

Merchant Venturers School of Engineering
Outreach Programme

Minecraft Redstone

Part 1 of 2: The Basics of Redstone

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Notes to Teachers & Helpers

- This workshop is intended to last 1 to $1\frac{1}{2}$ hours.
- The content is intended to be learnt through self-directed individual or pair game play, using this worksheet as a guide.
- The learning platform is Minecraft, the popular block-based building game.
- There are a number of versions of the Minecraft game, not all of which are compatible with this workshop:

Minecraft for Windows or Mac

This version **is compatible**.

This is the normal version downloadable from the Minecraft website.

Minecraft for RaspberryPi

This version **is not compatible**.

This version does not include the required Redstone features.

Minecraft Education Edition

This version **is compatible**.

You may wish to set this up with your class before we arrive to run the workshop.

- Students should already be comfortable playing Minecraft.

This means they should be able to move easily, place and destroy blocks, use items, access the inventory (in Creative mode) and be familiar with the various block types available in the game.

- This workshop teaches the following skills:

Items marked with an asterisk are directly relatable to the National Curriculum.

- Placing, destroying and designing basic circuits using Redstone in Minecraft
- * Basic logic equations
- * Logic gates: NOT, OR, NOR, AND
- * Principles of digital design: Combining logic gates

1 Introduction

Hi! In this short workshop we're going to try to introduce some of the concepts that electronic engineers use every day to design everything from your mobile phone, to computers and laptops to the settings of a toaster.

Let's get started. Each section is made up of three parts:

Actions Stuff for you to do. They are highlighted in blue.

Notes Notes about important stuff you need to be aware of (and possibly remember!). They are highlighted in red.

Questions Questions you should try to answer. Sometimes you'll need to write things down; other times you'll need to build something in the game. They are highlighted in yellow.

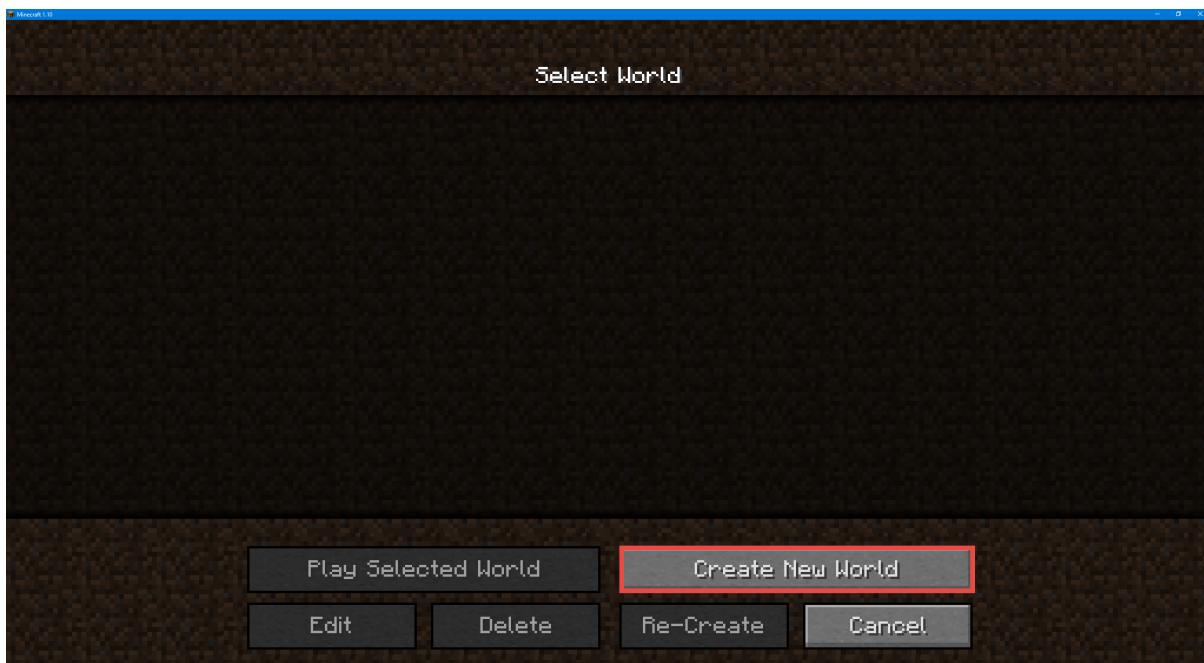
Ask a helper or the teacher to check your answers.

Goals Stuff you should have completed at the end of each section. They are highlighted in green.

We'll also write some information between parts and include plenty of screenshots to help you out.

