

_____ 's Whysheet for
Your name

Why don't bridges collapse in the middle?

Yeah, why? Write (or draw) your answer:



whybricks

Giving physical science form

Document number: 3.2.3.7.4.1 Rev 1.1

Part 1: Simple bridge

For the first part of this investigation, you will need the simple bridge.

Build it!

First, build the simple bridge out of Whybricks.

 **Grab this resource!** 

The **Simple bridge** build guide.

Make a prediction and run a test

For this test you will need your simple bridge and somewhere flat to put your bridge, like your desk, a table or the floor. Read what the test is, write down your prediction and then run the test.

To run the test, first place the bridge on the flat surface. Next, push down on the middle of the bridge with your finger. Press down firmly to test the strength of the bridge. **What do you think the bridge will do?**

Write down your prediction:

Now, run the test. If you want, you can run it more than once.



I notice...

What do you notice about this phenomenon? Write your observations on your Notice sheet.

I wonder...

What are you now wondering about? Write your questions on your Wonder sheet.

What is going on?

When you push down on the middle of the bridge, what happens? The centre beam flexes as you push, but your finger cannot push all the way through. Why not?

 **Grab this resource!** 

The **What is normal force?** WOW sheet.

Explain what **normal force** means using your simple bridge test as an example:



I wonder... What if I needed a longer bridge?

Some bridges stretch long distances, reaching across canyons, rivers, or even seas! How do engineers build these extremely long bridges? Can you make a bridge that can span a gap longer than any single Whybricks piece?

Part 2: Across the canyon

In this part of the investigation, you are going to create a bridge that can span across a canyon.

Build it!

First, build the canyon out of Whybricks. In this build, you will create two structures that act as canyon walls. When you use them, be sure to spread them apart from each other to make a canyon in the middle.

 **Grab this resource!** 

The **Canyon** build guide.

Build it!

Next, build the bigger bridge out of Whybricks. You will build a bridge that uses the canyon walls. The bigger bridge will stretch across these walls.

 **Grab this resource!** 

The **Bigger bridge** build guide.



Make a prediction, then run a test

For this test, you will need your bigger bridge and the canyon plus a flat surface to place your canyon and bridge, like a desk or table.

Read what the test is, write your prediction, then run the test.

To run the test, first set up your canyon walls. Put the canyon walls on the flat surface. The walls should form a 'canyon' in the middle that is as wide as the bridge is long. Next, place the bridge on the canyon walls. Push down on the middle of the bridge with your finger. Press down firmly to test the strength of the bridge. **What do you think the bridge will do?**

Write down your prediction:

Now, run the test. If you want, you can run it more than once.

I notice...

What do you notice about this phenomenon? Write your observations on your Notice sheet.

I wonder...

What are you now wondering about? Write your questions on your Wonder sheet.



What is going on?

We know that big, long bridges exist in the world. How do they work? These bridges are so long, they cannot use a single piece of building material to stretch all the way across. What makes these bridges both long and strong?

If you look at photographs of large bridges, you may notice something. A lot of big bridges use ropes and cables with vertical beams.

Why is that? What are those cables and beams doing?

 **Grab this resource!** 

The **What is tension?** WOW sheet.

Explain (or draw) how you think **tension** might be able to be used to help your bridge stretch across the canyon:



Let's try using tension to make the bridge stronger.

Build it!

Now, build the stronger bridge out of Whybricks.

 **Grab this resource!** 

The **Stronger bridge** build guide.

Make a prediction, then run a test

For this test, you will need your stronger bridge, the canyon, and a flat surface to place your canyon and bridge, like a desk or table. Read what the test is, write your prediction, then run the test.

To run the test, place the stronger bridge on the canyon walls. Push down on the middle of the bridge with your finger. Press down firmly to test the strength of the bridge. **What do you think the bridge will do?**

Write down your prediction:

Now, run the test. If you want, you can run it more than once.

Bonus challenge!

Your stronger bridge uses four 15-hole long beams to create tension in your bridge. But could you get the same result using string? Try it and see!



So...why don't bridges collapse in the middle?

Now that you've completed this investigation, what do you think about your original answer? Can you add any new information to your original explanation?

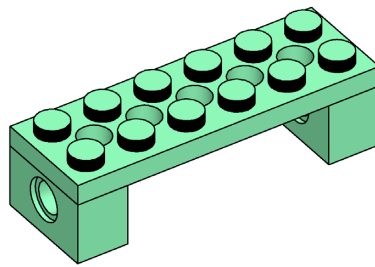
And... what are you wondering about now?

  **Now I wonder...**

Now that you have completed the investigation, what new questions do you have?

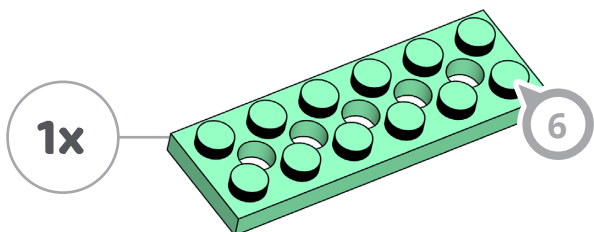
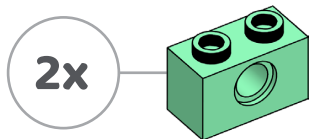


