



Educator Guide

3 Lessons

Single Student

Computing with Minecraft: 2- City Planner

[EDUCATION.MINECRAFT.NET](https://education.minecraft.net)

THEME OVERVIEW

This second unit in Computing with Minecraft provides students with the opportunity to explore new coding blocks and how they can assist students when building in Minecraft through code. At the end of these lessons, your students will have designed and coded a road network, buildings, and houses in their Minecraft city using the **PLAYER**, **AGENT**, and **BLOCKS** coding features.

LESSONS OVERVIEW

All of the following lessons are intended to be completed in 60-75 minutes, depending on how much time is given to students to explore coding activities.

Lesson 1: Code a Road Network

Lesson 2: Code a Building

Lesson 3: Code a Row of Houses

LESSON OBJECTIVES

- Create code with an intended outcome
- Utilize multiple coding features into one outcome
- Understand how code is more efficient in create large-scale actions instead of manual actions
- Use block code to change their Minecraft world





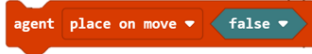




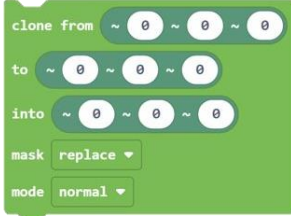

THINGS TO KEEP IN MIND

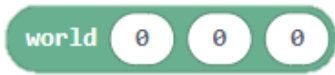
- Students are given a whistle in the first slot of their hotbar. This item allows students to call the Agent directly to them (i.e., instead on having students to code the Agent to teleport to them). The student will need to be standing and facing in the direction they would like the Agent to teleport to.
- Students are given a compass in the second slot of their hotbar. This item points to the world spawn point.
- Remind students that there may be more than one solution for each of the activities.

MINECRAFT MECHANICS

| | |
|-----|--|
| C | C Summons the Agent and opens Code Builder |
| T | T Opens chat panel in Minecraft for commands to be typed |
| ESC | ESC When a student wants to leave the game, leave chat, or pause the game |

CODING BLOCKS

| | |
|---|---|
|  | On chat command Runs the code when the student types the chosen text in the chat window |
|  | Agent Teleport to Player Tells the Agent to turn left or right |
|  | Agent Move Tells the Agent to move in a certain direction by a defined amount |
|  | Agent Turn Tells the Agent to turn left or right |
|  | Agent Place on Move Tells the Agent whether to place a block (if set to true) or not to place a block (if set to false) |
|  | Agent Place Tells the Agent where to place a block |
|  | Agent Destroy Tells the Agent to break a block in a specific direction |
|  | Agent Set Active Slot Sets the agent's active inventory slot; Slots are counted from left to right and then top to bottom, starting at the top-left corner of the agent's inventory |
|  | Repeat Creates a loop (which repeats a section of code until a specific condition is met) |
|  | Clone Clones (duplicates) a cubic region into a different location |
|  | Relative Creates a new relative position; A relative position is the distance in each direction from the player's feet. |

| | |
|---|---|
|  | World Creates a new world position; A world position is the distance in each direction from the world's origin, which is (0, 0, 0). The distance is measured in blocks. |
|---|---|

KEY VOCABULARY

Minecraft – game-based learning platform with endless creativity and possibilities

Controls – provides the ability to move during game play (will differ based on devices)

Code Builder – the coding editor program used in-game to create code

Agent – your own personal Robot you can program to complete tasks for you in the game

Loops – repeats code a certain number of times until a condition is met

Positions – represents a specific location within a Minecraft world

Absolute World Position: a position based on a position in the world (i.e., the distance from the world's origin point (0, 0, 0) to an object or entity)

Relative Player Position: a position that is based on where the player is (i.e., distance from the player to an object or entity)

Coordinates – uses a set of three numbers (coordinates) used to specify a position in a Minecraft world (X, Y, Z)

ADDITIONAL RESOURCES

If you would like additional support about the concepts and skills covered in these lessons, review the following resources:

- **PLAYER** blocks: <https://minecraft.makecode.com/reference/player>
- **AGENT** blocks: <https://minecraft.makecode.com/reference/agent>
- **LOOPS** blocks: <https://minecraft.makecode.com/blocks/loops>
- **BLOCKS:** <https://minecraft.makecode.com/reference/blocks>
- **POSITIONS** blocks and coordinates:
<https://minecraft.makecode.com/reference/positions>
- For additional support with Minecraft: Education Edition, contact the support team at aka.ms/meesupport or engage with the educator community at <https://educommunity.minecraft.net/hc/community/topics>

LESSON ACTIVITIES

LESSON 1: CODING A ROAD NETWORK

Direction Instruction (Teacher-Led; “I Do”)

We are going to continue to work on Computing with Minecraft (**slide 1**). Today’s lesson is called “Code a Road Network” (**slide 2**).

Review the objectives on **Slide 3**.

The first thing we are going to do is prepare for our build. We are going to complete 2 tasks before we code our network. We are going to plan the design of our road (**slide 4**)

The road we are going to create is going to be black and white—we are going to plan the design on paper first using some numbers. (**slides 5**)

At the time, provide students with the handout, “Code a Road Network”. This handout can be found at the end of this EDU guide. (**slide 7**)

After students have completed the handout, take time to recap the learning from this task: (**slide 8**)

- How many white blocks are in the road?
- How many black blocks are in the road?
- Where do the white blocks start?
- Is there a pattern in the middle (where the white blocks are)?

Guided Instruction (Teacher Modeling; “We Do”)

For this task, you are going to have students log into Minecraft: Education Edition. (**slide 9**)

Once students are logged in, you will use **Slides 9-12** to guide them through the beginning of the world. All students will start in the Teleport Hub. Instruct students to talk to the Teleport Manager to receive guidance on how to navigate into the second area—City Planner. City Planner can be accessed through the orange portal.

Activity: Manually Build a Road Network (Slides 13-28)

We are going to manually build a road before actually coding the road network. This will help students to visualize and better understand the code. You, as the teacher, should demonstrate these steps for students. Students should follow along as you monitor their progress.

In this activity, students will need to find a grassy area (**slide 15**). There is a great spot located directly behind the Agency headquarters. Once you are in the grassy area, allow students to switch over to Creative mode (**slides 16-18**). Then collect gray concrete blocks from the inventory (**slides 19-20**). Now, students will need clear out the grass blocks (**slides 21-24**) to make 5x10 area. Then students will need to fill the area with the gray concrete blocks to make their road (**slides 25-26**). Finally, students will use white carpet squares to make the road marks. Have your students compare their design on paper to the road they manually created in Minecraft (**slide 27**). Do they look the same? They should!

Have students return back to Adventure mode (**slide 28**).

Activity: Code a Road Network (Slides 29-28)

Start this activity by launching the tutorial (slide 29). Explain the important features of Code Builder (slides 30-31)- students should start to familiarize themselves with this vocabulary. Now, it is time to begin creating the code for the coding task (**slides 31-36**).

Step 1: Rename the **on chat command** block to road_1

Step 2: Drag a **fill with** block into the **on chat command** block

Step 3: Use the drop-down menu to change the block types from grass to gray concrete

Step 4: Drag a **world [0] [0] [0]** positions code block from the **POSITIONS** drawer and replace both **relative** positions block inside the **fill with** block

Step 6: We will need to change the coordinates in our code. The first set of coordinates is **-21, 68, -565** and the second set of coordinates is **61, 68, -569**

Now, we are going to test our code. Move into the correct position (slide 37). Explain the rationale behind the code (slides 38-42)—students need to begin to better understand the usefulness of coordinates in Minecraft. Test the code by typing in **road_1** into the chat field (**slide 43**). Your road should be complete! (**slide 44**)

Coding Solution:



Independent Work (Teacher Support; "You Do")

This activity will have your students create the 2nd road on their own, using the same coding concept of coordinates. Students will need to find the next starting point for the road network (located directly behind the teleporter).



Coding Solution:



If time permits, allow students to complete the extension activity of placing the white road marks (**slide 46**).

