

You will need these items:—

Sheet of paper for drawing  
Sheet of paper for folding

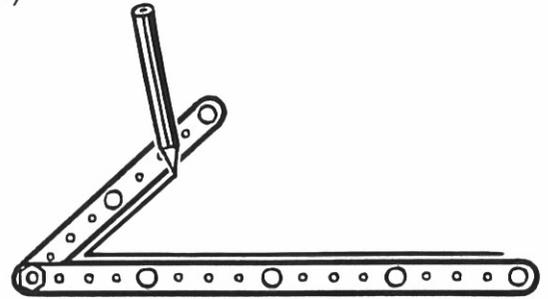
Ruler  
Pencil or pen



Bolt together, loosely, a long and medium length Meccano strip.  
 Hold the long one firmly on the paper and rotate (turn) the smaller arm a little way.

Move the strips to another part of the paper.

Draw this position



Using an arrow mark on your drawing the direction of rotation.

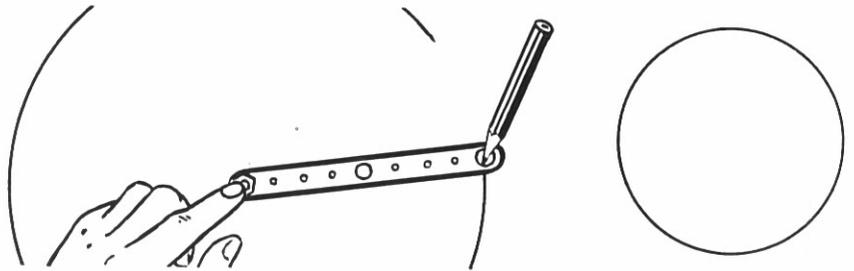


Do this for a number of positions, rotating the small arm still further, until the strips come together again.

Each figure you have drawn is an ANGLE.

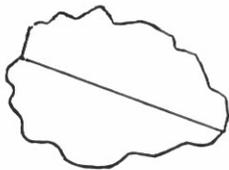
ANGLES are measurements of the AMOUNT OF ROTATION.

Use a strip, a bolt and a pencil.  
 Draw one complete revolution.



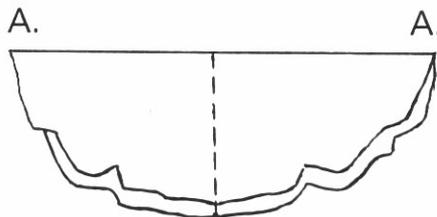
This figure is called a circle.

Take a piece of paper.  
 Fold it anywhere.

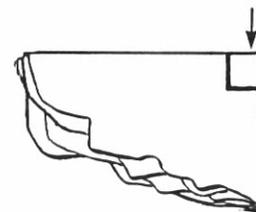


First fold

Fold edge A on itself.



This angle is a RIGHT ANGLE.



Open your folded paper. How many right angles can you find where the creases cross?  
 How many right angles are there in one complete rotation (circle)?

Use your folded paper to find in the class room, shapes which have edges meeting at right angles.  
 Make a list of them.



You will need these items:—

Sheet of paper	Pencil or pen
Ruler	Ruled exercise book



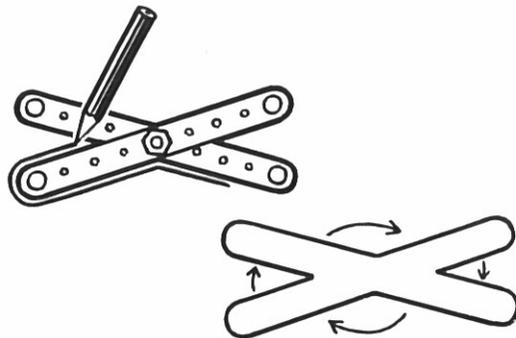
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Join two strips of Meccano at their centres.  
Open the strips slightly.  
Draw all the angles you have made.

Are there any angles which are equal?  
Describe how you discovered this.

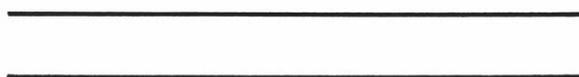
Open your strips into different positions.  
Draw the angles which are made in each position.



What can you find out from your drawings about the angles you have made.

Draw two straight lines which cross. Are your discoveries about the angles they make still true?