Actions

1. Open Minecraft
2. Log in
3. Go to Single Player



The Minecraft Single Player World List

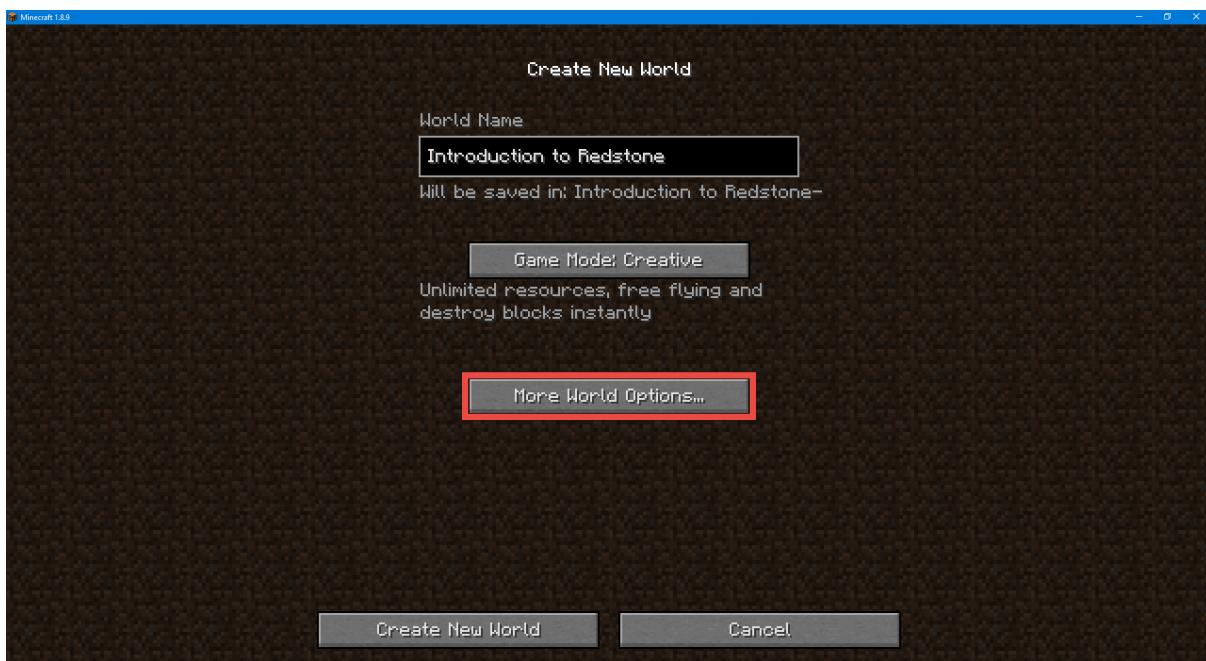
Notes

Click “Create New World”

Actions

4. Create a new Creative world with the following setup:

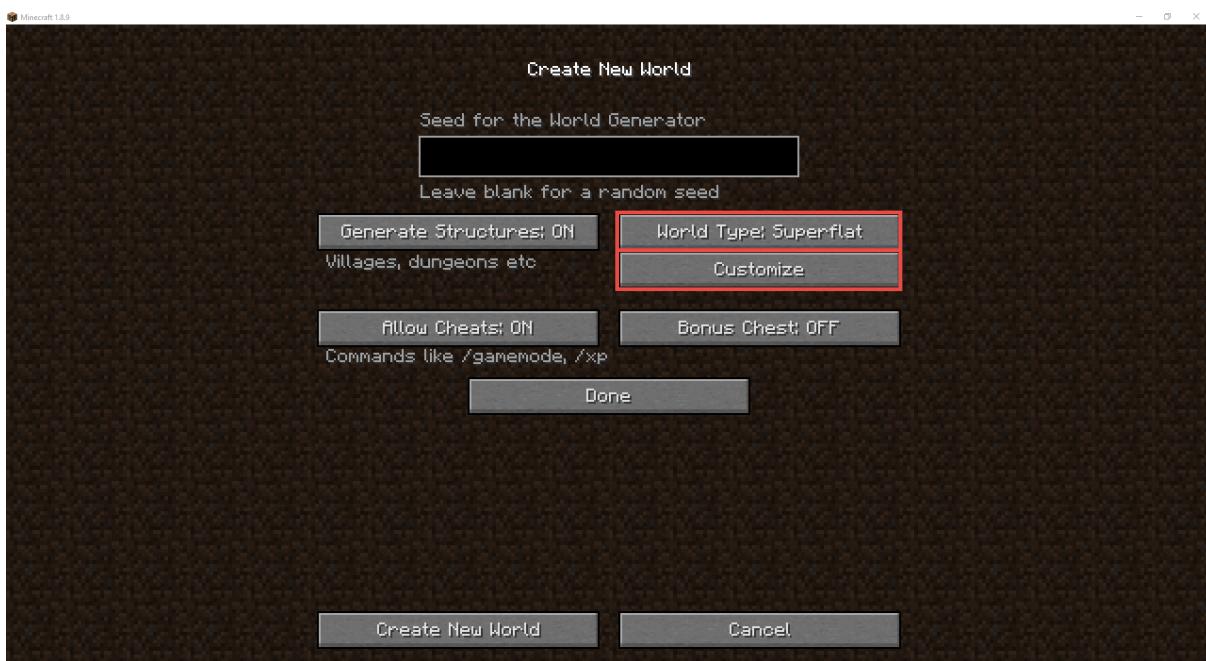
Game Mode	Creative
World Type	Superflat
Preset	Redstone Ready
Generate Structures	ON
Allow Cheats	ON



Create New World (Stage 1)

Notes

Click "More World Options..."

