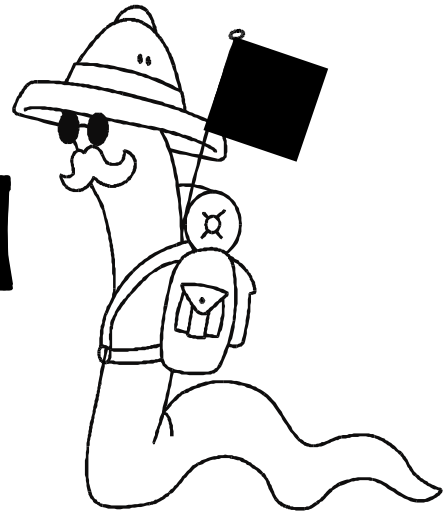


# The second Platonic solid



## What are you trying to do?

- ◆ Discover the second Platonic solid based on squares

## What will you need?

- ◆ Brenex paper squares in 6 colours, "How to make an origami cube" instruction sheet (and parent helper if possible)
- ◆ Toothpicks/marshmallows, straws/pipe cleaners (cut into 4 cm lengths), square polydrons, net of a cube/scissors/glue
- ◆ "What does it look like?" workcards

## How many can play?

- ◆ Whole class, small groups

## How do you play?

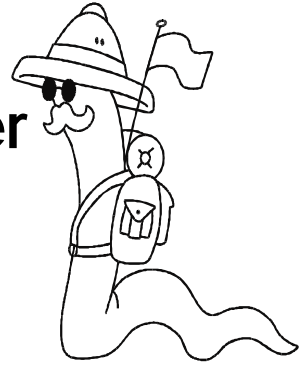
- ◆ The second Platonic solid is made entirely from squares. What is a square? List the special features. What 3D shape do you know that has every face a square? (a cube)
- ◆ Break into 4 groups. Challenge each group to construct the second solid using the suggestions on the "What does it look like?" workcards.
  1. Origami cube (with teacher or parent helper)
  2. Toothpick/marshmallow cube
  3. Straw/pipecleaner cube
  4. Square polydron cube (and other 3D shapes e.g, rectangular prism)
  5. Cut/fold/paste net of cube
- ◆ Discuss discoveries together. Another name for a cube is a 'hexahedron'. List all the special features. Record details on the Euler's Theorem worksheet.

## Variation

- ◆ Fast workers discuss "What if ...?" or cut out and fold the net to make a cube.
- ◆ Follow up with the "Draw a cube" worksheet. Can you discover any other ways to draw a cube?

# What does it look like?

Which 3D shape do you discover  
when you join 3 toothpicks  
to each marshmallow  
and you make only squares?  
How many skewers do you use?  
How many marshmallows?



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# What does it look like?

Which 3D shape do you discover  
when you join 3 straws  
to each corner  
and you make only squares?  
How many straws do you use?  
How many corners?



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# What does it look like?

Construct 3D objects using only square polyhedrons.



What shapes do you discover?  
How many corners, faces, edges?



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# What does it look like?

Cut out the net of a cube.  
Fold and glue the tabs  
to construct the 2nd Platonic solid.



Describe real life objects  
which have this shape.

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# What's a Soma cube?

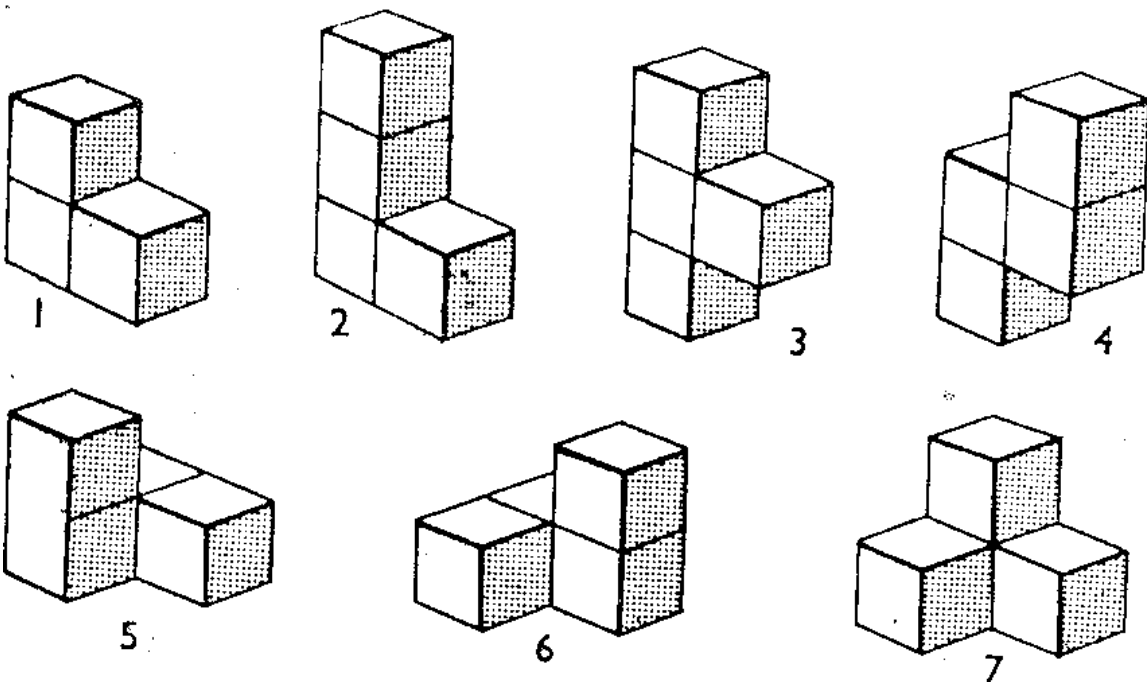
This special cube was invented by a Danish mathematician called Piet Hein.

