

Bridges

A



_ACTIVITY BOOK
RIBA KS3 | **Mathematics**

By testing the bridge with weights such as toy cars and/or trains, can you demonstrate which bridge is stronger and which is more flexible?



'LET'S DO SOME MATHS!'



ACTIVITY /

Today you are going to help Sophie and Tomas design bridges for Towncaster and will build a model of either a Suspension Bridge or a Truss Bridge.

Your teacher will organise you into groups of 4 or 5 and will explain which bridge you are going to make.

Suspension Bridge / First **check** that you have the right materials. Your group should have:



MATERIAL	SIZE	QUANTITY
Large Sheet of Paper	A2/Flip Chart Sheet	1
Ruler	30cm (or longer)	2
Marker Pens		2
Sticky Tape (on dispenser)	10/15mm Wide	2
Corrugated Card/6mm Thick	A2 sheet or bigger	1
Scissors	To cut the card	4

STEP 1 /

“On the paper, using the rulers and pens, mark out axes on which you are going to plot a graph.

The X axis is -250mm to +250mm and the Y axis is 125mm.

Use the formula:

$$y = \frac{x^2}{500}$$



STEP 5 /

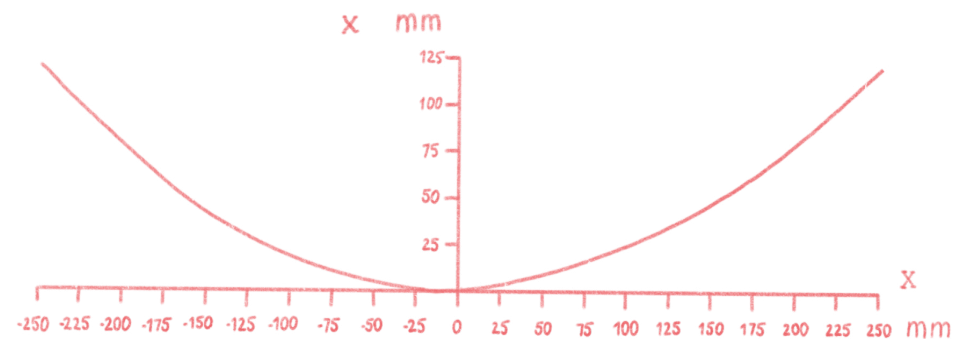
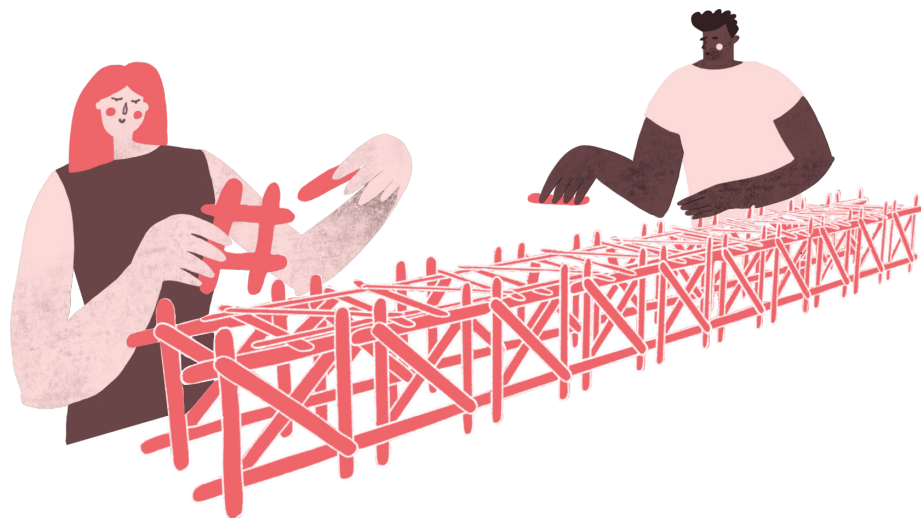


“Assemble the truss structure to the deck to make a bridge which can span between two chairs.”