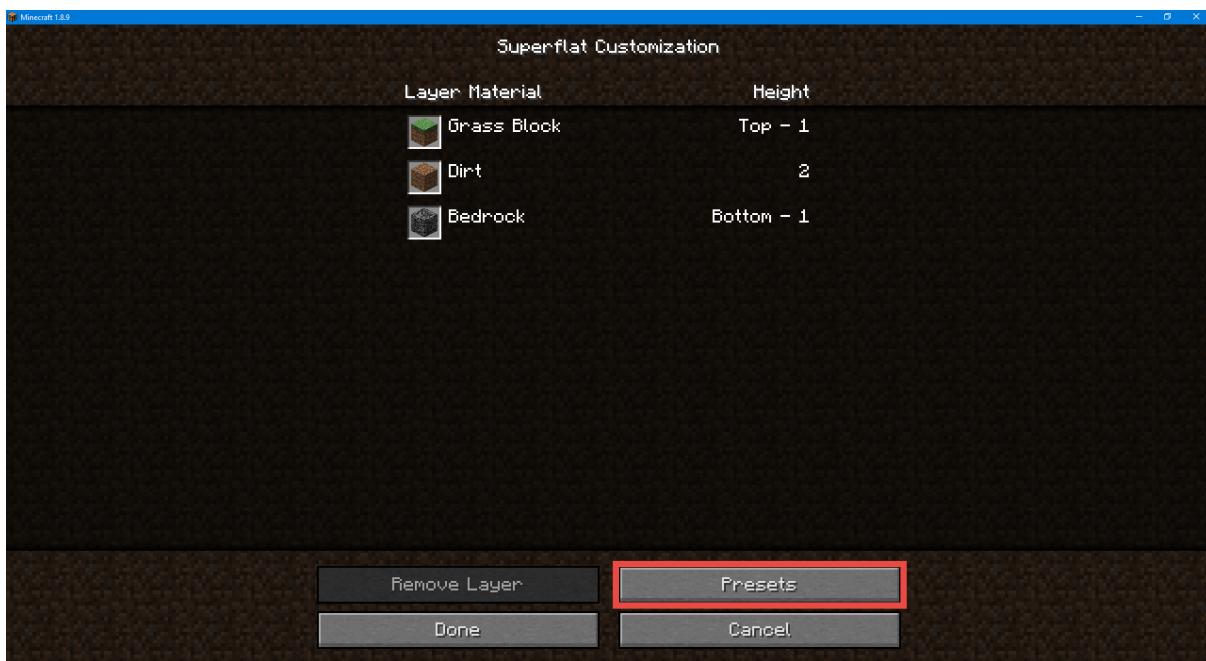


Create New World (Stage 2)

Notes

Set “World Type” to “Superflat” by repeat clicking it.

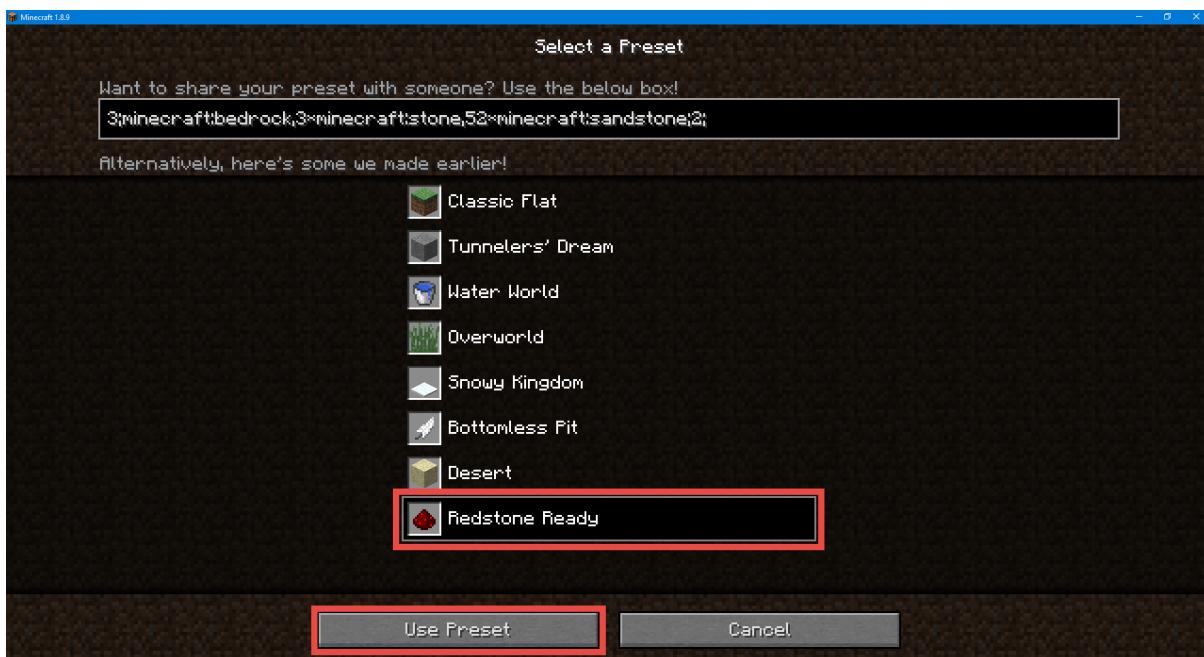
Then click “Customize”



Superflat Customisation

Notes

Click “Presets”



Select Redstone Ready preset (bottom of list)

Notes

Scroll to the bottom and click “Redstone Ready”

Finally, click “Use Preset” then “Done” then “Create New World”.

Wait for the world to load.

Goals

That's it for the introduction - you should now have created your new world ready for Redstone building.

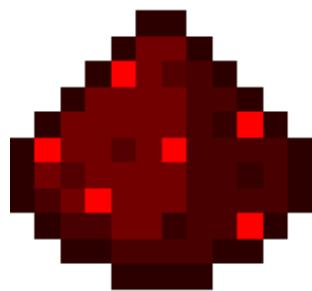
You can build Redstone in any type of world, but Redstone Ready worlds make it much easier.

Questions

1. What kind of block is the Redstone ready world made from?
2. How many blocks vertically downwards are there till you reach the bedrock?

