Numeracy in the Environment

Making sense of our world through numbers.

Children are constantly trying to make sense of the world and they do this best through ACTIVITY.
We cannot divide everything into neat boxes – SO DON'T TRY.
Enable children to see maths as relevant to the world around them.

Collections

- All sorts to make patterns
- Things that weigh nothing or next to nothing
- Things that weigh a certain amount within a range eg. 20-50 grams
- Things that you can measure eg. length, width
- Opposites eg. Long/short, heavy/ light
- **Are two of anything exactly the same?**

Number

-*describe an object in numbers*

Ladybird –

1 Head;

2 antennae;

2 eyes;

Number of spots;

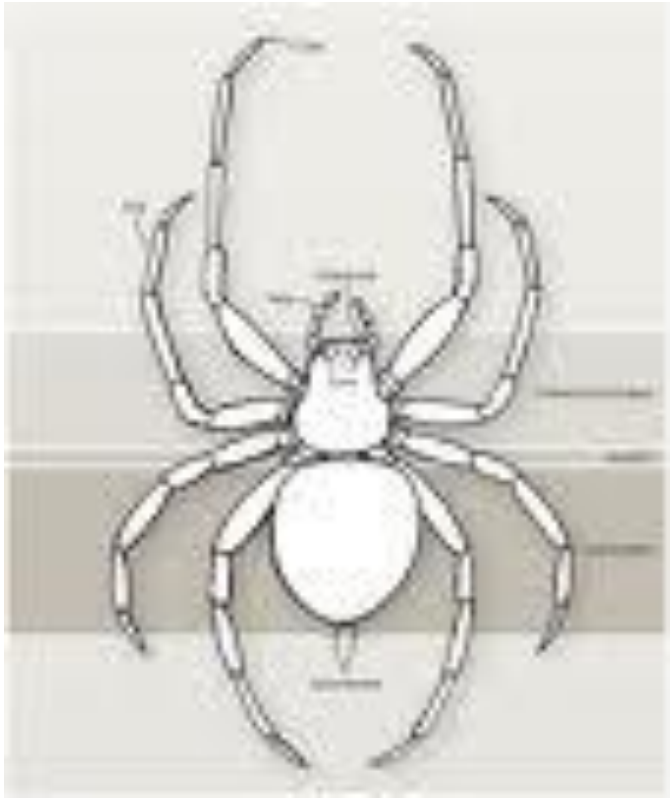
Whose ladybird totals the largest number?

Spider

8 legs;

2 body parts, etc

[you can make this as complicated as you wish in relation to the age/ability of the children eg. Introduce 7 times table by including that each leg is made up of 7 segments].

