# Maths-Whizz®
by whizz EDUCATION

# Making Maths Stick
## End of year six

## Maths-Whizz account details:

Username _____

Password _____

🌐 www.whizz.com

📘 @MathsWhizzTutor

🐦 @MathsWhizzTutor

# Contents

# Making Maths Stick

## Did you know?

At Whizz Education, we've been examining our live learning data which shows that **children can lose 2.6 months' worth of learning** when their learning is disrupted for 6 weeks (say, because of the summer holiday or school closures).

This is known as **learning loss** and we've decided to do something about it.



**Overall learning loss**
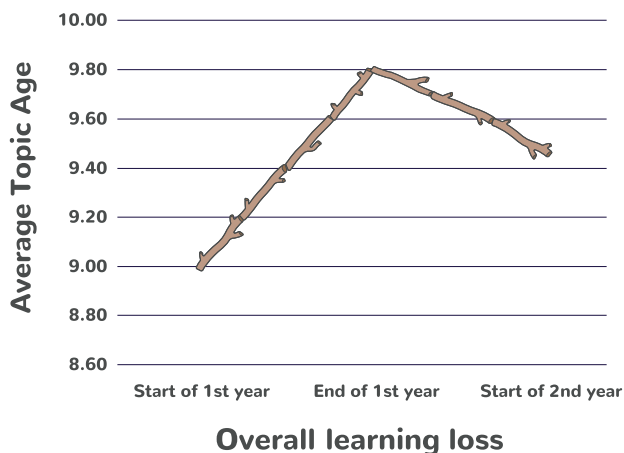
## Turning learning loss into learning gains

We recommend children continue to use Maths-Whizz throughout the year, achieving at least 3 Progressions each week (that's likely to take between 45 and 60 minutes per week). So, over several weeks, not only will children be able to maintain their maths knowledge, they will also make additional progress as well. For such a small amount of time each week the gains are huge!

## Making Maths Stick

We've created a handy chart for you to stick up at home as a way of tracking the Progressions your child has made on Maths-Whizz over the coming period.

We've also created a fun activity pack, full of ideas, activities and games to bring the maths your children have been learning at school to life, and all inspired by the outdoors! The activities and games can be done at home, in the local park, the wood, in the garden or (when the time is right) when you're on holiday or visiting friends.. Our activities involve a wide range of engaging, hands-on activities and games. Every activity aims to encourage enquiry, creativity and teamwork in making maths fun.

## Getting started

Everything you need can be found outdoors or in cupboards at home, so you can be creative! For rainy days or if you want to (or simply have to) stay indoors, you can use paper straws, spaghetti, pencils, beans or building blocks. If you're outside, remind children to be kind to the environment - be careful not to disturb or damage trees or plants, use what you find on the ground instead. And always wash your hands before handling food and drinks.

## What's in the pack?

There are 12 activities, for each year group - have a look through and you can choose the pack that matches the year group your child has just finished or the year group they will join in September. Try to complete two a week throughout the holidays.

## Connect with us!

Share what you have been up to with us through Twitter or Facebook - just search **@MathsWhizzTutor**. We will share the best of your posts with our followers each week! Most of all, have fun Making Maths Stick.

**Name:**

# Weekly Progression chart

## Maths-Whizz Progressions

Draw a tick over the stone for every Progression you make.
How many did you make in total this week? Write it in the box!

**Week 1**

**Week 2**

**Week 3**

**Week 4**

**Week 5**

**Week 6**

## Activities

Put a tick in the box when you have completed the exercise in your 'Making Maths Stick' activity pack!

| 1 | 2 | 3 |
| --- | --- | --- |
| 4 | 5 | 6 |
| 7 | 8 | 9 |
| 10 | 11 | 12 |

# Activity one - Take ten sticks

## Key skills

- To problem solve.

## Have ready

- 10 sticks or alternatives.

## Activity

- Take ten sticks and put them into three piles any way you like.

- One possible distribution of the sticks is 4 - 1 - 5, but there are lots of other arrangements possible.

- Move the sticks in a way that means each pile now has a different number of sticks.

- Here, we have moved one stick from the left pile to the middle and one from the right pile to the middle. Our example now becomes 3 - 3 - 4.

- Keep rearranging the sticks so that each time there is a different number of sticks in each pile. What do you notice?

# Activity two - Nets

## Key skills

- To recognise, describe and build nets of 3D shapes.

## Have ready

- Sticks or alternatives.