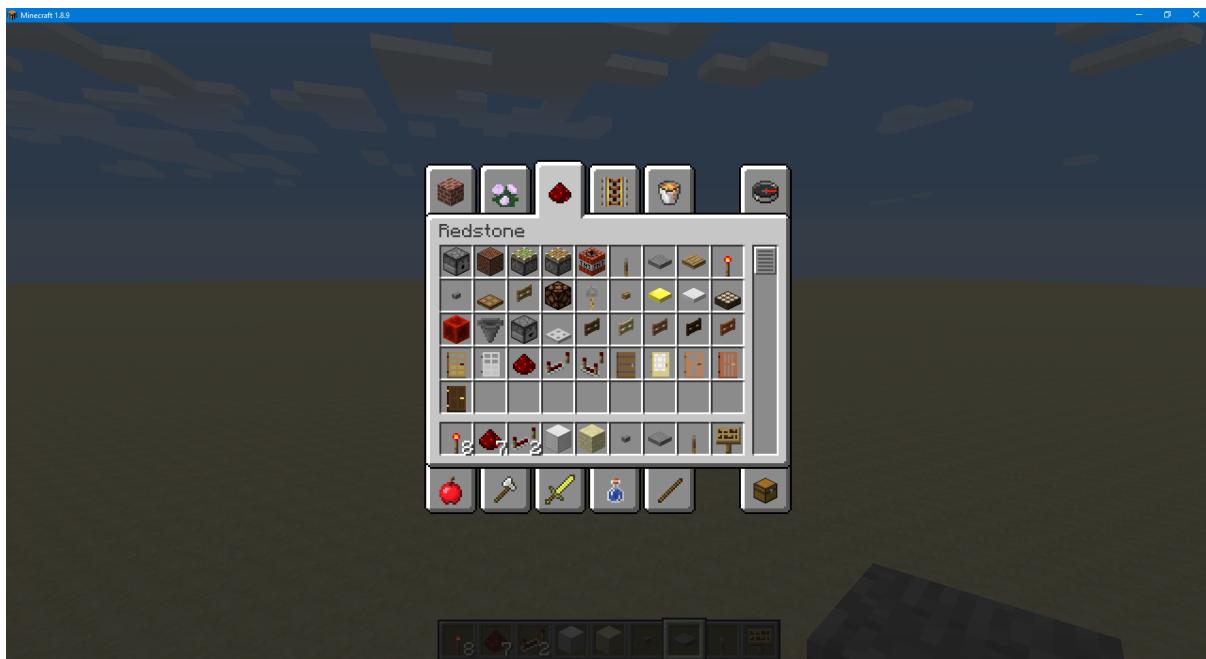
2 Placing and Powering Redstone

Let's get started with Redstone. It looks like this:



Redstone Dust

You can get it from the Redstone tab of the Inventory:



Redstone tab of the Inventory

Actions

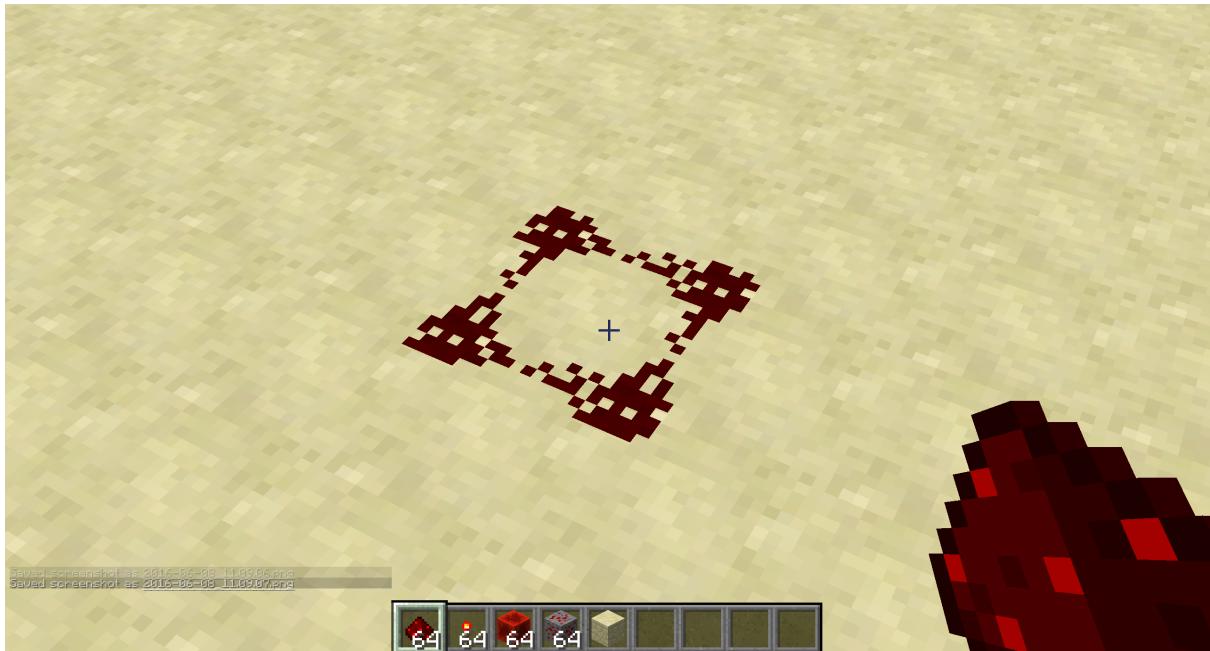
1. Open the inventory
2. Take some Redstone dust
3. Take a Redstone torch
4. Take a Redstone lamp
5. Take a Redstone repeater



Redstone Repeater

2.1 Powering a lamp

We can place Redstone dust on the ground to form wires. Wires move Redstone power around.