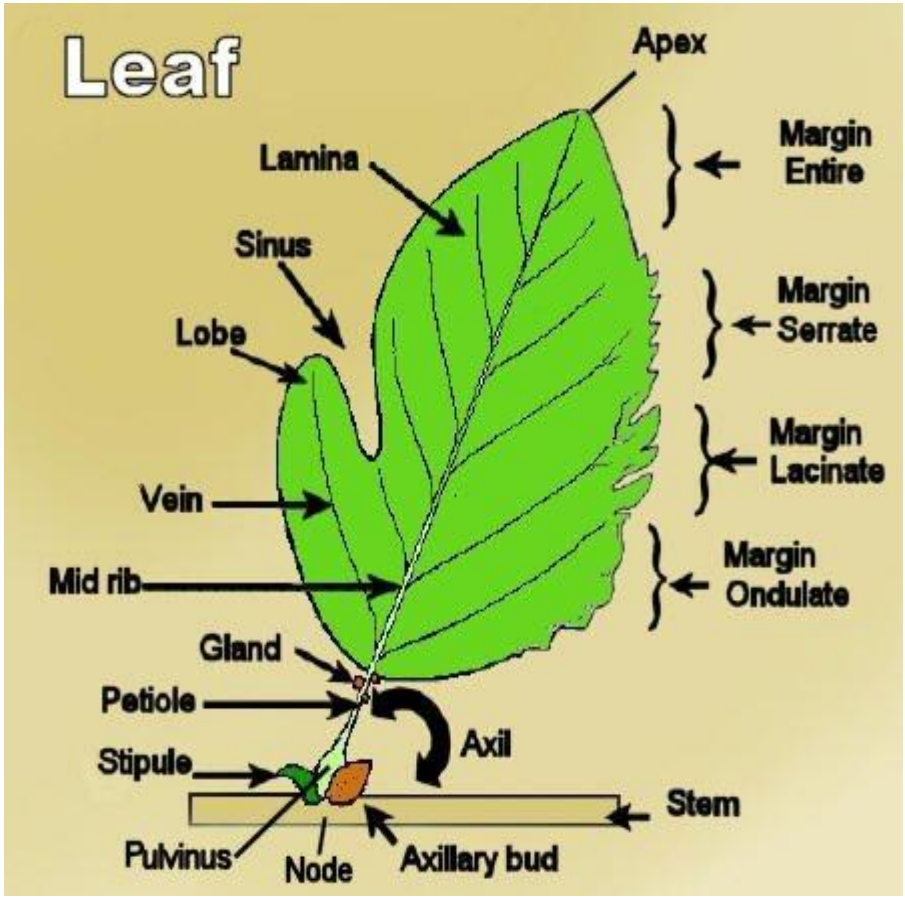


Leaves

How many leaves on a branch?

Give the total number of veins; mid ribs; lobes; apex, etc

[This can be done as repeated addition or multiplication]



Tree Rings

Any combination of the four operations [+ - x /];

Work out the year.

Different ring widths, etc.

Peas in a Pod

How many peas in a pod - are there the same number in each pod?

Does the length of the pod make a difference to the number of peas in it?

How many pods do I need to pick if I want x number of peas?

Can we use pods and peas in a multiplication sum?

Looking at Objects Mathematically

Choose an object and describe it in as many different mathematical ways.

Eg. A stone

- Weight in grams
- Measurement of length, width, circumfere
- How far can you throw it?
- Time it takes to fall a certain distance.
- Can you find two or more that are similar? – Are they ever the same?
- How many needed to make a line of given distance?
- How many needed to make a square/ circle/ triangle – are they true shapes?
- How many needed to make a cuboid / square based pyramid?
- How could you apply this knowledge?

Maps

- Create a map of short journey using measurements as well as features.
- Could you get to places by only turning right?
- Can you create a journey of shapes?
- Create a maths adventure map with puzzles to solve.
- Create a map that follows numbers eg.
  - Go through 1 gate
  - Continue forward and turn left at the 2 pebbles.
  - Follow the path until you come to 3 lazy daisies.
- Create a map that follows angles.
- This could be used with any sort of numbers - odd/ even/ prime/ multiplication or division facts.

Rain

Investigate

- Puddle depths, shapes, sizes
- How much rain can we collect? / How long does it take to collect? / Does it make a difference where we collect it? / Does the container we use make a difference?
- Making water move more swiftly or slowly with water pumps / water wheels.
- How much water can a sponge soak up? / Compare different sized sponges.

Questions

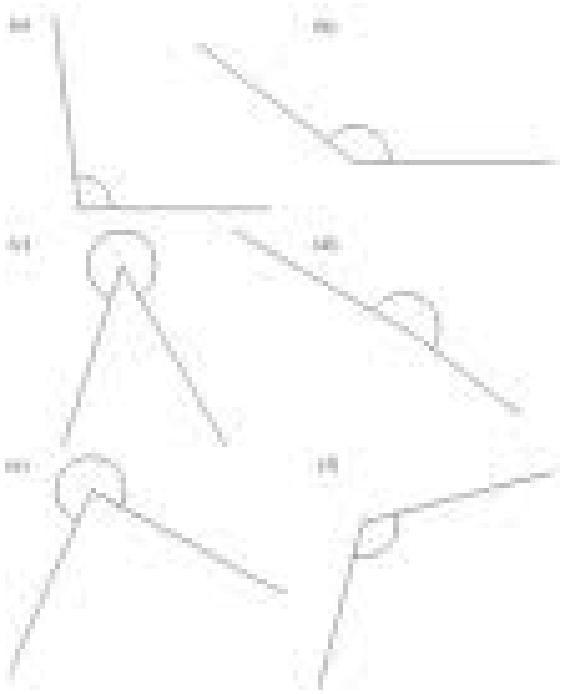
- How big is the biggest puddle?
- When is a puddle a pond?
- Is a reservoir a puddle?