LESSON 1 CONCLUSION

Upon completion of this lesson, students should be able to answer the following questions:

1. How is using Code Builder to create a road more efficient than manually building a road?
Answer: It completes the task much quicker; saves time.
2. What's the difference between absolute world position and relative player position?
Answer: Absolute world position = A position that is based on position in the world (in other words, the distance from the world's origin point (0, 0, 0) to an object or entity). Relative player position = A position that is based on where the player is (in other words, the distance from the player to an object or entity)
3. What other ideas do you have for using positions when coding?
Answer: (Answers will vary)

These questions can also be used as a formative assessment. The formative assessments can be found at the end of this document and can be printed out.

LESSON 2: CODE A BUILDING

Direction Instruction (Teacher-Led; "I Do")

"We are going to work on Lesson 2 today. It is called 'Code a Building'." (**slide 48**)

Review the objectives on **Slide 49**.

In this lesson, students will create a house. Before they code the building, they will plan the design of the house on paper and manually build the house so they can better understand the code. (**slide 50**)

Provide the planning template (found at the end of this document) to all students. Students will plan out a design of their house. (**slide 51**)

Guided Instruction (Teacher Modeling; "We Do")

At the time, have all students log into Minecraft: Education Edition. (**Slide 52**)

Activity: Manually Build a House (Slides 53-62)

Once students are logged in, students should begin in the same location they left off in (i.e., if they successfully completed previous lesson, “Code a Road Network”). If not, they will need to teleport to the City Planner area.

Starting from this point, students will need to find an open spot in the grass by the roads (**slide 53**). Now, instruct students to change the settings to switch over to Creative mode (**slides 54-56**). Using the planning template, students need to select their materials from the inventory (**slide 57**).

Step 1: Build the walls. The walls should be six blocks across and 4 blocks tall (**slide 58**)

Step 2: Build the roof. The roof will be a flat top roof. Slabs should be used to completely cover the area. (**slide 59**)

Step 3: Place the door. Destroy the existing blocks in order to place the door into the spot. (**slide 60**)

Step 4: Place the glass block for the window by destroying the block in the exact spot you would like to place the window. (**slide 61**)

Your house is complete! Switch back to Adventure Mode (**slide 62**).

Activity: Code a Building (Slides 63-68)

In this activity, students will be code the Agent to build a house. Return to the Unit 2, Lesson 2 NPC. Press on the NPC to see the dialog box (**slide 63**). Select the tutorial button to launch Code Builder (**slide 64**).

Step 1: Rename the **on chat command** block to **build_a_structure**

Step 2: Drag and drop the **agent set active slot** block into the **on chat command** block

Step 3: Drag an **agent place on move** block into the **on chat command** block; change the **false** element of this block to **true**

Step 4: Visit the **LOOPS** toolbox drawer and place a **repeat 4 times** block into the **on chat command** set

Step 5: Place an **agent move** forward block and change the number to 5; the drag an **agent turn** left block into the set

Step 6: Drag an **agent move** block into the set; change it to up

Step 7: Place an **agent place on move** block in the set; set the value to **false**

Step 8: Drag an **agent move** right by 1 block into the set

Step 9: Drag an **agent place on move** block and set the value to **true**

Step 10: Place another **repeat 4 times** block around this entire set of code

Step 11: Place an **agent set active slot** block and change the value to the number 2

Step 12: Drag a **repeat 3 times** block underneath

Step 13: Place **agent move** forward by 5 block, **agent move** left by 1 block, **agent move** back by 5 block, and **agent move** left by 1 block

Step 14: Drag an **agent place on move** block and set the value to **false** under the previous loop

Step 15: Drag an **agent move** down by 3 block and **agent move** forward by 1 block into the set

Step 16: Drag an **agent set active slot** and change the value to 3

Step 17: Underneath this, place an **agent destroy** right block, **agent place** right, **agent move** forward by 2, **agent destroy** right, **agent move** down by 1, and **agent destroy** right

Step 18: Drag an **agent set active slot** and change the value to 4

Step 19: Drag an **agent place** right block into the set

Coding Solution:

(shown on next page)



Test your code (slide 66) and you should have a completed house (slide 67).