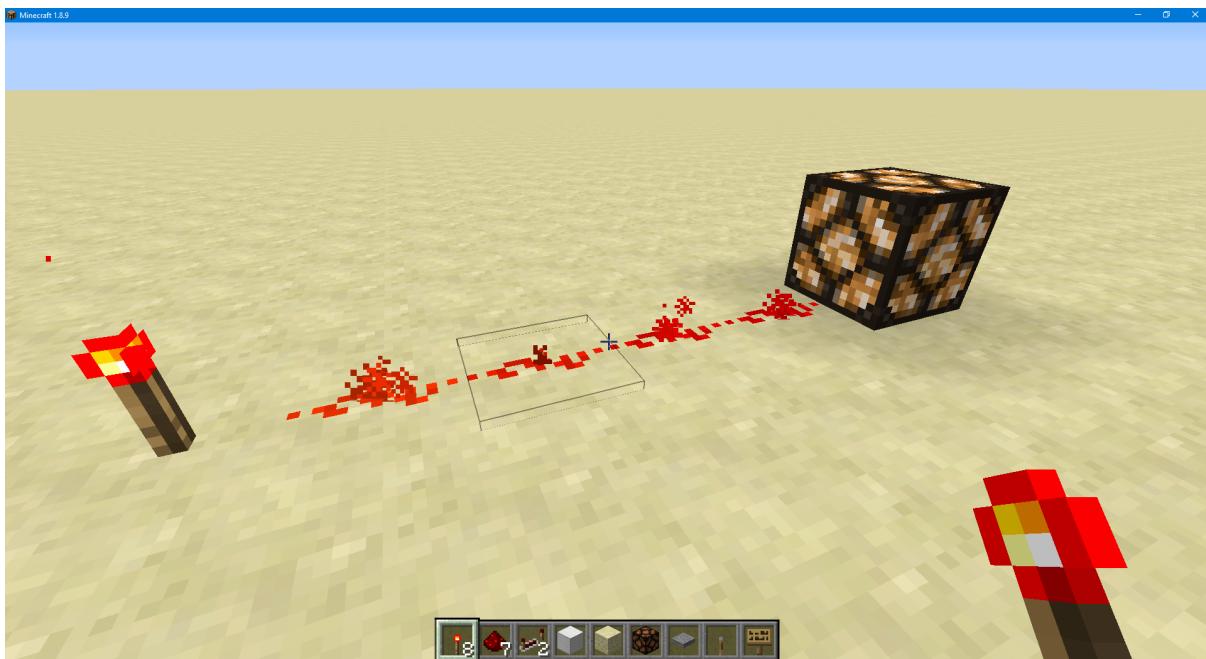
Four bits of Redstone dust placed on the ground

Actions

1. Place some Redstone dust on the ground
2. Place more Redstone dust to form a line
3. Place a Lamp at one end of the line (on the end, not next to it)
4. Place a Redstone torch at the other end of the line

Notes

Redstone torches look similar to normal torches - don't use the wrong one!



Powered wire going into lamp



Unpowered (left) and powered (right) Redstone wires

Goals

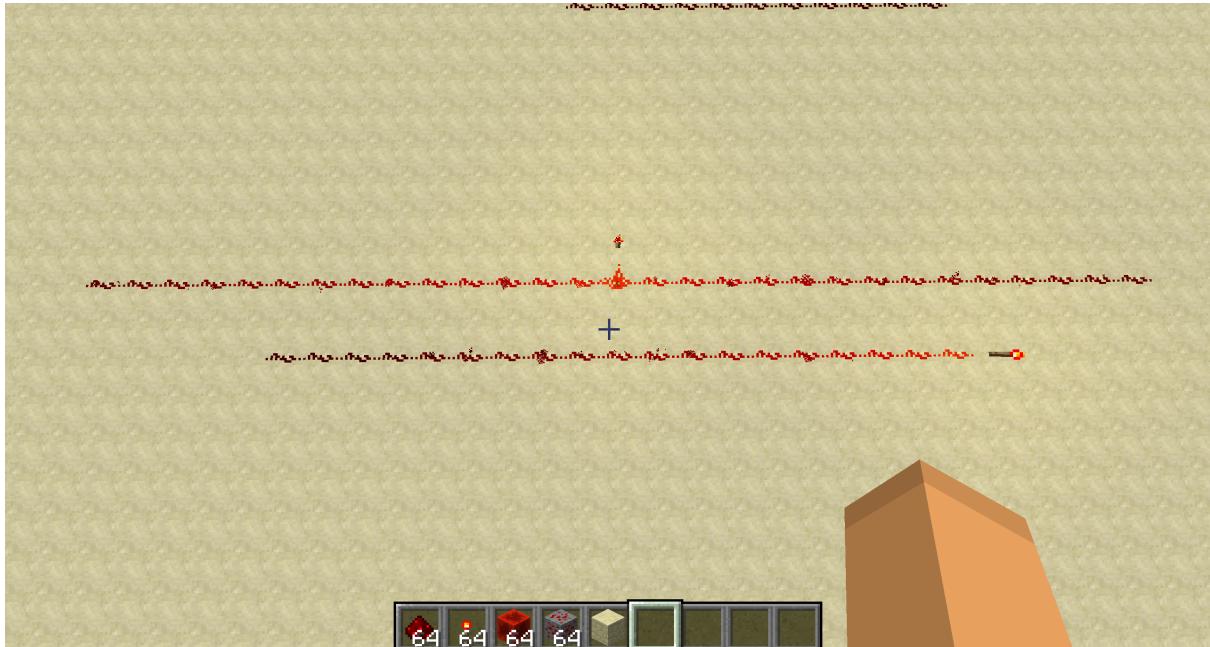
The torch should be supplying power to the wire. The power should be traveling down the wire into the lamp, so the lamp should light up.

2.2 Boosting power

Redstone power gets weaker the further it is from the source of power (i.e. the torch). A “Repeater” allows us to boost the power.

Notes

Redstone power runs out after 15 blocks.



2 wires where the power runs out

Notes

We can use a repeater to boost the power. A repeater is a power source, but it only transmits power when it is supplied with power!



A repeater (Right: input wire, Left: output wire)

Notes

A repeater only accepts power in on one side and only outputs power on the other side.