## Activity

- Find a 3D shape and then work out its net.
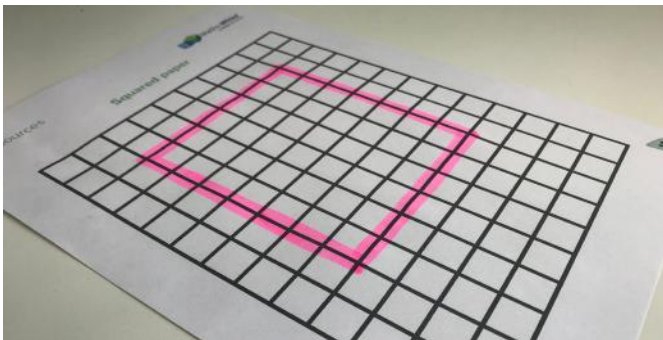
- Is there more than one possibility?

# Activity three - Scale

## Key skills

- To draw shapes to scale.

## Have ready

- Different sized sticks.

- Squared paper (see resources).



## Activity

- Make different shapes using the sticks. Think about how to accurately draw these shapes onto paper. Will the shapes stay the same size? Do you have to change the scale?

- Decide the scale, e.g.

    1cm on paper = one **30**cm stick

    2cm on paper = one **60**cm stick.

- Draw the shapes you have just made onto the squared paper.

- Have a go the other way, draw the shapes on squared paper, decide on the scale and then make the shape with sticks.

# Activity four - Perimeter and area

## Key skills

- To calculate the perimeter and area of shapes.

## Have ready

- Sticks or other alternatives.

- Pencil and paper.

- Tape measure or ruler.

## Activity

- Can you find rectangles where the value of the area is the same as the value of the perimeter?

- Build your rectangles with sticks or stones.

# Activity five - What maths can you see?

## Key skills

- To make connections with mathematics and the real world.

## Have ready

- Tape measure.

- Camera.

- Pencil and paper.

## Activity

- Look at nature or architecture to identify geometric shapes and properties.

- Look around you. What can you see that has a mathematical connection? Write or draw any mathematical words or shapes in and around the space you are in.

- Write your ideas down in words or draw a mathematical calculation. Take a photo.
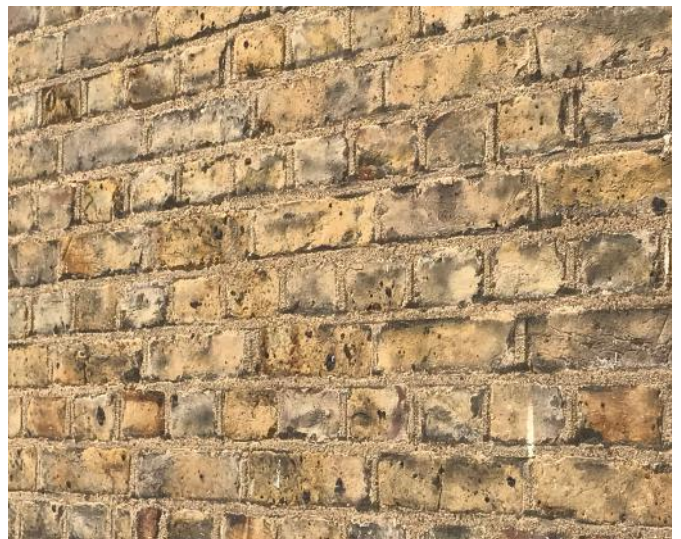
# Activity six - Pebbles (adapted from Nrich)

- To problem solve.

- Stones, beans, counters.