Umbrellas

- Are all umbrellas the same size?
- Why do we have different sizes?
- What area do different sized umbrellas keep dry?
- Does the height an umbrella is held matter?
- What angle are the spokes at? / Does it change with the size of the umbrella?
- How much of you do umbrellas keep dry?
- Is a tree an umbrella?
- What things are like umbrellas? Eg. A mushroom could be an umbrella for a mouse / goggles are umbrellas for your eyes.

Angles

Before heading out for a bit of organic maths, children will need to define, recognise and name angles to get the most out of their experience. One way of helping them remember the types of angles is to ask them what a lion does when it is angry - ROARS [Right angle, Obtuse, Acute, Reflex and Straight]



Angles all around -

- Window frames; playground markings, goal posts, playground furniture; etc.
- Look up to see tall buildings or vapour trails in the sky.
- Angles formed by branches / leaves on a tree or shrub.
- People make angles - between arms and legs - or 'invisible' angles when people pass a ball to each other or run across an open space.
- Find different examples of each angle and record it in a table.
- Take photographs of angles to create and angle map or angle quiz.
- Have teams of 'Anglers' fishing for many examples of one particular angle - gets children to be really observant.
- Differentiate between man-made and natural angles.
- Create quizzes with true/false statements or odd- one- out.
- Write an angle song or poem to help remember the different angles.

Right Angles

Children will soon realize that right angles dominate the environment, particularly the man-made world.

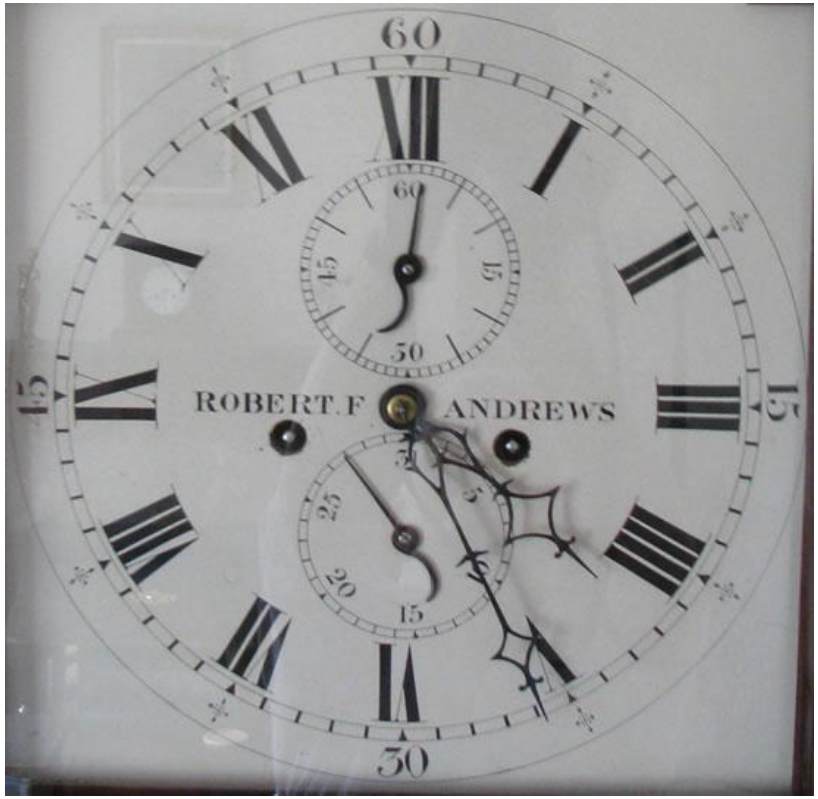
- How can you place two sticks to make one right angle?
- Now make two right angles with the two sticks.
- Can you make three right angles? Four right angles?
- Can you imagine what the world would be like without right angles?
- What would the world look like with other types of angles?
- Are some angles more important than others?

Den/ Barrier Construction

- Construct den of given dimensions; area
- Estimate how much material needed to build den
- Construct a barrier to keep animals out of an area
- KS1 - count how many branches you would need / KS2 measure lengths; add together; give total.
- More complicated - create tokens to purchase material; different amounts to different groups; view differences in constructions at the end and relate to inequality in the world.
- Percentages/ Fractions of materials used.
- Include things to eat - carrots, apples, tomatoes, etc [weigh; sell; etc.]

