Making Mini Greenhouses

Learning Objective:

To investigate stable structures

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Can you remember how a greenhouse helps plants to grow?

Explain it in as much detail as you can to your partner.

See how many of the words below you can use!

transparent	glass	plastic	sunlight	warm
trap	heat	high	overheat	ventilate

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Today we are going to look at what makes a structure **stable.**

Do you know what this means?

Think, pair, then share your ideas.

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If a structure is **stable**, it is steady, strong and safe.
It is not likely to collapse or fall over.

Do you think these structures are stable? Why? Explain your opinions to a partner.

What would make them more stable? Why?

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The stability of a structure depends on many aspects, but the main two we are going to investigate are...

The **materials** it is made from...

...and the **shape** it is.

Today we are going to focus on how the **shape** of a structure can affect its stability.

Let's have a look at some everyday objects to help us with this...

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Which of these plastic chairs is the **most** stable?

Which is the **least** stable?

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The yellow chair is the most stable.
Did you say this? What reasons did you give?

'The blue chair is the least stable because it only has three legs, and the yellow chair has four legs. You can't sit on a chair with only three legs!'

Do you agree with this explanation?

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This wooden stool only has three legs. Does this mean that it is unstable?

With a partner, discuss the difference in **shape** between both of these three-legged chairs.

Which is **more** stable, and why?

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The wooden stool is **more stable** because the three legs are <u>equally spread</u> apart. This means that when the stool is sat on, the person's weight will be equally spread over the three legs, making the structure **steady, strong** and **safe.**

The plastic chair is **less stable** because the three legs are <u>not equally spread</u> apart. This means that when it is sat on, the person's weight cannot be equally spread over the three legs, making the structure **unsteady, weak** and **unsafe.**

What have you learnt about stability by comparing these chairs?

Think, pair, then share your ideas.

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Which of these tables do you think is the **most stable** and why?

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Did you discuss any of these points?

This table has a small base compared to the size of the top. If a heavy object was placed on the edge of the table, what could happen?

The legs on this table are quite thin, and the wooden top is large and heavy. What might happen if lots of heavy objects were placed on the table?

The two wide, thick legs on this table will make it stable. Where could the legs be placed to make it even more stable?

The four legs on this table have been made even more stable by being joined together at the base. Can you explain how this makes it more stable?

What have you learnt about stability by comparing these tables?

Think, pair, then share your ideas.

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So, from looking at the chairs, we know that the weight of the structure needs to be evenly spread on the **base** for it to be stable.

By exploring the different tables, we know that the wider the **base** of a structure is, the more stable it will be.

Let's apply this knowledge to greenhouses... which of these would you say is the most stable structure, and why?

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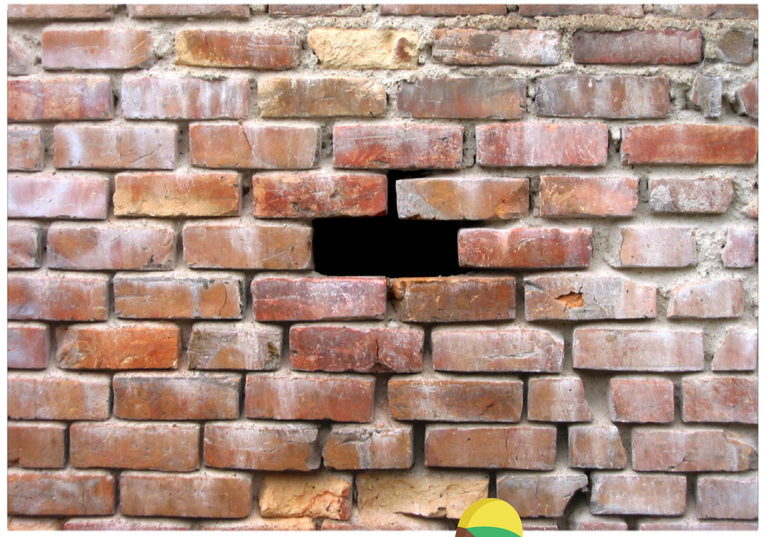
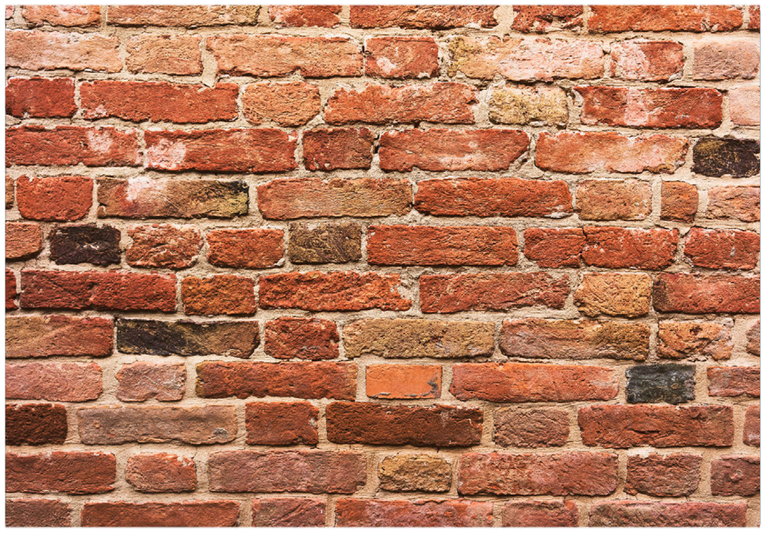
Now let's have a look at the sides of a structure...