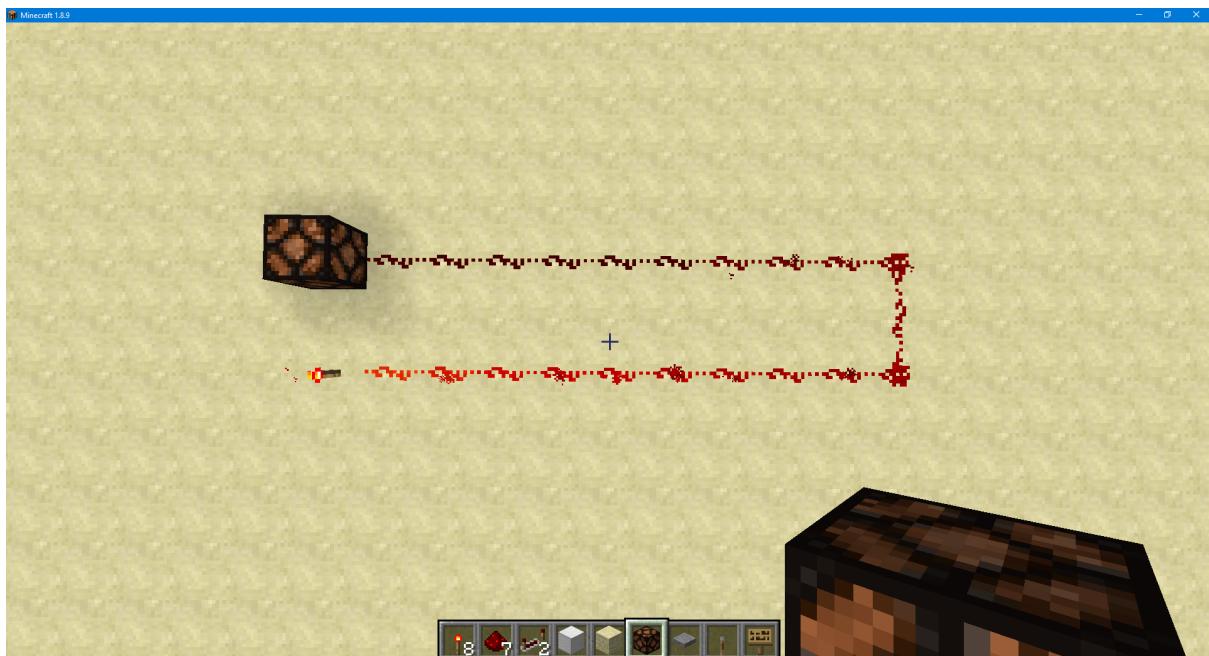
A repeater acts like a diode

Actions

1. Destroy the lamp you placed
2. Extend the wire so it is more than 15 blocks long (but less than 30!)
3. Place a lamp at the end of the new, longer wire

Goals

Notice how the Redstone power “runs out” after 15 blocks so the lamp doesn’t switch on.



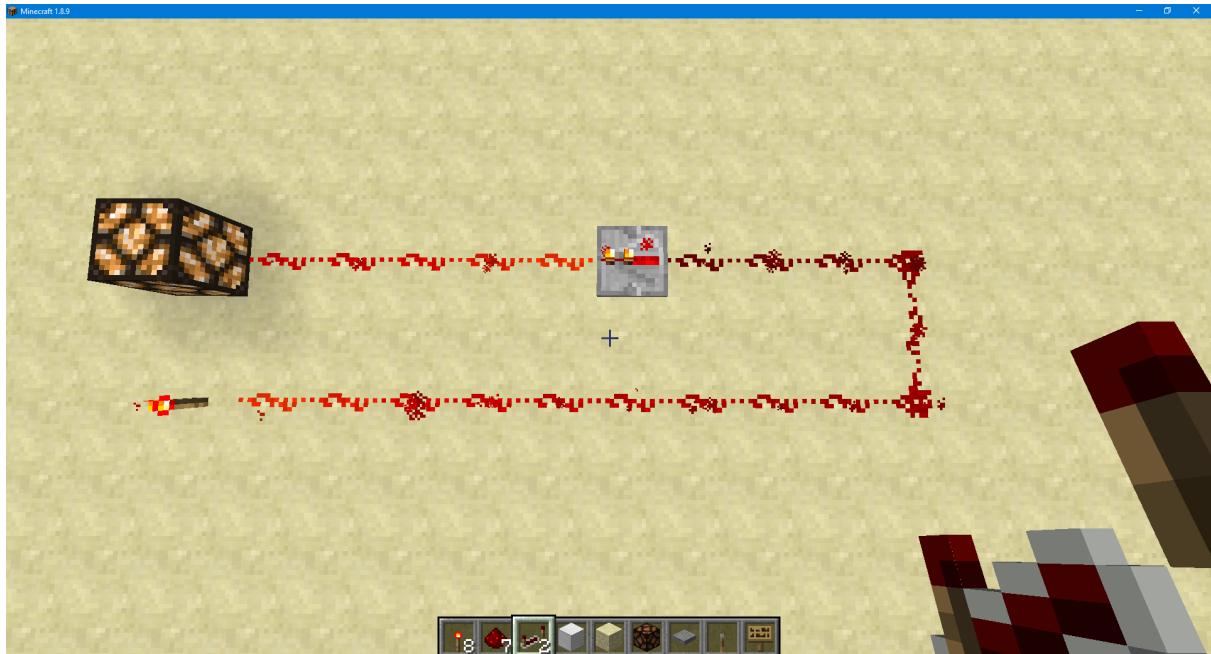
Redstone power decreases with each block

Actions

4. Find the block of Redstone dust where the power first runs out
5. Destroy the dust at this point
6. Place a repeater where the dust was

Notes

Make sure your repeater points in the right direction.