Here are two lines which do not meet.



They are said to be PARALLEL.

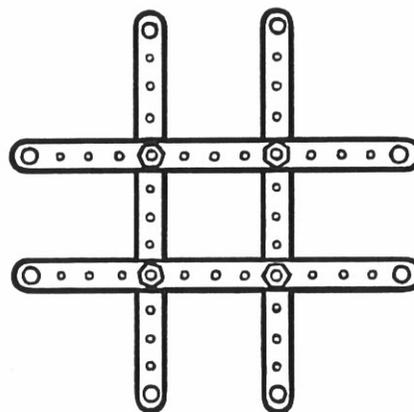
Look at the lines in your exercise book. Do the lines look PARALLEL?

Would these lines meet if you drew them longer and longer?

Turn your book into other positions. Are the lines still parallel?

Make a list of the things you can find in the classroom which are parallel.

Make this figure with 4 pieces of Meccano.  
Be sure to copy the figure accurately.  
Which strips are parallel?

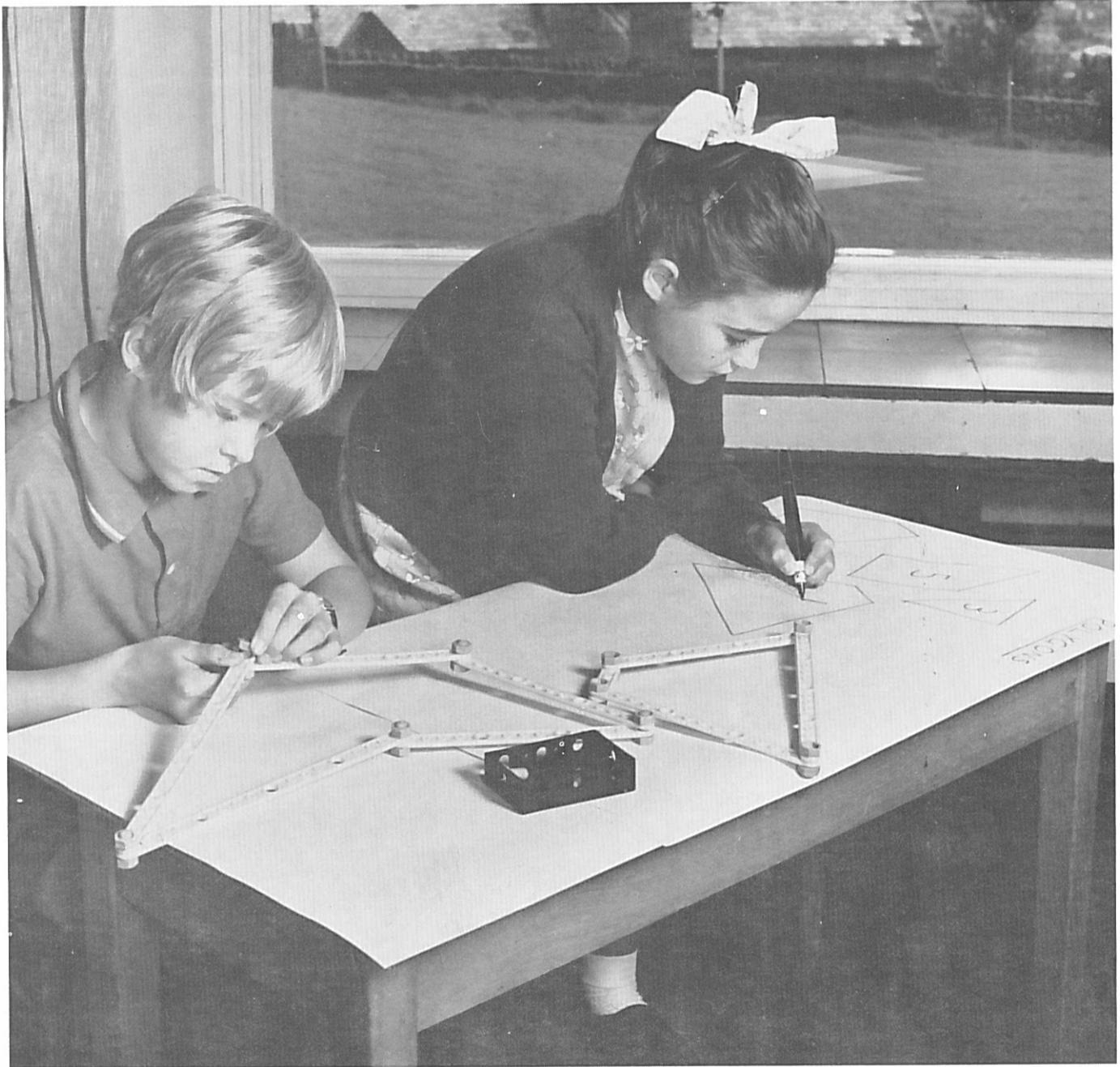


Push on the opposite corners to alter the shape of the figure.  
Are the strips still parallel?

Do the strips always stay parallel no matter how you alter the shape of the figure?

Move the figure into different positions.  
Draw round it in each position.

What can you discover about the angles you have drawn?

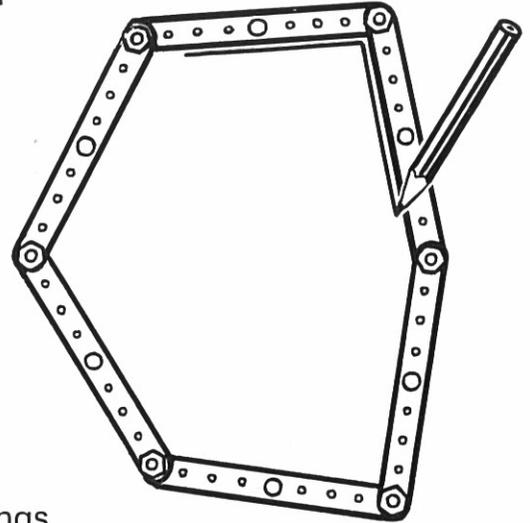


You will need these items:—

Sheet of paper  
Coloured Pencils or pens



How many different shapes can you make with the strips?  
 Put the shapes on to a sheet of paper.  
 Draw round the inside of  
 your shapes.  