Which of these walls is the most stable? Which is the least stable?

Explain your ideas to a partner.





What does this tell you about the sides of a structure and their stability?

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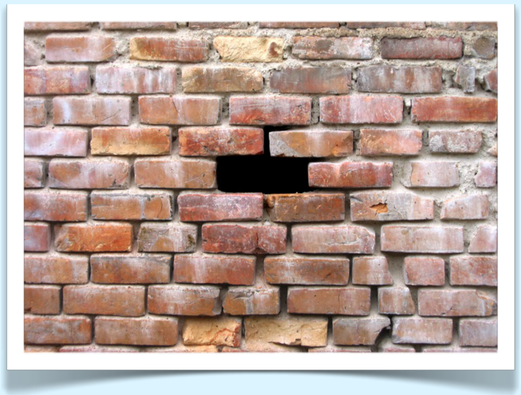
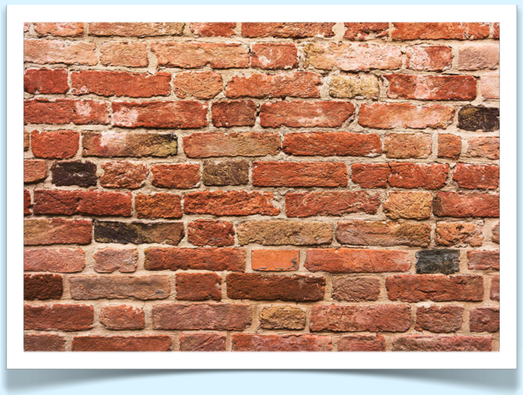
Least stable

Most stable





If the sides, or walls, of a structure have some sections missing, then this is going to make them less stable, and more likely to collapse or fall down.

Now let's apply some of this knowledge about stability to constructing greenhouses...

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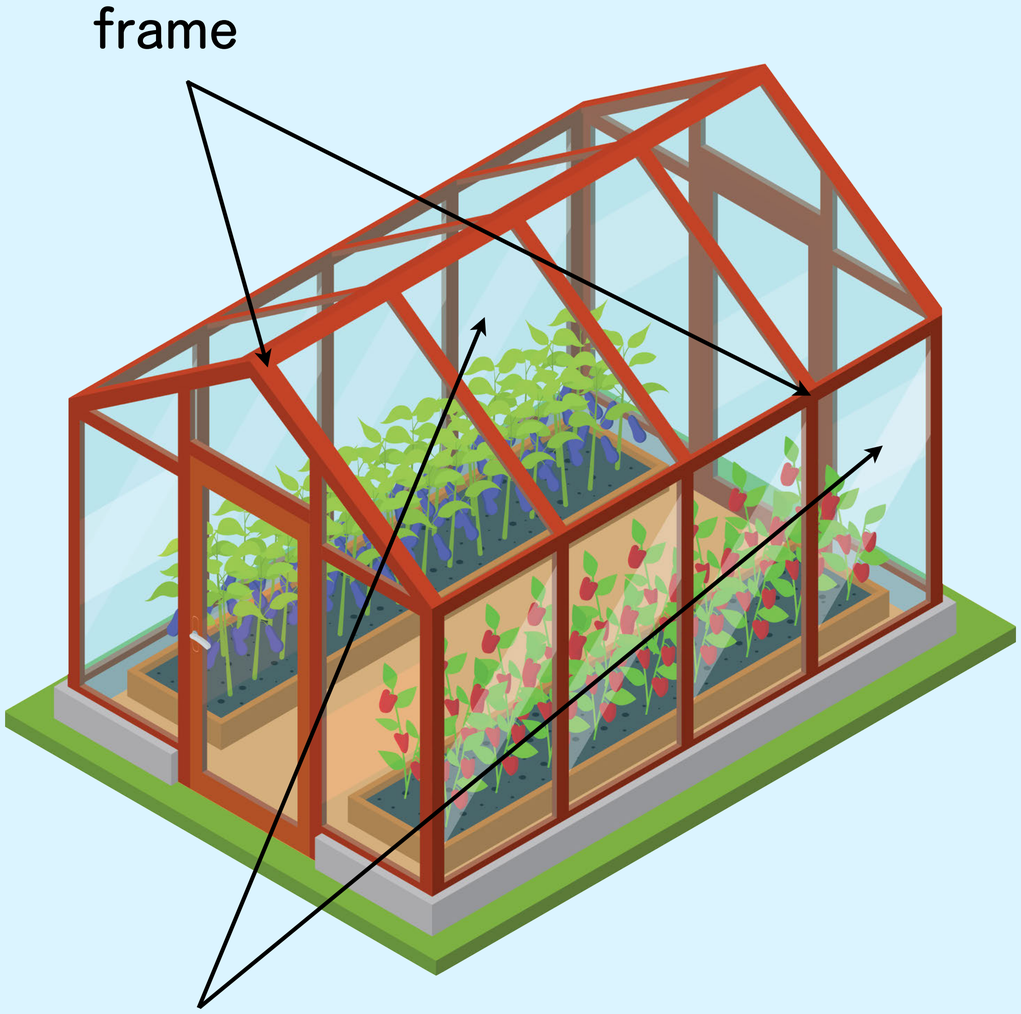
The **frame** of a greenhouse is most commonly made from wood, metal or plastic tubing. However, the sections within the frame are filled with glass or plastic sheeting. These materials can be **less stable** than those that the frame is made from. This means that the frame itself has to be strong and stable, as it has to stop the structure collapsing.



