

LESSON 3

DECOMPOSITION AND ABSTRACTION

KINDERGARTEN



Award # 1837380

Lesson created by the GMU-ODU CSforAll Team. For more information about this lesson and our CSforAll initiative, contact Dr. Amy Hutchison at achutchison1@ua.edu

SUMMARY AND STANDARDS

Summary: In this lesson, students will decompose a story with a beginning, middle, and end, and abstract the story sequence by retelling it with coding blocks.

ELA Standards:

K.1 The student will demonstrate growth in the use of oral language.

- a) Listen to a variety of literary forms, including stories and poems.
- b) Participate in a variety of oral language activities including choral and echo speaking and recitation of short poems, rhymes, songs, and stories with
- c) repeated word order patterns.

K.9 The student will demonstrate comprehension of fictional texts.

- d) Begin to ask and answer questions about what is read.
- e) Retell familiar stories, using beginning, middle, and end.

CS Standards:

K.1 The student will construct sets of step-by-step instructions (algorithms) either independently or collaboratively including sequencing that emphasize the beginning, middle, and end.

K.2 The student will construct programs to accomplish tasks as a means of creative expression using a block based programming language or unplugged activities, either independently or collaboratively, including sequencing, emphasizing the beginning, middle, and end.

MATERIALS AND RESOURCES NEEDED FOR THIS LESSON:

- [“The Itsy Bitsy Spider”](#) Scaffolded Graphic Organizer
- [Itsy Bitsy Spider CODING](#) Scaffolded Graphic Organizer
- [K Word Wall Cards](#)

LESSON OBJECTIVES: I CAN...

- Ask and answer questions about a story
- Retell a story with beginning, middle, and end
- Sequence a story with a beginning, middle, and end
- Put a story in the correct sequence
- Decompose a story into beginning, middle, and end
- Abstract a story sequence by retelling the beginning, middle, and end with coding blocks

Vocab:

Decomposition

Abstraction

WARM UP



Computer Science

Review Vocabulary with Emphasis on Patterns (Slides 6-8)

Teacher: “Welcome back to thinking like computer scientists (show “computer science”(Slide 6) in Kindergarten! Last time, we learned that computer scientists use sequences (Slide 7) to tell the computer what to do. We also learned that if there’s a problem in the sequence, we can debug it (Slide 8) by finding the problem and fixing it

LET'S THINK ABOUT OUR LAST COMPUTER SCIENCE LESSON...



1

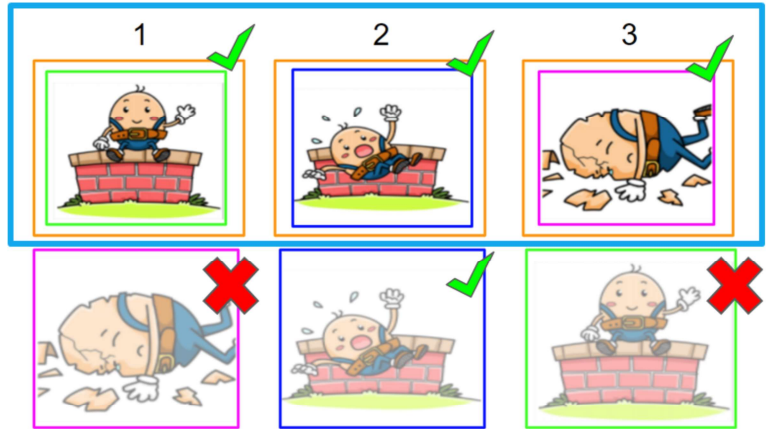


2



3

sequence

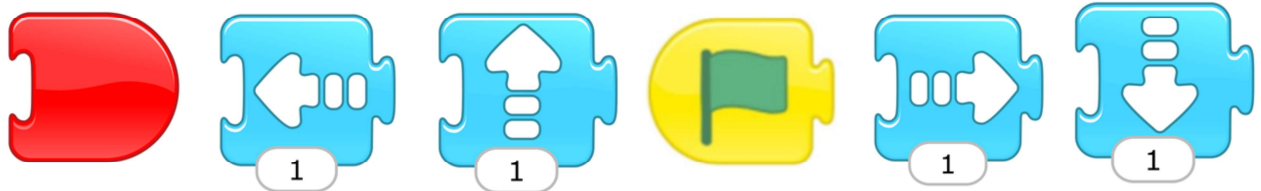


debug

INTRODUCTION

“Simon Says”

Coding Blocks Edition



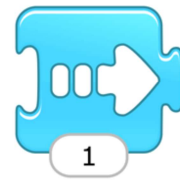
Review CS Concepts with Emphasis on ScratchJr Commands

Engagement & Interest: “Simon Says ScratchJr Edition” (10 minutes; beginning on slide 10)

NOTE: Please think about any physical options that may be necessary to meet your students’ needs prior to doing this part of the lesson. It can be amended to fit all students’ physical abilities!

→ “Now, just like computer scientists, we are always thinking about how we use words and pictures to communicate, and we are going to look at some commands in ScratchJr. I want you to think about what the commands mean

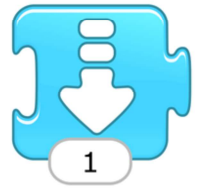
Which one means “go” or “start”?



Walk students through **slides 11-24**, ask questions for them to share answers. Provide students an opportunity to unmute mics to share.

→ Which command means “Start”?

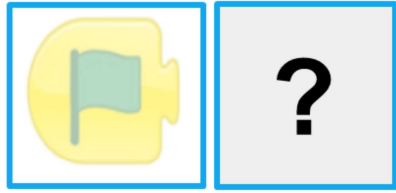
Green flag means “go” or “start”!



Green flag.

- Great! The green flag means “begin” or “start” and we **MUST** use the green start flag any time we create code.

Which command means move right?

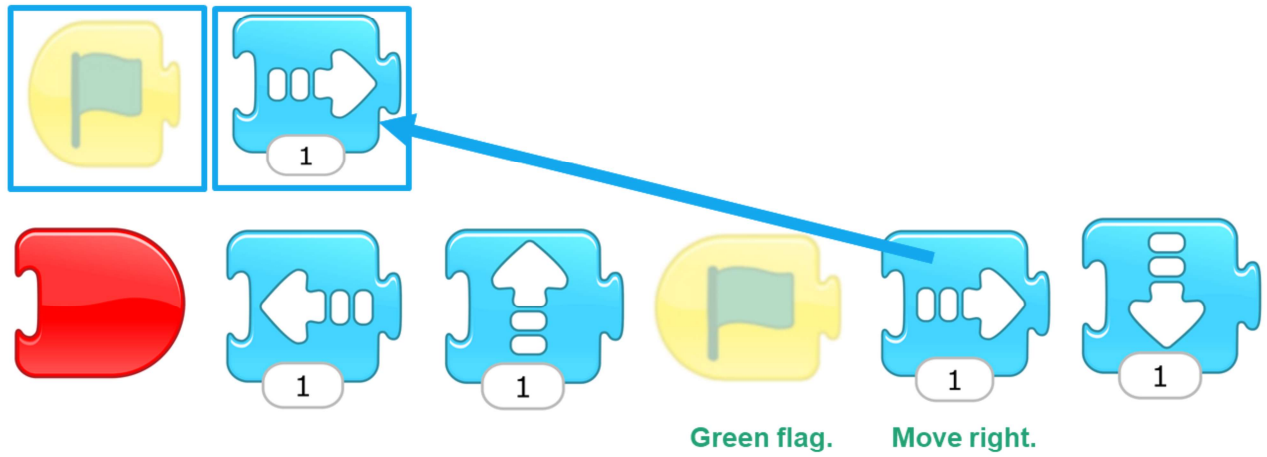


Green flag.