 Undo the shapes and make  
 different ones.  
 Draw your new shapes.  
 Colour the drawings which are the same  
 shape but a different size. Use different  
 colours for different shapes.

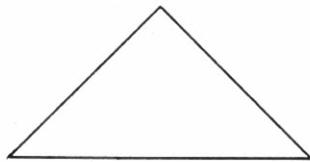


In the centre of each drawing write how many sides it has.  
 What can you say about your drawings?

Complete this table.

Number of sides	Number of angles inside each drawing (internal angles).

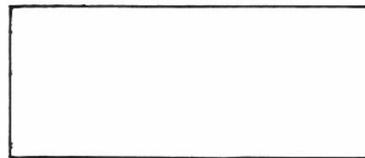
All the shapes you have drawn are called POLYGONS.  
 Here are some polygons with special names.



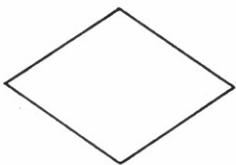
triangle



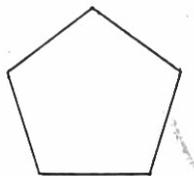
square



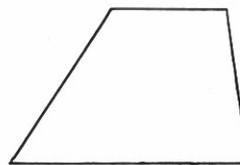
rectangle



rhombus



pentagon



trapezium

Can you discover any more?



You will need these items:—

Sheet of paper

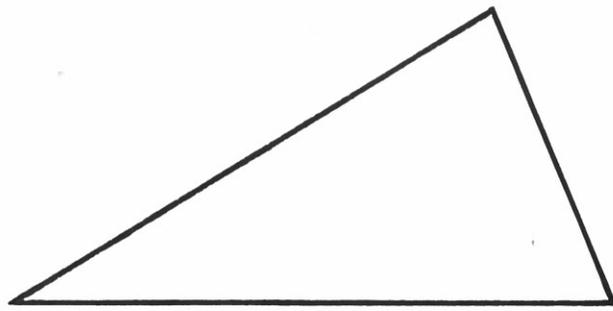
Coloured pencils or pens

Scissors

Gummed coloured paper



This is a TRIANGLE



A triangle has ..... sides and ..... internal angles.

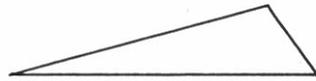
How many different shapes of triangle can you make?