Time and Tide

This activity is taken from the nrich maths site [http://nrich.maths.org and is good for offering children a rich opportunity to think, talk and discuss their ideas about what they understand about the passage of time both during the day and during a year.




DOM.
LUN
MAR.
MER.
GIO.
VEN.
SAB.

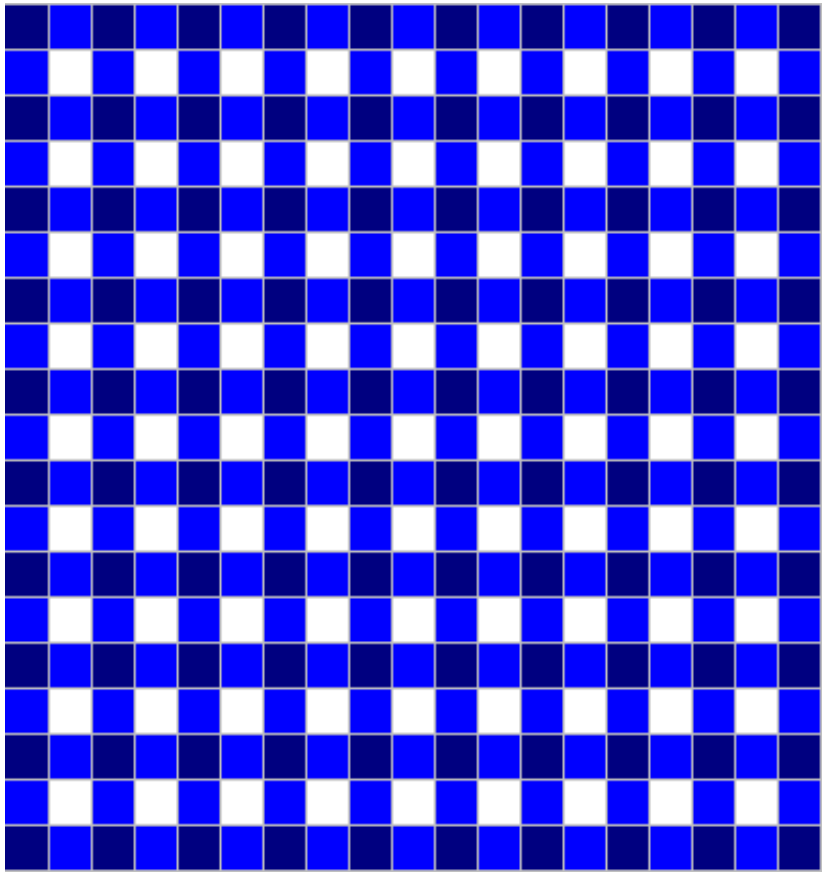

DEC.
IAN.
FEBR.
MAR.
APR.
MAI.
IVN.
IVL.
AVG.
SEPT.
OCT.
NOV.

Maze Design – Step 1

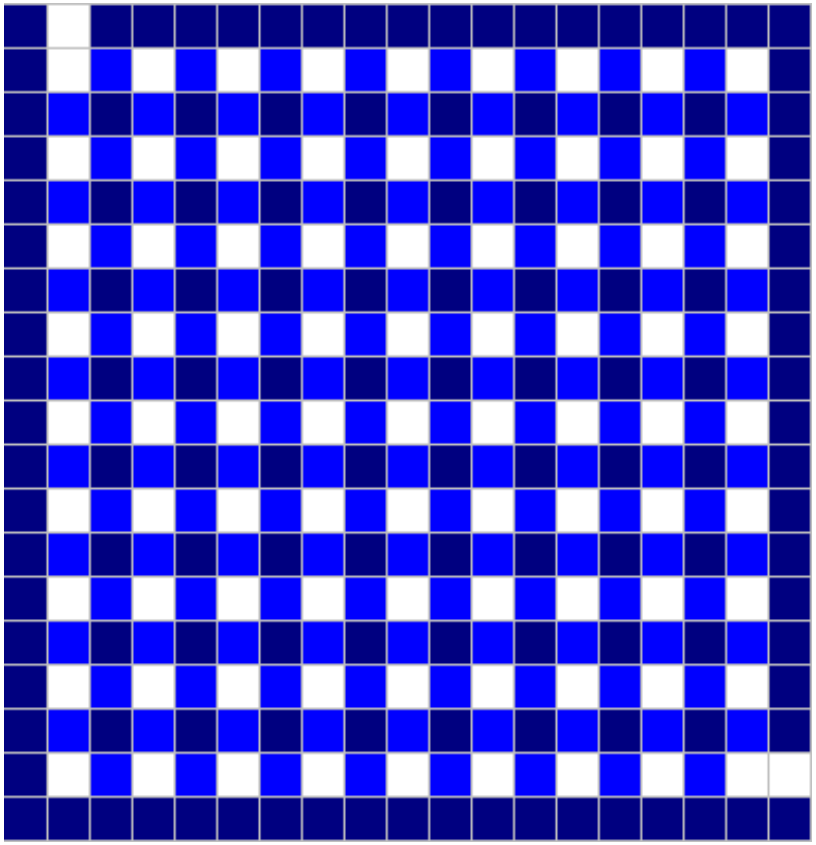
How to design a maze – courtesy of gwydir.demon.co.uk