- You start off by collecting just four pebbles and you place them on the ground/ sand in the form of a square. The area inside is of course just 1 square something, maybe 1 square metre, 1 square foot, 1 square finger ... whatever.
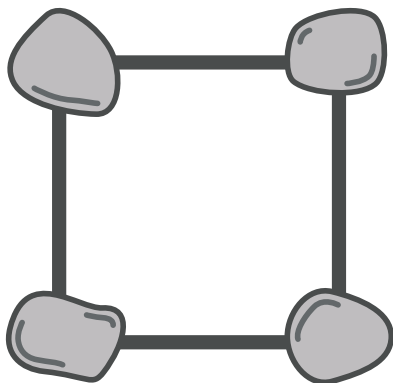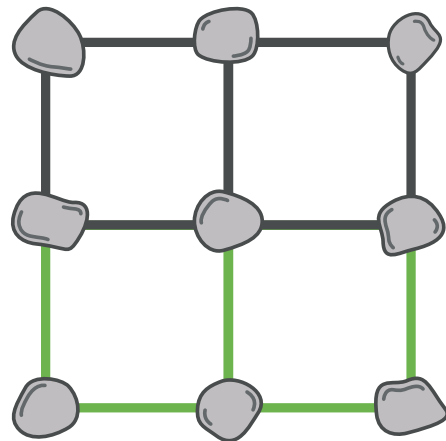
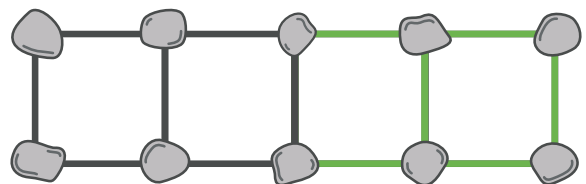- By adding another 2 pebbles in line you double the area to 2, like this:
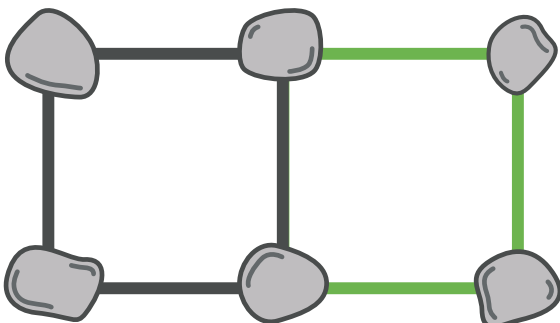
- The rule that's developing is

  You keep the pebbles that are down already (not moving them to any new positions) and add as FEW pebbles as necessary to DOUBLE the PREVIOUS area, using RECTANGLES ONLY!

- So, to continue, we add another three pebbles to get an area of 4:

- You could have doubled the area by doing:

- But this would not obey the rule that you must add as **few** pebbles as possible each time. So this one is not allowed as we have added four pebbles.

- Well, now it's time for you to have a go! How could you record this?

- What patterns do you notice? How many extra pebbles are added each time? How big is the area (in squares)? How many pebbles inside the rectangle?

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# Activity Seven - Make a sun clock

## Key skills

- To explain how a sundial works with sunlight and to compare the accuracy and precision of this method with an analogue or digital clock.
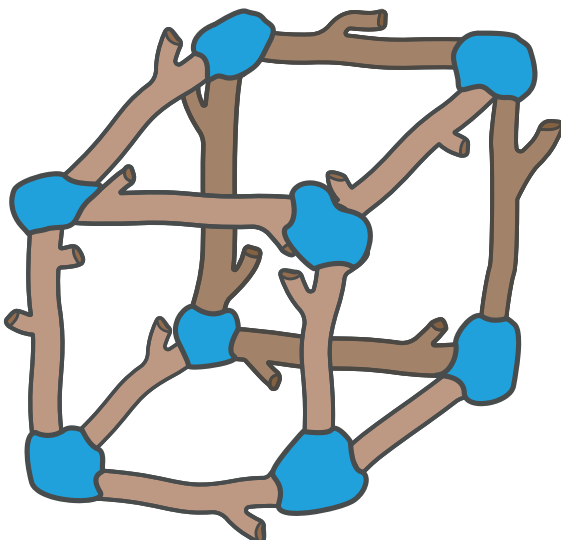
## Have ready

- A stick.
- Stones.
- A watch.

## Activity

- Use a stick to tell the time for a day and see how the earth moves in relation to the sun. You will need a watch or clock handy.

- Find an open area of ground that gets the sun all day. It needs to be somewhere where it won't get disturbed.

- As early as possible in the morning, push the 1m stick in the ground. Make sure the stick is vertical.

- Every hour on the dot mark the tip of the stick's shadow with a short stick or pebble, writing the hour beside it.

- The following day you can tell the time by looking at your sundial.

- Work out the timings between the sticks. How accurate is your sundial?



# Activity eight - Volume



## Key skills

- To calculate the volume of cubes and cuboids.

## Have ready

- Sticks or alternatives.

## Activity

- If the volume of a cuboid is 144cm$^3$, what could the length, width and height be? Is there more than one possibility?

- Create a cube with a volume of 144cm$^3$

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# Activity nine - Fractals

- To problem solve.

**Have ready**

- Pencil and paper.

- Sticks or alternatives.







**Activity**

- A fractal is a never-ending pattern that repeats itself at different scales. A fractal repeatedly follows a rule and continually reproduces copies of itself in various sizes and/or directions. Fractals are surprisingly simple to make.

- One way to examine fractals in nature is to compare a branch with the whole of a tree. The pattern of the branches and leaves on the small branch should mimic the overall shape of the whole tree. Again, it is possible to experiment with the patterns of trees using sticks. Have a go.