gaps within frame filled with less stable materials

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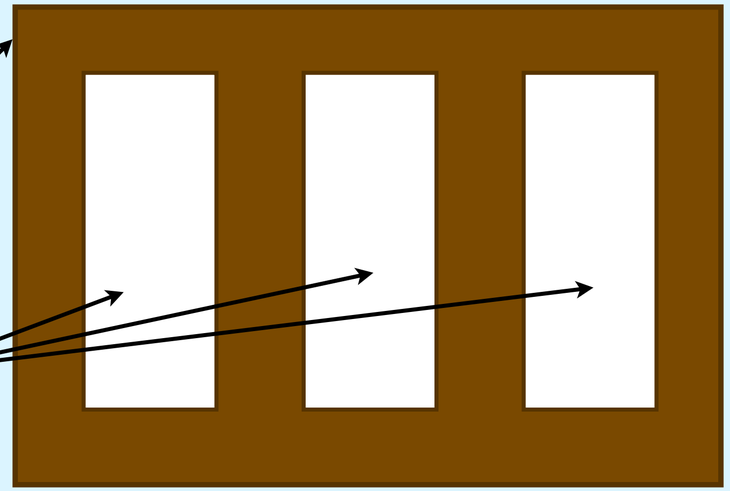
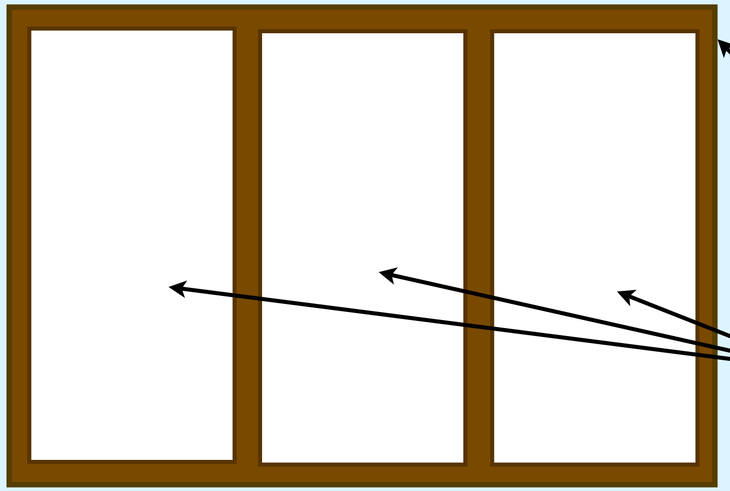
Look at these diagrams of the sides of two different greenhouse designs.





Which will be the most stable structure and why?

Which will let the most sunlight in and why?