STEP 4 /

“Make three trusses which are 10 components long and fix them together with glue and sticky tape”



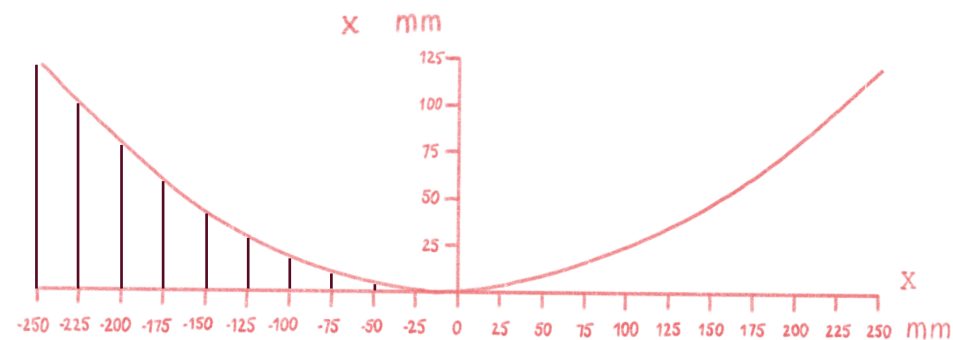
“Plot a graph. It should look like the one above.”

This will be the curve of a suspension cable

Now add the vertical lines for the vertical cable”



STEP 2 /



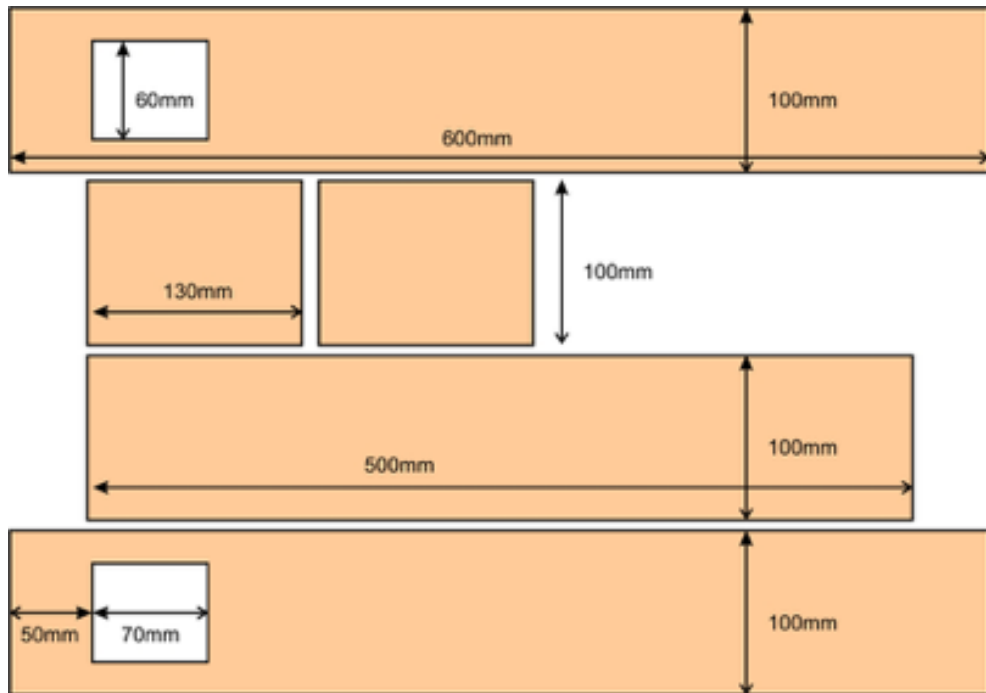
STEP 3 /

“Cut out around the lines to make a delicate cable system made of paper. You will need two of these”