Simple bridge

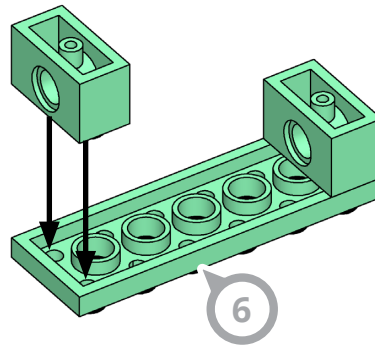


Whybricks
Giving physical science form

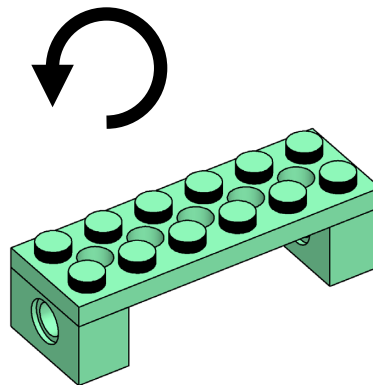
Parts



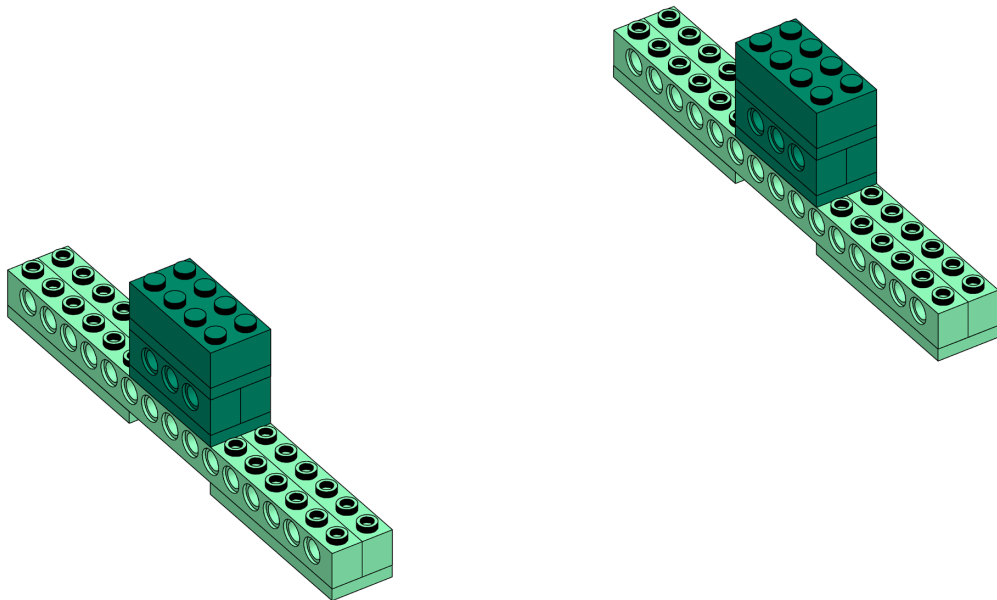
1



2

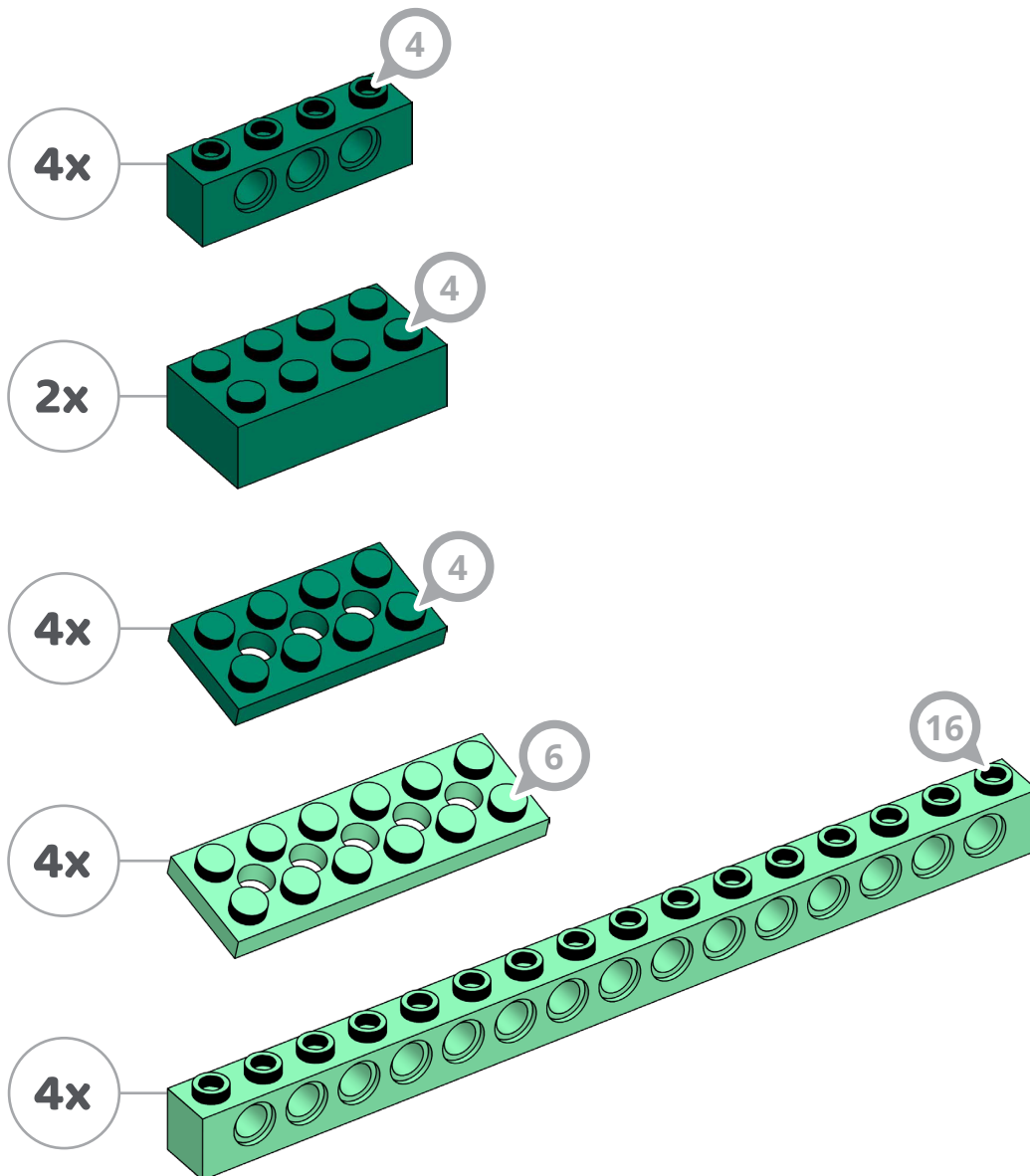


Canyon

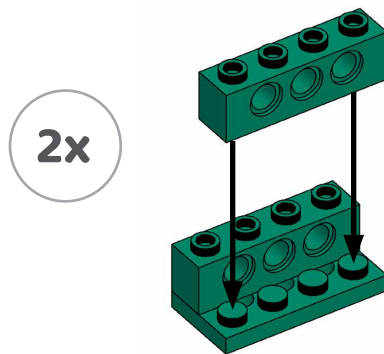


Whybricks
Giving physical science form