Draw them.

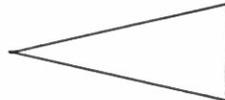
Look at your drawings carefully. How many triangles have you drawn which are the same shape but a different size. Colour them using a different colour for a different shape.

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Special triangles



Scalene



Isosceles



Equilateral

Make these triangles.  
Draw them.

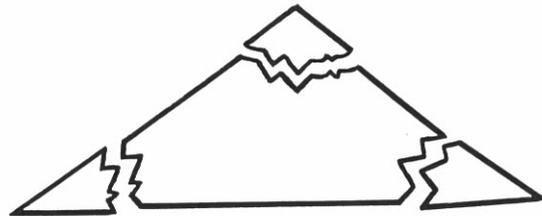
Discover all you can  
about their sides  
and internal angles.

Make drawings of things in the classroom which form a triangle.  
Label them with their special names.

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Cut out one of your drawings of a triangle.

Tear off the angles



Fit the angles together

What is formed?

How many right angles is this?

Each triangle has ..... sides and ..... angles,  
which added together equal ..... right angles.



Cut out scalene, equilateral and isosceles triangles from sticky, coloured paper. Using only one sort of triangle what other shapes can you make from it?



You will need these items:—

Sheet of paper      Pencil or pen

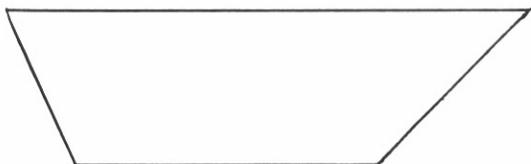
Scissors



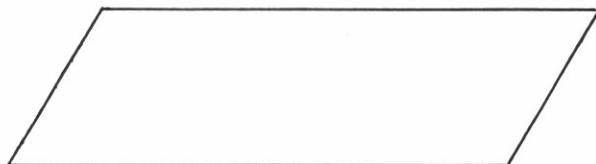
Using only 4 strips for each shape make as many different shapes as you can.  
Draw your shapes.

All these shapes you have drawn are called QUADRILATERALS

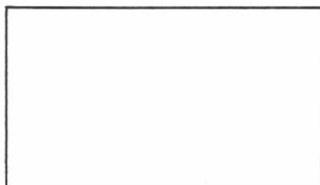
Special quadrilaterals.



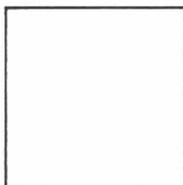
trapezium



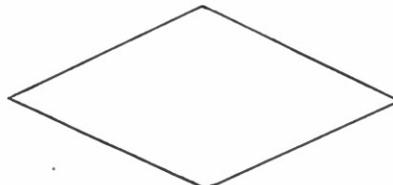
parallelogram



rectangle



square



rhombus.

Find these special quadrilaterals in your drawings and label them.

Copy this table and complete it.

	1 pair of opposite sides equal	2 pairs of opposite sides equal	all sides equal	1 pair of opposite sides parallel	2 pairs of opposite sides parallel	opposite angles equal	Number of right angles
Trapezium	No	No	No	Yes	No	No	
Parallelogram							
Rectangle							
Rhombus							
Square							

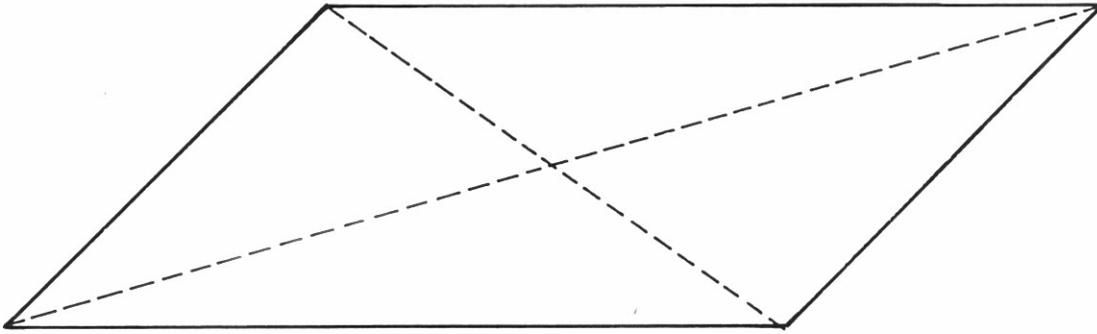


You will need these items:—

Sheet of paper      Scissors  
Pencil or pen



Make drawings of the five special quadrilaterals on card 5.  
 Draw the DIAGONALS in each of your drawings.



