

Storytelling in Scratch

Scratch is a great tool for telling stories. Just like a graphic novel, you can easily tell your story through both art and text. Scratch also allows for animations and interactions too, which makes it like writing a play or making a movie! You can explore a variety of [stories created in Scratch](#) on the Scratch website.

In this activity, you will learn how to tell a story in Scratch by telling the story of Isaac Newton's "year of wonders." In 1665, Isaac Newton was a young university student at Trinity College in Cambridge, England. At the time, the plague was spreading through the western world. In an effort to slow the spread of the disease, Newton and his fellow classmates left the university and Cambridge. At home, Newton studied independently, exploring everything from mathematics to light to gravity. His investigations and thinking were so fruitful that historians have called his year at home a "year of wonders." You can read more about Newton's year of wonders in an [article in the Washington Post](#).



Figure 1 Newton's year of wonders

Isaac Newton's Year of Wonders

When authors or coders start a new project, they often begin by creating a storyline that includes an outline of the important events and a description of how they want to tell the story. Here is an outline of Isaac Newton's "year of wonders" that you can use for this activity:



Scene

Trinity College in Cambridge

Text (Narrator Sprite)

Title: "Isaac Newton's Year of Wonders"

In 1665, **Isaac Newton** left his university studies at Trinity College to help slow the spread of the plague.

What Happens

At beginning, title shows in front of Trinity College background.

Then, title switches to narration text and **Isaac Newton** walks across the screen, as if he's walking home.



Scene

At home

Text (Narrator Sprite)

Back at home, Isaac studied and wrote on his own. He explored many subjects, such as calculus and the properties of light.

What Happens

Narration text switches.

Isaac Newton stands in his darkened bedroom, only a single ray of light comes through the window. He brings the prism up into the ray of light and a **rainbow** appears.



Scene

Outside the house

Text (Narrator Sprite)

He also realized that the same force of gravity that causes an apple to fall to the earth also holds the moon in orbit around the earth!

What Happens

Narration text switches.

Isaac Newton is sitting in the garden and thinking. An **apple** falls from a nearby tree. Newton thinks "Universal gravitation!"

How will you turn this story outline into a Scratch project?

- Each scene in the story will have a separate backdrop in Scratch. The backdrop is the background of the Scratch Stage, where the story will play out.
- Each of the items in **bold red** will become a sprite. Sprites are like characters on the Stage. You will create code to make the sprites move or change appearance.
- The Narrator sprite will display text and advance the story from one scene to the next.

Getting Started

1. Open the Scratch editor window at <http://scratch.mit.edu/projects/editor>
2. From the File menu, select "Load from your computer".
3. Select the "Year of Wonders - Starter.sb3" file and open it.

The Scratch window is divided into three main sections.

- A. Stage and Sprites:** The Stage is where the action happens! Below the Stage, you will see all the sprites used in your Scratch project. Sprites can be anything from game elements to story characters to user instructions.
- B. Sprite Code:** The center section is where you create programs for each sprite.
- C. Block Palettes and Code:** The interlocking blocks on the left, organized into palettes such as Motion, Looks, and Variable, are the code you use to control Sprites and the Stage. You drag blocks from this section into the Sprite Code section to create your program.

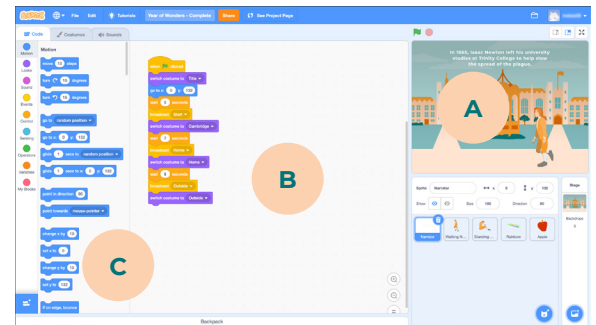


Figure 2 The Scratch Window

By starting with the Year of Wonders.sb3 file, you'll already have five sprites and the Stage.



A Trinity College backdrop for the **Stage** is shown. Two other backdrops are available for the Stage as well: Home and Outside.