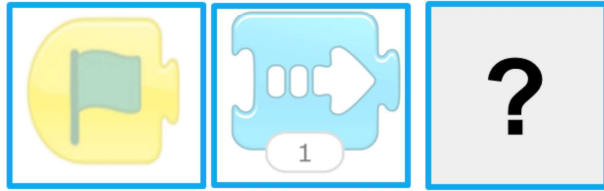
→ Which command means “go to the right”?

Which command means move right?



→ “Yes, the blue arrow pointing to the right means, “move right.” That’s right!

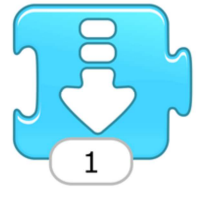
Which command means move down?



Green flag.

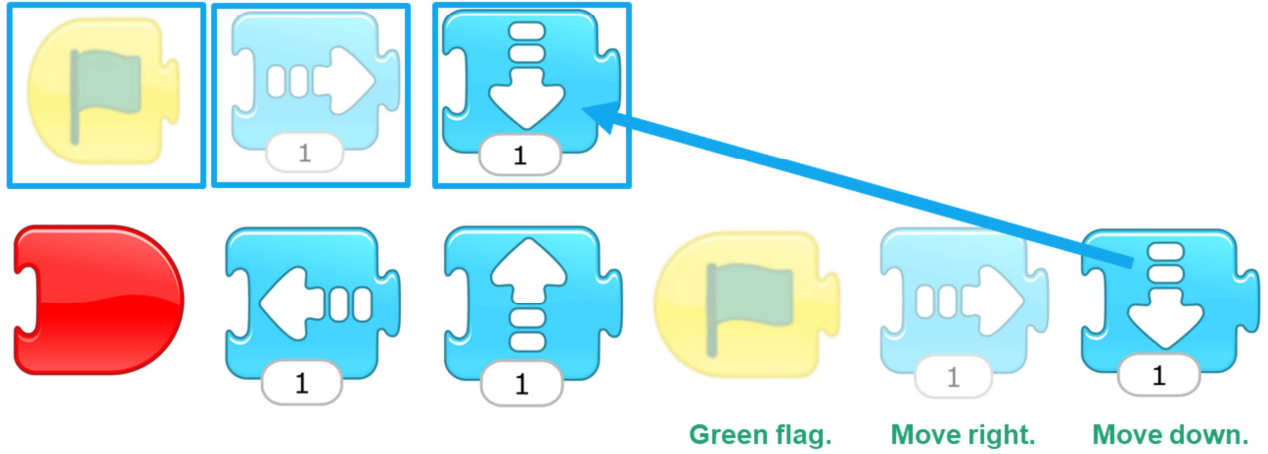


Move right.



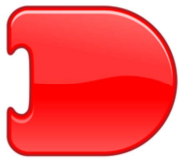
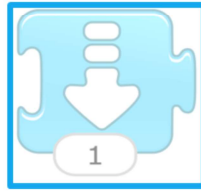
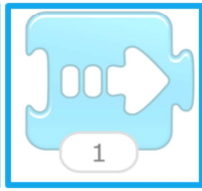
→ Which command means “down”?

Which command means move down?



→ Correct! The down arrow makes your character or sprite move down

Which command means move left?



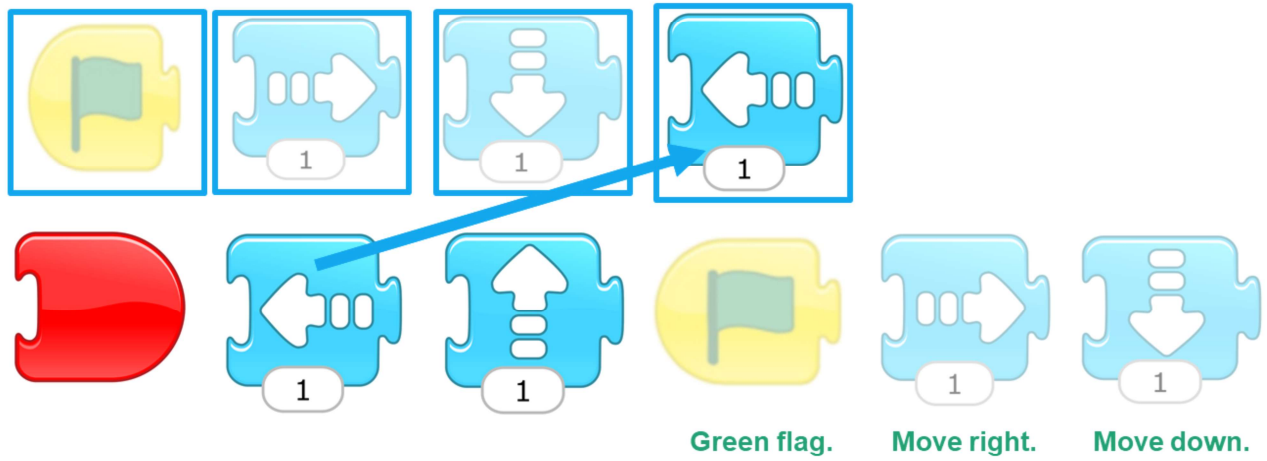
Green flag.

Move right.

Move down.

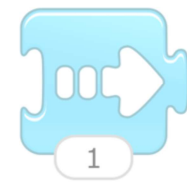
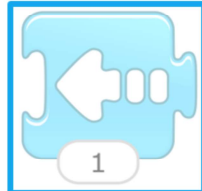
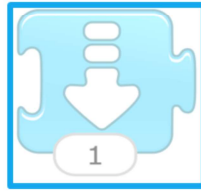
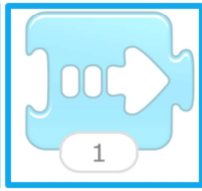
→ Which command means “go to the left”?

Which command means move left?



→ Fantastic! The move left arrow makes our character or sprite move to the left.

Which command means move up?



Move left.

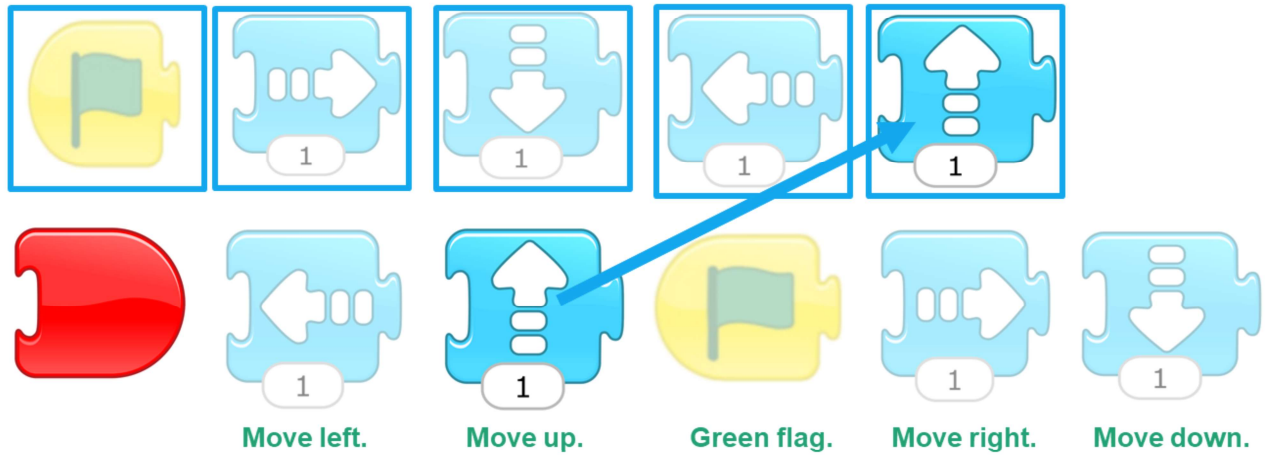
Green flag.