Look at the diagonals carefully. Copy this table and complete it.

	Are the diagonals equal?	Are the diagonals at right angles?	What else can you discover about the diagonals.
trapezium			
parallelogram			
rectangle			
rhombus			
square			

Find as many examples of these shapes as you can.

Cut out one of your quadrilaterals.  
 Tear off the angles.  
 Fit the angles together.  
 How many right angles are formed?

Now try the same with other quadrilaterals.  
 Do the angles of each quadrilateral equal the same number of right angles?



You will need these items:—

Sheet of paper	Gummed coloured paper
Pencil or pen	Ruler



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The next shapes you will make are REGULAR shapes. Their sides are equal and each interior angle is equal.

Make each shape with the same size strip. Copy the shapes and label them. Remember the interior angles must be equal.

Pentagon — 5 sides      Heptagon — 7 sides      Nonagon — 9 sides  
 Hexagon — 6 sides      Octagon — 8 sides      Decagon — 10 sides

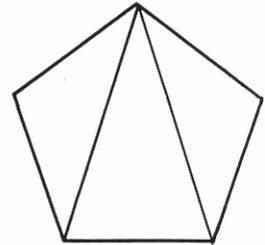
Can you find these shapes:—

1. Around your classroom and school?
2. In nature? For example: what shape are bees' cells?

Cut out a number of each shape in coloured, sticky paper. Make patterns with each shape, fitting them as closely as you can. What can you discover from your patterns?

With the help of Meccano strips, draw a pentagon.

Join the angles as shown in the diagram. How many triangles are formed?



Discovery Card 4 shows you that the interior angles of a triangle are equal to 2 right angles. Therefore the interior angles of a pentagon are equal to ..... right angles.

Now draw a square, hexagon, heptagon, octagon etc. in the same way as you drew the pentagon, and join the angles in a similar way.

Complete this table.

Geometrical figure	Number of sides	Number of triangles formed	Number of right angles in the sum of interior angles
triangle	3	1	2
square			
pentagon			
etc.			



You will need these items:—

Sheet of paper  
Pencil or pen



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For all the shapes on this card use only the strips with three holes.  
Do not fasten the nuts and bolts tightly.

Make a triangle and a regular quadrilateral.

Can you push either out of shape ?

Can you make the quadrilateral stronger by adding one strip ?

What can you say about your shape now ?

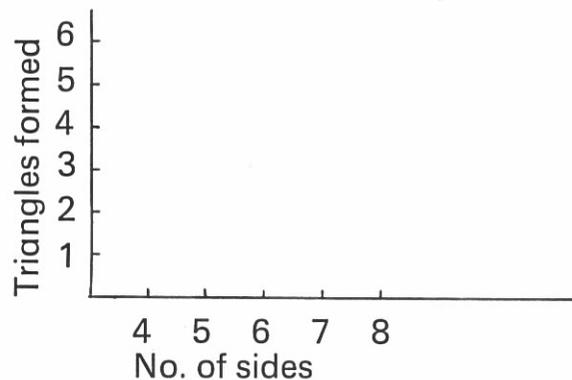
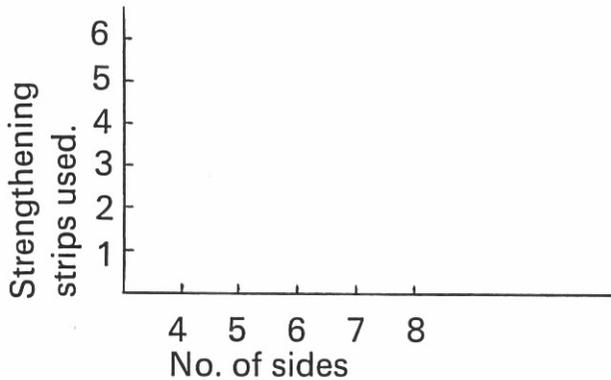
Make a regular pentagon, hexagon, heptagon and octagon.

How can you make your shapes stronger by using the least possible number of strips ?

How many triangles are there in each of your new shapes ?