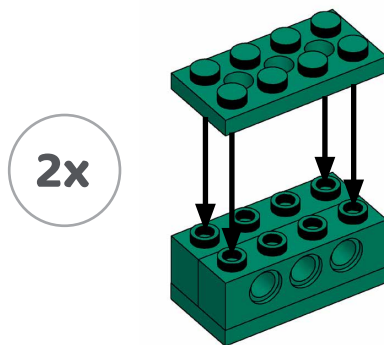
Parts



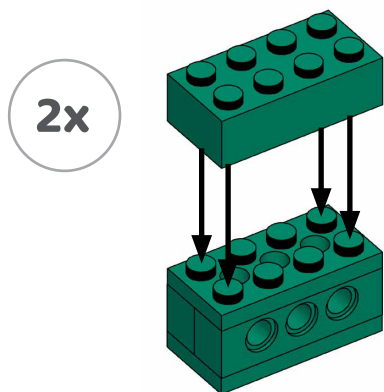
1



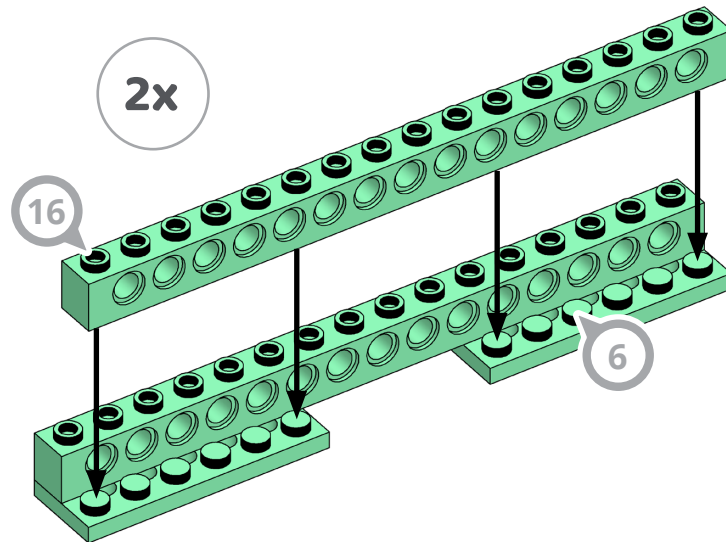
2



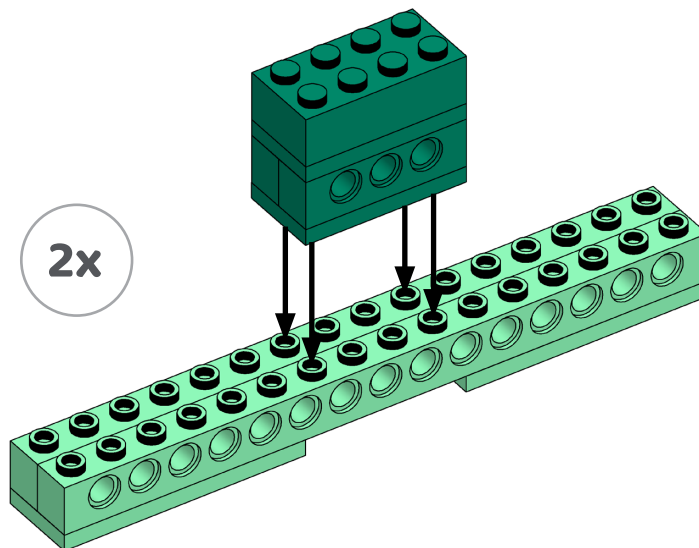
3



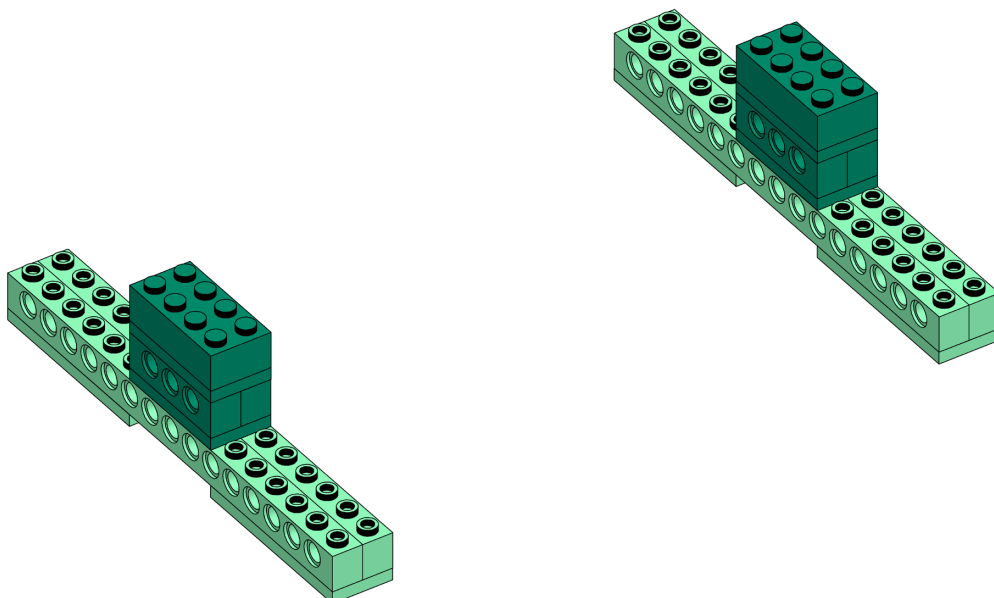
4



5



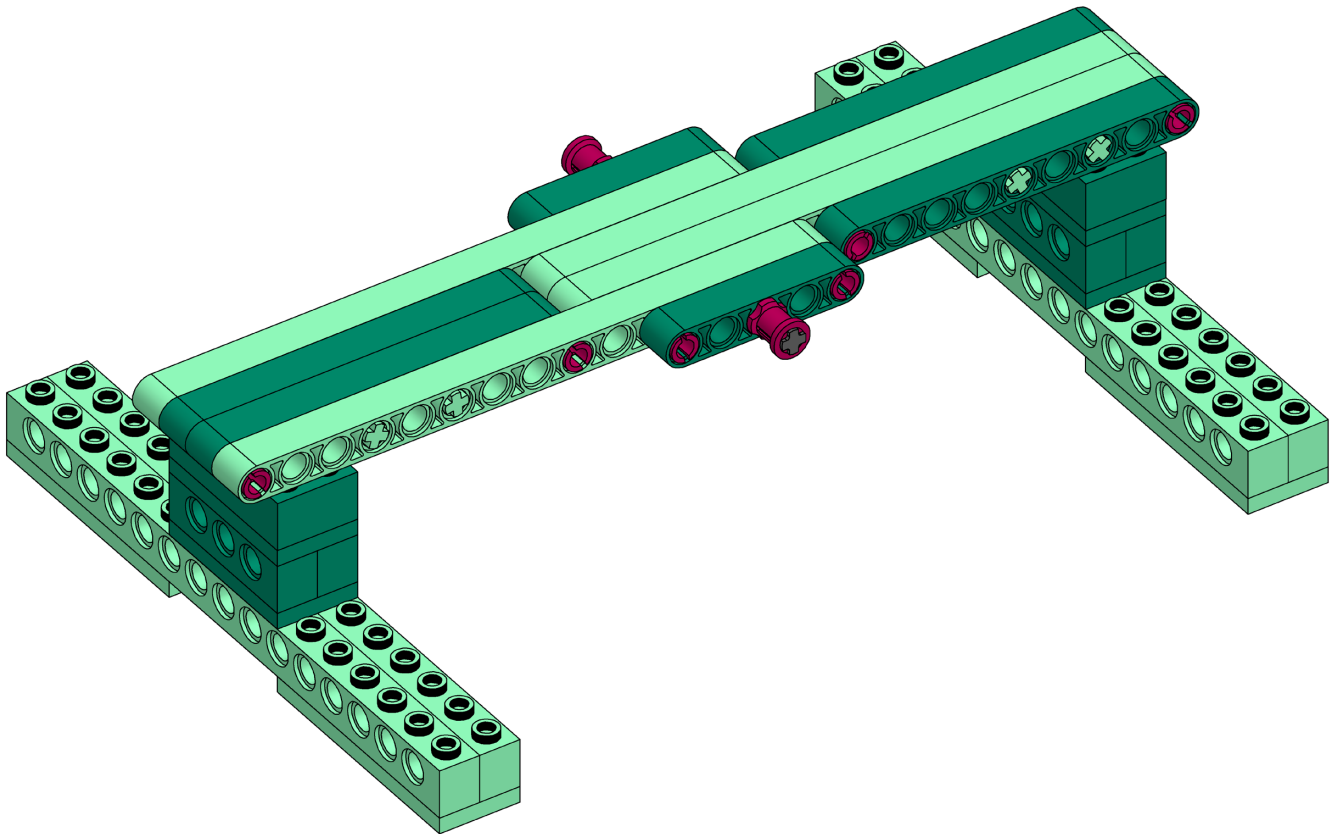
6



Bigger bridge

This build requires the following completed builds:

Canyon



Whybricks

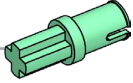
Giving physical science form

Parts

2x



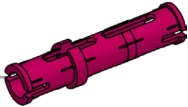
8x



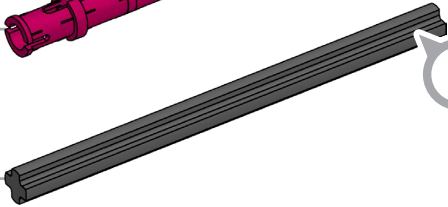
8x



4x

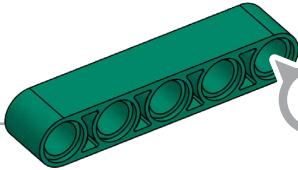


1x



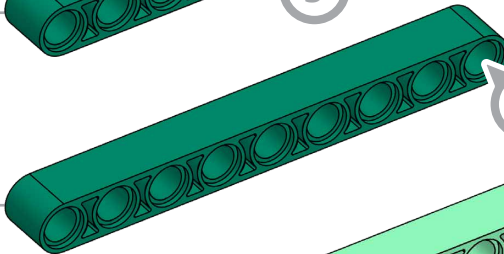
8

2x



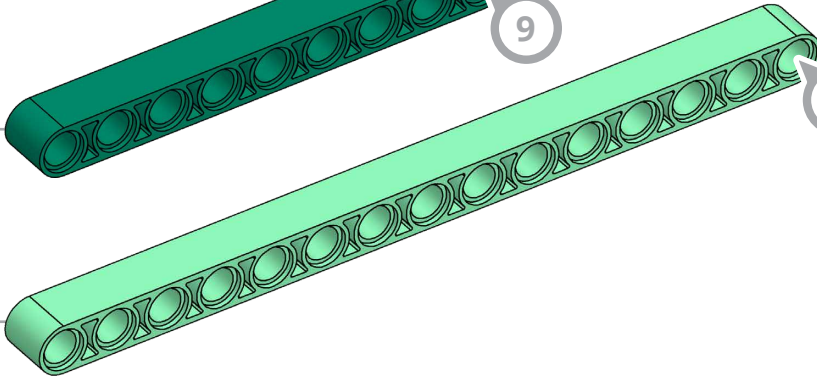
5

4x



9

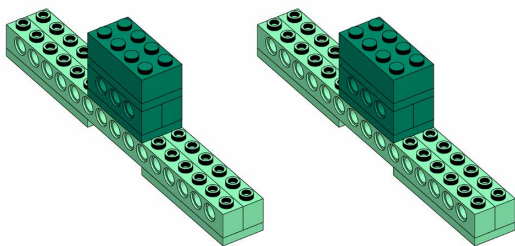
4x



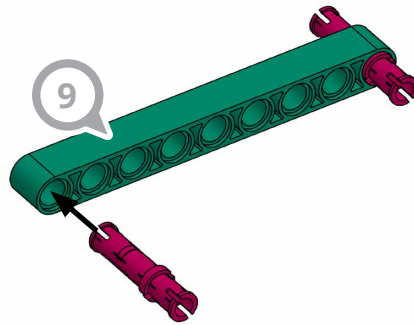
15

1x

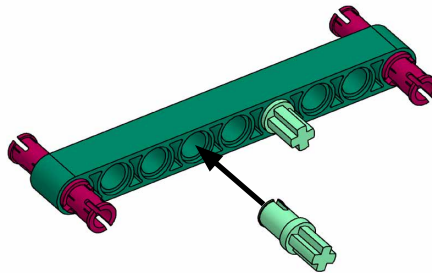