Move right.

Move down.

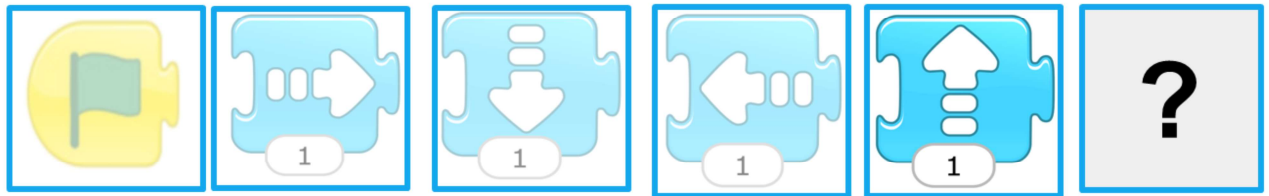
→ Which command makes our sprite move up?

Which command means move up?



→ Yes, you're thinking like computer programmers! Now, I have a question. How many spaces up is our sprite moving when I click this up arrow?

Which command means stop?



Move left.

Move up.

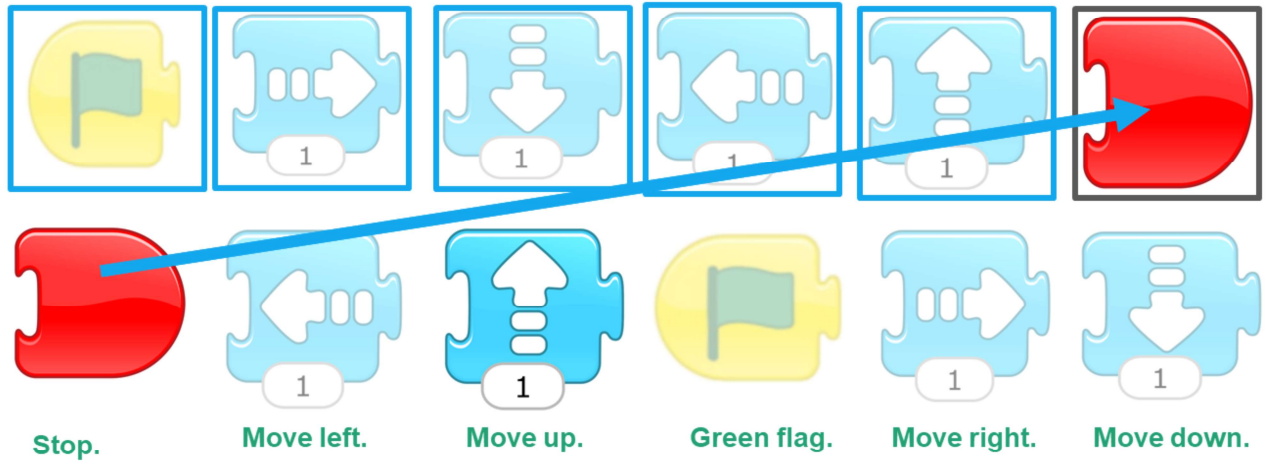
Green flag.

Move right.

Move down.

→ Now, what command do we choose EVERY time we end our code? (Wait time)

Which command means stop?



- Yes, I must choose the red “end or stop” button each time I want to finish my character or sprite’s actions.

How many spaces?



_____ is moving ___ space(s) to the right.

- Now, let's review ONE more time how we know how FAR our sprite is moving! We have three different sprites, or characters here. Two characters have names: Tic is our blue sprite. Tac is our purple sprite. We also have a car sprite. Now, I want you to look at the blue command buttons.
- Which direction are each of these character's moving? (Wait time). "Yes, that's correct; they're moving to the right. Hmm. Which character is moving the farthest? (Wait time). That's right. The car is moving the farthest? How do I know? (Wait time).

Correct, I looked at the numbers at the bottom of the right arrow command, and the biggest number was 10, so I knew that the car went the farthest!. Now, which of my sprites is moving the fewest spaces? (Wait time). Yes, my character named Tac, the blue character, is only moving 1 space. How many spaces is my purple sprite named Tac moving? (Wait time). Yes, Tac is moving 5 spaces to the right!

Great job, computer scientists. Now, I have something very exciting for you, and paying attention to the type of command and how many spaces the command says are important for our next activity.

LET'S REVIEW OUR CODING COMMANDS!



Hand forward. Move left _ steps. Hands up high. Run in place. Move right _ steps. Touch toes.

Ask students to stand next to their desks or work spaces. Prepare to play the Simon Says game together by acting out each ScratchJr command over the camera so that students can see what each action looks like “in person”.

Now, we are going to play a special game of Simon Says. And I am SO excited to play this Simon Says game with you because it uses our ScratchJr Commands! So, you'll see here that each of our commands equals an action that we take.

If we see the “end” command, we place our hand out like we're telling someone to stop. *Put your hand out like a stop sign.*

If we see the left arrow, we move to the left. *Step or slide to the left.*

If we see the up arrow, we make our hands go up high! *Raise hands up high.*

If we see the green flag, we are going to run in place. *Jog in place.*

If we see the right arrow, we move to the right. *Step or slide to the right.*

If we see the down arrow, we are going to touch our toes. *Bend down and touch toes or put hands on your lap if students need to sit.*

Okay, now, we are going to start. Let's practice! When I click on the slide, I want you to do the command!

“SIMON SAYS” CODING STYLE!

Let's practice!

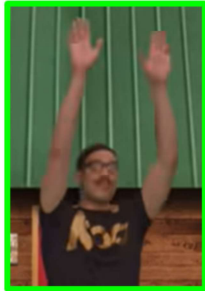


Practice using **slide 26** (*Some students will only do the action one time. This is a great time to get to remind them to think about the number of times an action is occurring*) and remind them to pay attention to the numbers on the block (**Slide 27, 28**).

“Great job! I saw some of you raise your hands up high! But I have a question, did what you do look like this?”

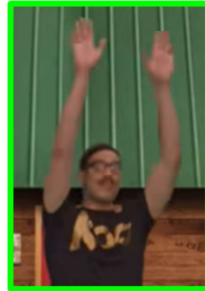
“SIMON SAYS” CODING STYLE!

Did you?



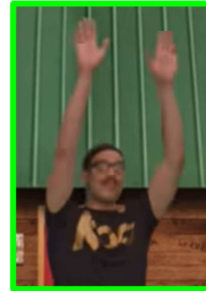
Hands up high.

1



Hands up high.

2



Hands up high.

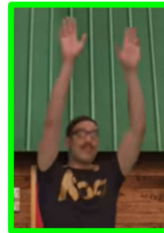
3

→ “Wait a minute! He raised his hands up high three times. How did he (*or some of **you** if some students caught this*) know to do this three times?”

HOW DID YOU KNOW TO RAISE YOUR HANDS 3 TIMES?