	Number of sides	Number of strengthening strips used.	Number of triangles formed.
quadrilateral			
pentagon			
heptagon			
hexagon			
octagon			

Draw these graphs

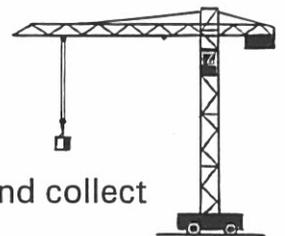


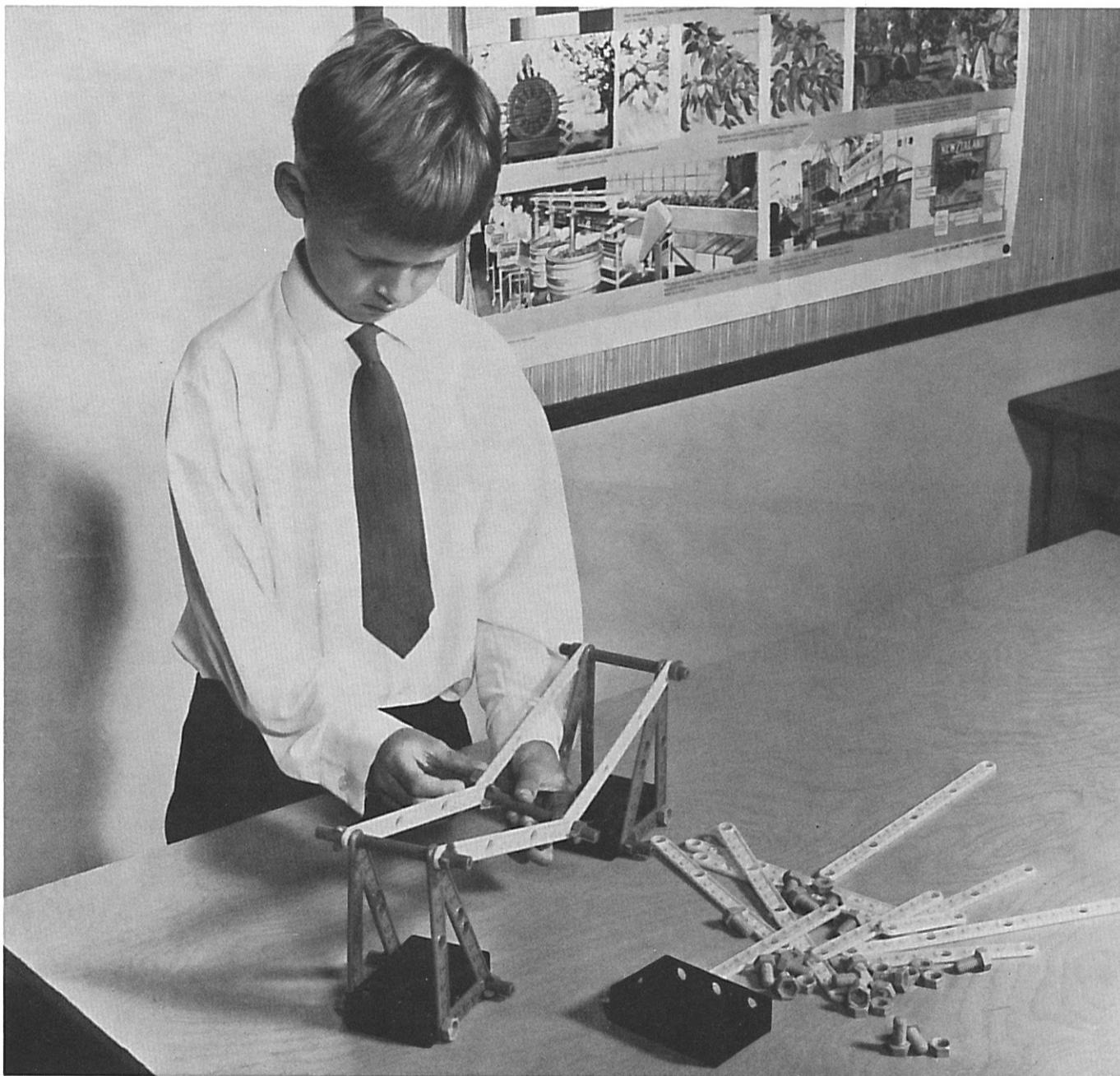
A triangle is a rigid shape.