- Have a look in nature. Go close up and examine continuation of a pattern in nature.

- The best way to understand the properties and rules of fractals is to make one. This can be done indoors or out. Pick a shape and make up a rule for its repetition.

- Here is an example:
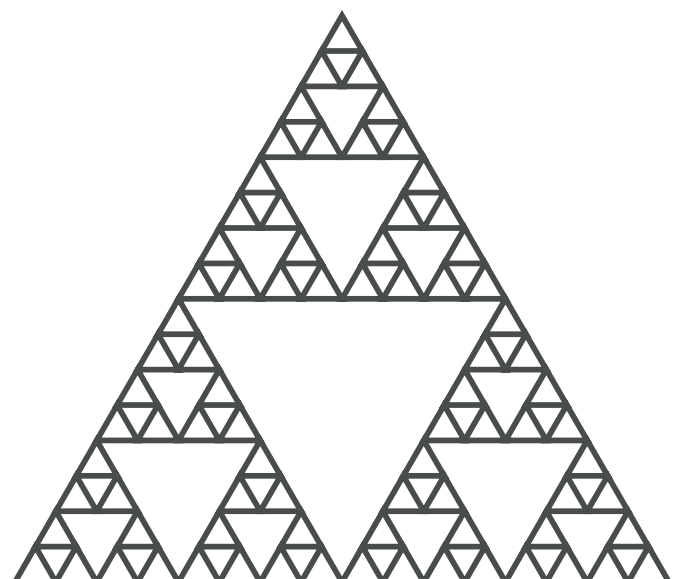
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# Activity ten - Achi

## Activity

- Be the first to connect **3** of your counters in a row, vertically, horizontally, or diagonally.

- Players take turns placing one counter at a time on the empty spaces of the board.
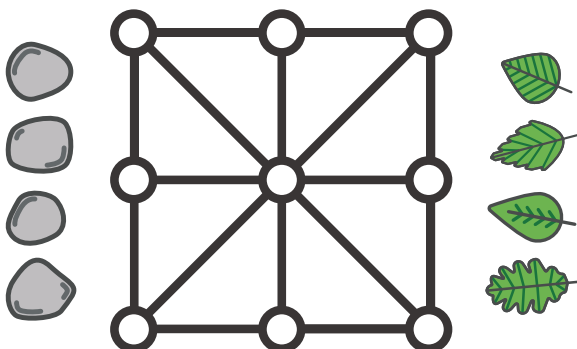
- If a player connects **3** counters in a row during this phase, he/she wins the game. Connections can be vertical, horizontal, or diagonal.
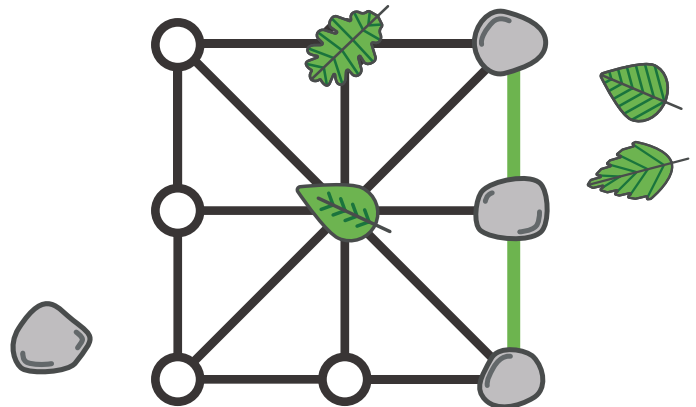
- Once all 8 rocks have been placed on the board, one space will be left empty. Players take turns moving one of their rocks to an empty space next to it.
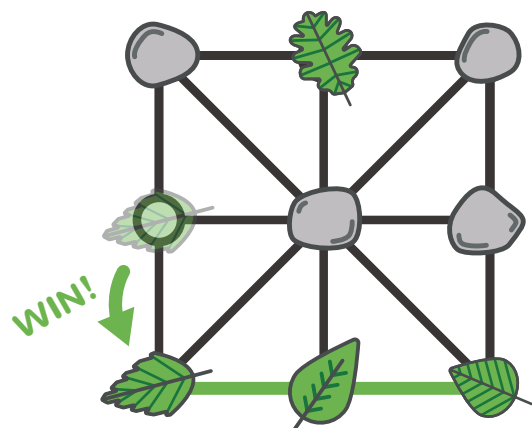
- Move when possible. If a player can move, he/she must move. If a player cannot move, his/her turn is skipped.

