Unit 4

Programs with

Get started!

A computer can run more than one program at the same time. For example, a web browser and a word processing program.

Just like a computer, humans can also do more than one thing at the same time. For example, eating a sandwich while watching the television.

What other tasks do you perform at the same time? With your partner, discuss some other examples from everyday life.



You will learn:

- that efficient algorithms are concise
- to identify steps that are repeated in tasks
- to create programs running more than one algorithm
- to develop programs that reset objects.

In this unit, you will create programs with multiple algorithms in Scratch.



LIVEWORKSHEETS

Warm up

Jump rope

Look at the instructions below for a jumping rope:

1. Hold the rope with both hands at hip level. Ensure the rope is behind your feet.
2. Swing the rope over your head.
3. Jump over the rope with both feet at the same time.
4. Repeat steps _____



Step 1 | Step 2 | Step 3

1. What actions are repeated? _____
2. Can you think of other activities that have repeated steps? _____

Do you remember?

Before starting this unit, check that you:

- know an algorithm is a precise set of instructions
- can identify the steps in tasks
- can create algorithms as programs.



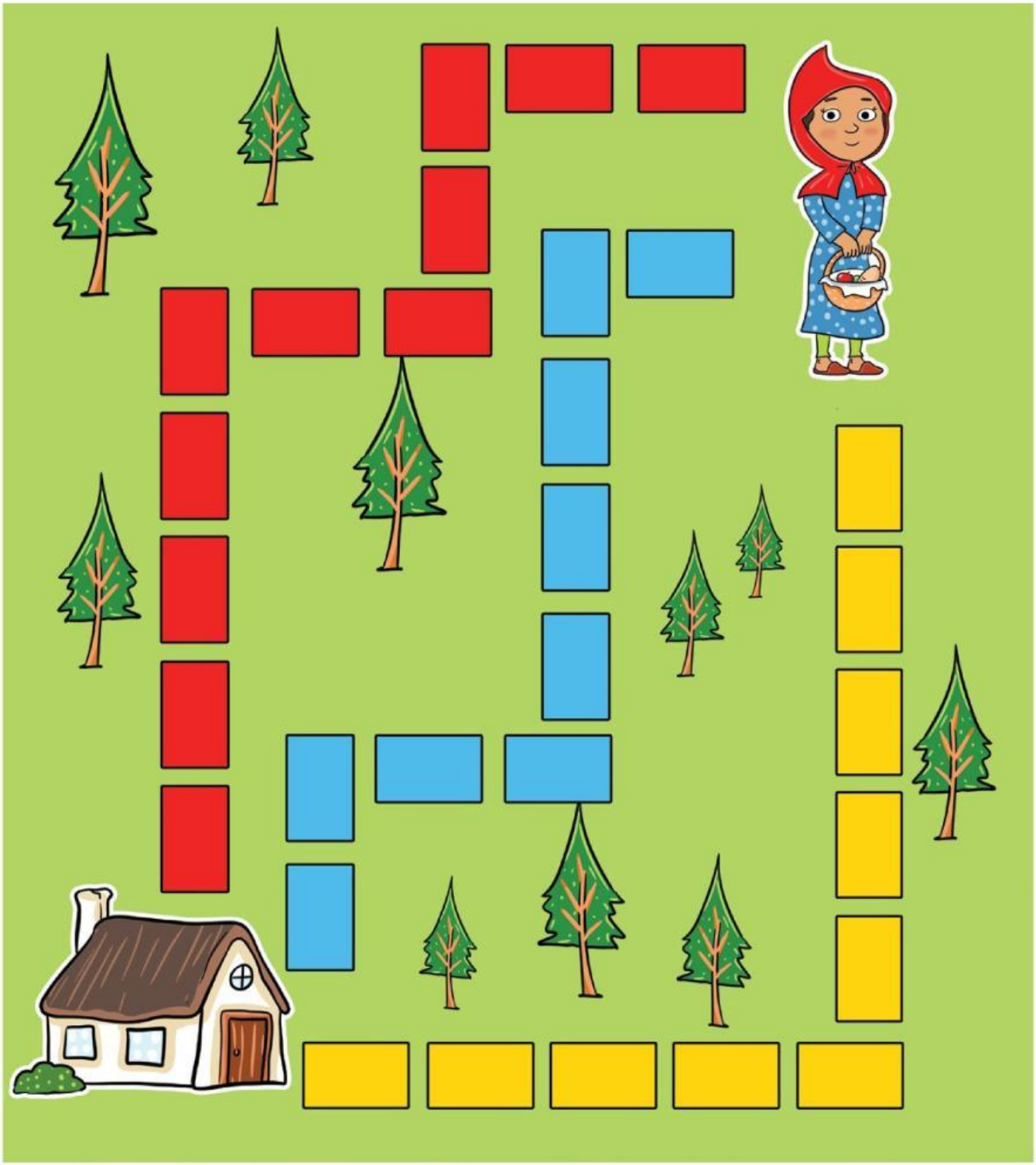
LIVEWORKSHEETS

Efficient algorithms

Name: _____

Mary is in a hurry to reach grandma's house. Give Mary instructions to reach grandma's house in the shortest time.