Independent Work (Teacher Support; “You Do”)

Now, it is the students turn to try to create another structure on their own (slide 68). They should try to create another structure using code. Students may return to creative mode should they need to access additional inventory for their Agent.

LESSON 2 CONCLUSION

Upon completion of this lesson, students should be able to answer the following questions: (slide 69)

1. What does the **LOOPS** toolbox drawer help you do?
Answer: It offers a series of code blocks that allow them to repeat code without having to rewrite code without having to rewrite each repeated line. It gives you options for timing your code, and when and how to start your code. You can have code running from the very second you load it in or running on an endless loop.
2. What other types of buildings could you create using the code you’ve learned?
Answer: (Responses will vary)

These questions can also be used as a formative assessment. The formative assessments can be found at the end of this document that can be printed out.

LESSON 3: CODE A ROW OF HOUSES

Direction Instruction (Teacher-Led; “I Do”)

We are going to work on Lesson 3 today. It is called “Code a Row of Houses”. (slide 71)

Review the objectives on Slide 72.

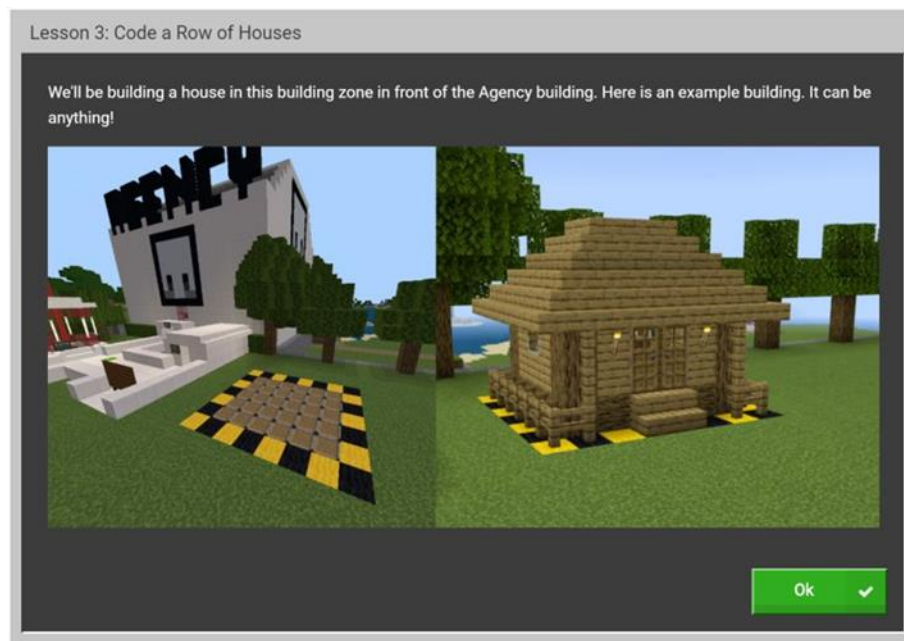
At the time, have all students log into Minecraft: Education Edition.

Guided Instruction (Teacher Modeling; “We Do”)

Activity: Manually Build a House

Once students are logged in, students should begin in the same location they left off in (i.e., if they successfully completed Lesson 2). Students will need to gather the preselected materials from the inventory. Drag and drop into the hotbar (**Slide 74**)

Starting from this point, students will need to press “C” to launch Code Builder. In the first part of the coding task, students will see the image of a constructed house. They will need to manually build a house in the designated area. They should **ONLY** build in/on the area outlined by the yellow and black carpet squares. (**Slide 75**)

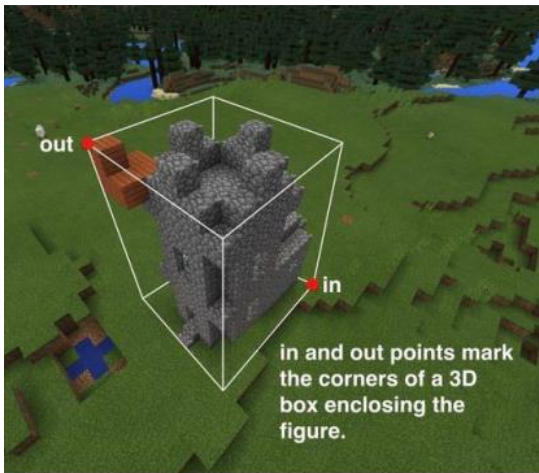


Then, lead the students through the discussion (**Slide 76**) about how to begin the coding task. Use **Slides 77-78** to explain how they are going to gather the first set of coordinates for their code. Use **Slides 79-81** to explain how they are going to gather the second set of coordinates for their code.