Redstone power is boosted by the repeater

Goals

The repeater boosts the power. Your lamp should now be switched on as power now reaches the end of the wire.

Questions

3. Which side of a repeater accepts power in?
4. Which side of a repeater outputs power?
5. How far (counted in blocks) does power travel out of a repeater?

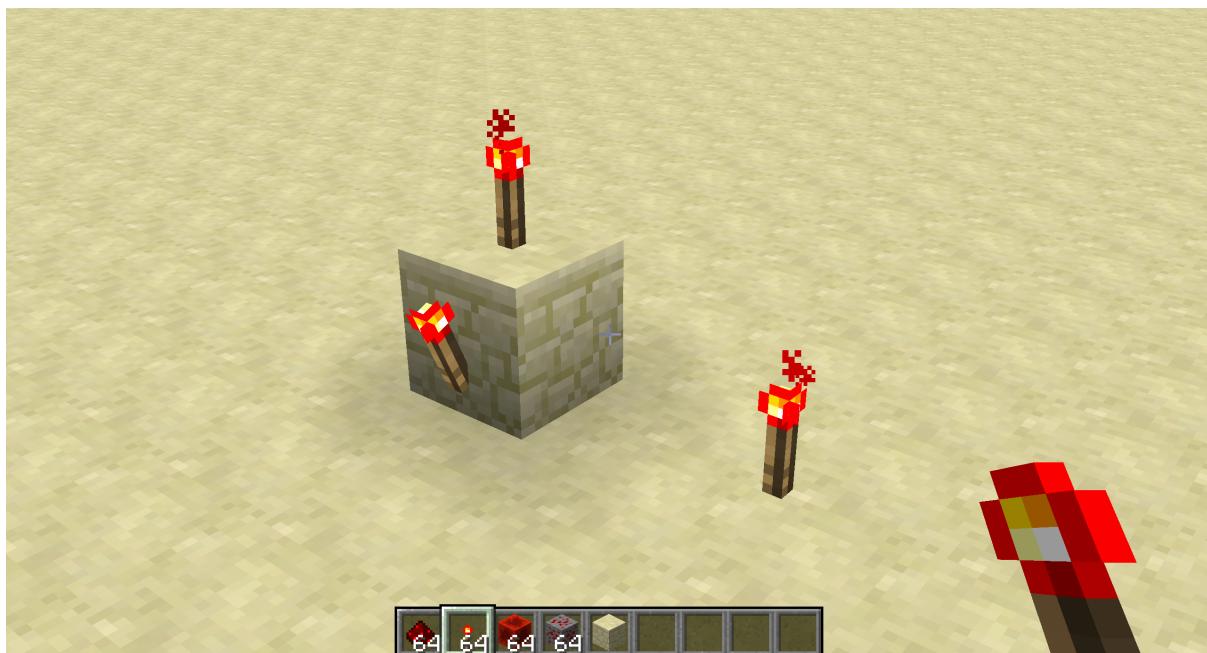
Goals

You should now know how to:

- Get Redstone from the inventory
- Place Redstone dust to form a wire
- Power and unpower Redstone wires using Redstone torches
- Boost Redstone power using a repeater

3 Redstone Torches

Redstone torches can be placed on top of or on the side of blocks.



Some Redstone torches

3.1 Flow of power from a torch

Redstone torches output power in all directions except diagonally and except to the block they are placed on.

Notes

Redstone torches **don't** output power to **either**:

- the block they are hanging on the side of **or**,
- the block they are placed on top of.

Notes

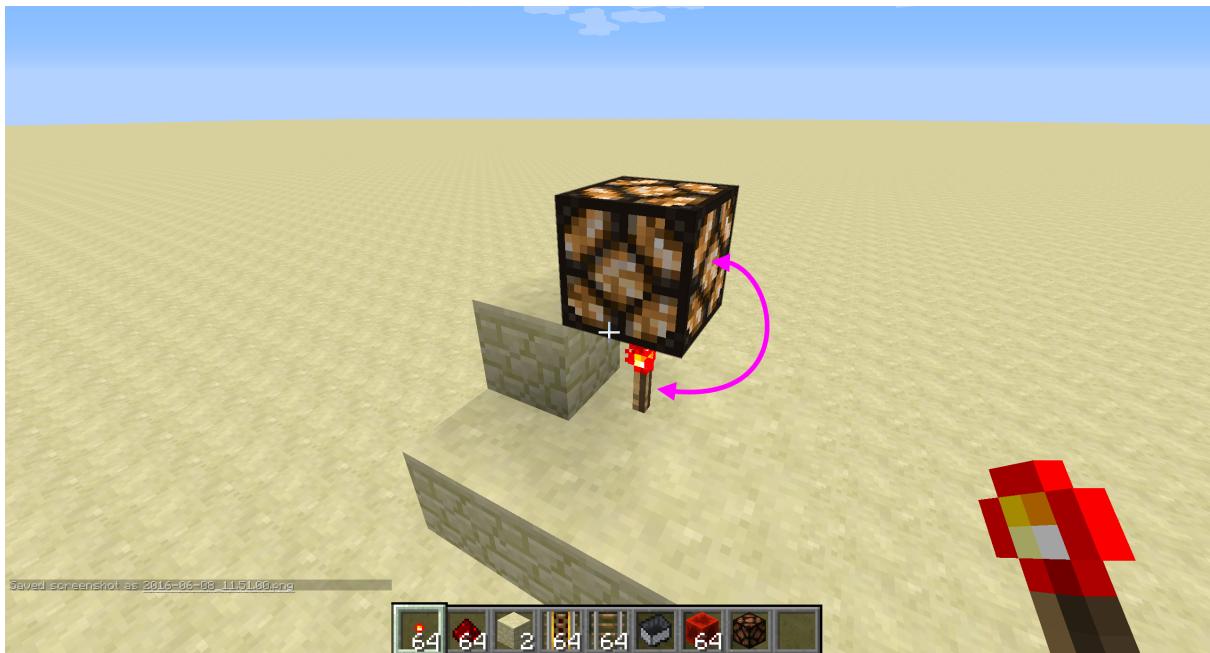
Redstone torches do not output power diagonally.

