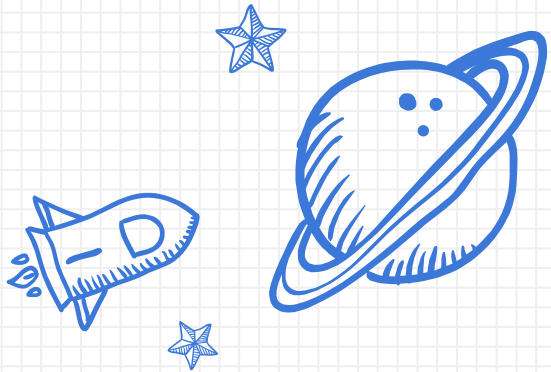
Make your Own Conversion Calculator



Let's try making our own calculator.

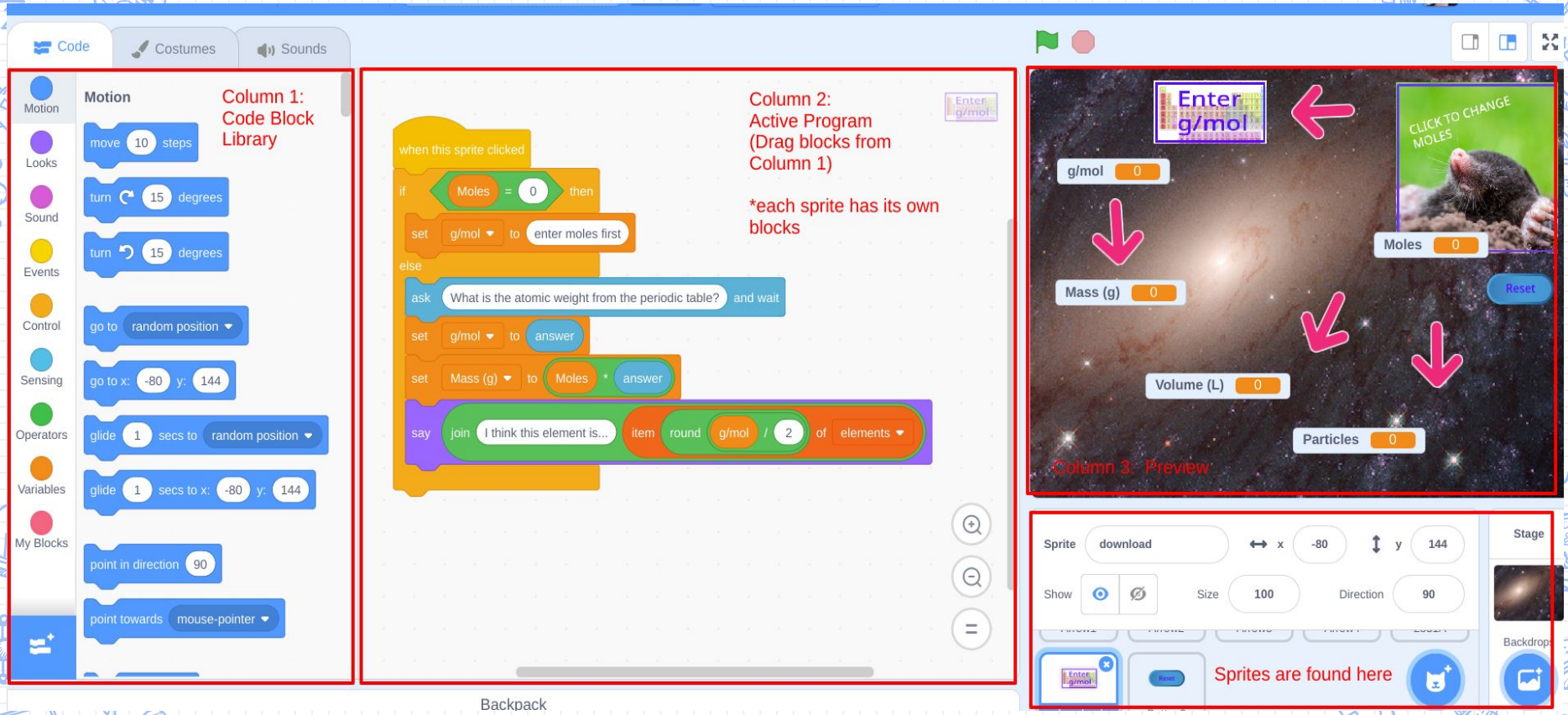
We'll be using **Scratch**.