Examine a bicycle for triangular shapes.

Draw a bicycle with all triangles in red.

Look for triangular shapes in buildings and structures. Make drawings and collect pictures of them.





You will need these items:—

Sheet of paper  
Coloured pencil or pen



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John is building a bridge. He found two ways of making it rigid.

One way, he used four "3 hole" strips.

The other way, he used ten "4 hole" strips.

Can you discover the two ways he built his bridge? (Remember: which is the only rigid shape?)

Which of his ways of building a bridge would be stronger?

Why would this be?

Press in the centre of the bridge. What happens?

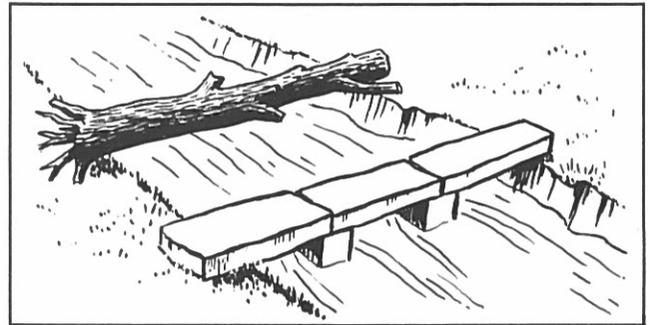
How could this be prevented?

Can you find any other ways in which John could have finished his bridge?

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The earliest bridges were tree trunks placed across streams.

Flat stones placed on piles were also used. These are called 'CLAPPER' Bridges.

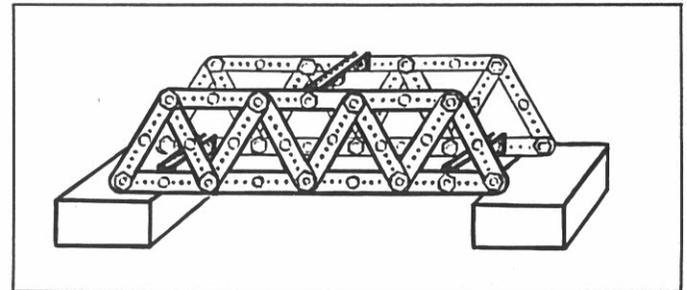


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The bridge John built was a "BEAM" or "GIRDER" Bridge.



A Bailey Bridge



Meccano beam bridge

Where does the weight of the bridge rest?

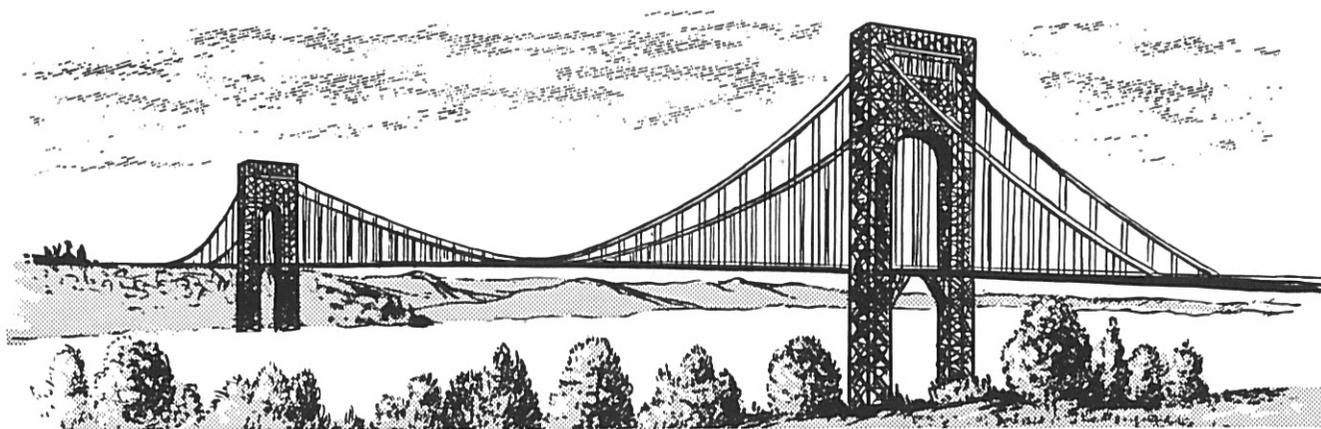
If you made a long beam bridge, how would you prevent it sagging?