Todo

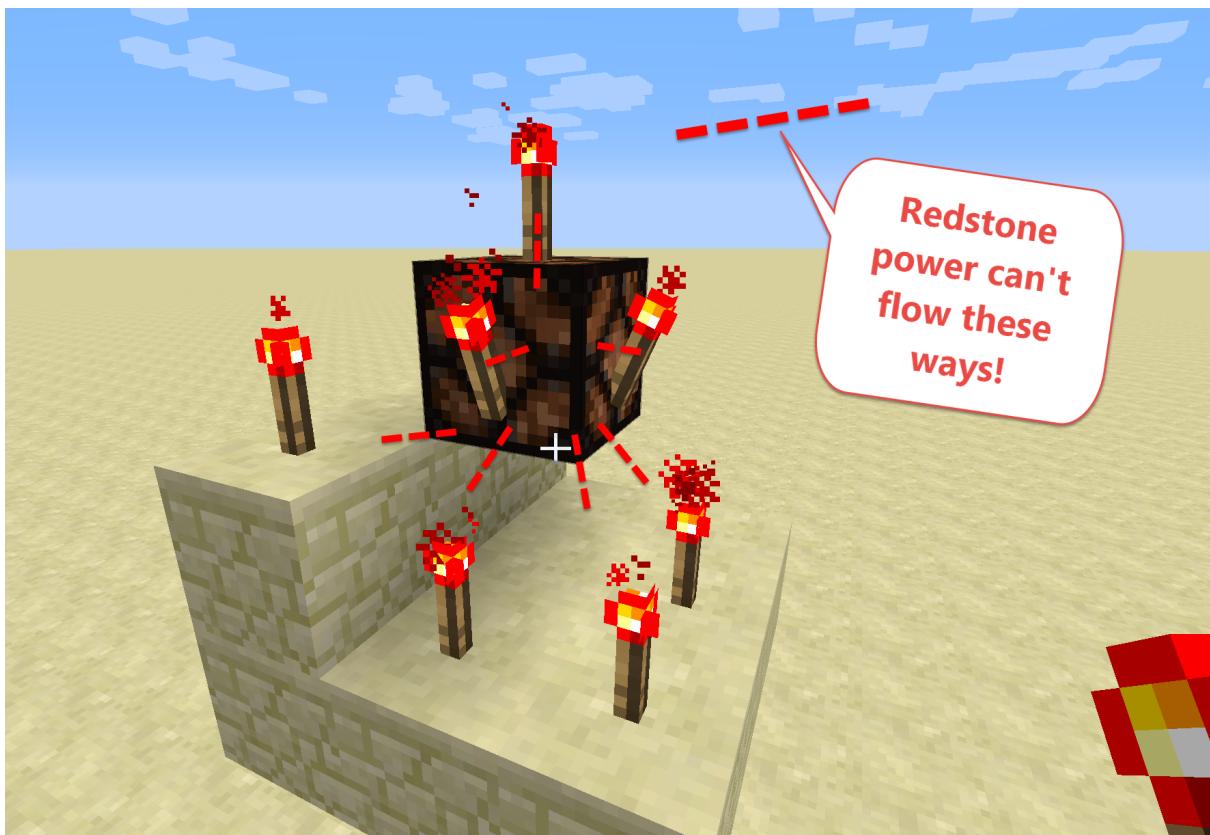
Some actions for trying out the above rules.



Lamp powered by torch to the side of it



Lamp powered by torch underneath it



Lamp not powered by torches placed on it or placed diagonally from it

Goals

You should now know which directions power flows from a Redstone torch.

3.2 Torch on a block

A Redstone torch placed on a block has a special feature. If a block is powered (just like we powered the lamp earlier) then any Redstone torch placed on the block will switch off!

Notes

Redstone torches on unpowered blocks switch on. Redstone torches on powered blocks switch off.

Todo

Actions to try out the above

Todo

Screenshot of the two cases

Goals

You should now be able to work out whether a torch on a block will be on by seeing if there is any power flowing into the block the torch is placed on.

We can describe what is going here like this:

A torch on a powered block is not on.

A torch on an unpowered block is not off.

In other words, if we call the power (or lack of power) going into the block the “input”, and the power supplied by the torch the “output”, then “the input is not the output”.

Notes

A torch on a block is called a **NOT gate**.

- Power going into block is called the “input”.
- Power going out from the torch on the block is called the “output”.
- If the torch is on, we say the output of the gate is on.
- If the torch is off, we say the output of the gate is off.
- For a NOT gate (which is a torch on a block), the output is the opposite of any inputs.
- We call this a NOR gate when there is more than one input
- We write the names of gates in CAPITAL LETTERS to distinguish them from ordinary English words.

Todo

Actions to further explore the above

Todo

Screenshot of the NOR-gate case

3.3 Building a repeater from torches

Todo

All of this subsection

4 Wrap-up

We hope you enjoyed this workshop! This workshop also has a second part where we teach you how to build more complex circuits. Ask your teacher about it!

Goals

Hmmm...

- TODO

5 Extra Resources

Here's a few extra resources to help you along with this worksheet and some stuff to try at home.

- Minecraft website