ISAAC NEWTON'S
Year of Wonders

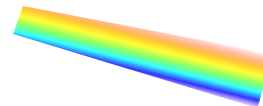
A complete Narrator sprite:

This sprite is a text box and tells the story. Each sentence is a different costume. This sprite also guides the flow of the story by broadcasting messages to the other sprites.



Two incomplete Isaac Newton sprites, Walking Newton and Standing Newton:

These sprites are our Isaac Newton character. You'll need to create code to move him across the Stage in the three scenes.



An incomplete Rainbow sprite:

This sprite only appears in the second scene. You'll need to create code to make it appear at the right time.



An incomplete Apple sprite:

This sprite only appears in the third scene. You'll need to create code to make it fall at the right time.

Narrator Sprite and Stage Code

When you open the Year of Wonders file, you will see the code for the Narrator sprite. Click the Costumes tab (upper-left of the Scratch window) to see the four costumes for this sprite. Click back to the Code tab to see how the code works.

- A.** “switch costume to” block: Each sprite can have multiple “costumes”. Costumes are images or text boxes that are “worn” by a sprite. The Narrator sprite has four costumes—each of which is a text box. As the story progresses, the Narrator sprite switches costumes, which changes the text that is displayed on the Stage.
- B.** “broadcast” block: Sprites can interact with each other by “broadcasting” messages. Each message is given a name, such as “Start” or “Home”. When another sprite or the Stage receives these messages, they can trigger actions or other messages.

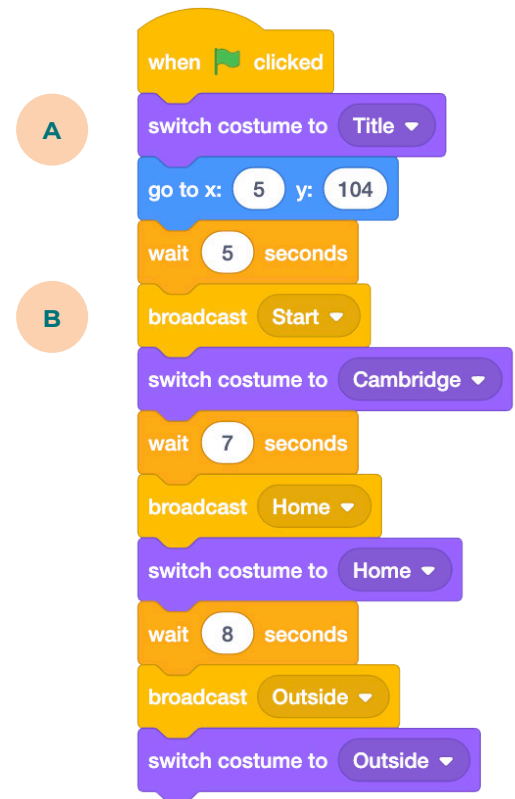


Figure 3 Narrator sprite code

To see the code and the three backdrop images for the Stage, click the Stage icon in the lower-right area of the Scratch window (see Figure 4). Take a look at the code for the stage (see Figure 5):

- A.** The Stage switches to the Trinity College backdrop (or Stage costume) when the green flag is clicked (when the story starts playing).
- B.** When the Stage receives the “Home” message from the Narrator sprite, the Stage switches to the Home backdrop.
- C.** When the Stage receives the “Outside” message from the Narrator sprite, the Stage switches to the Outside backdrop.

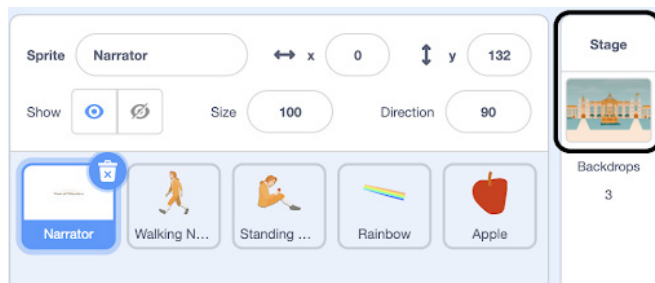


Figure 4 Click the Stage icon to see the code for the Stage.