First, a quick refresher on helpful **blocks**.

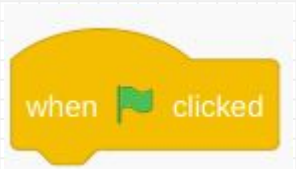
Go to Scratch.mit.edu

Sign in & Click “Create”
for a new Project

Quick Refresh of Scratch Layout

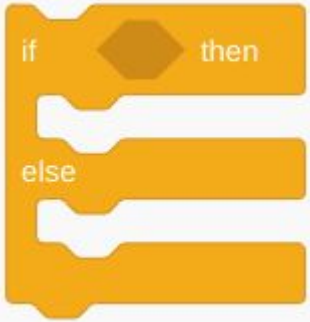


Quick Reference – Helpful Blocks *Just a few of the possibilities!*



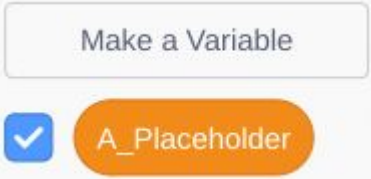
Always start with an event.

Movement can make your project more interesting.



If ___, do this.

If not, do that.



Make & Name a Variable

Ask the user a question;

afterwards, do something with the answer.

Add

Subtract

Multiply

Divide

Set or change your variable – *ovals fits the green operators!*

Types of Other Blocks

Motion

Make your sprite turn, glide, flip, walk, or go to a specific place.

Looks

Make your sprite say text, change size, switch costume, backdrop, or be hidden.

Sound

Make your sprite play sounds (be mindful of others in the room).

Events

Always start your script with an Event. This triggers the code to start.

Control

Very helpful blocks! Repeat actions, or only play them under certain conditions.

Sensing

Detect key press or mouse click, ask for user input, or respond to other events.

Operators

Change values: Do math with numbers, alter text, or use logic (and, or, not)

Variables

Set or change variables if your code needs them.

My Blocks

Make a custom block.

Part 1: Moles to Particles

- A "Mole" is 6.02×10^{23} of something.
  - 602,000,000,000,000,000,000,000
  - Also called "Avogadro's Number"
  - Useful for counting a *large amount* of *very small* things!

Video: Powers of Ten

(Eames, 1977)

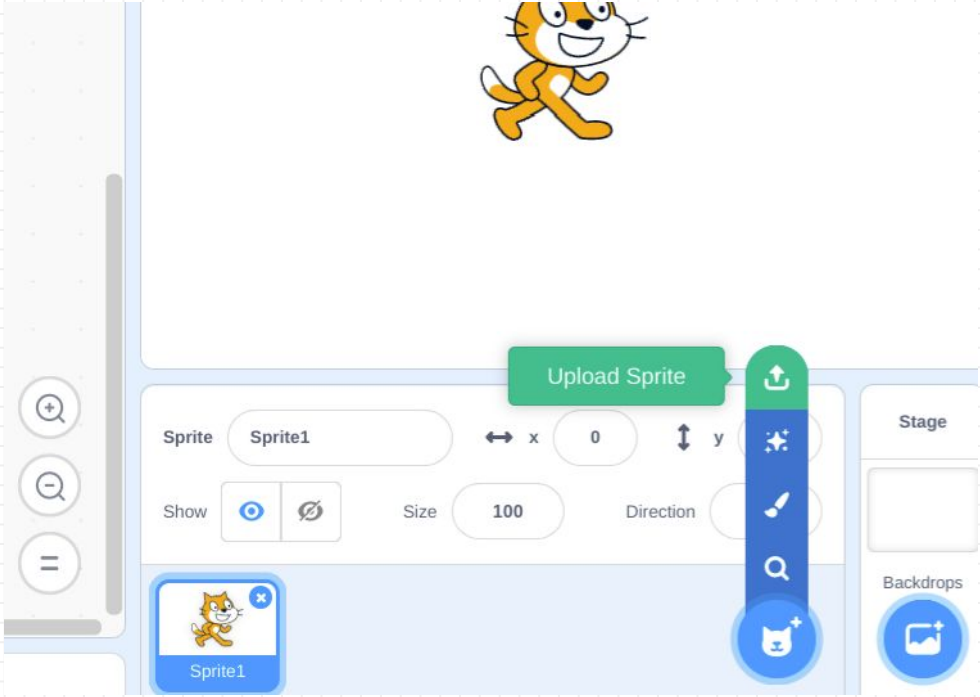
Do This Now!