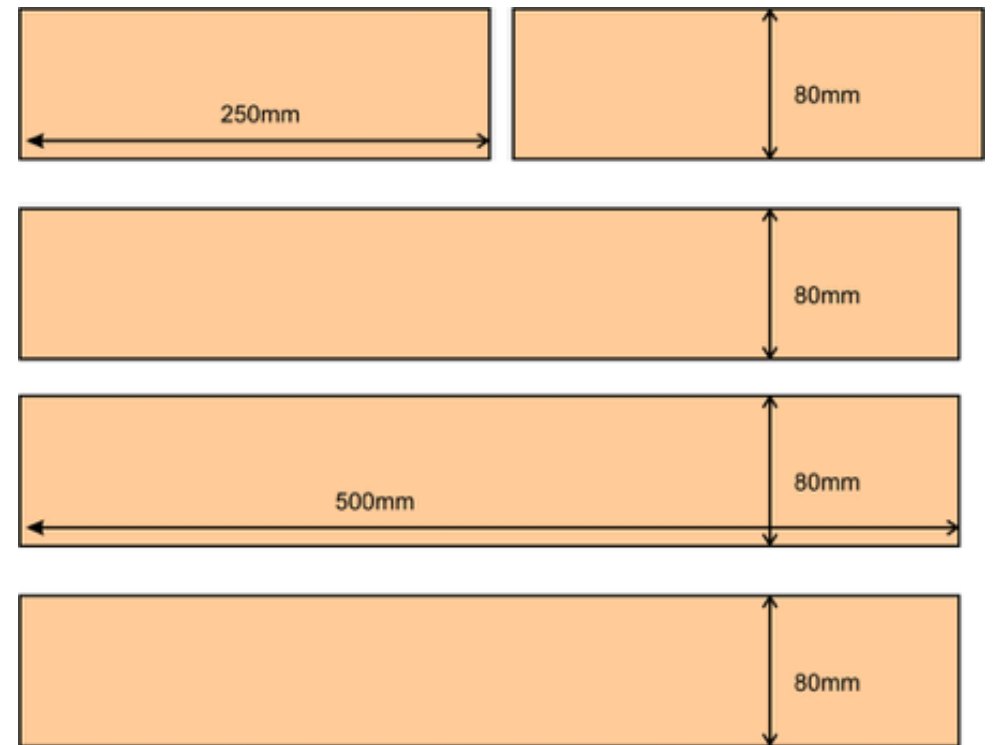
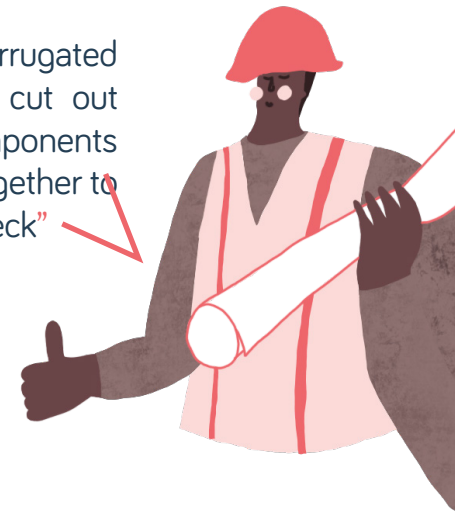
STEP 3 /

“From the sheet of corrugated cardboard draw and cut out the other bridge components”



STEP 3 /

“From the sheet of corrugated cardboard draw and cut out the other bridge components which you can tape together to make a strong deck”



STEP 2 /

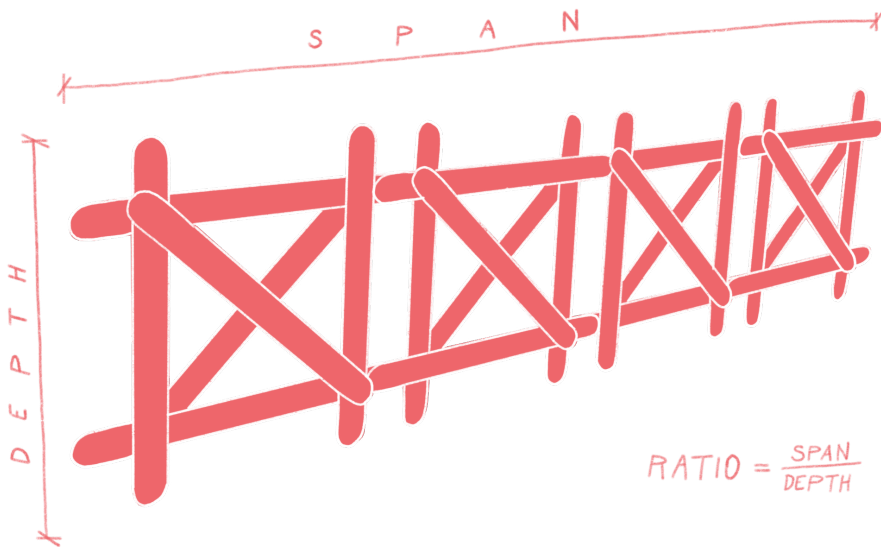


“By gluing together lots of these components you can make a truss.

The bridge we are designing has a span to depth ratio of 10.