Find out how to make your own using 27 cubes glued together to make the 7 different pieces.

There are over 100 different ways to construct one large cube using these 7 pieces. Can you discover one solution?



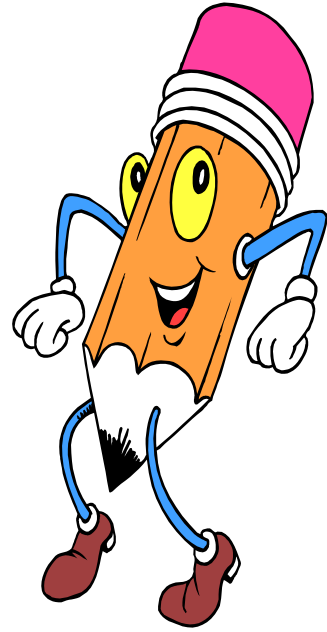
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# What if ...?

Imagine if common real-life objects were shaped like a cube.

List the advantages and disadvantages of this shape.

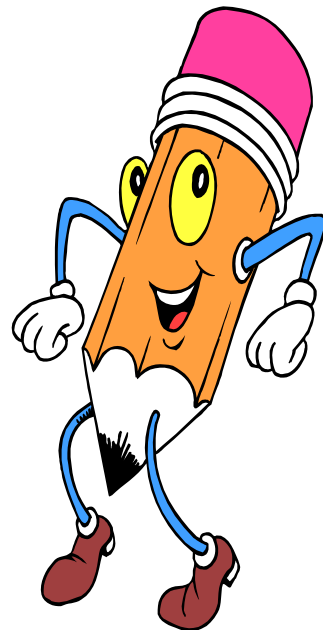


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# What if ...?

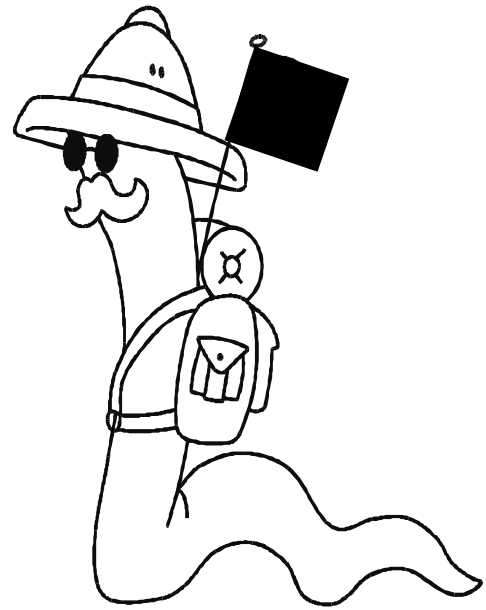
Imagine if common real-life objects were shaped like a cube.

List the advantages and disadvantages of this shape.



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# Origami Cube



## What are you trying to do?

- ◆ Construct a cube by paper folding

## What will you need?

- ◆ Samples of origami shapes made from paper
- ◆ Various coloured paper squares
- ◆ An Origami Cube instructions card
- ◆ Six different coloured paper squares for each person (e.g. 20 x 20 cm)

## How many can play?

- ◆ Small groups, individuals

## How do you play?

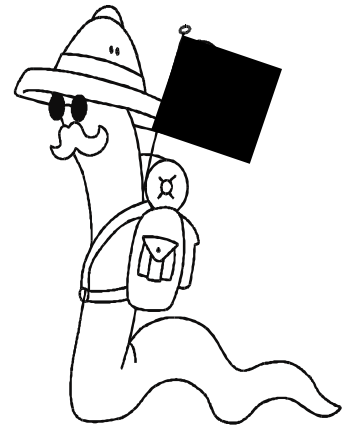
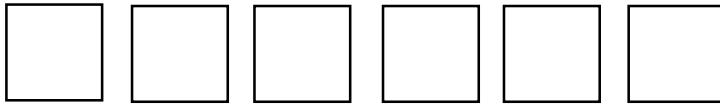
- ◆ Discuss the shapes of the origami examples.
- ◆ How could you paper fold a cube?  
Discuss each suggestion. Experiment to see if any work.
- ◆ Make an origami cube. The Origami Cube card shows one way to construct a cube from paper. Use this if other methods are unsuccessful. This cube is extremely strong and lends itself to use in group games. It can withstand rough treatment.
- ◆ Decorate your cube. What could you use it for? e.g. Make a die by writing numbers from 1-6 on each face. Toss your die twice and multiply the numbers. What else can you do with it?