Hands up high.



Hands up high.



Hands up high.



- “That’s right! Our command has a 3 in it. That means Simon Says “Raise your hands UP 3 times!”. You are brilliant computer scientists! I bet you’ll pay attention to the number and the action next time. Okay, now we are going to start for real!

READY, HERE WE GO!



Start playing the Simon Says game (**slide 29-38**)
You can choose to stop between each of these slides or do them in succession depending on student needs. You can ask questions, like “How did you know that?” if some students are getting stuck and allow students to explain it to their peers.

NOTE: *If you are a teacher who has chosen to teach this lesson across multiple days, this is a possible stopping point.*

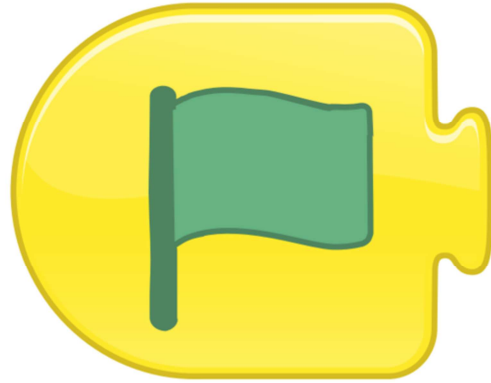
→ *Wait time. Hands up high 2 times!*

SIMON SAYS...



→ *Wait time.* Hands up high 4 times!

SIMON SAYS...



→ *Wait time.* Run in place!

SIMON SAYS...



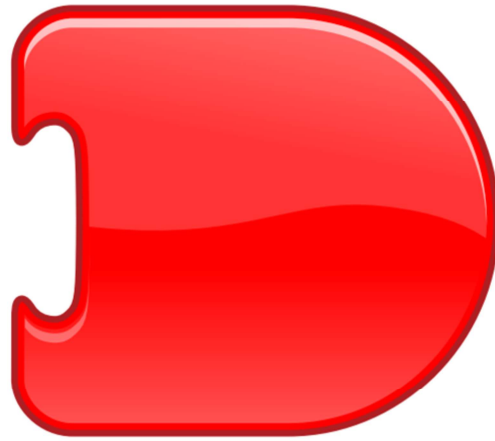
→ *Wait time.* Touch your toes 3 times!

SIMON SAYS...



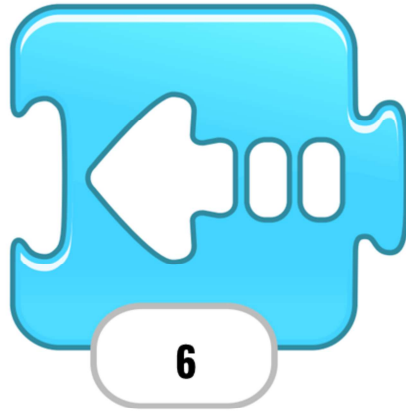
- *Wait time. Move right one space! Students may get left and right confused, so monitor for that. Choose how much to engage this based upon time.*

SIMON SAYS...



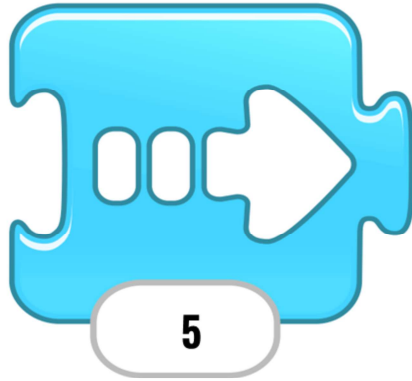
→ *Wait time.* That's right! Hand out like a stop sign!

SIMON SAYS...



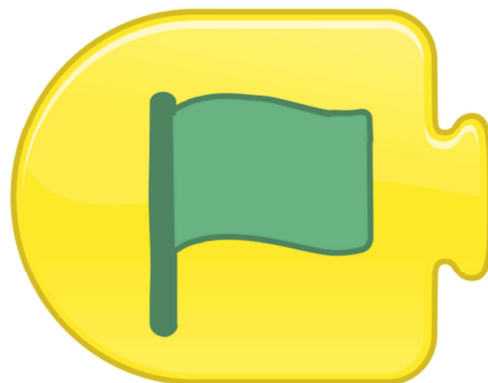
→ *Wait time.* Great! Move left 6 steps.

SIMON SAYS...



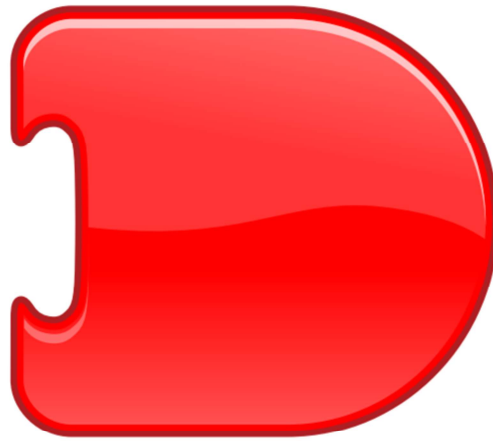
→ *Wait time.* Wonderful! Move right 5 steps.

SIMON SAYS...



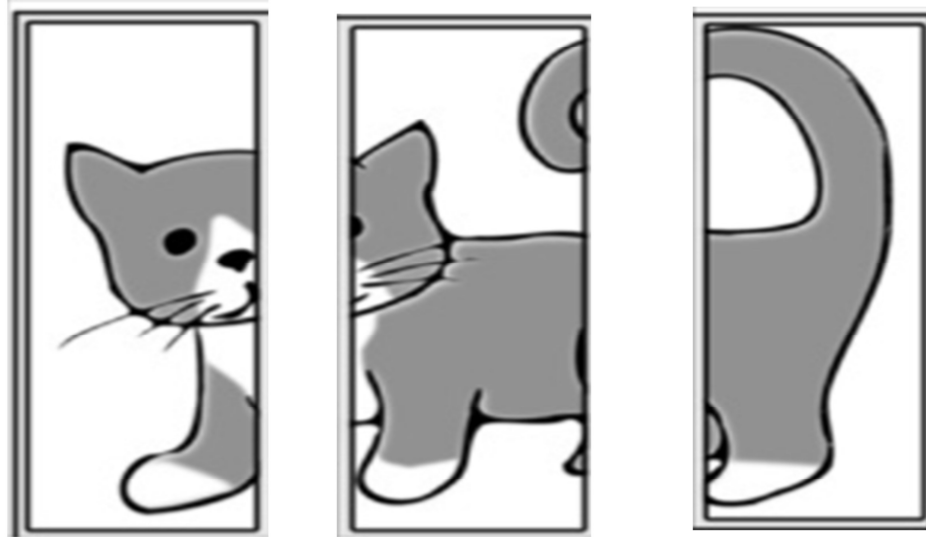
→ *Wait time.* Whew! Yes! Run in place!

SIMON SAYS...



- *Wait time.* Yes! Hand up like a stop sign! Wow! You are amazing! You know these ScratchJr commands so well! I am impressed! We are going to always think about what our commands are telling us and we are going to think about what WE want to TELL our commands! When thinking like computer scientists and writers, it will be up to YOU to decide how many steps your characters take. Every choice you make as new computer scientists affects how readers understand your story! Great job!