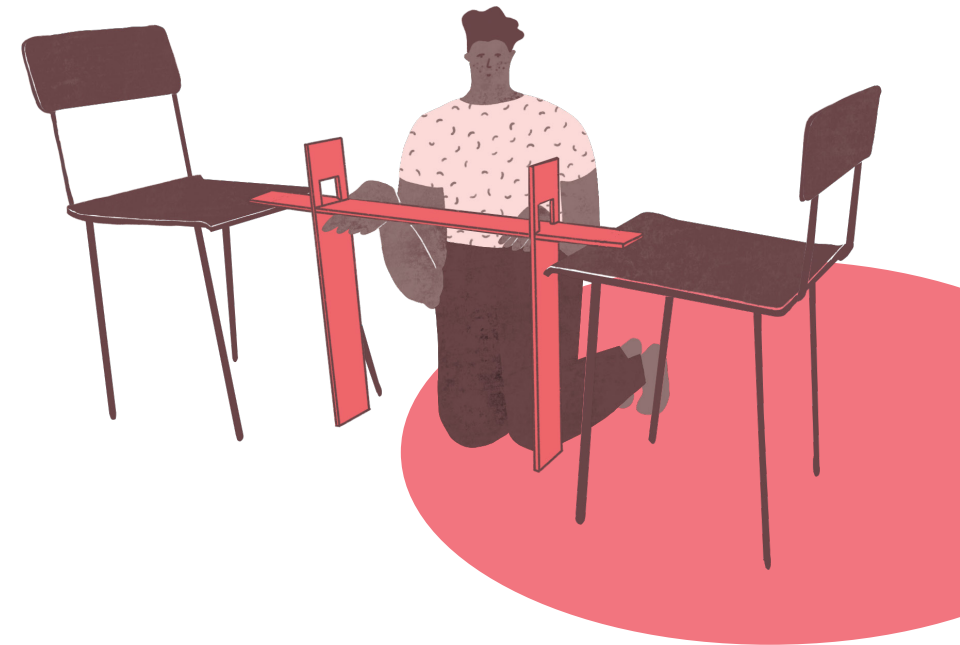
$$R = \frac{\text{Span}}{\text{Depth}} = 10$$

The bridge needs 3 trusses, so you can work out how many lolly pop sticks are needed.”



STEP 4 /

“Using sticky tape you can now assemble the card board components to make a simple bridge which can span between two chairs”



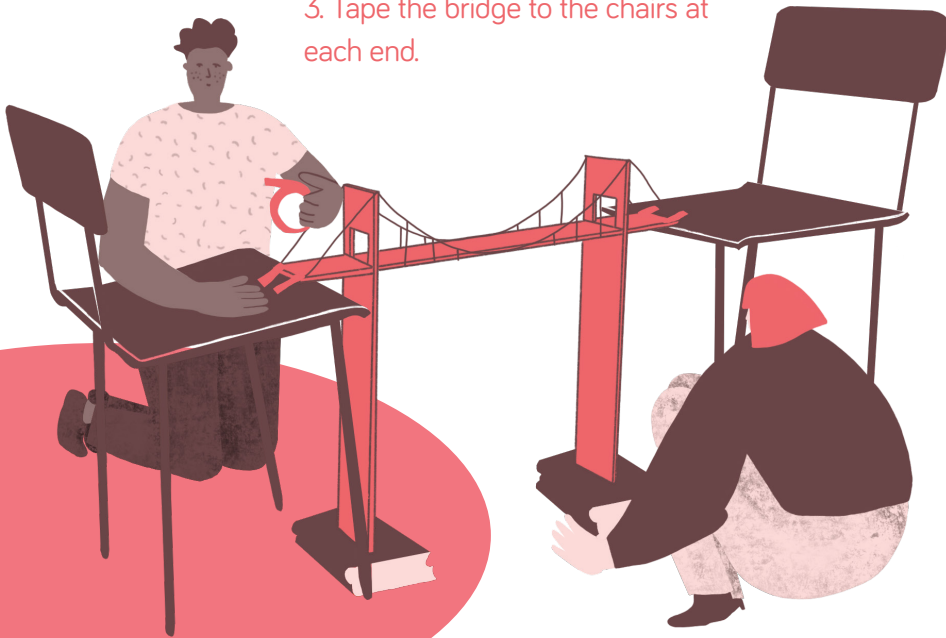
STEP 5 /



“If the vertical pieces don't easily reach the ground add a book or two underneath. This bridge is not very strong so using sticky tape add the paper cables which are surprisingly strong when part of a structural system.”

To make sure this bridge works properly you must:

1. Add the four additional 45 degree cables at the ends of the bridge.
2. Make sure the cables are securely taped to the cardboard at each point.
3. Tape the bridge to the chairs at each end.



Truss Bridge / First check that you have the right materials. Your group should have:

MATERIAL	SIZE	QUANTITY
Lolly Pop Sticks	115mm x 10mm	200
Glue Gun		4 or 5
Glue Sticks		10
Sticky Tape (on dispenser)	10/15mm Wide	1
Corrugated Card/6mm Thick	A2 sheet	1
Scissors	To cut the card	4

STEP 1 /

“Take 6 lolly pop sticks glue them together to make this component”

