# PARENT LETTER

## MINECRAFTING CIRCUITS AND CITIES

Thank you for signing your child up for our Minecrafting Circuits and Cities camp! We would like to fill you in on what your child will be learning this week at camp.

We aren't *just* playing Minecraft here! These are the four main goals for this week of camp:

1. Learn the fundamental properties of redstone in Minecraft
2. Build an adding machine using the binary numeral system inside Minecraft
3. Create a functional community that utilizes trade
4. Build a basic understanding of programming concepts and commands

We love this game because the player must be creative and self motivated in order to enjoy playing it. There is no obvious story plot to follow or achievements to gain, just the player's creative drive. We use that creative energy and love for the game to teach our students basic computer science concepts such as Boolean Logic and the Binary numeral system. We incorporated Scratch in order to give them a running start in programming as well.

At the end of this letter, you will also find a picture of the more advanced calculator diagram. This uses Boolean logic symbols and will help your child remember and use what he/she learned in camp at home! Most likely, he/she will have only completely built the 1-bit input, 2-bit output adding machine, so this will be a more advanced version of what they have already done.

There will be a separate section at the end overviewing the Stop Motion portion of camp!

## DAY 1

On our first day, we will start with learning the basics of Redstone. Redstone is an item that, when powered, acts as electricity in the game. No additional downloads or Mods are required to use redstone in Minecraft.

Students will learn how to use redstone dust, torches, levers, buttons, pressure plates, and repeaters. At the end of each redstone portion there will be an ultimate challenge. Today the challenge is to use what they learned to get a redstone signal up 10 blocks!

The day is ended with the Community Development portion. The students pretend that they have landed on an undiscovered island and must create a functioning community. We will talk about what is needed for survival and the different roles in a community. Then students will choose their role and we will start working toward achieving the set goals for the end of the week.

## DAY 2

On the second day, we will use what we've learned so far about redstone to make hidden automatic doors! After the teacher has demonstrated a unique, advanced version, the students will be able to copy the example and/or created their own! Building an automatic door takes planning and using of time delays with repeaters, so it is fairly advanced.

The community development portion for each day is just a continuation of what we started on the first day. The students will utilize trade and will have to compromise with the rest of the community to make sure that all of the goals are met by the end of the week. For example, the most popular role is the miner, but if everyone is a miner, there won't be paved roads, farms, or wood to build houses with! Each afternoon we will discuss what we completed the day before and set goals for what we think we can achieve that day.

## DAY 3

On Wednesday we will learn about dispensers and hoppers, then use that knowledge to build an automatic farm with a partner. The instructor will set up and discuss 3 different designs for automatic farms and talk about the benefits of each.

When water flows over farmland it will automatically harvest all of the crops planted on that farmland. To make an automatic farm, you just need a way to release the water by flipping a lever, and stop the water when the crops have been harvested. This will also help students understand different "rules" for how things act in the game, such as source blocks and how far water will flow from a source block.

The biggest portion of day 3 is the science portion. We will close up our computers for a while and use wires, light bulbs and batteries to create our own simple, series, and parallel circuits. This is taught in a very experimental fashion (we basically say "here are your supplies, now make the light turn on).

Once the students have a good understanding of basic circuits, we will make upstairs/downstairs circuits using homemade switches (made with index cards, brass tacks, and a paper clip). Students will learn about circuit diagrams and use one to help them put the circuit together. Then we will transition into how electricity in our world is different from electricity in Minecraft, the biggest difference being that electricity (redstone) in Minecraft does not flow in a circle like it does in our world.

From there we enter into Boolean Logic. The upstairs/downstairs switch is an XOR gate, our basic redstone torch is a NOT gate, the series circuit is like an AND gate, and the parallel circuit is like an OR gate. These are great discovery questions to remind your child about the different types of gates!

Discovery Question: When is an AND gate's output on?

      Answer: When both inputs are on.

Discovery Question: When is an OR gate's output off?

Answer: When both inputs are off.

Discovery Question: When is an XOR gate's output on?

Answer: When the inputs are in opposite positions (one on and one off).

We will then build these 3 logic gates in the game of Minecraft.

## DAY 4

Now we get to the really fun stuff- the Minecart tracks! Students will learn about redstone as it relates to minecarts and then build their own creative rollercoasters in the game!

After we get that out of our systems, we will once again close our computers and start to talk about making our adding machine (or calculator). Since there are no numbers in Minecraft, we have to use binary to make our calculators. We will learn how to count in binary (we can count to 31 on one hand!) Then we will learn about adding binary numbers and how to figure out what number we are looking at.

Discovery Question: What type of numeral system do we use?

Answer: Base 10 (because there are 10 different digits that we use)

Discovery Question: What type of numeral system is Binary?