Canyon



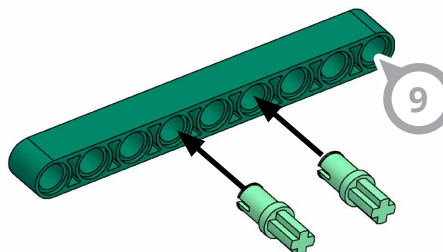
1



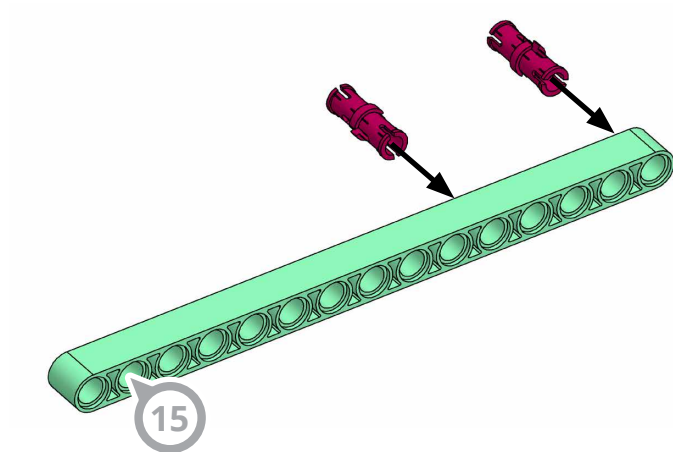
2



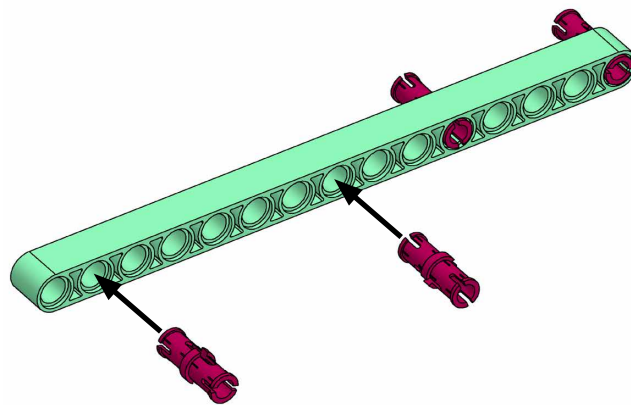
3



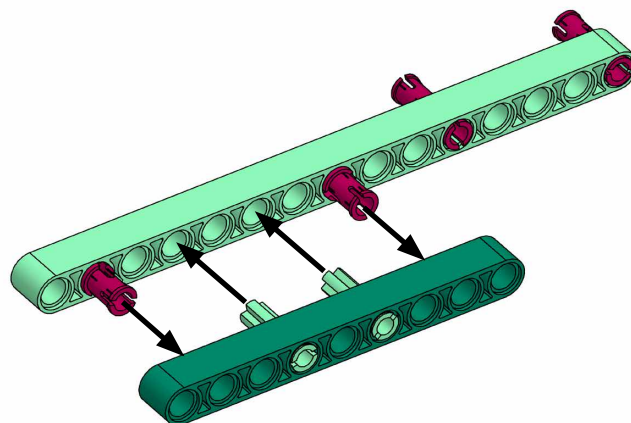
4



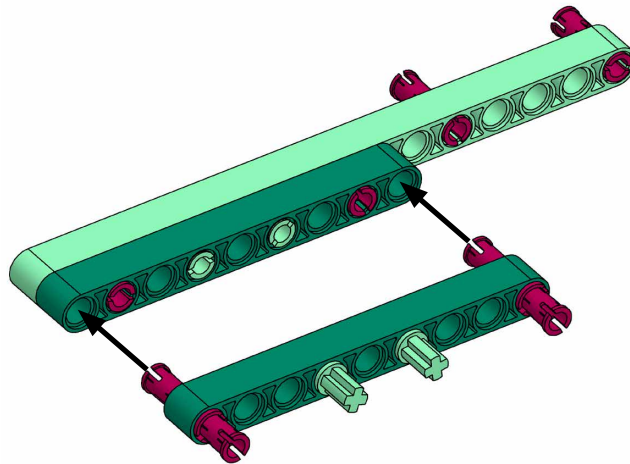
5



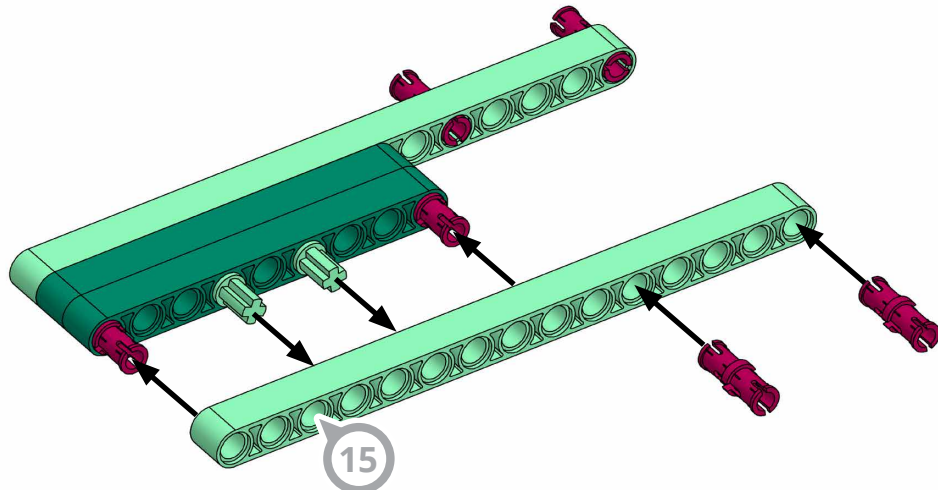
6



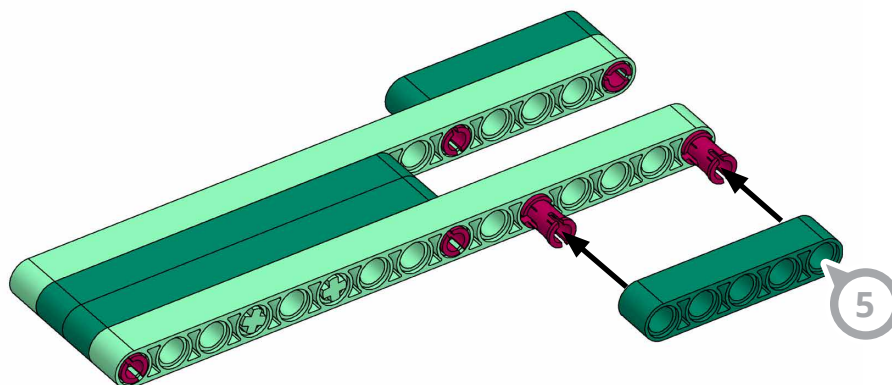
7



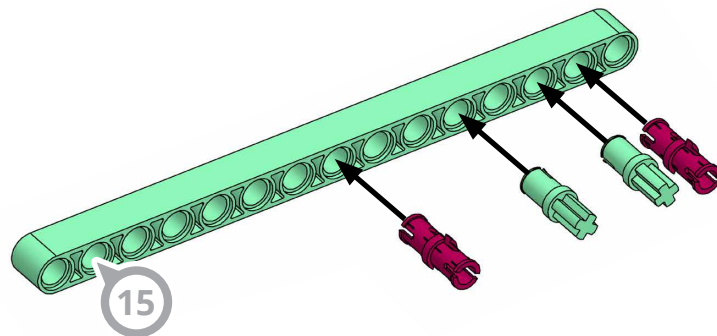
8



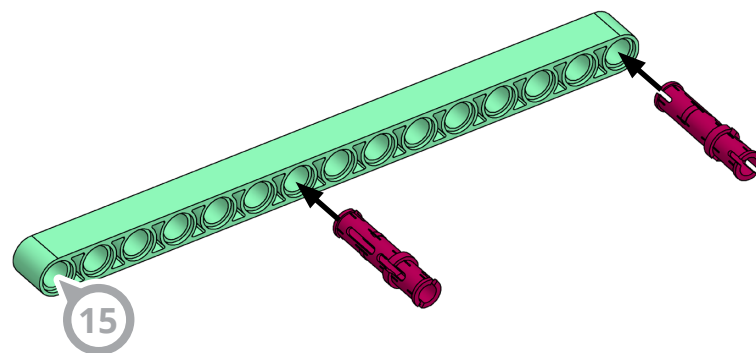
9



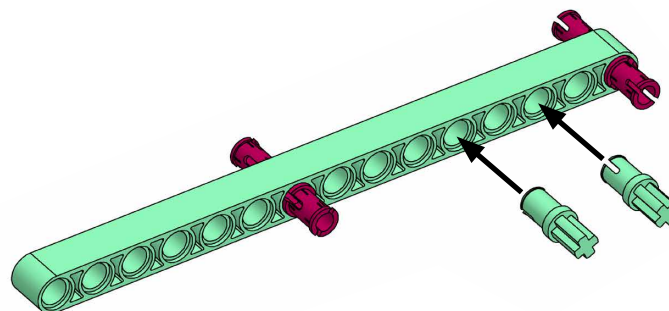