Determine the most efficient path for Mary to reach grandma's house.



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LIVEWORKSHEETS

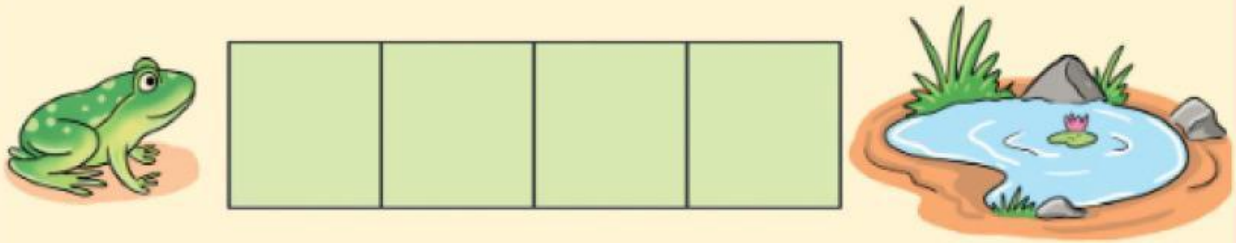
Efficient

Learn

An algorithm is a series of instructions to solve a problem.

Different algorithms can solve the same problem. However, the goal is to create an efficient algorithm.

For example, this frog needs to reach the pond.



Algorithm 1	
Step	**Instruction**
1	Start program
2	Jump 1 step forward
3	Jump 1 step forward
4	Jump 1 step forward
5	Jump 1 step forward
6	Jump 1 step forward
7	Stop program

Algorithm 1 is one solution to move the frog to the pond.

This algorithm has a total of _____.

Algorithm 1 tells the frog to jump one step at a time.

Algorithm 2	
Step	**Instruction**
1	Start program
2	Jump 3 steps forward
3	Jump 2 steps forward
4	Stop program

Algorithm 2 is another solution to move the frog to the pond.

This algorithm has a total of _____.

Algorithm 2 tells the frog to jump three steps followed by two steps.

LIVEWORKSHEETS

Algorithm 3	
Step	**Instruction**
1	Start program
2	Move 5 steps forward
3	Stop program

Algorithm 3 is another solution to move the frog to the pond.

This algorithm has a total of 3 steps.

Algorithm 3 tells the frog to jump five steps at once.

Algorithms 1, 2 and 3 are all different solutions to the same problem.

Algorithm 3 is the most efficient algorithm because it only has three steps.