The clone block allows you to clone a designated area of a Minecraft world and place it elsewhere. It's like using copy and paste in other software. You copy an area and then paste it somewhere else in your world.

When you clone, the orientation or direction of the building will be the same as the copied building. So, if the building you copy is facing east, the cloned building will also face east.

The clone block is a great block, but it is slightly tricky to understand at first.



The first two sets of coordinates represent a three-dimensional box with the clone from coordinates as one corner and the to coordinates as the opposite corner, capturing everything in between like the box in the picture.

The third set of coordinates for the into represents the coordinates you want the cloned structure to paste into.

Coding Solution:



It is a good idea to practice in the air first. There is no undo button in Minecraft—test it until you have it right and then clone it to the final location. (slide 84)

Independent Work (Teacher Support; “You Do”)

Activity: Clone a Row of Houses (Slides 85-86)

Students will find their desired location for their row of houses. You should strongly suggest that they clone houses right next to their model house as these houses will face the same direction.

LESSON 3 CONCLUSION

Upon completion of this lesson, students should be able to answer the following questions: (Slide 87)

1. Since there is no undo button, what are some ways you can practice without causing a loss of time and previous work?

Answer: Move, turn, destroy, collect, chop down trees, build things

2. Why is it helpful to manually build your house before using the clone feature?

Answer: Right-click on the Agent (keyboard) or tap on the Agent (touch)

These questions can also be used as a formative assessment. The formative assessments can be found at the end of this document that can be printed out.

EDUCATIONAL STANDARDS

| UNITED STATES | AUSTRALIA | UNITED KINGDOM |
|---|--|--|
| <p>DEVELOP PROGRAMS WITH SEQUENCES AND SIMPLE LOOPS, TO EXPRESS IDEAS OR ADDRESS A PROBLEM.</p> <p>CSTA 1A-AP-10</p> | <p>WRITING AND ENTERING A SIMPLE SET OF INSTRUCTIONS JOINTLY TO SEQUENCE EVENTS AND INSTRUCTIONS</p> <p>FOUNDATION TO YEAR 2 ACTDIP004</p> | <p>UNDERSTAND WHAT ALGORITHMS ARE; HOW THEY ARE IMPLEMENTED AS PROGRAMS ON DIGITAL DEVICES; AND THAT PROGRAMS EXECUTE BY FOLLOWING PRECISE AND UNAMBIGUOUS INSTRUCTIONS</p> <p>COMPUTING KEY STAGE 1</p> |
| <p>DEBUG (IDENTIFY AND FIX) ERRORS IN AN ALGORITHM OR PROGRAM THAT INCLUDES SEQUENCES AND SIMPLE LOOPS.</p> <p>CSTA 1A-AP-14</p> | | <p>CREATE AND DEBUG SIMPLE PROGRAMS</p> <p>COMPUTING KEY STAGE 1</p> |
| <p>STUDENTS BREAK DOWN PROBLEMS INTO COMPONENT PARTS, EXTRACT KEY INFORMATION, AND DEVELOP DESCRIPTIVE MODELS TO UNDERSTAND COMPLEX SYSTEMS OR FACILITATE PROBLEM-SOLVING.</p> <p>ISTE 5C</p> | | |
| <p>STUDENTS UNDERSTAND HOW AUTOMATION WORKS AND USE ALGORITHMIC THINKING TO DEVELOP A SEQUENCE OF STEPS TO CREATE AND TEST AUTOMATED SOLUTIONS.</p> <p>ISTE 5D</p> | | |

Computing with Minecraft: Unit 2, Lesson 1

Code a Road Network

In this lesson, you are going to create a road for your Minecraft city. We are going to practice the design of the road on this planning sheet first before building and coding in the game.