10



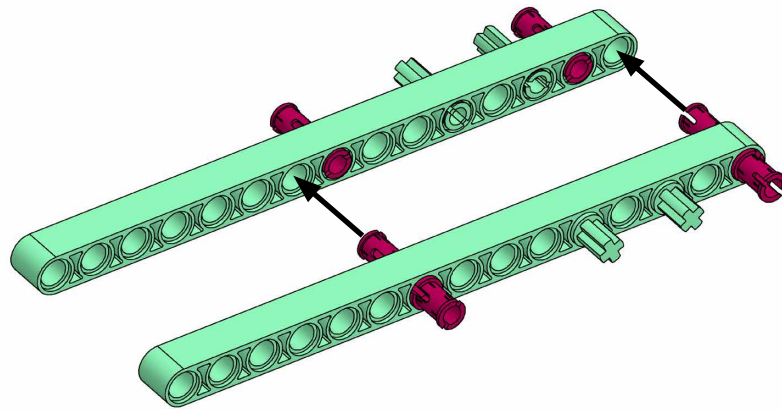
11



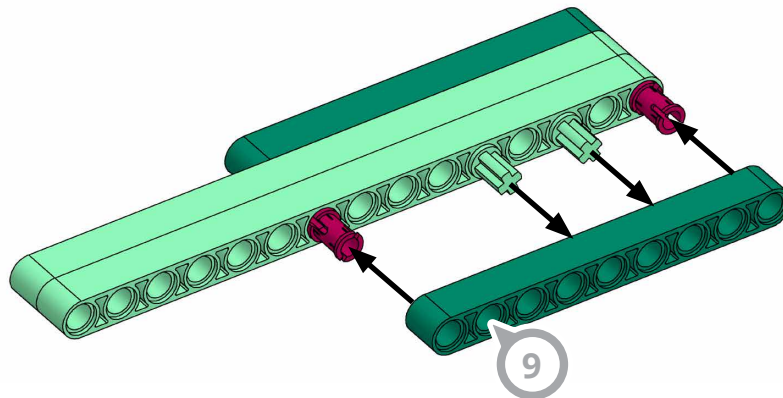
12



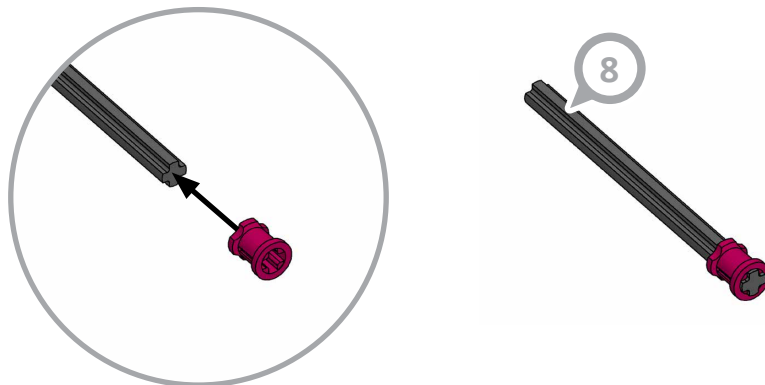
13



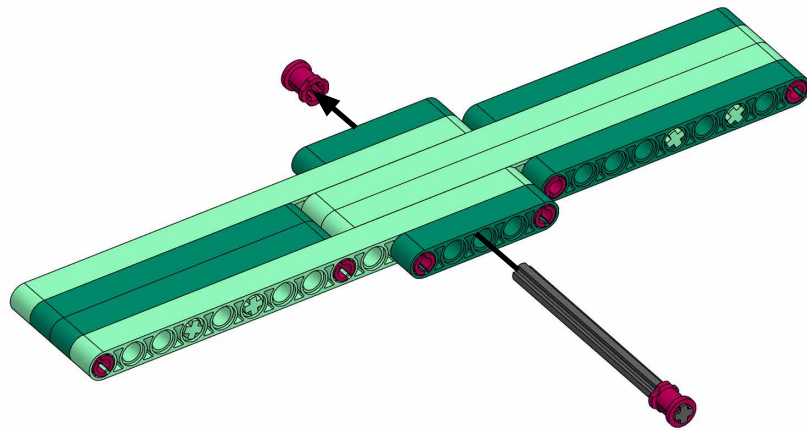
14



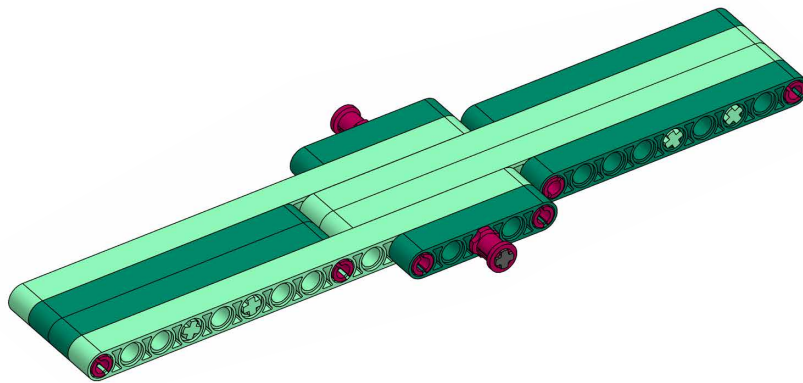
15



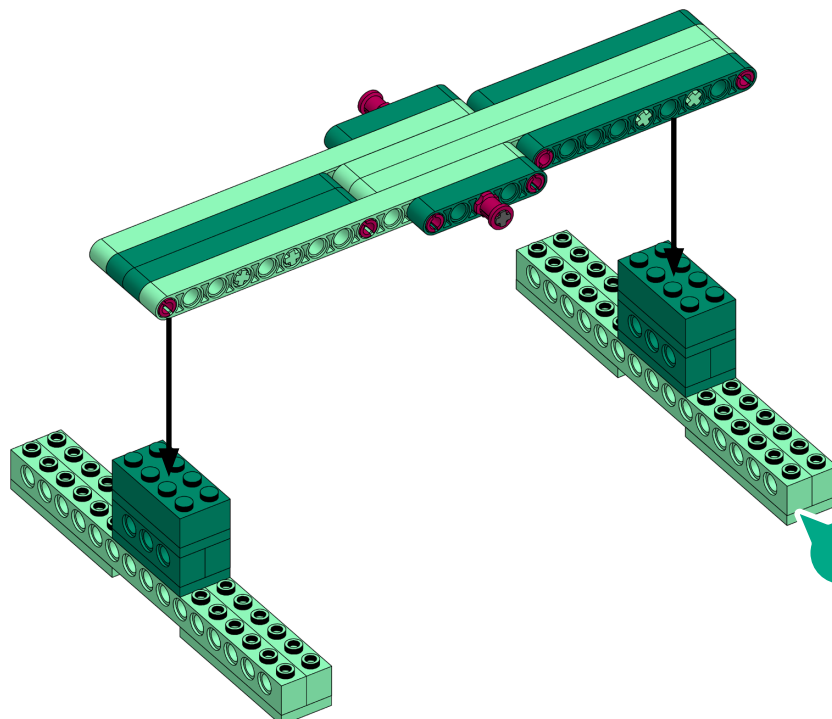
16



17

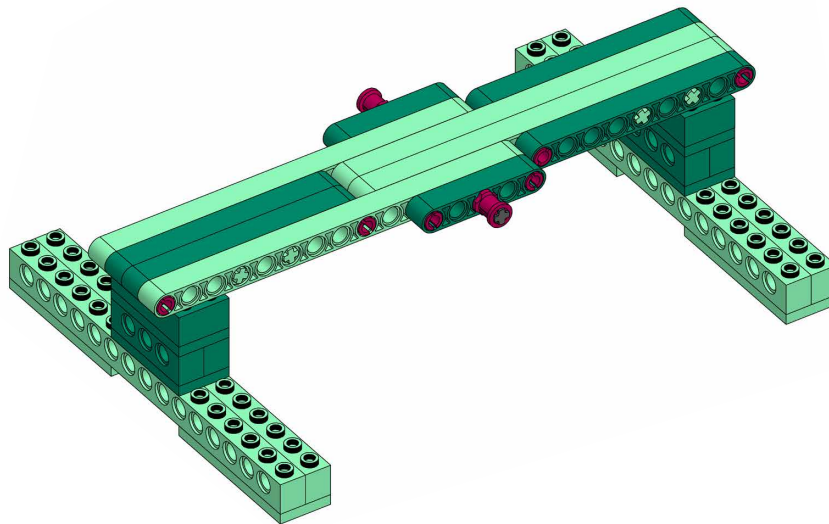


18



Canyon

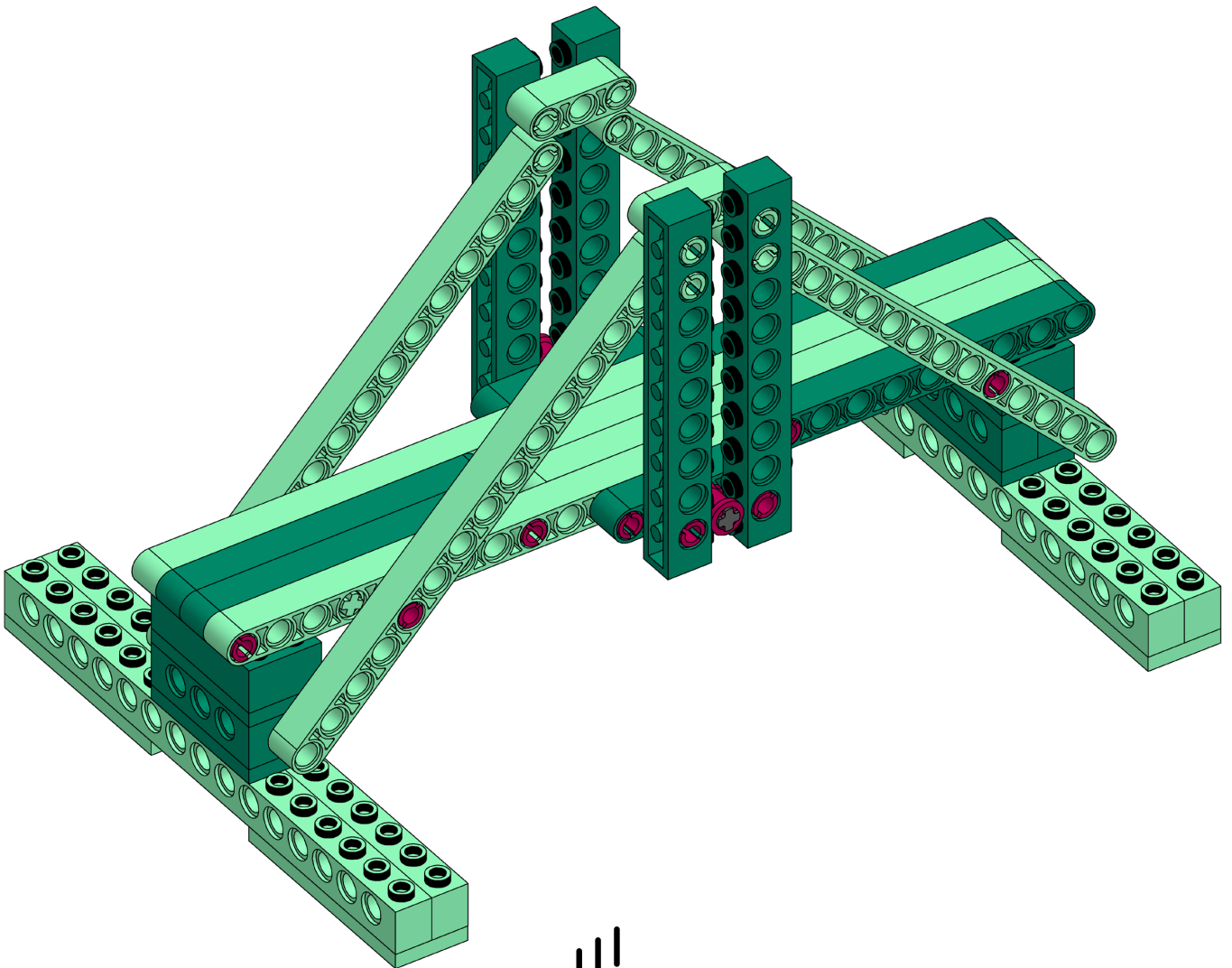




Stronger bridge

This build requires the following completed builds:

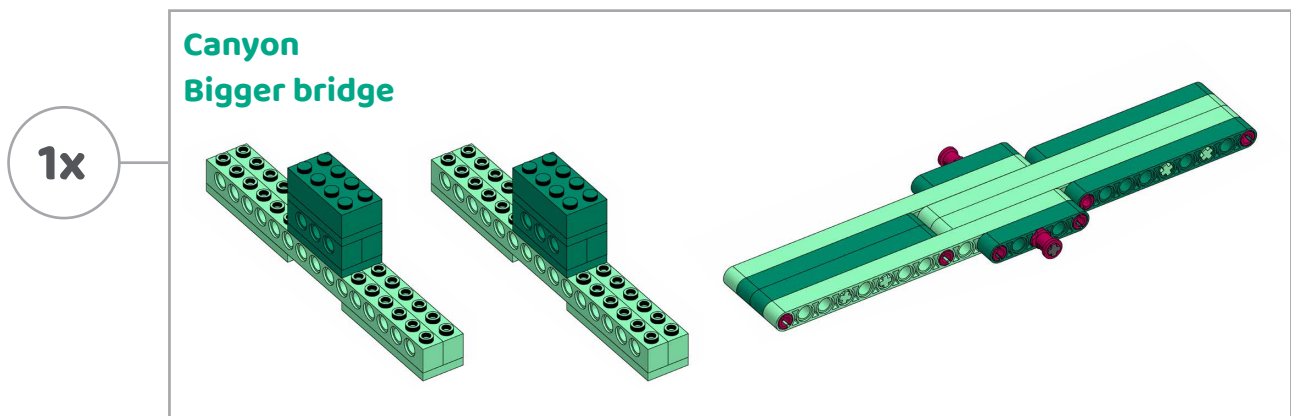
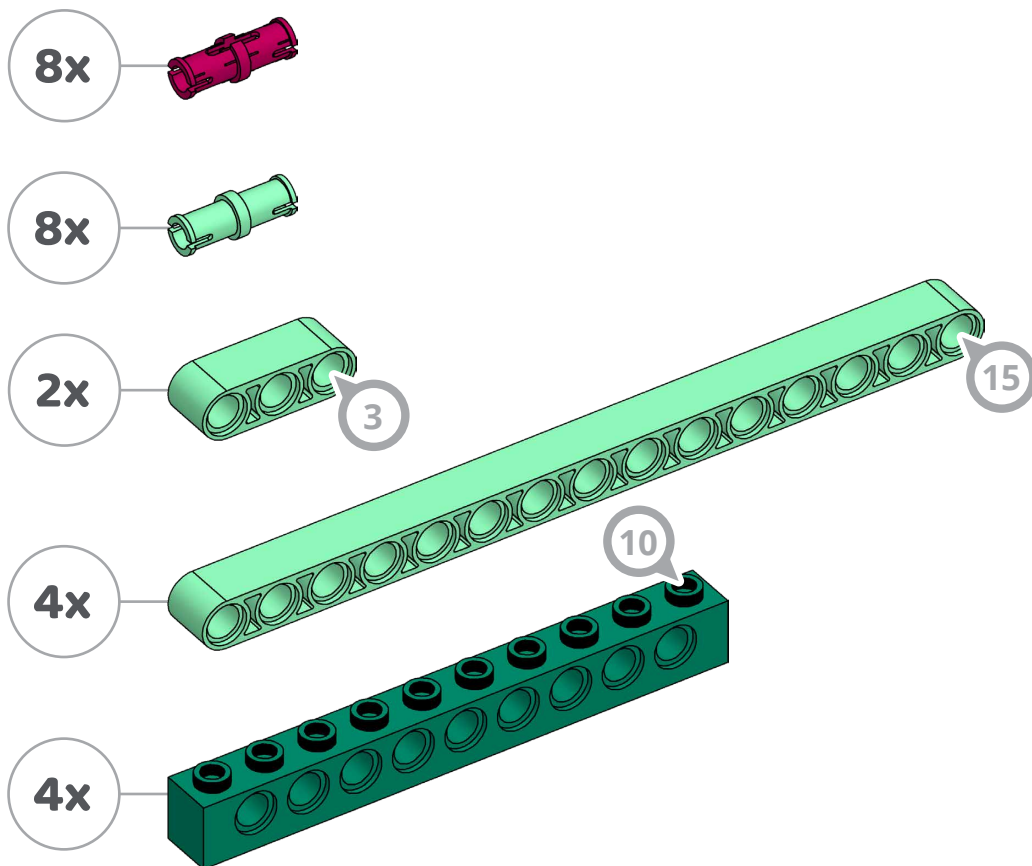
Bigger bridge
Canyon