Designing a puzzle maze

- Here is a fool-proof way to make a branching puzzle maze.
- Take some squared paper and draw out a rectangle with an odd number of squares on each side. This design has 19 squares on each side, but it could be a rectangle. When drawing the maze, use a soft pencil, as you'll be rubbing lots out.
- Fill in alternate lines and columns like the picture on the right, making a waffle pattern. All the white squares will end up as part of the paths. All the dark blue squares will be walls. Medium blue squares will be either paths or wall. You don't have to use colour, of course, but shade the medium blue squares very lightly, as you will be rubbing some of them out.



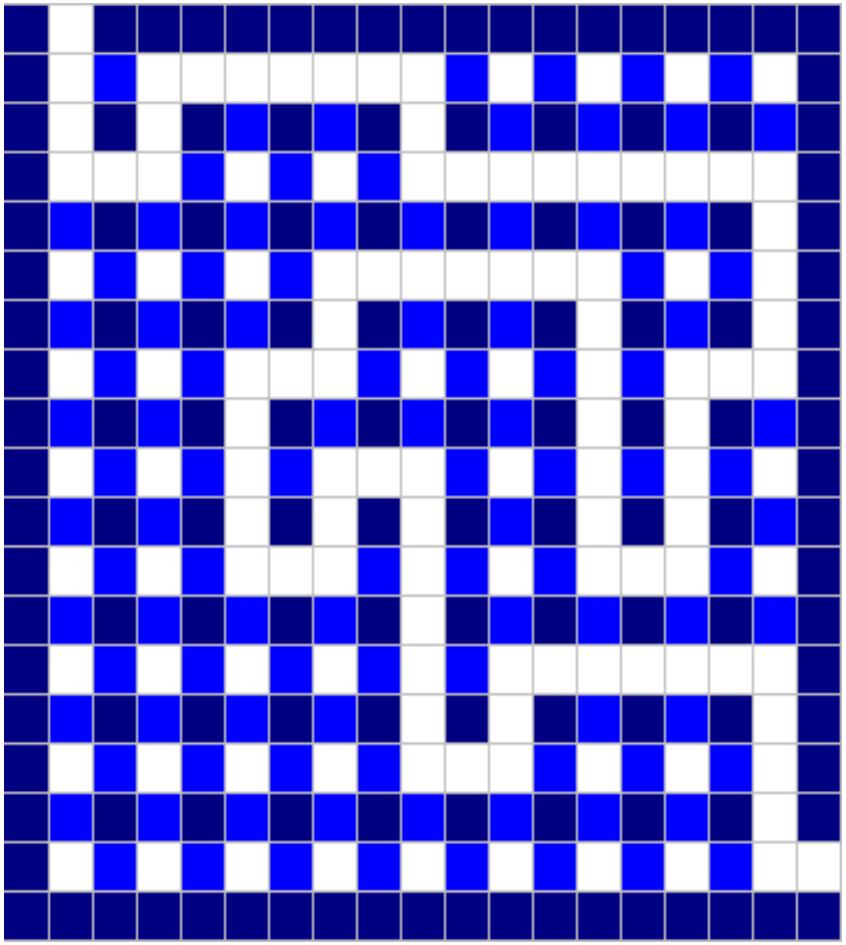
Maze design - Step 2



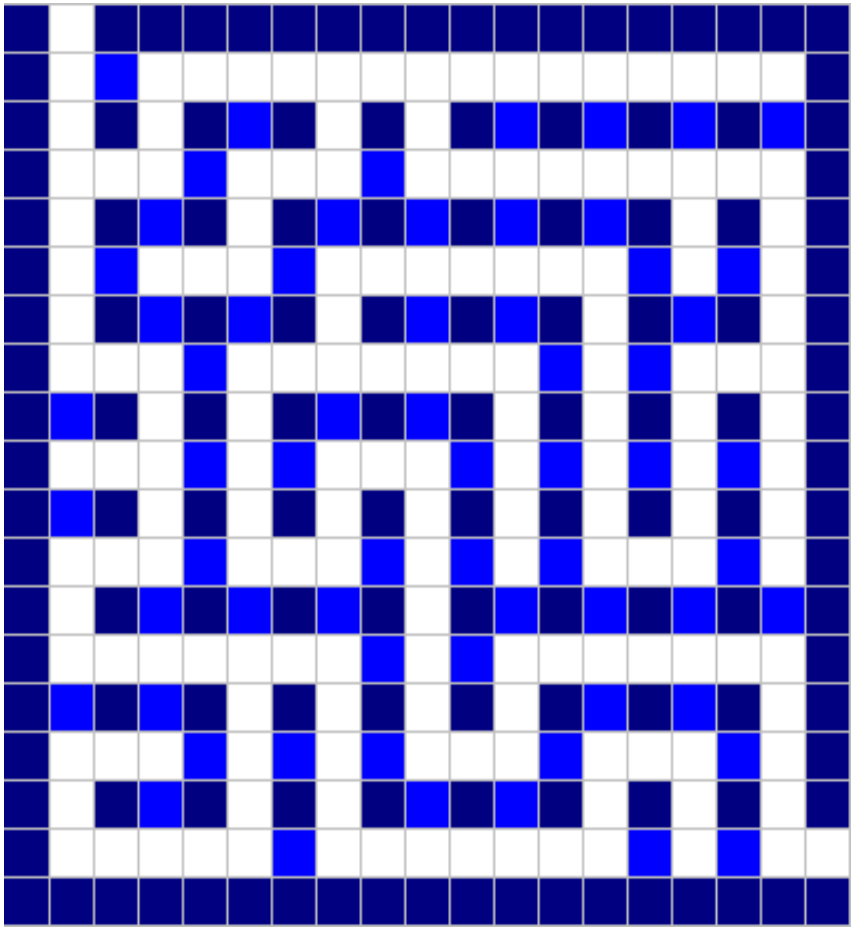
- From now on, you are rubbing squares out, and you must ONLY rub out medium blue squares (to make them from walls into paths). Dark blue squares are definitely walls, and so must NOT be rubbed out.
- You need to choose an entry point to the maze which must be on the edge of the maze (and a medium blue square, of course). Make it white. Mine is top left.
- You also need to choose a destination. Again, it must be a medium blue square. For my maze, I've chosen an exit on the edge, bottom right, but you could have a destination in the middle of the maze if you prefer. Make that white as well.
- The rest of the outer edge of the rectangle will be the outer wall of the maze, and you mustn't make any parts of it white. I've coloured it all dark blue to remind me of this.

Maze Design – Step 3

- Now you need to draw the main path, or solution to the maze.
- Start from the entrance and, rubbing out only medium blue squares, make a path to the destination. If you find the path on the right hard to see, try looking at it through half-closed eyes.
- Make sure that the path is not too short, or someone may solve the maze very quickly. But don't make it too long, or you won't be able to have many choices or dead-ends, and then it wouldn't be a very challenging maze. It's quite fun to head for the exit and then turn away again.
- Wiggle the path around, but make sure that the path never crosses itself. This can be surprisingly tricky. If your path does meet itself, then redraw a few medium blue walls and try again. I had to do this a few times while drawing this maze.