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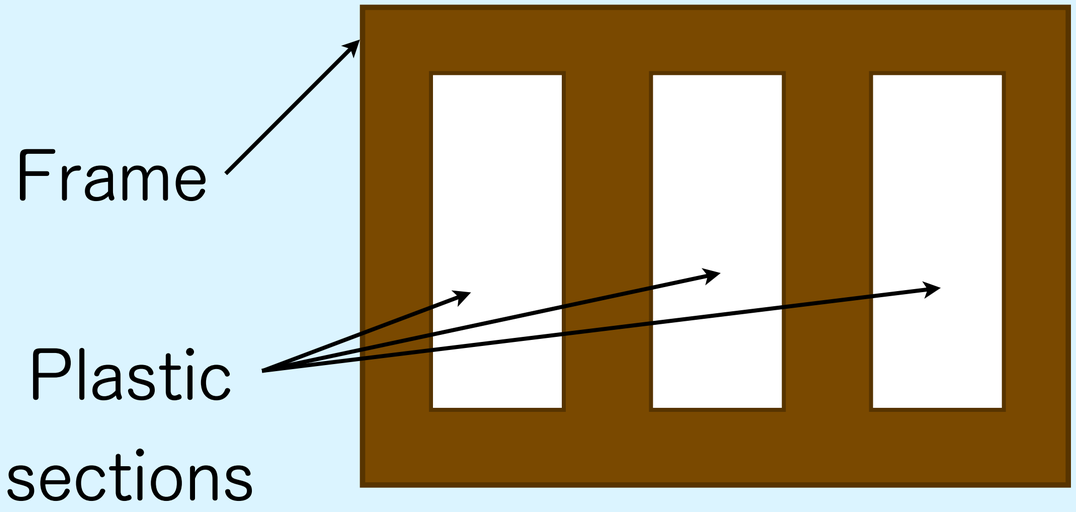
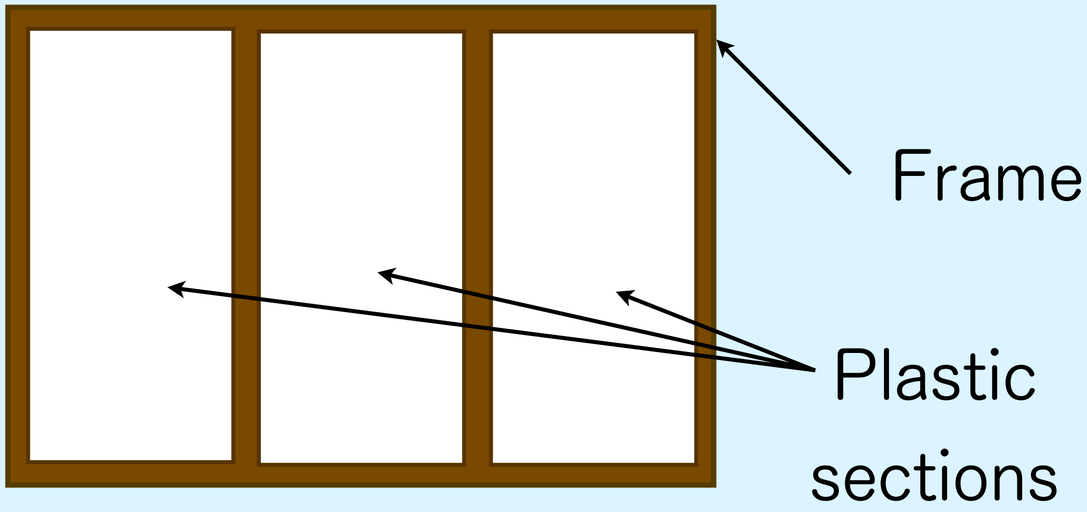


This structure has a **thick** frame. The sections of plastic are **small** so the stability of the frame is **stronger**. However, **less** sunlight can enter the greenhouse.



This structure has a **thin** frame. The sections of plastic are **large** so the stability of the frame is **weaker**. However, **more** sunlight can enter the greenhouse.

Which is the better design for a greenhouse?

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A greenhouse needs to be stable and allow the maximum amount of sunlight to enter.

Today you are going to investigate how to successfully include both of these requirements by exploring the frame sizes of different 3D shapes.

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Plenary:

This doesn't look like a stable structure!

https://upload.wikimedia.org/wikipedia/commons/7/7f/Zillebeke_%283%29.JPG

Can you explain how this structure is standing?

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If the water was stopped, you would be able to see a hollow, metal pipe running from the tap into the ground. This is what keeps the structure stable, even though you cannot see it! The material that the tap is made from will be lighter than it is made to look, so that the metal pipe can easily support it.

https://upload.wikimedia.org/wikipedia/commons/7/7f/Zillebeke_%283%29.JPG

This is what the metal pipe will look like underneath the water.

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