GUIDED INSTRUCTION



decompose

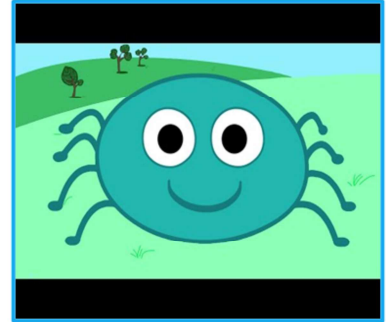
- Introduce “decompose” and “decomposition”.
- “I bet that by now, you’re all experts on being able to put a sequence in order with the beginning (hold up one finger), the middle (hold up two fingers), and the end (hold up three fingers). You can even find the beginning, middle, and end in nursery rhymes, like “The Itsy Bitsy Spider!” While we read, we are going to think about the beginning, middle, and end. Since we are using words computer scientists use, we will call this **decomposing** or **decomposition**
- **Decompose** means to break something up into parts. We are going to read the poem and think about the most important parts **for the spider**. Where does the spider want to go, and what happens to her? Let’s warm up our reading brains and read the poem together. While we’re reading, see if you can notice what happens at the beginning, middle, and end, AND... what direction does the itsy bitsy spider go? Does she go up? Down? Side to side? See what you can find.

Itsy Bitsy Spider

The itsy bitsy spider
Climbed up the water spout
Down came the rain
And washed the spider out



Out came the sun
And dried up all the rain
And the itsy bitsy spider
Went up the spout again!



Itsy-Bitsy Spider: https://youtu.be/w_ICi8U49mY

- Ask students to read Itsy Bitsy Spider together and pay attention to the beginning, middle, and end of the story and how the spider moves.
- “Great job! Now...did you notice how the Itsy Bitsy Spider moved during the poem?”
- *Display the “[Itsy Bitsy Spider](#)” poem as it appears in the slides where all students can read along, or write the poem on sentence strips.*
- *Optional: Play [The Itsy Bitsy Spider Song](#) on Slide 41.*

Itsy Bitsy Spider



The itsy bitsy spider
Climbed up the water spout
Down came the rain
And washed the spider out

Out came the sun
And dried up all the rain
And the itsy bitsy spider
Went up the spout again!



?

?

?



- Ask students to share how the spider moves at the beginning, middle, and end (**slides 42-47**). *Wait time. Use your fingers to give visual cues.*
- “What did the Itsy Bitsy Spider do in the beginning?”

Itsy Bitsy Spider



The itsy bitsy spider
Climbed up the water spout
Down came the rain
And washed the spider out

Out came the sun
And dried up all the rain
And the itsy bitsy spider
Went up the spout again!



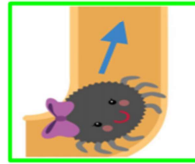
→ “That’s right! She climbed up the water spout! (*Point up as a visual cue*).

Itsy Bitsy Spider



The itsy bitsy spider
Climbed up the water spout
Down came the rain
And washed the spider out

Out came the sun
And dried up all the rain
And the itsy bitsy spider
Went up the spout again!



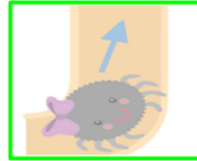
→ "Then where did she go in the middle?"

Itsy Bitsy Spider



The itsy bitsy spider
Climbed up the water spout
Down came the rain
And washed the spider out

Out came the sun
And dried up all the rain
And the itsy bitsy spider
Went up the spout again!



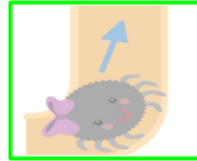
- “Right! The rain came down and washed her out!” *(Point down or act out water coming down the spout as a visual cue).*

Itsy Bitsy Spider



The itsy bitsy spider
Climbed up the water spout
Down came the rain
And washed the spider out

Out came the sun
And dried up all the rain
And the itsy bitsy spider
Went up the spout again!



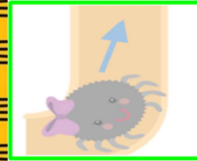
→ “Then where did she go at the end?”

Itsy Bitsy Spider

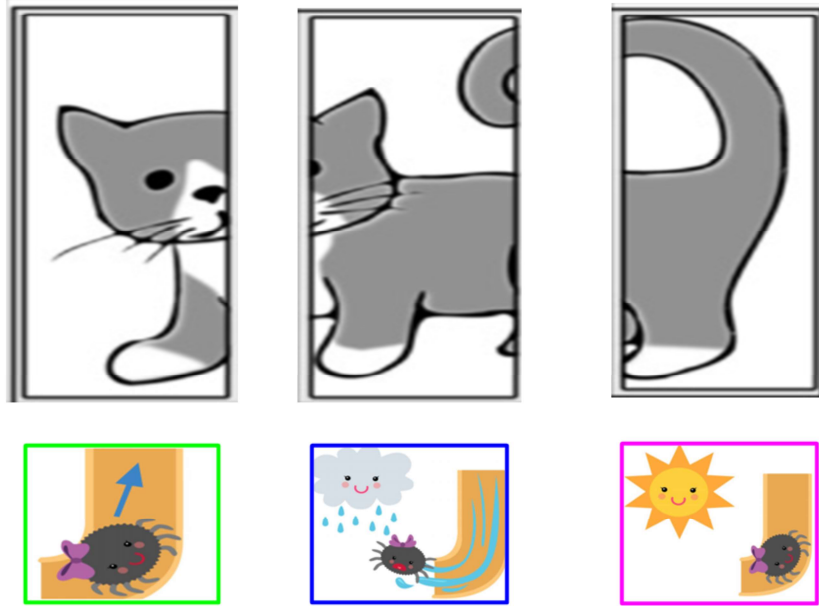


The itsy bitsy spider
Climbed up the water spout
Down came the rain
And washed the spider out

Out came the sun
And dried up all the rain
And the itsy bitsy spider
went up the spout again!

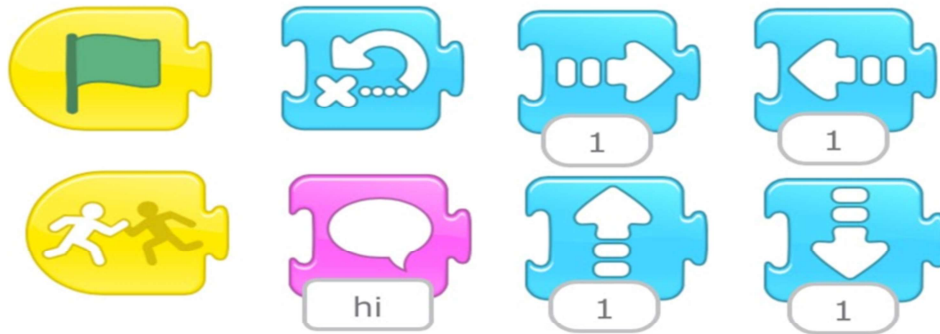


- Exactly! When the sun came out, she went back up the spout!" (*Point up as a visual cue*)



“We decomposed our story.”

- Review how we did a three finger retell to decompose the story. *Wait time. If necessary, lift up a single finger like you’re doing a three finger retell to prompt students’ thinking.*
- “You did such a good job retelling the beginning, middle, and end! Since you are learning to think like computer scientists, let’s practice using our computer science words. I want you to say it with me. *Have students unmute mics. All together! We **decomposed** our story.*” How did we **decompose** our story? What steps did we take?
- “Yes, we did a three finger retell to think about the spider in the story. Computer scientists might not use their fingers to help retell a story, but computer scientists do the exact same thing that we did when they see a problem. They decompose it! When we break problems and stories down into smaller parts, they become easier for us to figure out, just like we did with the beginning, middle, and end of the Itsy Bitsy Spider!