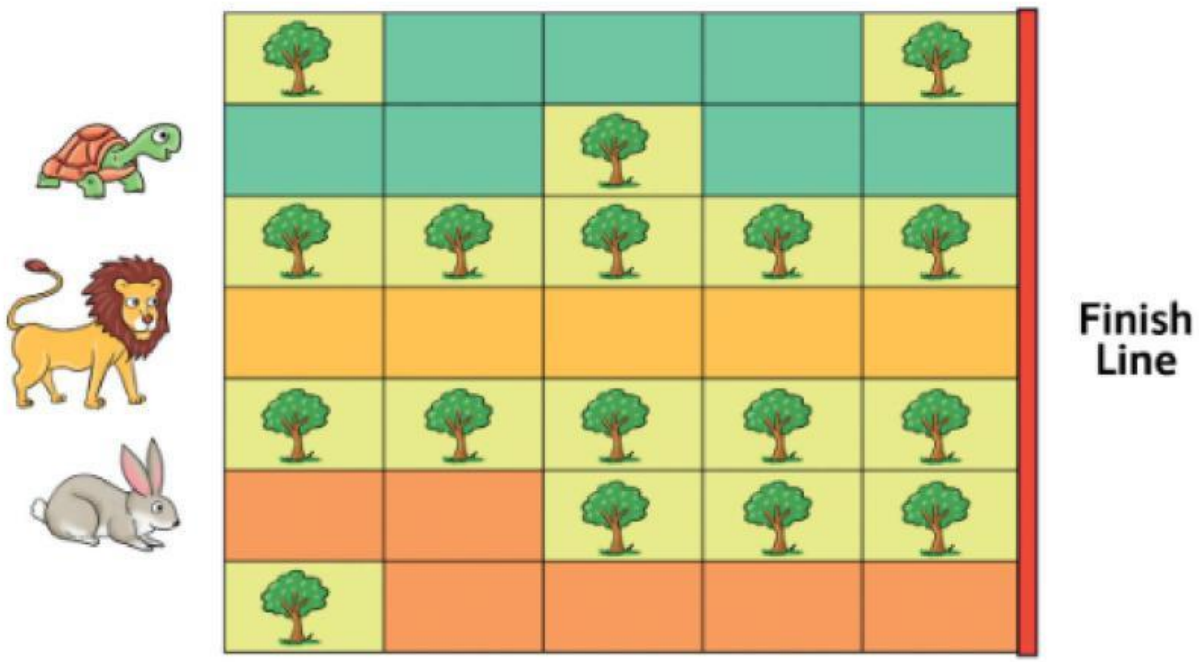
Efficient algorithms are ( ). This means the algorithm uses the least number of steps to solve the problem.

Practise

A lion, rabbit and turtle decide to run a race to see who is the fastest.

All three animals take different paths through the forest to reach the finish line.

The turtle follows the green path, the lion follows the yellow path and the rabbit follows the orange path.



LIVEWORKSHEETS

The algorithms below for the rabbit, lion and turtle are not the most efficient.

1 Rewrite the steps for all three algorithms, to create the most efficient algorithm for each animal.

2 Compare the number of steps in each algorithm with the ones you created.

Old code:

New code:

Algorithm for the rabbit	
Step	**Instruction**
1	Start
2	Move 1 step forward
3	Move 1 step forward
4	Turn right
5	Move 1 step forward
6	Turn left
7	Move 1 step forward
8	Move 1 step forward
9	Move 1 step forward
10	Stop

Algorithm for the lion	
Step	**Instruction**
1	Start
2	Move 1 step forward
3	Move 1 step forward
4	Move 1 step forward
5	Move 1 step forward
6	Move 1 step forward
7	Stop

Old code:

New code:

Algorithm for the turtle	
Step	**Instruction**
1	Start
2	Move 1 step forward
3	Move 1 step forward
4	Turn left
5	Move 1 step forward
6	Turn right
7	Move 1 step forward
8	Move 1 step forward
9	Turn right
10	Move 1 step forward
11	Turn left
12	Move 1 step forward
13	Stop

Old code:

New code:



LIVEWORKSHEETS

Repetition in tasks

Name: _____

Circle all the activities that involve repeated actions – doing the same thing over and over again.



comb hair



exercise



go to bed



have breakfast



get up



drying hair



watch TV



brush my teeth



go to work

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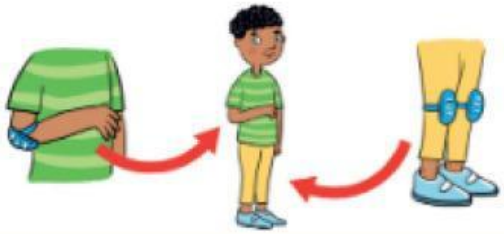
LIVEWORKSHEETS