Why do they call 6.02×10^{23} a "Mole" of something?

I don't know. But it's convenient because a mole is also a cute animal.

Find and download a picture of a mole.

Do This Now!



In Scratch (Lower Right Corner), click to

Add a Sprite.

Choose "**Upload Sprite**" and upload your **Mole picture**.

Do This Now!

Our Mole is going to ask us for information.

Choose an event block and drag it in.

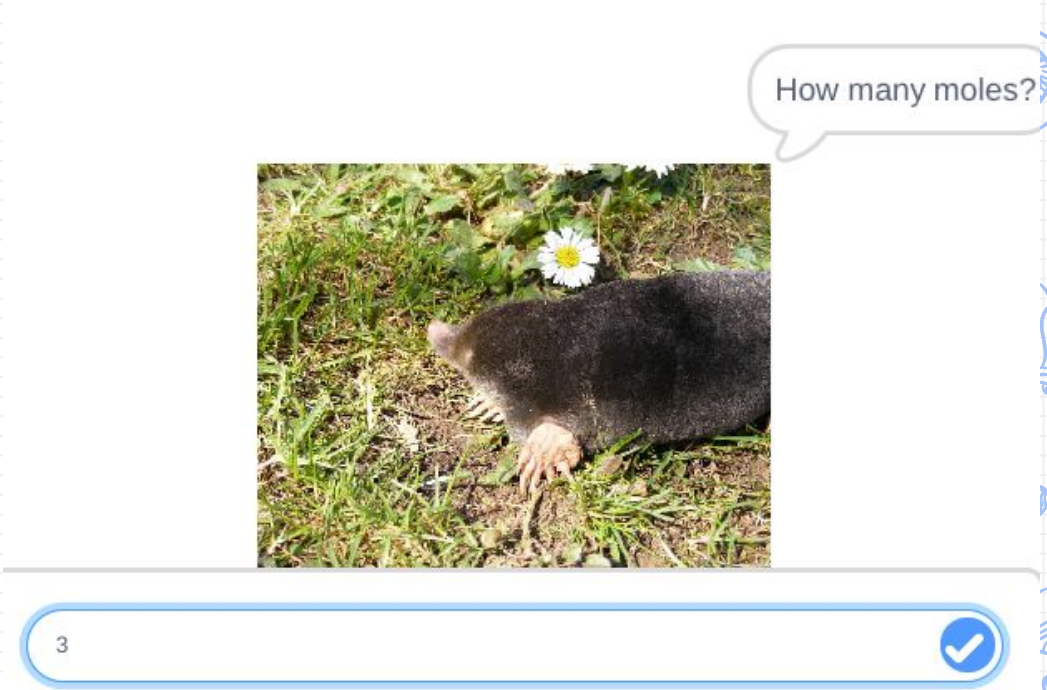
Then make your mole ask “How many moles?” and **wait for an answer.**

Do This Now!

Try it in the preview.

What does this do?'

Is this useful?



Do This Now!