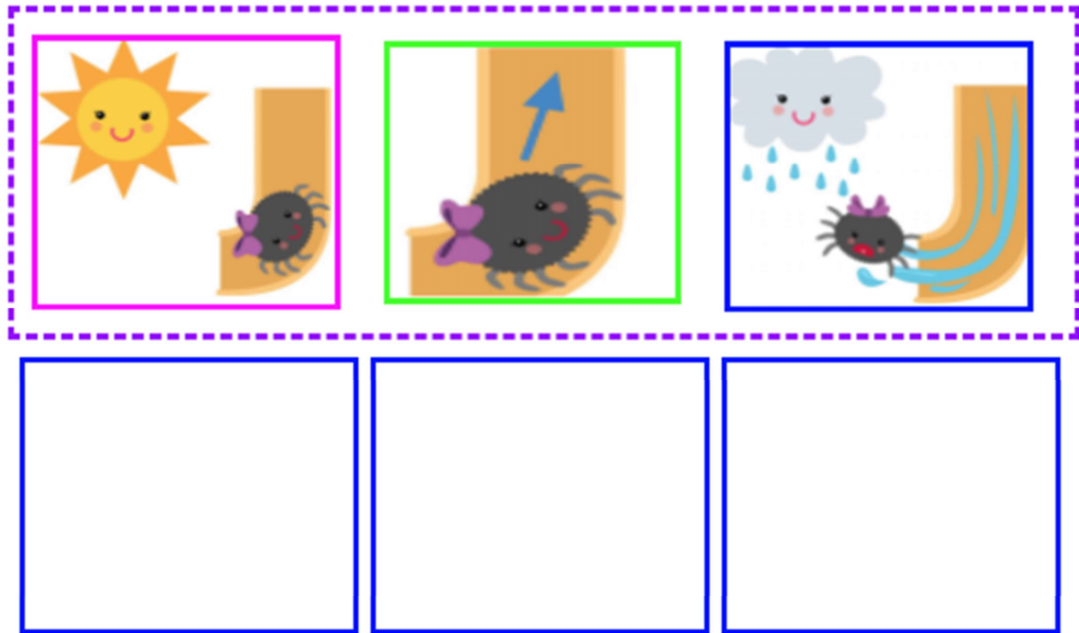
coding block

- Display the coding blocks on the slide. *If time permits, show students the different coding blocks available using the [Coding Blocks](#) document*
- Prompt students to notice that the color of the blocks indicates a type of function (e.g. blue motion blocks, yellow triggering blocks). Connect to the concept of abstraction.
- Whew! Okay! Your brains are growing with new computer science words! I'm so proud of you. Something else computer scientists do is tell the computer exactly what to do by using coding blocks. Coding blocks are what we used earlier to play Simon Says! Look at all the choices we have for coding blocks!"
- "What do you notice about these coding blocks? What color are most of the blocks? *Wait time. Allow students to unmute to share or type in chat.* That's right! A lot of them are blue! The blue blocks can be used to make characters move, just like we moved up, down, to the left, and to the right during Simon Says! We call the blue blocks **motion blocks**.

- The colors of the blocks tell us what they can be used for! Now, we just said the blue blocks are called what? *Wait time. Allow students to unmute mics to share or type in chat.* That is right, the blue blocks are **motion blocks**.
- We call the yellow blocks **triggering blocks**, which tells the computer when to start. Later, we might see other colors and can use our **computer science** skills to figure out what they do, too.”
- We did such a great **decomposing** our story.. Now, we are going to really start thinking like computer scientists.

GUIDED PRACTICE

ABSTRACT



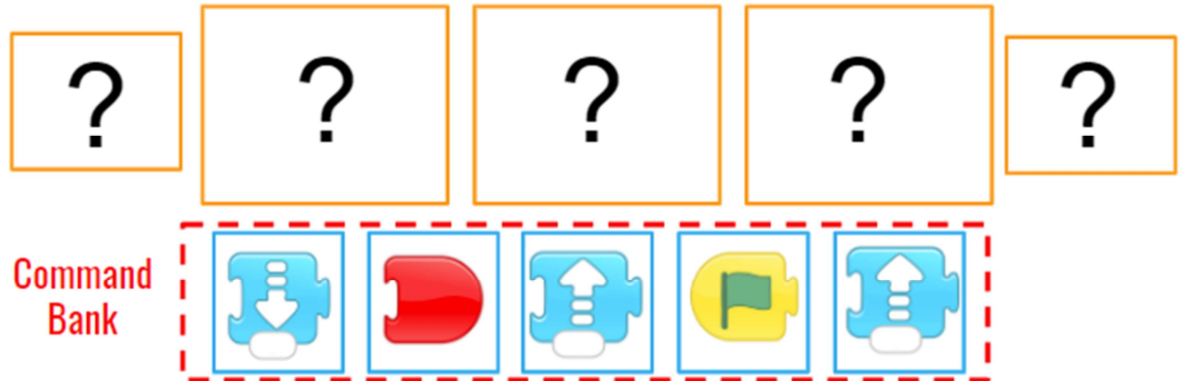
- For this section, we suggest the [Itsy Bitsy Coding Graphic Organizer](#). If students need additional practice, they can use the [Itsy Bitsy Spider Abstracting Graphic Organizer](#) prior to this lesson. For this section, give students a choice of whole group, small group, partners, independent work.
- Now using the coding blocks to abstract the story. Using the graphic organizer, ask students to cut out the parts of the story in the green boxes and glue them in the dark purple boxes.
- Give students time to cut and glue OR use the

*scaffolded version of the graphic organizer
(same graphic organizer - different page) that
already has this step complete.*

“With your partner, we’re going to use the coding blocks for the **abstraction** of the story, or to put it back together with *the most important parts* using the commands we reviewed earlier from ScratchJr! First, you’re going to put the most important parts of the story back together in the correct order.

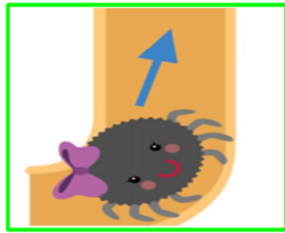
On your graphic organizer, you’re going to cut out the parts of the story in the green boxes and glue them in the dark purple boxes.

USE THE COMMANDS TO CODE THE STORY...

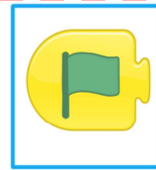


- Use the blocks to think about the ways that the spider moves. Prompt students to review what each block does. *This can be done in small groups and then reviewed as a whole group activity.*
- “We are going to use these commands to think about the ways that the spider moves and what we would tell a computer to do to act out the most important motion parts of the story. I want you to think about what we talked about earlier as to what each command does.

Let's code our abstracted story...

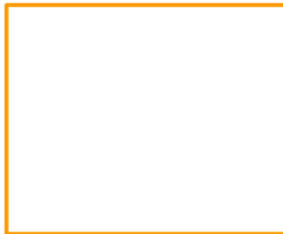
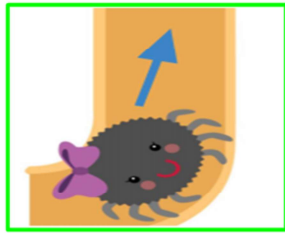


Command
Bank

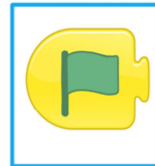


- “Earlier, we noticed that the **blue motion blocks** blocks tell the computer how to make our character move. Now, I want you to remember what we talked about earlier. *Show students visual cues to evoke their memory.*”

Which **command** comes first?