Repetition in tasks

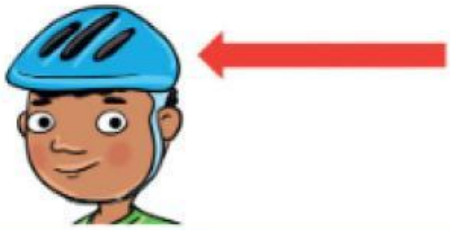
Learn

A _____ task involves actions that are done more than once.
Let's look at the example of riding a bicycle.

Step 1: Put on elbow and knee pads.



Step 2: Put on helmet.



Step 3: Get on bicycle. Place left foot on the left pedal and push off the ground using the right foot.



Step 4: Use the left foot to push down on left pedal.



Step 5: Use right foot to push down on right pedal.



Step 6: Repeat steps 4 and 5 to continue pedalling to move the bicycle forward.



When riding a bicycle, there are two steps that are repeated:

1. Pushing down using the left foot
2. Pushing down using the right foot



The bicycle will come to a stop if these steps are not repeated.

Keyword

repetitive: doing the same thing over and over again

LIVEWORKSHEETS

Practise

Walking up a staircase

Step 1: Lift left foot and place on stair.



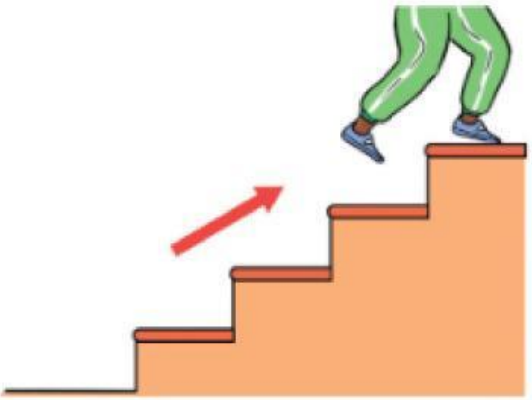
Step 2: Step up using the left foot and place right foot on next stair.



Step 3: Step up using right foot and place left foot on next stair.



Step 4: Repeat steps ____ to ____ until you have reached the top of the staircase.



1 Identify the steps that are repeated when walking up a staircase.

Eating a sandwich

Step 1: Pick up sandwich

Step 2: Take a bite from the sandwich

Step 3: Chew and swallow

Step 4: Repeat steps ____ and ____ until sandwich is finished

2 Identify the steps that are repeated when eating a sandwich. _____

LIVEWORKSHEETS

Coding with multiple algorithms

Name: _____

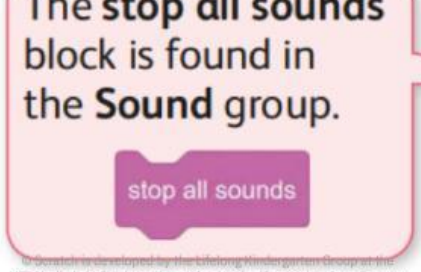
Coding the program for a Dance Battle between Jouvi and Champ99

Algorithm to set Jouvi position	
Step	**Instruction**
1	Start program when Green flag is clicked
2	Set Jouvi's position to x = 109, y = -33
3	Switch costume to jo stance

Algorithm to set Champ99 position	
Step	**Instruction**
1	Start program when Green flag is clicked
2	Set Champ99 position to x = -125, y = -50
3	Switch costume to champ99-b

Algorithm for Jouvi dancing	
Step	**Instruction**
1	Start program when left arrow key is pressed
2	Switch costume to jo top R leg
3	Wait 1 second
4	Switch costume to jo top L leg
5	Wait 1 second
6	Switch costume to jo pop front
7	Wait 1 second
8	Switch costume to jo pop left
9	Wait 1 second
10	Say 'It's your turn!' for 2 seconds

The **stop all sounds** block is found in the **Sound** group.