## Variation

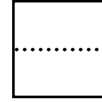
- ◆ Research in origami books or on the internet to discover other regular 3D shapes you can construct by paper-folding.

# How to make an origami cube

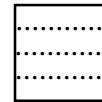
- You need 6 different coloured Brenex paper squares.



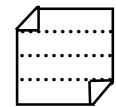
- Fold one square in half, with the coloured side to the back. Press firmly then open out again.



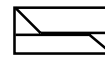
- Fold the top edge down to touch the centre fold line. Fold the bottom edge up to touch the centre fold line. Press fold lines firmly then open out again.



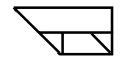
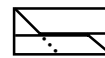
- Fold the top left corner down to the upper fold line to make a triangle. Fold the bottom right corner up to the lower fold line to make a triangle.



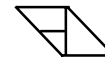
- Fold the top section down to meet the centre fold. Fold the bottom section up to meet the centre fold.



- Fold the bottom left corner to touch the centre of the top edge. Press the diagonal firmly, then open it out and tuck the bottom left flap under the top flap.



- Fold the top right corner to touch the bottom edge. Press the diagonal firmly, then open it out and tuck the top right flap under the bottom flap.



- Fold the right and left end flaps back to reveal a small square formed from 4 small triangles. This section is now one side of your origami cube.



- Two sides have flaps and two sides have no flaps.

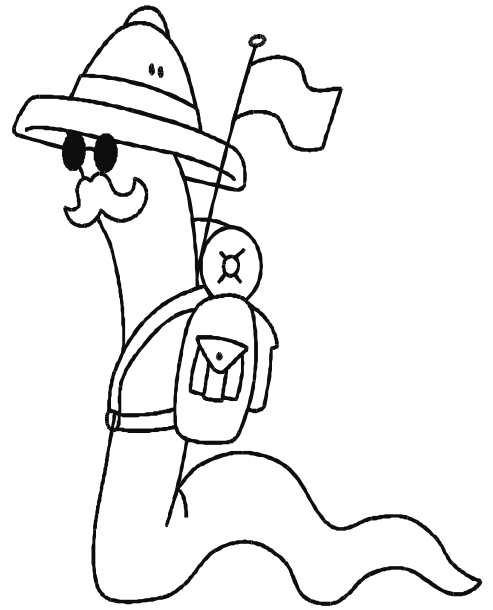


- Repeat each step above for the other 5 paper squares. You will then have 6 identical shapes.

- To make your cube, carefully tuck a side flap of one square into the front of a non-flap side of another square. Repeat until all the sides flaps have been tucked in. There should be no extra flaps left on the inside of your cube. Each flap must be tucked in on the outside of each face.

- You should now have a beautiful origami cube.

# Blowing Bubbles



## What are you trying to do?

- ◆ Investigate shapes made by 3D bubble blowers

## What will you need?

- ◆ Bubble blowers in the shape of 3D solids e.g. cube, tetrahedron
- ◆ Bubble mix in a container large enough to cover the bubble blower
- ◆ Fine wire, scissors

## How many can play?

- ◆ Whole class demonstration, small groups

## How do you play?

- ◆ Discuss the shape of each bubble blower.
- ◆ Predict what shape you think the bubble will be. Give reasons for your prediction.
- ◆ Dip the bubble blower into the bubble mix. Gently blow until a bubble forms.
- ◆ Discuss your discoveries. How close were your predictions?
- ◆ Explore making different 3D shapes with the wire. Investigate the different bubble shapes they each create.

## Variation

- ◆ Investigate different types of bubble mix by adding more water or more detergent to your mixture. What combination seems to make the best bubbles?
- ◆ Collect a variety of bubble makers from small to very large. What's the size of the smallest bubbles you can make? ... the largest?

# Draw a Cube



## What are you trying to do?

- ◆ Recognise a 3D shape in a 2D diagram or photograph
- ◆ Draw a 3D shape from memory
- ◆ Identify the number of edges, faces, vertices of a 3D shape

## What will you need?

- ◆ Various size cubes, including transparent ones
- ◆ Straws, pipe cleaners, scissors
- ◆ Paper, pencils
- ◆ "Complete the cube" worksheet

## How many can play?

- ◆ Small groups, individuals

## How do you play?

- ◆ Impress me with all you know about a cube.  
e.g. Some rooms are this shape, it is a prism, cubes stack well, they have 6 faces.
- ◆ Examine a variety of cubes. What are the essential features?
- ◆ Construct a cube from pipe cleaners. Join the ends by cutting pipe cleaner into small pieces. What is special about this construction?  
e.g. It is a skeleton, you can see through it.
- ◆ How do you draw a cube? e.g. Is it a solid shape or can you see through it?  
Is this a cube? What is similar? What is different?
- ◆ How many different ways can you discover to draw a cube?  
Give a time limit e.g. 5 minutes. Discuss the different solutions together.

## Variation

- ◆ Look at the "Complete the cube" worksheet.