**WIN!**

# Activity eleven - Circles





| Key skills |
|---|
| ● To illustrate and name parts of circles. |

| Have ready |
|---|
| ● Stick. |
| ● String. |
| ● Stones. |

| Activity |
|---|
| ● Make a circle outdoors. |
| ● Tie a length of string to a stick. Place the stick in the ground and hold the string so it is taut. Place stones on the ground as you slowly walk round the stick, keeping the string taut at all times. You should end up where you started with a stone circle. |
| ● Check the diameter is twice the radius! |

**How big can you make your circle?**

**How small?**
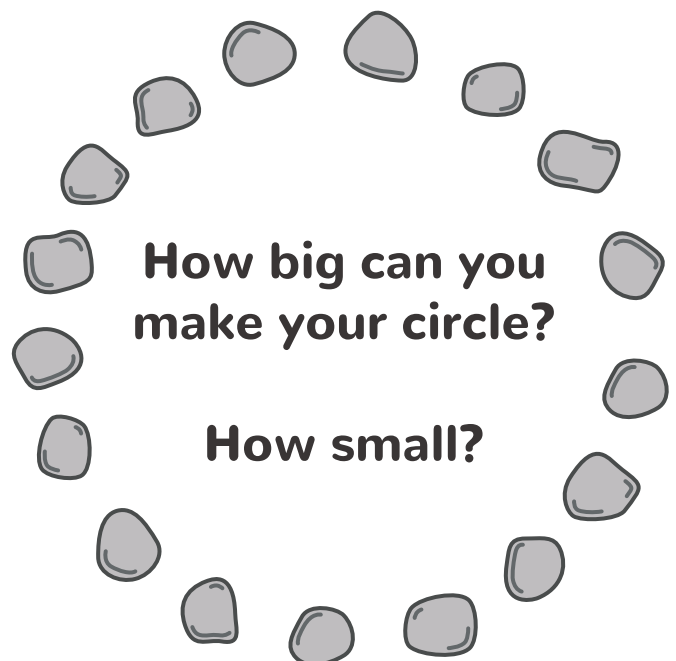
# Activity twelve - More circles

## Key skills

- To problem solve.

## Have ready

- Circular objects.

## Activity

- Here are some shapes made from circles which are coins, counters, and rings. Opposite you can see 10 coins, 19 counters, and 12 rings.

- The shapes made up by the circles are a triangle, a hexagon, and a rectangle.

- How many coins, counters, and rings would you need to make the next size up for each? What is your idea of the 'next size up'?