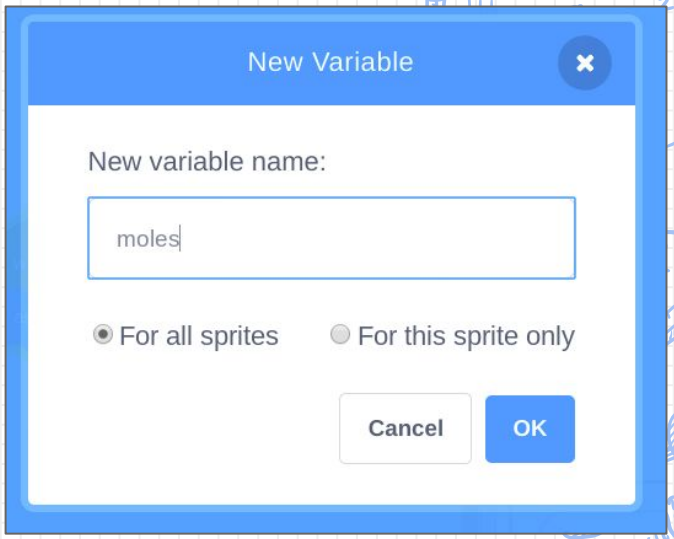
Now let's find a way to **remember your answer** so we can *do* something with it.

We can use **a variable** to do this.

a Variable is a place-holder for something else... like our answer.

In math, we often use a variable called "x".

Let's make a variable and call it "moles".



Do This Now!

Now you should see something like this in your preview:

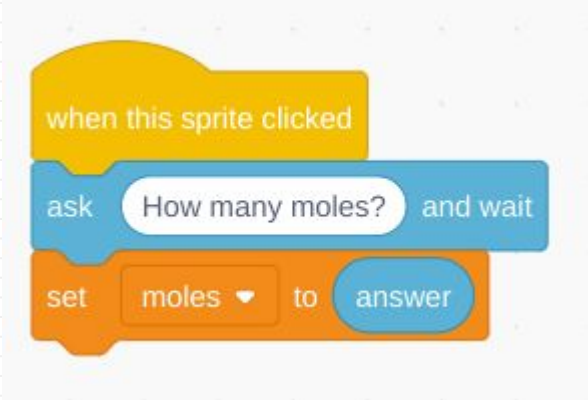
Good job!

Challenge:

Figure out how to *set the variable "moles"* based on how you answer Mr. Mole's question.

Add blocks to your code and try it out... If you succeed, the number next to "moles" will change.

Are these the blocks you used?



No matter what blocks you used, if you found a way to save the answer in the “moles” variable, **you did it**!

Part 1: Moles to Particles

- Remember scientific notation:
  - Every time you multiply by 10, move the decimal over one time. If you run out of digits, you add a zero.
    - 10^{23} moves the decimal over *23 times!*

Ex: 6.02×10^{23} =

602,000,000,000,000,000,000,000

Part 1: Moles to Particles

Positive exponents mean the number is getting **LARGER**.

$$1.00 \times 10^{5} = 100{,}000.00$$

Negative exponents mean the number is getting **SMALLER**.

$$1.00 \times 10^{-5} = 0.00001$$

Part 1: Moles to Particles

- Remember scientific notation:
  - **In a calculator, the Sci Notation button will add in *x10^##* and you enter the ## numbers for the exponent.**

These buttons all mean the same thing.

  - **When writing in pretty much any code, we can use the letter "E" to represent this too.**

Ex: 6.02E23 = 6.02×10^{23}

Because "E" is easier to write than "x10^##"

Part 1: Moles to Particles

- We're going to need to convert any number of moles to particles.
  - How to do this? Let's use unit analysis:

$$\cancel{Moles} \times \frac{Particles}{\cancel{Moles}} = Particles$$

  - Let's say we have 3 moles. We know that for every 1 mole, there are 6.02×10^{23} particles.

$$3\ Moles \times \frac{6\ E23\ Particles}{1\ Moles} = 18\ E23\ Particles\ (or\ 1.8\ E24)$$

Part 1: Moles to Particles

- ✘ It's not that hard, but it takes some time to get used to multiplying scientific notation, right?
- ✘ **Can you make your calculator do it for you?**
- ✘ **Challenge: Create a second variable called "particles". Make it so that when you put in the moles, it also shows the number of particles.**

