Cache Code Math Computer Lab Lesson Plans: Repeated Addition & Multiplication

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Repeated Addition & Multiplication

Fall 2023
Math Vocabulary

Addend: a number that is added to another

\[ 5 + 5 = 10 \]

Base: the number that is used as the repeated factor in exponential form

\[ 2^5 = 32 \]

Exponent: the number that tells how many times the base is used as a factor

Factor: a number that is multiplied by another

\[ 2 \times 5 = 5 + 5 = 10 \]
Sets the specified variable to the amount entered

In this code, what is the value of the variable, ADDEND?
The stamp block is a pen block. It will stamp (copy) the sprite.

The repeat block will loop (or repeat) the code that is put within the block code.

*How many times will the 2nd repeat block loop?*

*How many stamps will there be?*
Repeated addition of addends can be represented by a multiplication equation:

5 + 5 = 10
5 x 2 = 10
What do you think this code will do?

What will be the final value of the variable RESULT?
Watch the Code
Go to the following URL & click “See Inside”

https://scratch.mit.edu/projects/873533865
Click on the Tera sprite.
Click the green flag to run the code!
The sprite's size is set to 30% of its original size. It needs to be small because we are going to "repeat" many of them.

Tera (sprite) goes to the bottom left corner of the screen.

The rows of Tera are repeated FACTOR # of times (2) and the total is stored in the RESULT variable.

The answer is calculated by adding ADDEND to previous value of the RESULT variable.

An image of the sprite is "stamped" (copied) ADDEND # of times.

Tera moves up to the start of a new row.
Tera moves to a new row after leaving 5 “stamps” (copies) of itself underneath.

In one row, Tera is stamped \texttt{ADDEND} times (variable \texttt{ADDEND} is set to 5). In math this would be represented as: \[1+1+1+1+1\]

5 Teras are displayed in that row.
Understand the Code

The rows of Tera are repeated **FACTOR** number of times (FACTOR is set to 2).

Total is stored in the **RESULT** variable (10).

\[ 5 \times 2 = 10 \]
\[ 5 + 5 = 10 \]
Your Turn!

Change Tera’s code to model

3 \times 4 = 12
3+3+3+3 = 12
Your Turn!

Change the code to model a multiplication problem of your choice!

Share with your neighbor.
Click Tera and reset the variables in your Tera code.

Set ADDEND To 5.
Set FACTOR to 2.
Set RESULT to 0.
Repeated multiplication of factors can be efficiently represented by exponent notation.

\[ 2^5 = 32 \]
\[ 2 \times 2 \times 2 \times 2 \times 2 = 32 \]
We will modify the repeated addition code to program repeated multiplication.

\[2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32\]
Select Ladybug

Click on the Ladybug2 sprite.
Change ADDEND to **BASE** and set value to **2**.

Change FACTOR to **EXPONENT** and set value to **5**.

Set **RESULT** value to **1**.

*Chicks sprite has the correct code for exponents*
Repeat Blocks

In repeat blocks:
Change FACTOR to EXPONENT
Change ADDEND to RESULT
Remove addition operator block and replace with multiplication operator block.
Assign Operators

Add the RESULT and BASE variables to the multiplication operator.

Chicks sprite has the correct code for exponents.
Press **spacebar** to run the code!
Uh Oh!

The ladybugs duplicate to a number where they start to duplicate outside the screen area.
We can use an “if, then” control block and a sensing block to help the duplicating ladybugs stay within the screen.
Add "If, then" control block in the repeat RESULT block under move block.
Add touching block to the “if, then” control block and set to “edge.”
Add **“change y by”** motion block; set to 15.
Add **“set x to”** motion block; set to -230.
Understand the Code

The sprite's size is set to 30% of its original size. It needs to be small because we are going to "repeat" many of them.

Ladybug (sprite) goes to the bottom left corner of the screen.

The rows of Ladybug are repeated EXPONENT number of times (5) and the total is stored in the RESULT variable.

The answer is calculated by multiplying BASE by previous value of the RESULT variable.

An image of the sprite is "stamped" (copied) RESULT number of times.

Ladybug does not move off the stage and instead starts a new row.

Ladybug moves up to the start of a new row.
Click the green flag to run Tera.
Press the spacebar to run LadyBug2.

What differences do you notice?
There are $2^5$ ladybugs.

We get this answer by repeated multiplication of BASE and RESULT, EXPONENT number of times.

In a math equation, this is: $2 \times 2 \times 2 \times 2 \times 2 = 32$
Your Turn!

Change the code to model

$3^4 = 81$

$3 \times 3 \times 3 \times 3 = 81$
Your Turn!

Change the code to model an exponent of your choice!

Share with your neighbor.
Complete Exit Ticket

Click:
https://usu.co1.qualtrics.com/jfe/form/SV_cT14yQ9tTxbQbRk