**What shapes could you make by putting circles together?**

**How many would you use?**

**How many would you need for the next size up?**

# Resources

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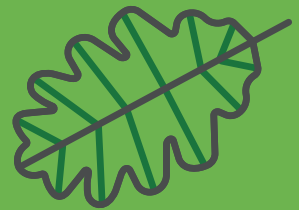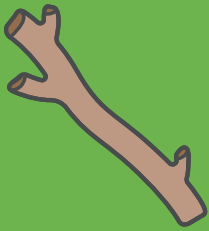
# Squared paper
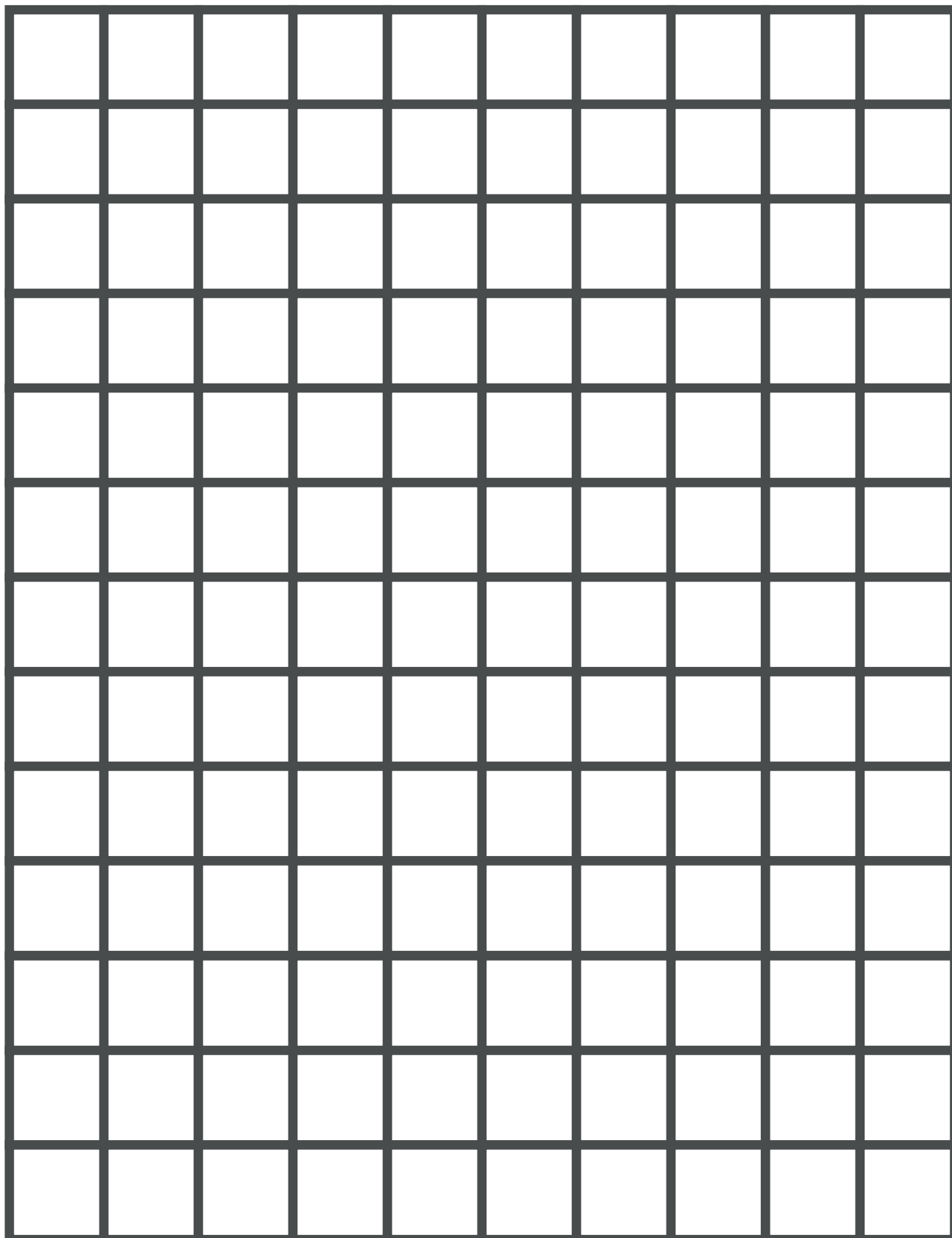
# Achi game board
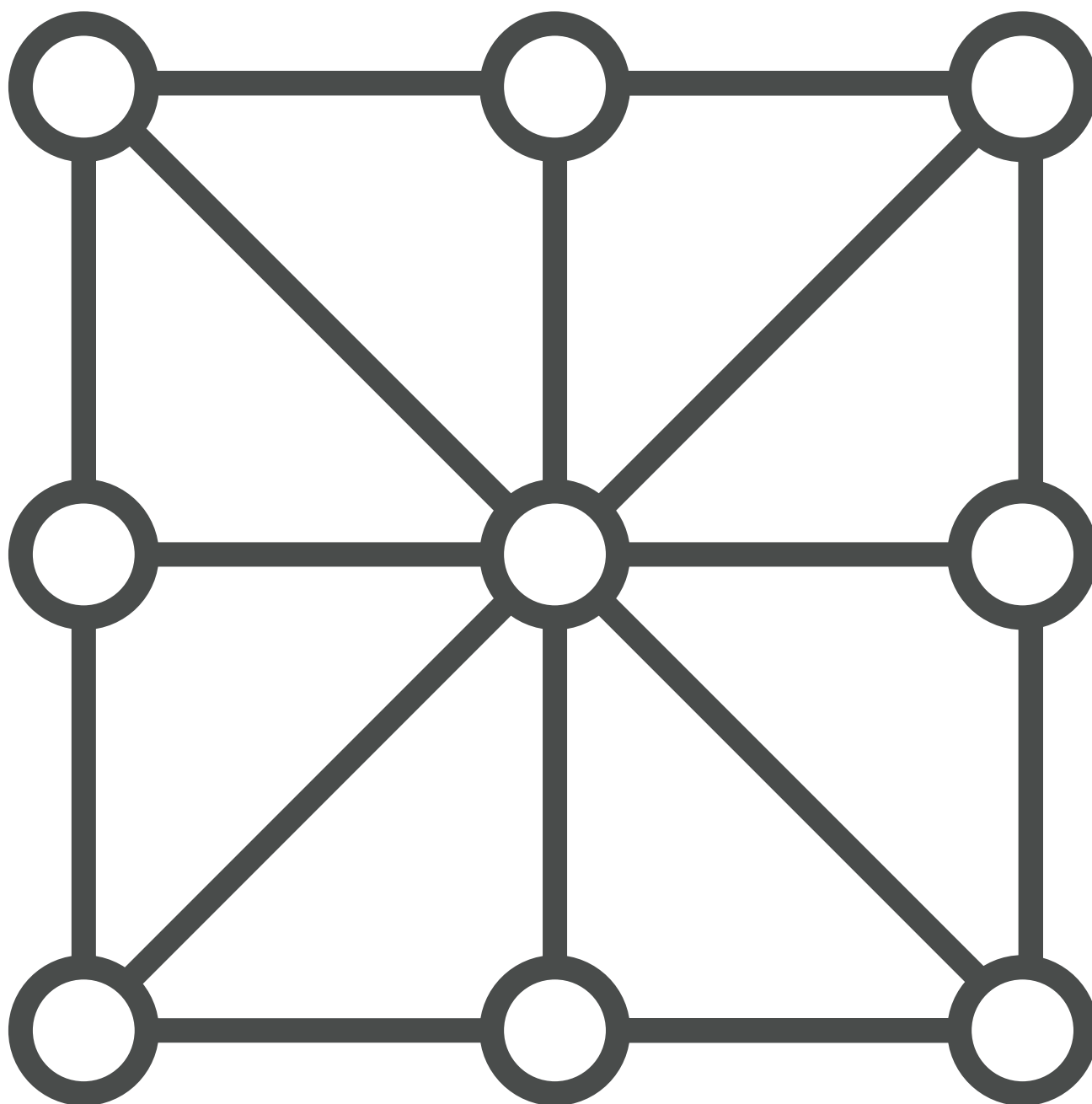
# Glossary