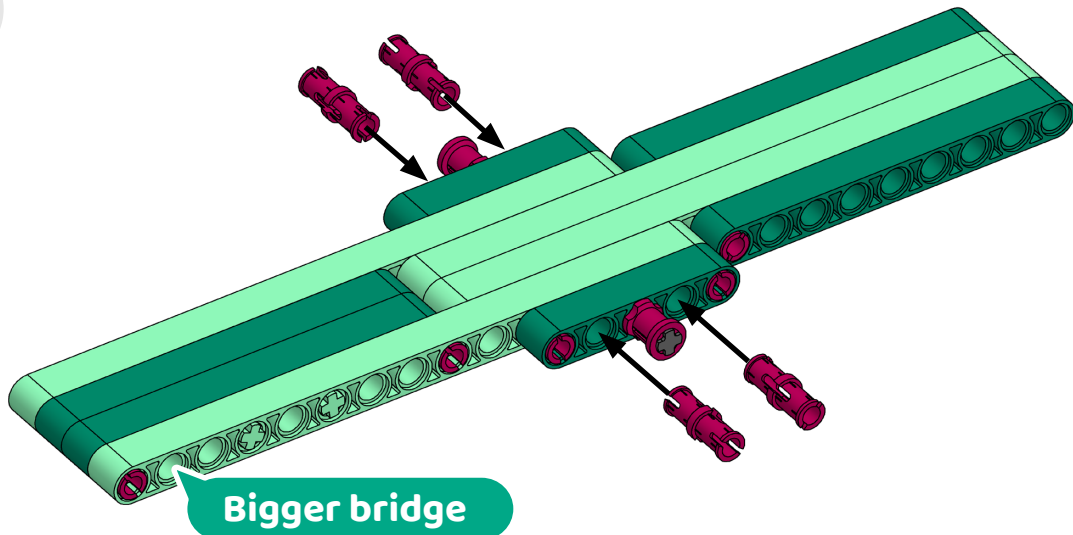
Whybricks

Giving physical science form

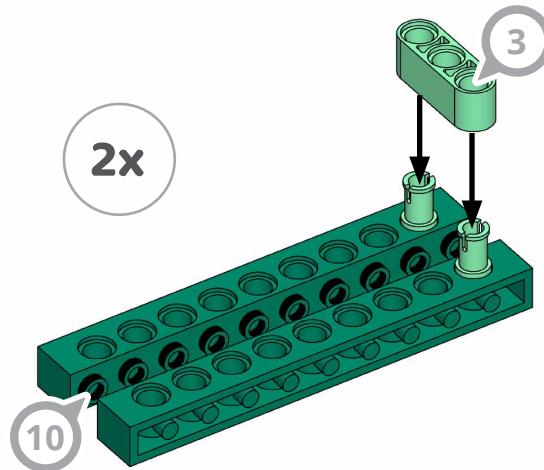
Parts



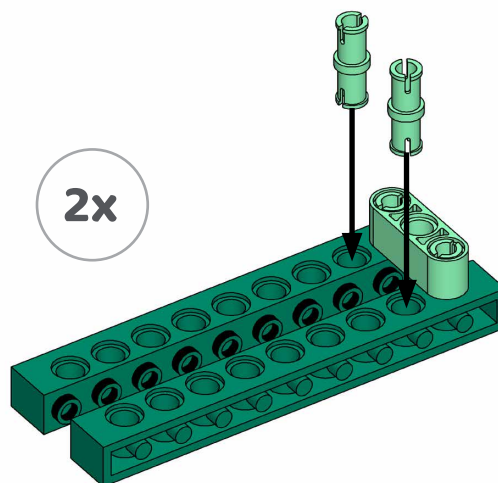
1



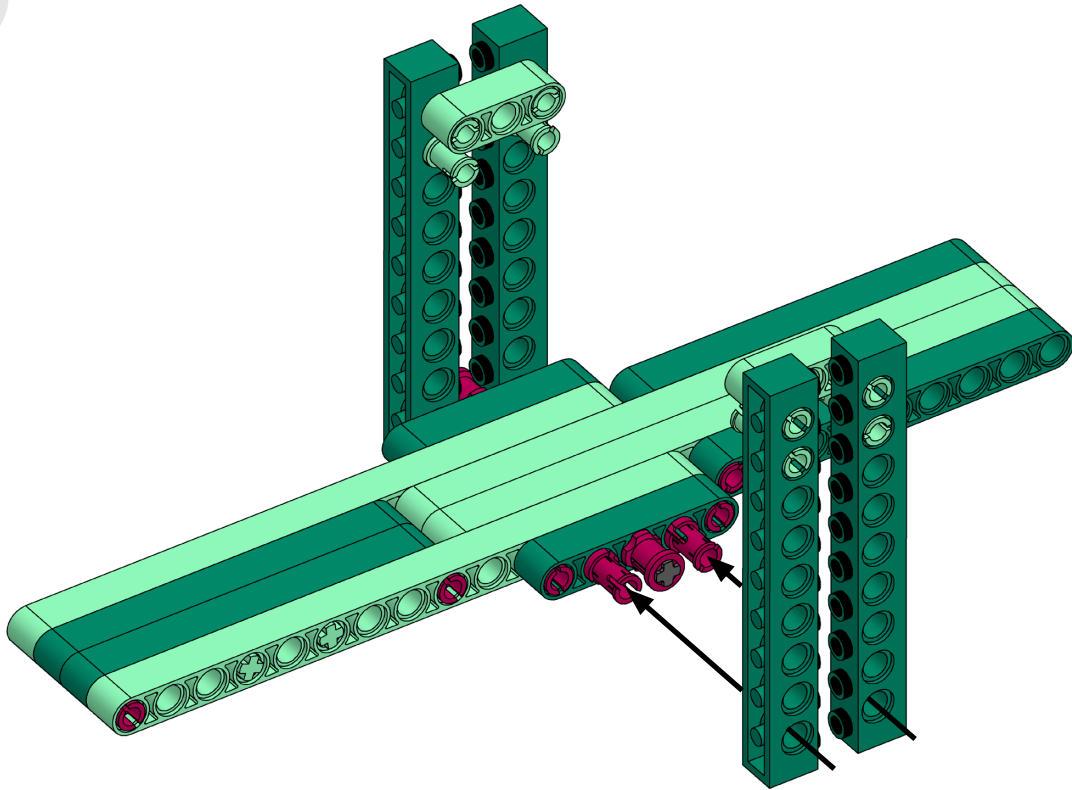
2



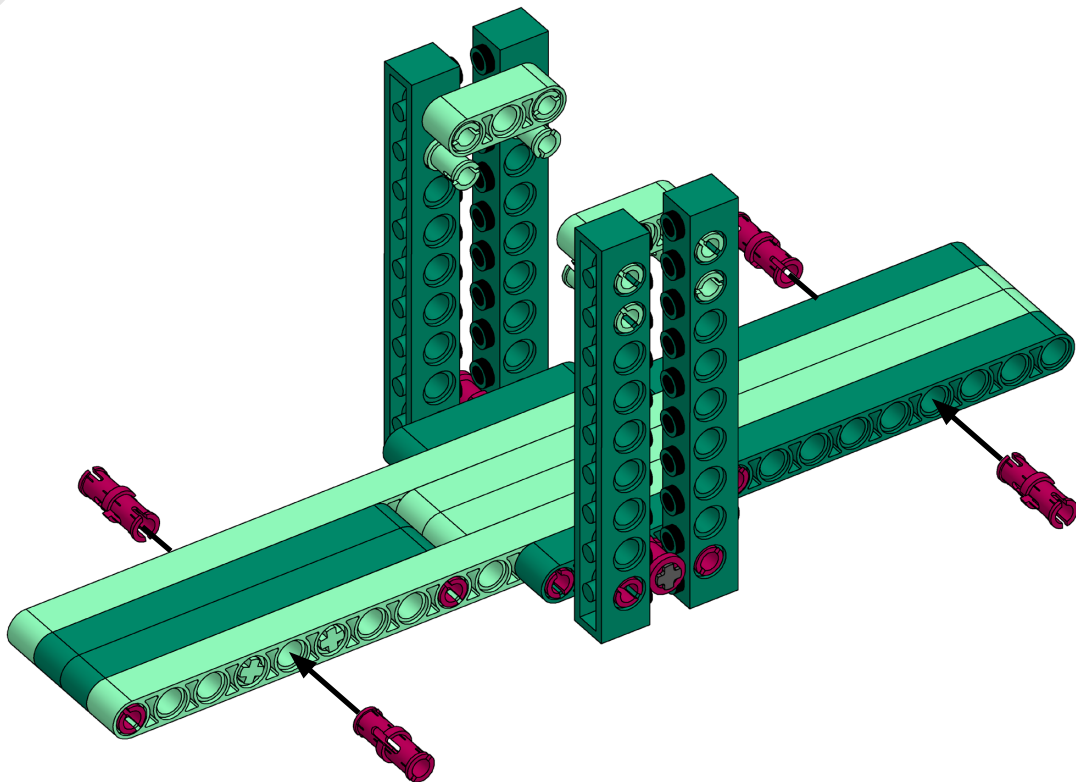
3



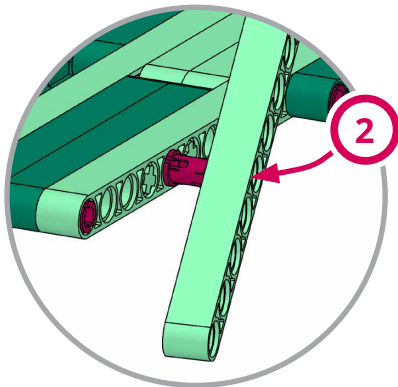
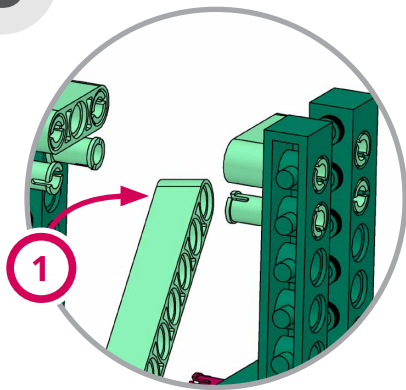
4



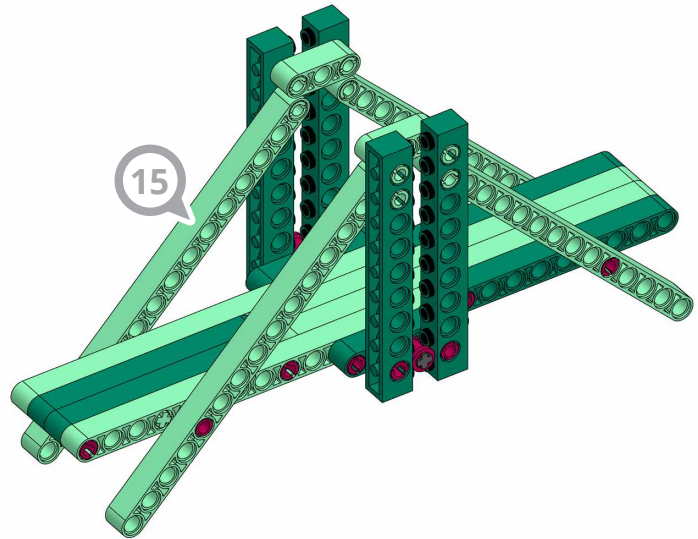
5



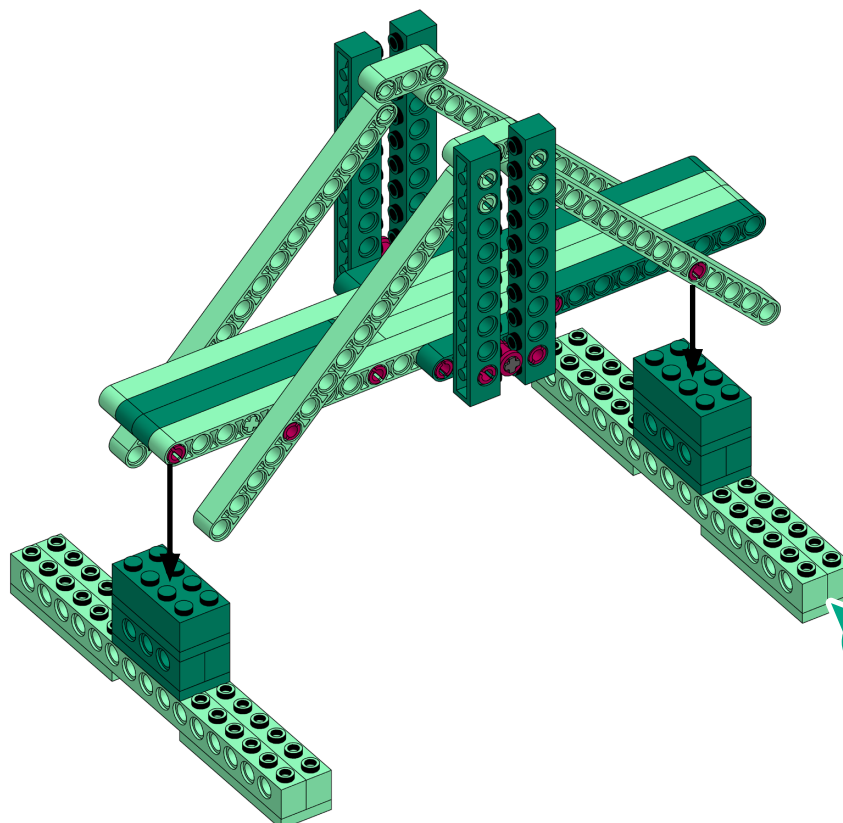
6



15



7



Canyon