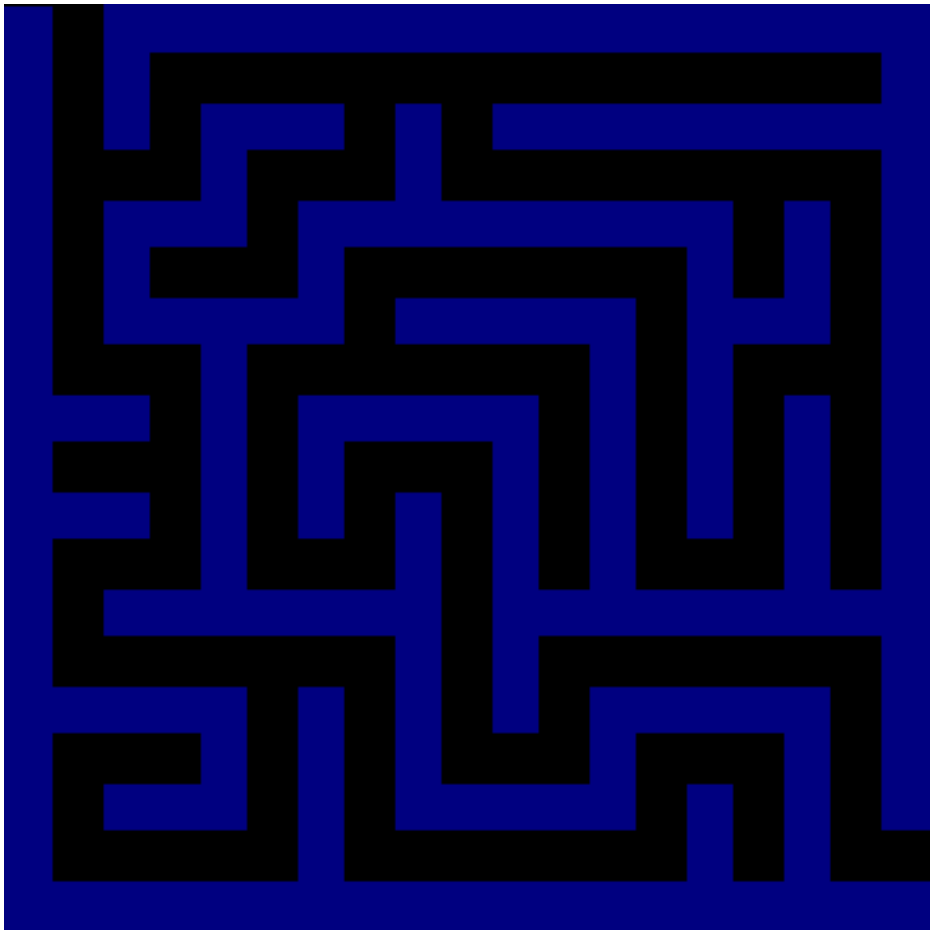
Maze Design – Step 4



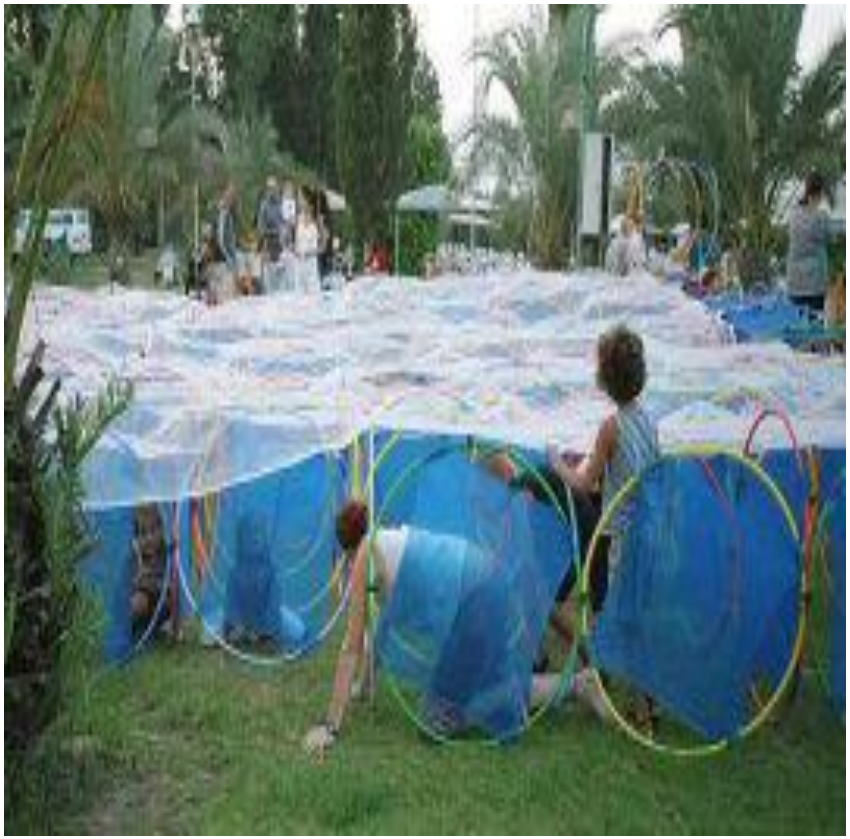
- You still have some white bits that aren't connected to the main path. So you make dead-ends off the main path, to join the cut-off bits to the main path.
- Find a white square all by itself. Make a path (remember, only rub out medium blue squares) towards the main path. This is now a dead-end.
- You can have one dead-end branching off another, like the small spiral in the bottom left hand corner. However, don't make most of the maze into one dead-end. If someone doesn't happen to choose that particular wrong turning, then they'll find the rest of the maze easy.
- If possible, try to make some dead-ends look more attractive than the main path, so the dead-end heads towards the destination, while the main path snakes away from it!