# Glossary
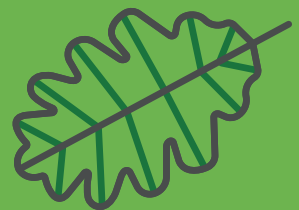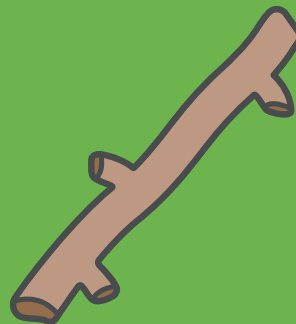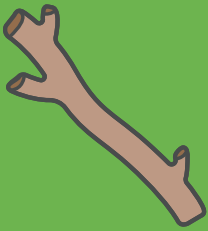
## Acute angle

An angle smaller than a right angle. It is an angle between 0° and 90°.

## Angle

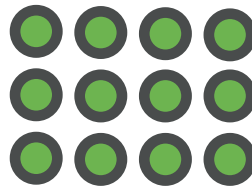An amount of turn. Angles are measured in degrees.

## Anti-clockwise
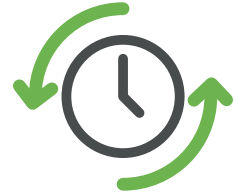
Turning the opposite way to the clock.

## Area

The area of a shape is a measure of how much surface it has.
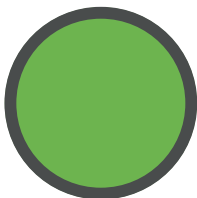Area = length x width

## Array

A regular arrangement of numbers or objects. It has rows and columns usually in the form of a rectangle.

## Ascending

Going up or increasing in order from smallest to largest.

## Circle

A shape with every point at its edge at exactly the same distance from the centre.
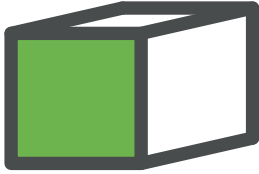
## Clockwise
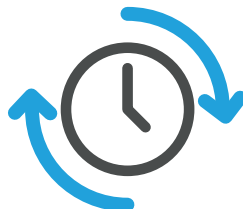
Turning the same way as a clock.

## Corner

A corner is a point where two or more lines meet.

# Glossary

## Cuboid

Solid shape with six rectangular faces.
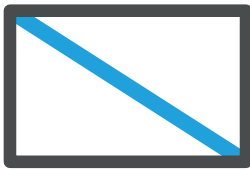
## Denominator

$$\frac{1}{2}$$

The number below the line in a fraction.

## Descending

Going down or reducing in size.