Scratch is developed by the Lifelong Kindergarten Group at the MIT Media Lab. See http://scratch.mit.edu/credits
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1 Create a new project in Scratch and delete Sprite 1.
2 Search and select the **Hall** Backdrop.
3 Search and select the **Jouvi Dance** sprite.
4 Add the two sets of code for **Jouvi position** and **Jouvi Dancing**.
5 Search and select the **Champ99** sprite.
6 Add the two sets of code for **Champ99 position** and **Champ99 Dancing**.
7 Include a static object such as a **speaker** sprite in the program.
8 Run the program. Click the **Green flag** then press the **left arrow** key.
9 Explain what happens.

LIVEWORKSHEETS

Unit 4 Word search

Name: _____

Can you find all the hidden words?

P	I	Q	J	P	W	L	S	A	G	A
O	G	Z	V	V	Z	I	K	L	K	J
V	O	E	M	C	G	W	N	E	K	F
U	M	P	C	N	C	H	Y	F	W	E
C	D	Q	K	P	S	N	R	F	V	S
M	R	E	P	E	T	I	T	I	V	E
E	C	O	N	C	I	S	E	C	X	Y
B	Y	H	V	S	X	Y	Q	I	W	E
K	M	U	L	T	I	P	L	E	T	O
J	K	P	A	F	X	U	O	N	A	W
A	F	P	Q	S	C	R	A	T	C	H

Words List

efficient concise Scratch

repetitive multiple

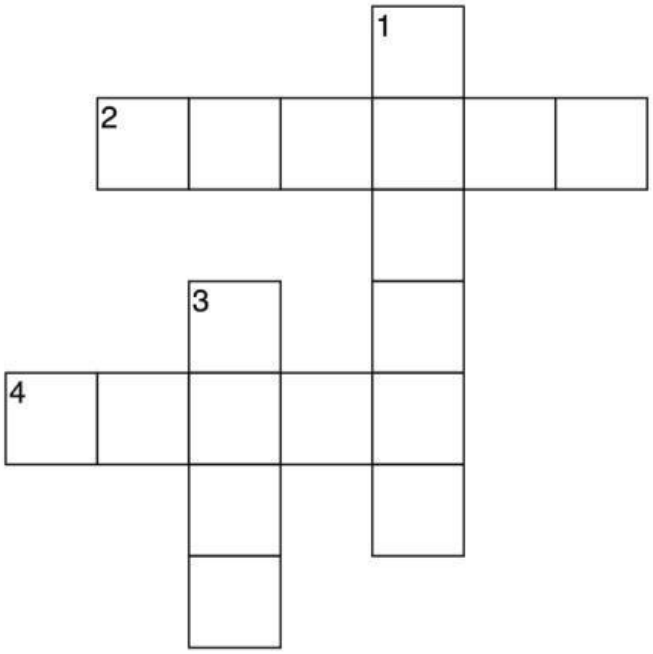
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LIVEWORKSHEETS

Unit 4 Crossword

Name: _____

Solve the following puzzle based on the clues given!



Across

[2] Lots of tasks include actions that rep__t

[4] In Scratch, the 'say' block is in the 'l___s' group

Down

[1] An efficient algorithm has the few___ number of steps

[3] A computer can run m___ than one program at the same time

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LIVEWORKSHEETS

Coding with multiple algorithms

Learn

We want to create a program for a **Batter** hitting a **baseball.** Look at Algorithm A for the **Batter:**

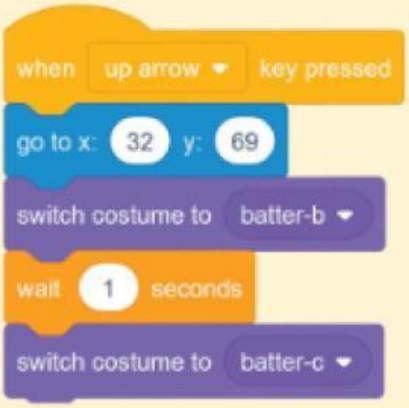
Algorithm A	
Step	**Instruction**
1	Start program when up arrow key is pressed
2	Set batter position to x = 32, y =
3	Switch costume to batter-b
4	Wait second
5	Switch costume to batter-c
6	Stop program