Answer: Base 2 (because we only use 2 digits: 0 and 1)

Discovery Question: What is 8 in binary?

Answer: 1000

Discovery Question: What is 2+2 in binary?

Answer: 10+10=100 (which is 4)

Discovery Question: What is the Base 10 equivalent of the binary number 1101?

Answer: 13. Add the numeral equivalent of each one's place that has a 1 in it (1=1, 10=2, 100=4, 1000=8, 10000=16, etc. 1+4+8=13.)

This is a very difficult concept for the student's to grasp, so it will be very helpful for you to review with them regularly!

We will also learn about the last 3 types of Boolean Logic gates: NAND, NOR, and XNOR, which are the same gates with a NOT gate added.

In Scratch the students will learn how to broadcast "Game over" and finish their mini games! They might also learn how to make a cartoon.

## DAY 5

On the last day we will make our calculators in Minecraft! But first we will learn about tripwire and make a cool trap using redstone and tripwire in Minecraft. Then we will review binary and the two logic gates we will be using: AND and XOR. Then we will discuss Boolean logic symbols and go over the calculator diagrams. Students will break into groups and build a 1-bit input, 2-bit output calculator using the diagrams and the example already built. If they finish early and are not mentally exhausted, they can then expand to the 2-bit input, 3-bit output. All that work and we can only add up to 6!



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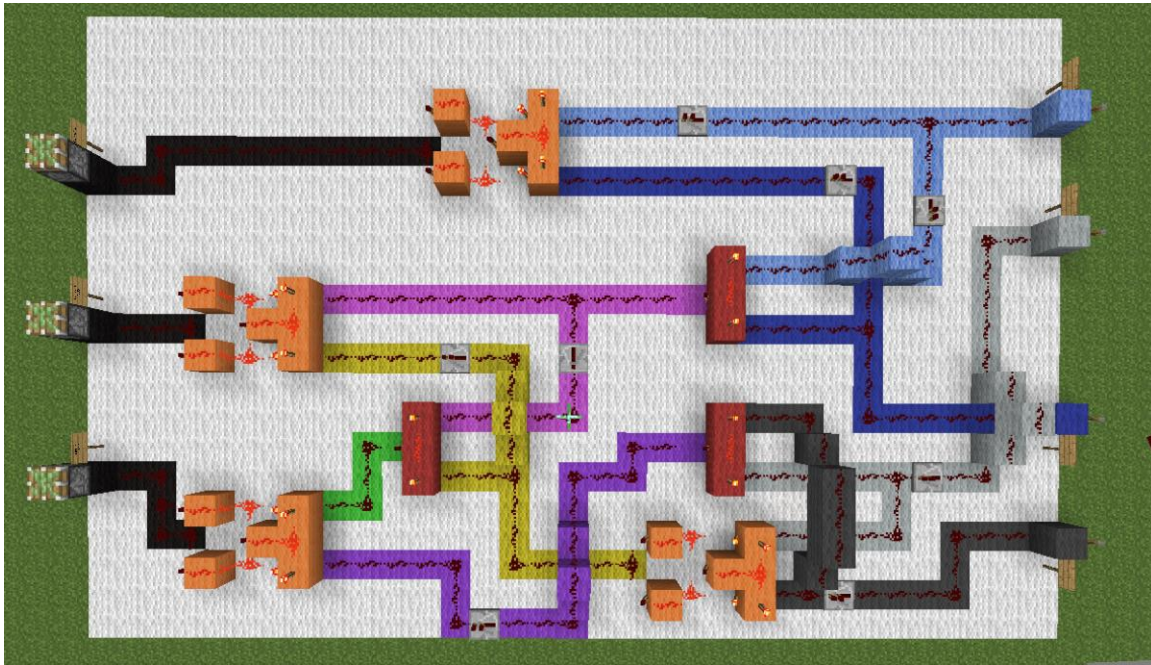
STOP MOTION

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Each day of camp we will introduce Stop Motion Videos where students will create their own stop motion film. Students will have the opportunity to use Minecraft figures in the films.

Students will need to use their Sequential Reasoning capabilities and thought processes to create their video. First, students need to lay out a plan that starts with a story-line followed by the storyboard. As students begin to set up their stage they will have to check and test all equipment for glitches! Pictures of each movement will be taken of the characters. In stop motion filming, every step must be taken in the correct order, one small movement at a time, just as a robot is programmed to move from point A to point B. These pictures are download to an app that will speed the flow of vision, creating the look of fluid movement. This helps students to gain an understanding of the concepts introduced in coding! Using logic and creativity results in all around great fun!

I hope your child has as much fun as we do at this camp! Please let us know if you have any questions or feedback!  We hope to see you again soon!


Smiles,

Imagine That! and Future Tech Staff