## Diagonal

A straight line that joins any two corners which are not adjacent.

## Diameter

A line that passes from one side of a circle through the centre to the other side.

## Half

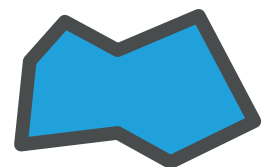One of two equal parts. When something is divided into two equal parts, each part is one half.

## Hexagon

Any polygon with six straight sides.

## Horizontal

Same direction as the horizon.

## Irregular polygon

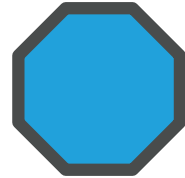Shapes that do not have all their sides the same length. They have different sized angles.

# Glossary


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## Numerator

$$\frac{1}{2}$$

The number above the line in a fraction.

## Obtuse angle

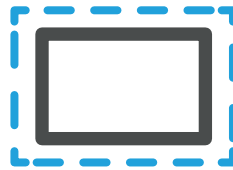An angle that measures between 90° - 180°.

## Octagon

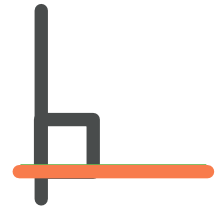Any polygon with eight straight sides.

## Parallel lines

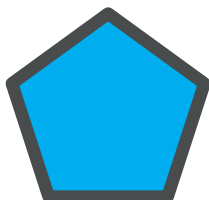Lines that stay at the same distance apart.

## Perimeter

The distance around the outside of the shape.
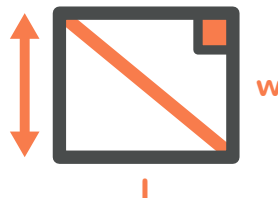
## Perpendicular lines

One line is at right angles to another line.
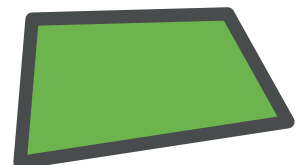
## Polygon

Any 2D shape with straight sides. Polygons can be regular or irregular

## Property

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l

A property of a shape is a particular fact or feature of it that makes it part of a group with the same properties.

## Quadrilateral

Any polygon that has four sides. The four angles add up to 360°.
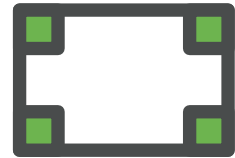
# Glossary

## Quarter
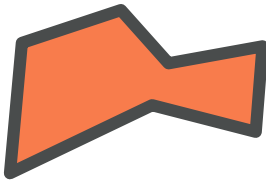
Is one of four equal parts.

## Radius

Is the length of a straight line from the centre of a circle to its circumference.

## Rectangle

A four-sided flat shape. It has two pairs of opposite, equal parallel sides and each angle is a right angle.

## Rectilinear

A rectilinear shape is a shape whose edges are all straight lines. All polygons are rectilinear shapes.

## Right angle

An angle of 90°. It is a quarter turn.

## Side

A side of a shape is the line that forms part of the edge or perimeter.

## Square

A flat shape with four straight and equal sides. The angles in its corners are all right angles.

## Square-based pyramid

Has a face that is square and the other four faces are triangles.

## Straight lines

A straight line is half a turn. It is two right angles.
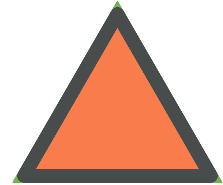
# Glossary

## Symmetry

The 'Line of Symmetry' is the imaginary line where you could fold the image and have both halves match exactly.
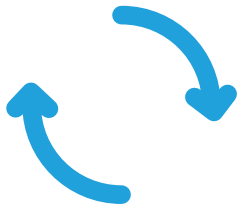
## Three-dimensional shape

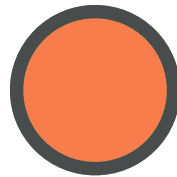Three-dimensional shapes are solid shapes.

## Triangle

Any polygon with three sides. The angles of a triangle add up to 180°.

## Turn

When something turns it spins, rotates, revolves, or whirls.

## Two-dimensional shape

Two dimensionsal shapes are flat shapes.

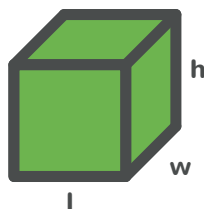## Unit fraction

$$\frac{1}{x}$$

Has a numerator of 1 and any number as a denominator.

## Vertical

At right angles to a horizontal line.

## Volume

Volume of an object is the amount of space it fills. To find the volume you multiply the length by the width by the height.
Volume = l x w x h