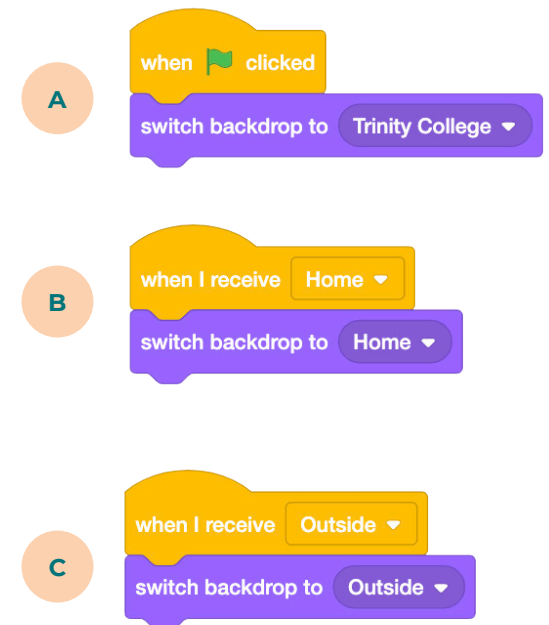


Figure 5 Stage code

Walking Newton and Standing Newton Sprite Code

Now it's time for you to start coding! You'll start by creating the code for the two Newton sprites.

- Click the Walking Newton sprite in the Sprites area below the Stage. (If you want to see the costumes for this sprite, click the Costumes tab in the upper-left of the Scratch window, and then return to the Code tab.)
- Look in the Palettes to find the blocks in Figure 6. Drag the blocks to the Sprite Code area and snap them together to create the two programs in Figure 6.
- Then, repeat the process to create the code shown in Figure 7 for the Standing Newton sprite.

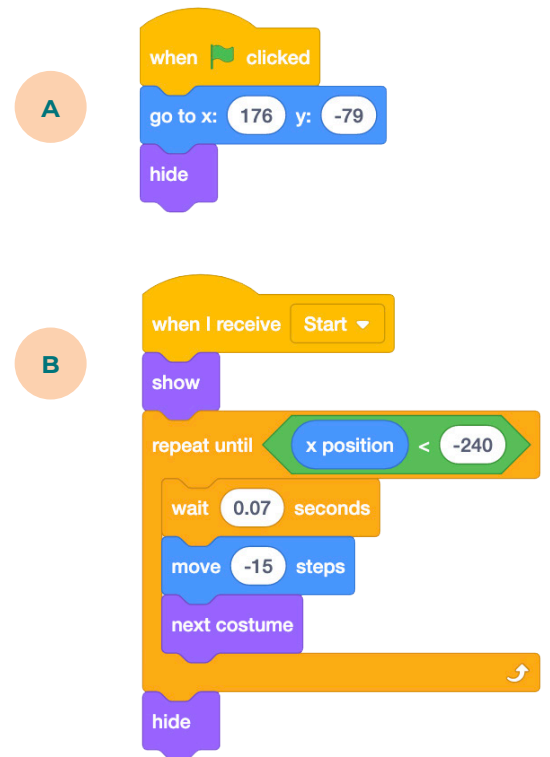


Figure 6 Walking Newton code

Think about how the code works:

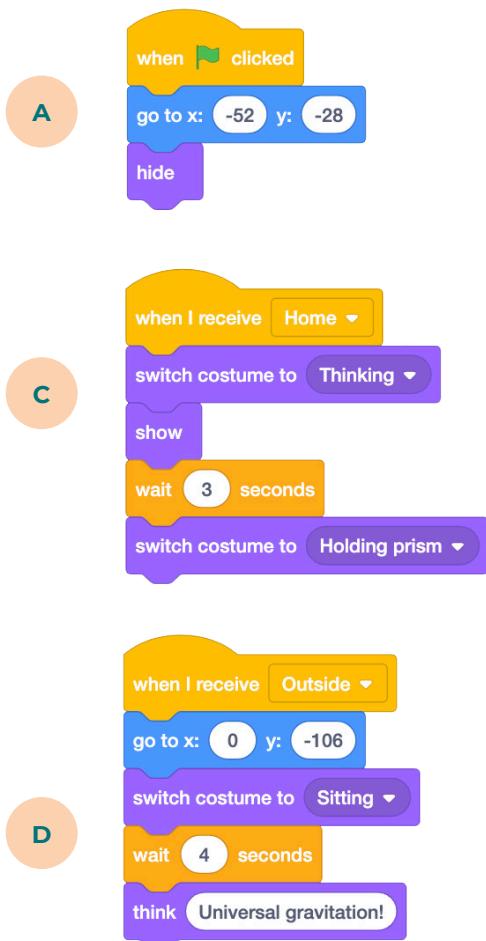


Figure 7 Standing Newton code

- When the program starts (when the green flag is clicked), both sprites go to a starting location and “hide” or disappear.
- When the Narrator sprite broadcasts “Start”, it triggers the Walking Newton sprite to show itself and walk across the screen. Try adjusting the “wait” block time to make Newton walk slower or faster. Once the sprite has reached the far left side of the Stage (its x position is less than -240), it hides again.
- Once the Narrator sprite reaches the Home scene, the Standing Newton sprite shows itself, waits 3 seconds, and then switches costume to the image of Newton holding a prism.
- When the Narrator sprite reaches the Outside scene, the Standing Newton sprite changes position and switches to its “Sitting” costume. Then, it waits 4 seconds while the Apple sprite falls. Finally, the Standing Newton sprite “thinks”, meaning the thought bubble with the words “Universal gravitation!” appears.

Rainbow and Apple Sprite Code

Now it's time to create the code for the Rainbow and Apple sprites.

- Click the Rainbow sprite in the Sprites area below the Scratch Stage.
- In the Sprite Code area, use blocks from the Palettes to create the programs for the Rainbow sprite (see Figure 8).
- Repeat the process for the Apple sprite (see Figure 9).

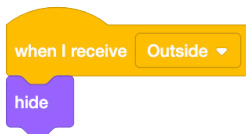
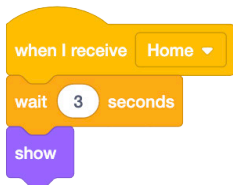
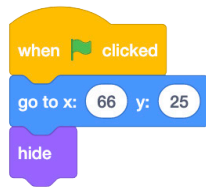


Figure 8 Rainbow sprite code

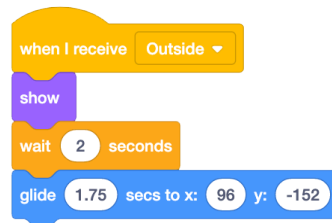
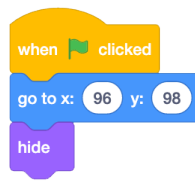


Figure 9 Apple sprite code

Notice that the code for these sprites is very similar to the code for the Walking and Standing Newton sprites. They all have Stage positions to which they move when the story begins (when the green flag is clicked) and then hide until the correct scene arrives. The Apple sprite “falls” by using the “glide” block. By entering a destination (x: and y: coordinates) and duration (in seconds), you can choose how long it takes the sprite to move to its new position.



Now that you've created all the code, try it out!

Click the green flag to start your story from the beginning.

Challenge Extensions

- Add additional scenes to the story. Research Newton's year of wonders and highlight other discoveries in your Scratch project. You'll need to
 - Write a short sentence or two to explain the discovery. Then, copy one of the Narrator's costumes and replace the text with your sentence(s).
 - Plan which Newton sprite you want to use and how it will move/act. Create code so it will do what you want it to do.
 - Choose another backdrop and add it to the Stage sprite.
 - Add code to the Narrator sprite to broadcast the scene change. Then, add code to the other sprites to respond appropriately.
- Use this project as a template for your own story! Are you stuck at home? What has your experience been? Change the backdrops, sprites, and text to tell your stay-at-home story.
- Use a Go Direct® Force and Acceleration Sensor to control the flow of the story.
 - Click the Extensions icon in the lower-left corner of the Scratch window.
 - Select the Go Direct Force and Acceleration extension. Be sure to have the Scratch Link software running and your Force and Acceleration sensor on; a window will pop up allowing you to choose your sensor from a list.
 - Once you've added the extension and connected to your sensor, you'll have a whole new set of blocks. You may want to tilt the sensor to advance the story. To do so, edit the Narrator Sprite's code so that rather than waiting a set number of seconds before advancing, it waits until the force sensor is tilted:
 