Hint: 6.02E23 = 6.02×10^{23}

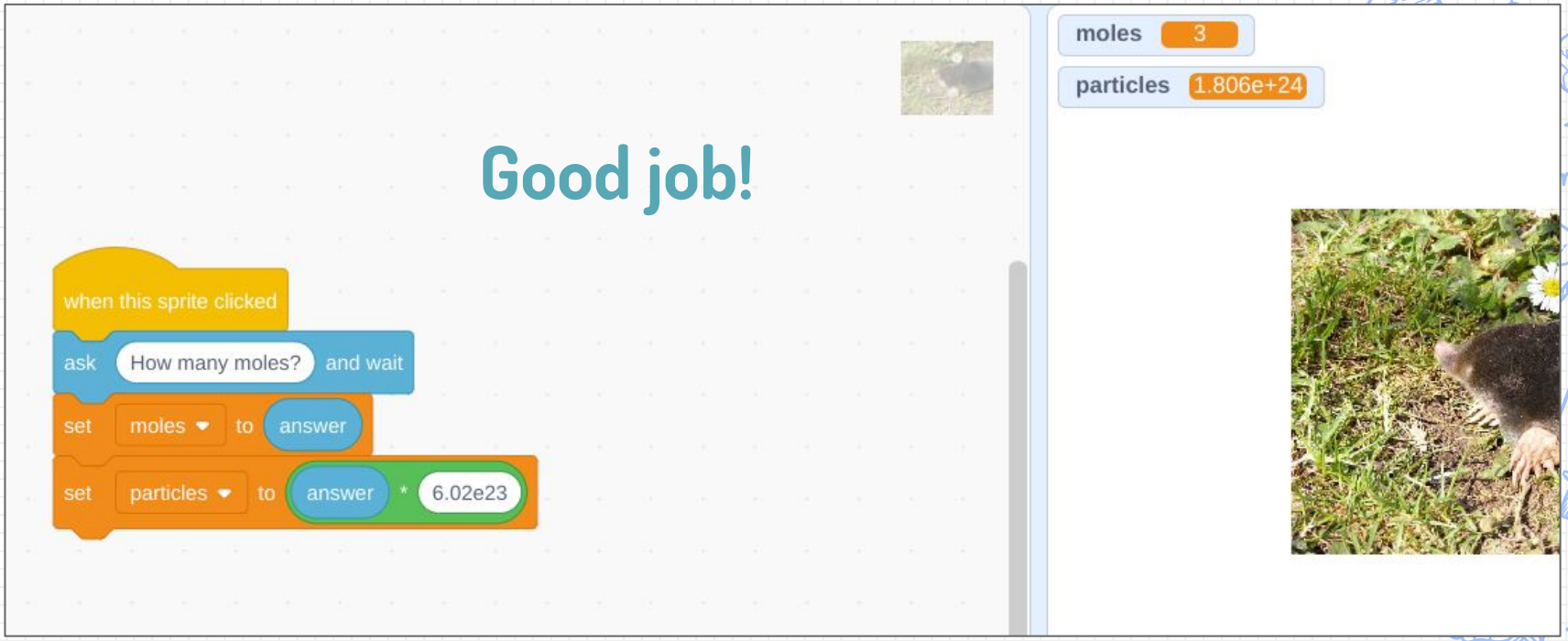
Part 1: Moles to Particles

SPOILER ALERT!

Did you do it for yourself yet?

Only click forward if you have...

Part 1: Moles to Particles



Ok, So What we're making is actually a "Mole Conversion Map".

Check out some others.

Take some time now to organize your "Mole Map" calculator in a way that works for you.

Leave space for FOUR conversions on your calculator.

When you're done,

Give your calculator a title and click 

Then post the link to our discussion board. We'll pick up Part 2 tomorrow!

Sources: Images & Media

- ✘ Slides 4-6: Scratch interface images taken directly from https://scratch.mit.edu/
- ✘ Slide 7: Eames Office LLC. (1977). Powers of ten [Video]. Retrieved from https://www.eamesoffice.com
- ✘ Slide 8: Wikimedia Commons https://en.wikipedia.org/wiki/Mole_(animal)

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