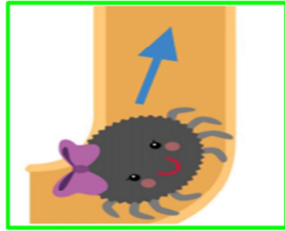


Command
Bank



- Guide students step by step to choose the right block for the spider's move. Ask questions and allow wait time. *Provide students an opportunity respond. Show students visual cues to evoke their memory.*
- What is the first thing we always need to do when we code in ScratchJr? What should our first command always be?

Our first command is ALWAYS the green flag...

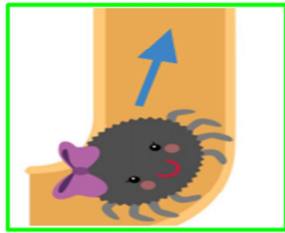


Command Bank

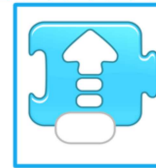


→ Yes! We always start with the green flag command.

Which **command** comes second?

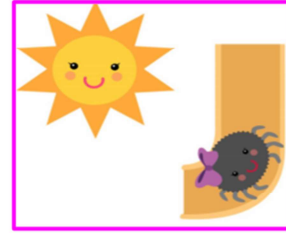
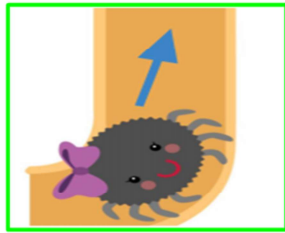


Command
Bank

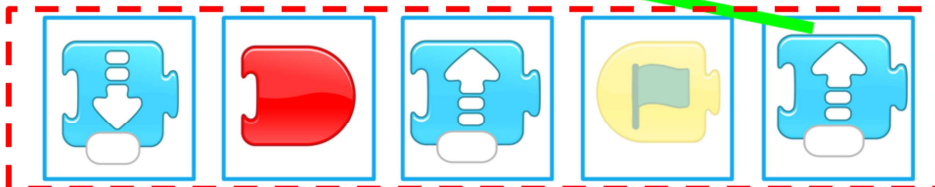


- Now, where was the first place Itsy Bitsy Spider wanted to go? *Wait time.*
- That's right! She wanted to go up the water spout. How do we show that with our ScratchJr commands? Which blue motion block do we use? (Wait time).

Yes, our spider goes UP!

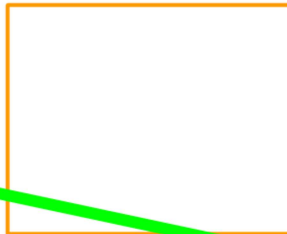
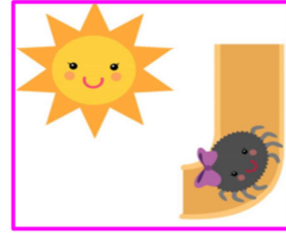
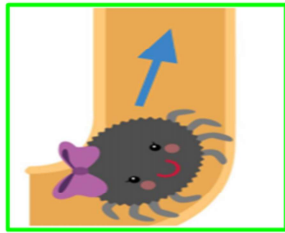


Command Bank



- Correct! She went UP, so we use the blue-colored UP arrow motion block. Now, I want you to look at the slide. Who can tell me how many spaces the spider moves in our story. (*Wait time*).
- 10 spaces, whoa, good job! Where did you look to see how many spaces she moved?

How many spaces do we want the spider to go up?

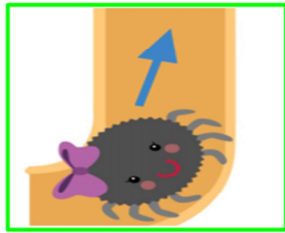


Command Bank

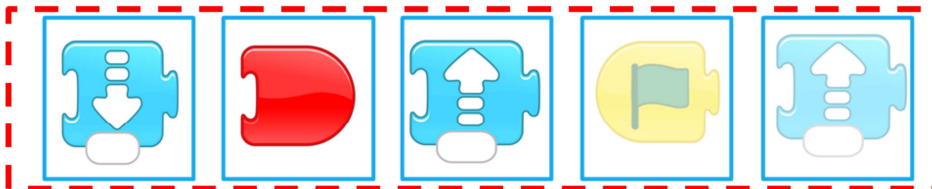


→ Great. We look at the bottom of the block to see how many spaces to move. Here, it's circled in green that the spider moves 10 spaces UP.

Which command comes third?

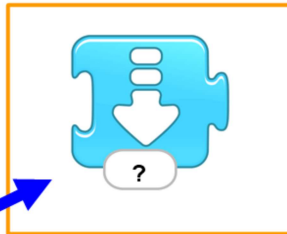
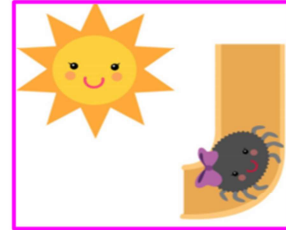
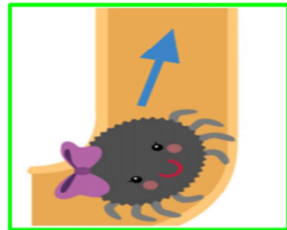


Command Bank



→ Now, what is the next command that we need to help our spider move? And, what happens in our story? What direction is the spider moving next?

Yes, our spider goes **DOWN!** Now, let's think about how **many** spaces...

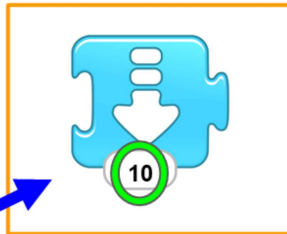
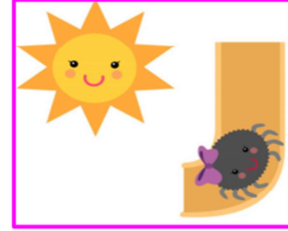
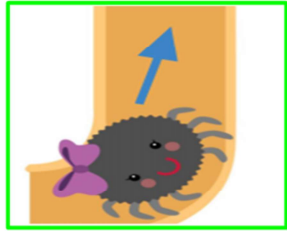


**Command
Bank**

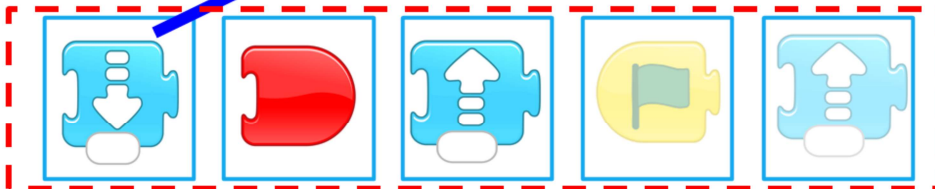


- That's right. We use the blue down arrow motion block since the spider got washed out of the water spout. Now, if we know the spider went up the water spout 10 spaces, how many spaces does the spider go down when she gets washed out?

How many spaces do we want the spider to go down?