Each of these squares represent a block in Minecraft. This is going to be our road.

- If there is a number 1 in the square, color the square **BLACK**.
- If the square is blank, leave it white.

| | | | | |
|---|---|---|---|---|
| 1 | 1 | | 1 | 1 |
| 1 | 1 | | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | | 1 | 1 |
| 1 | 1 | | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | | 1 | 1 |
| 1 | 1 | | 1 | 1 |

How many black squares are in our road? _____

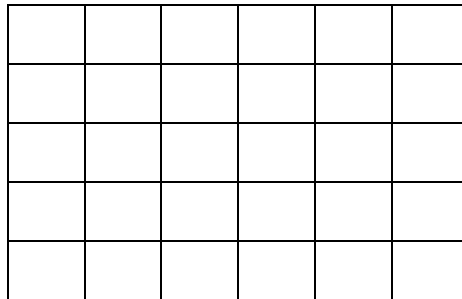
How many white squares are in our road? _____

Computing with Minecraft: Unit 2, Lesson 2

Code a Building

In this lesson, you are going to create a house for your Minecraft city. We are going to practice the design of the house on this planning sheet first before building and coding in the game.

WALLS OF THE HOUSE



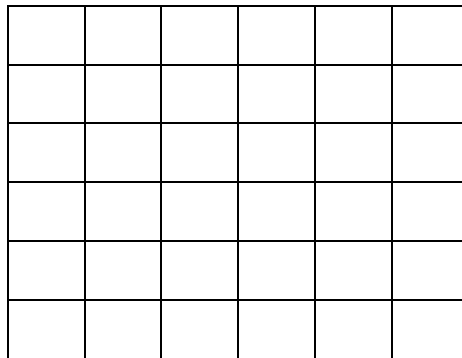
This is what the walls will look like if you are standing on the outside of the house and facing forward towards the house.

Now, remember... houses have more than one wall.

How many walls will our house have? _____

ROOF OF THE HOUSE

We have to have a roof to protect everything inside of the house.
We are going to build a simple, flat roof to go directly over the 4 walls of the house.



This is going to be the design of the roof.
This is what it will look like if you fly above and look directly below at the roof beneath you.

How many blocks are used in the roof? _____

Computing with Minecraft: Unit 2, Lesson 2 (continued)

Code a Building

WINDOW AND DOOR FOR THE HOUSE

| | | | | | |
|--|--|--|--|--|--|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

We need to place a door and a window for our house.

Color the spaces for where the door and window will be placed.

INVENTORY MATERIALS FOR THE HOUSE

| | | | | | | | | |
|--|--|--|--|--|--|--|--|--|
| | | | | | | | | |
|--|--|--|--|--|--|--|--|--|

Pretend that this is your hotbar. What inventory materials will you need to build your house?
Draw the materials into the hotbar. Then use the space below to label what is in each of the slots.

| | |
|---|--|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |

NAME: _____ **DATE:** _____

CITY PLANNER: LESSON 1 FORMATIVE ASSESSMENT

| | |
|---|--|
| <p>How is using Code Builder to create a road more efficient than manually building a road?</p> | |
| <p>What's the difference between absolute world position and relative player position?</p> | |
| <p>What other ideas do you have for using positions when coding?</p> | |

NAME: _____ **DATE:** _____

CITY PLANNER: LESSON 2 FORMATIVE ASSESSMENT

| | |
|--|--|
| <p>What does the LOOPS toolbox drawer help you do?</p> | |
| <p>What other type of buildings could you create with the code you've learned?</p> | |

NAME: _____ **DATE:** _____

CITY PLANNER: LESSON 3 FORMATIVE ASSESSMENT

| | |
|--|--|
| <p>Since there is no undo button in Minecraft, what are some ways you can practice without causing a loss of time and previous work?</p> | |
| <p>Why did we draw our houses on paper before writing the code?</p> | |