The steps below show how to create the program for Algorithm A:

1. Create a new project on Scratch and delete Sprite 1.
2. Search and select the **Baseball 1** backdrop.
3. Search and select the **Batter** sprite.
4. Under the **Events** group of blocks, select the **when () key pressed** block. Click on the dropdown arrow and select **up arrow.**
5. Under the **Motion** group of blocks, select the **go to x, y** block. Change the number for x to 32 and y to 69.
6. Under the **Looks** group of blocks, select the **switch costume** to block. Click on the dropdown arrow and select **batter-b.**
7. Under the **Control** group of blocks, select the **wait () seconds** block. The default is 1 second.

LIVEWORKSHEETS

8 Select the **switch costume to** block. Click on the dropdown arrow and select **batter-c.** The final code is:



Look at Algorithm B for the **Baseball:**

Algorithm B	
Step	**Instruction**
1	Start program when up arrow key is pressed
2	Set baseball position to x = –6, y = –136
3	Set size to 70 %
4	Glide 1 second to x = –30, y = 65
5	Wait 1 second
6	Glide 1 second to a random position
7	Stop program

The steps below show how to create the program for Algorithm B:

1 Search and select the **Baseball** sprite.

2 Select the **when () key pressed** block. Click on the dropdown arrow and select **up arrow.**

3 Select the **go to x, y** block. Change the number for x to -6 and y to -136.

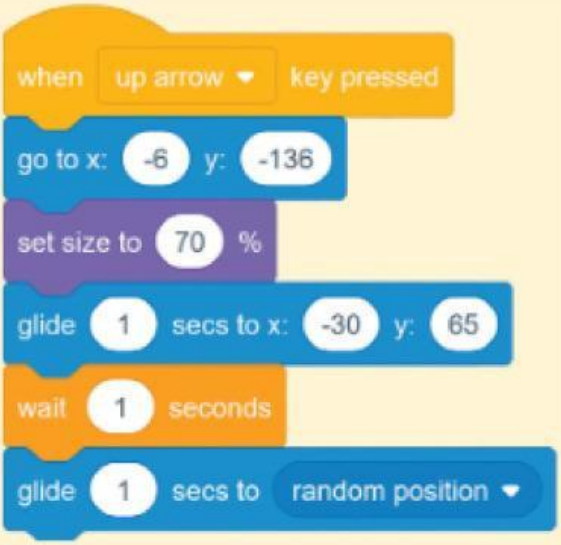
4 Under the Looks group of blocks, select the set size to block. Change the number to

LIVEWORKSHEETS

5 Under the **Motion** group of blocks, select the **glide () secs to x, y** block. Change the number for x to -30 and y to

6 Select the **wait () seconds** block. The default is 1 second.

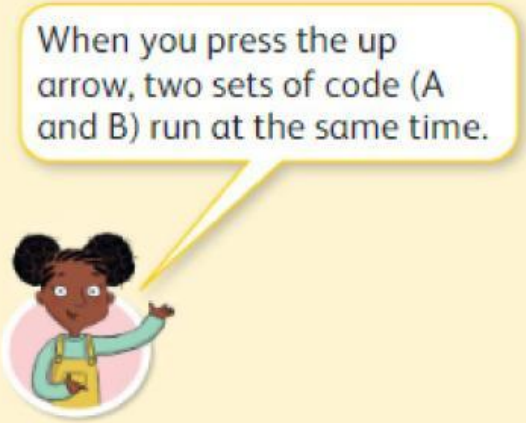
7 Under the **Motion** group of blocks, select the **glide () secs to ()** block. The default is 1 second to random position. The final code is:



To run the program, press the up arrow. You will notice the following:

a The **Baseball** glides for one second towards the **Batter,** waits for 1 second and then glides for 1 second to a random position.

b The **Batter** waits 1 second for the ball to reach the bat, then switches to **batter-c** costume.





LIVEWORKSHEETS