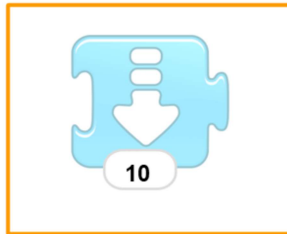
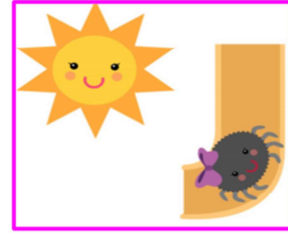
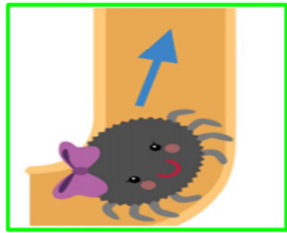


Command Bank



→ That's right. The spider moves 10 spaces because she went up 10 steps and then she gets washed down 10 steps.

Which **command** comes fourth?

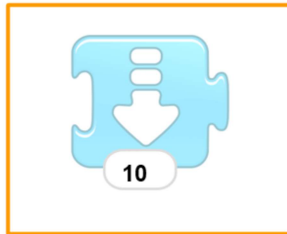
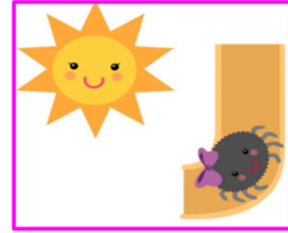
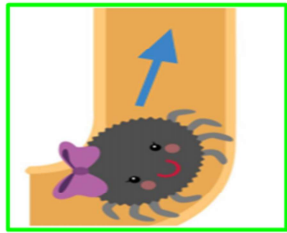


Command
Bank

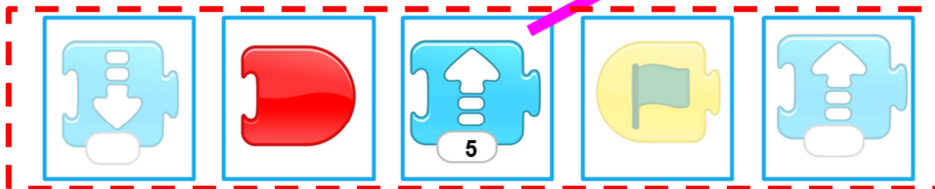


→ Now, what is the last motion the spider takes in the story?

Yes! Our spider goes back **UP** the water spout! Choose how **many** spaces...

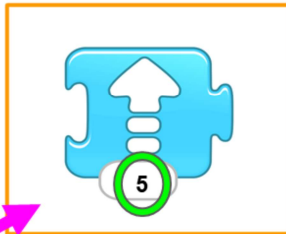
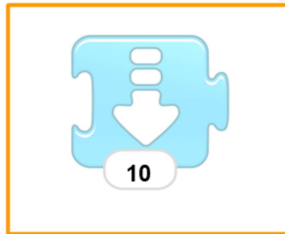
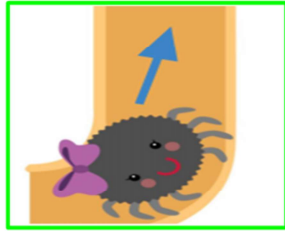


Command Bank

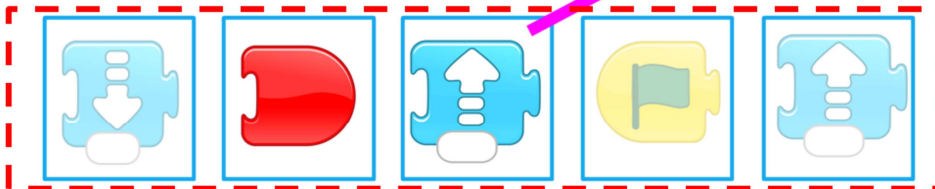


→ That's right, she starts to go back up the water spout. Who can tell me how many spaces she went up when our story ended. Hint, look at the blue block?

I chose 5 spaces...

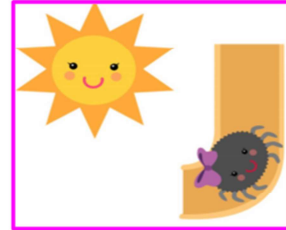
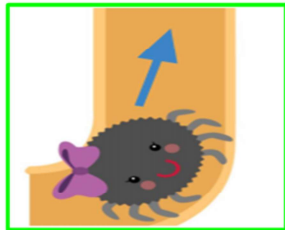


Command Bank

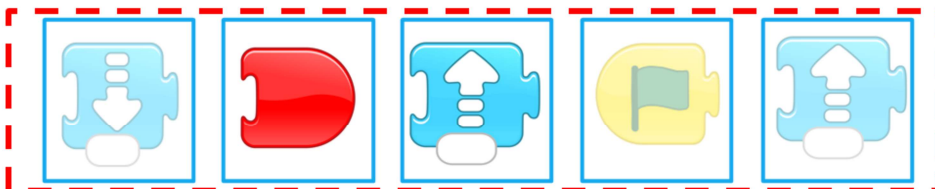


→ Excellent! The spider moved 5 spaces. We know this because our blue motion blocks says 5 at the bottom.

Which command comes last?

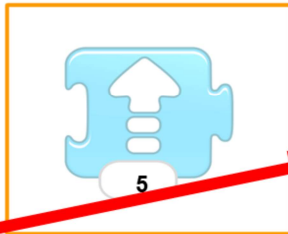
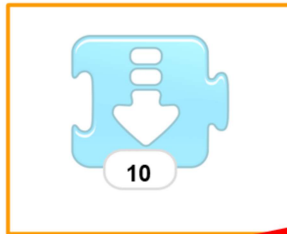
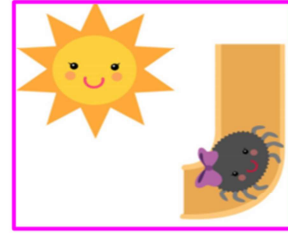
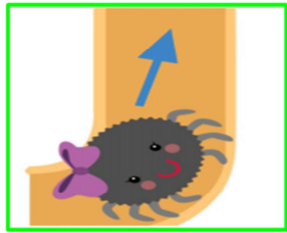


Command Bank



→ Now, every time we want to end our code we have to use a specific block. Which block ends our program?

Which command comes last?



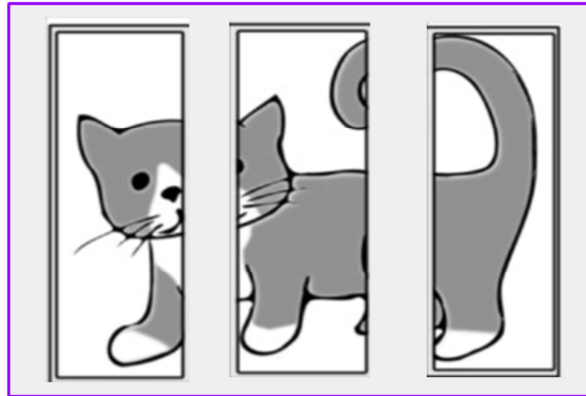
Command Bank



- Excellent! We use the red end or stop block every time we end our coding block. Great job! We just completed our first line of code like computer scientists would use to tell computers what to do. By using code, we told the computer our story!

WRAP UP

LET'S REVIEW...



decompose

- Review Concepts and Vocabulary:
decomposition, using blocks to retell a story.
- “Great job! You were working together to decompose the Itsy Bitsy Spider, and we added commands to retell the story with the most important parts, when Itsy Bitsy went **UP** the water spout, got washed **DOWN**, the water spout, and went back **UP** the water spout.

LET'S REVIEW...



commands

- We even used coding blocks to retell it! Remember, we can think like computer scientists when we take stories apart and put the essential story elements back together!”