Draw how you would make it.

Look for beam bridges in your district.

Make a model of one of them.

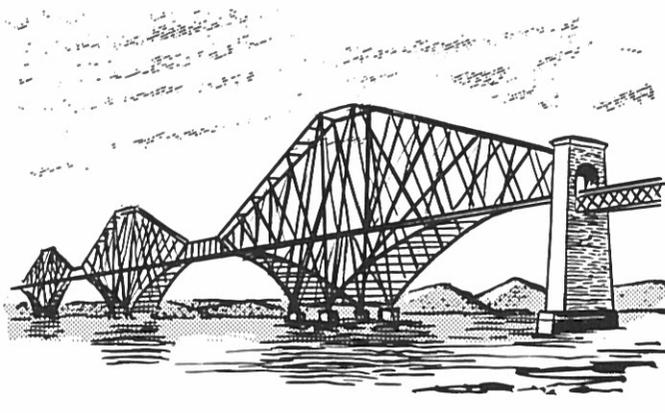
Suspension bridge



Arch bridge



Cantilever bridge



You will need these items:—

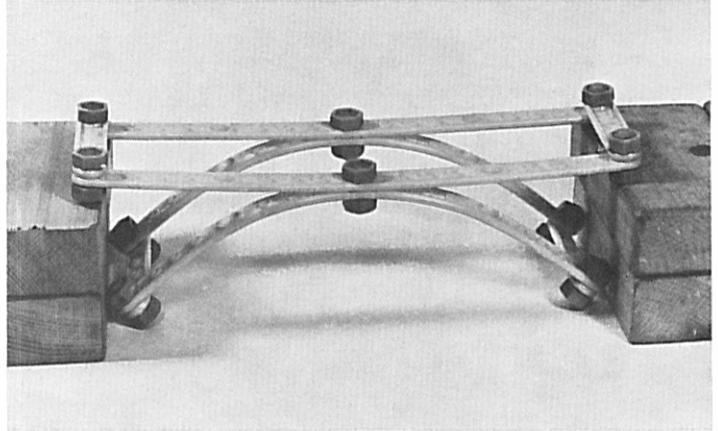
An elastic band

A weight (a book, plasticine)



Make an arch bridge.

The two curves are made by bending two "4 hole" strips. An elastic band stretched between two end nuts helps to keep the curve.

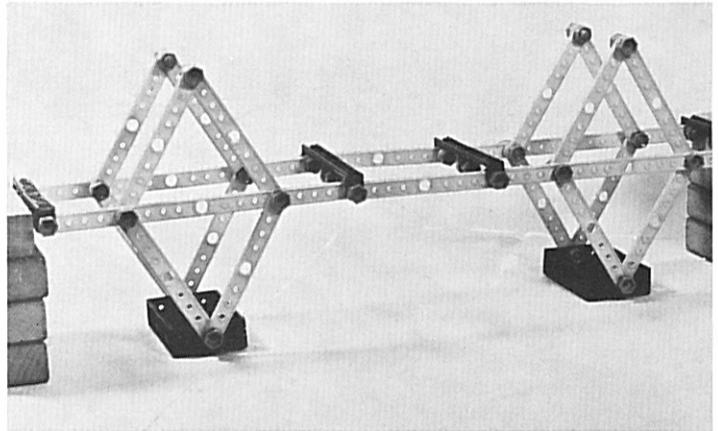


Place a weight in the centre of the bridge.  
What happens to the shape of curve and the ends of the curve?  
In what direction does the weight thrust (push)?  
Without joining the ends of the curve, how would you stop them moving?

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Make a cantilever bridge.

The supports of a real bridge are built firmly on piles in the valley or river. Make yours firm by connecting the bases of piles with strips of Meccano. Place a heavy weight at different positions along the bridge. What happens to the ends of the bridge? What would you have to do at the ends to prevent this?



Look at the picture of the suspension bridge.

Make a model of a suspension bridge.

What can you discover about (a) how the bridge is held rigid?  
(b) the direction in which the weight of the bridge is acting?

Make a collection of pictures and drawings of the various types of bridge in your district. Discover all you can about them.