Maze Design – Step 5

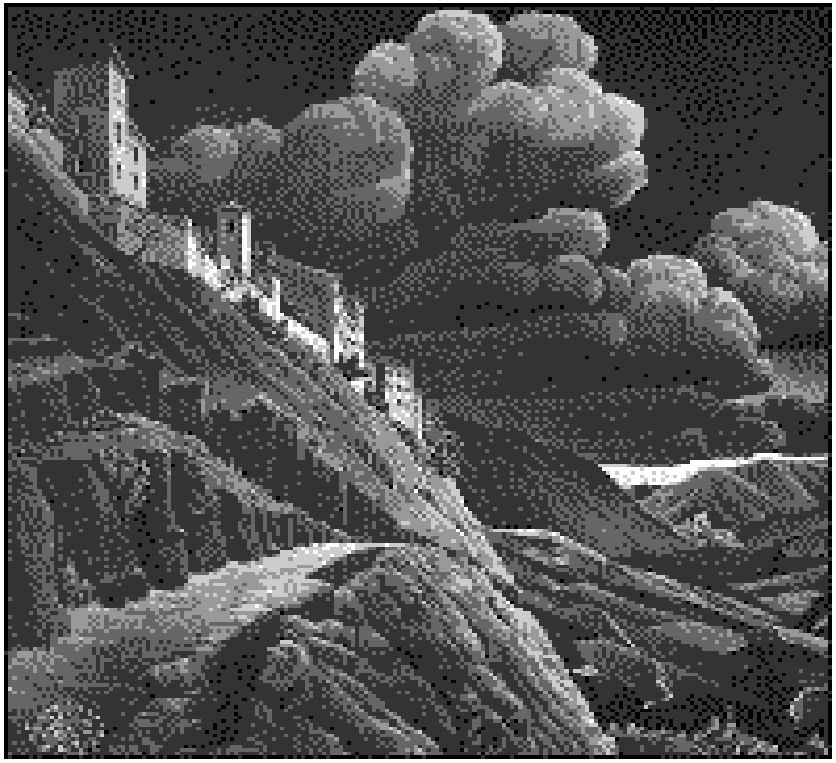
- You now have the finished design. If you want, you can tidy it up a little. Change all the medium pale squares into dark blue, as they are now officially walls. Remove all the grey lines outlining the squares. Of course, you can just leave the maze as it is, and pretend that it's a Roman mosaic!
- This type of maze is called a branching maze, as it has a single path to its destination (the trunk) and all other paths are eventually dead-ends (branches). It is possible to solve even if you don't know the design. Imagine that you are entering the maze, and put your right hand on the wall on the right. Walk forwards, but whenever there is a path to your right, turn right. This will keep your hand moving along the side of the wall. If you meet a dead-end, then turn round keeping your hand on the wall, and your right hand will now be on the other wall. Eventually, you will come to the destination, although you may go down several dead-ends. In fact, if you turn round at the destination, and re-enter the maze, still keeping your right hand on the wall, you will travel through the rest of the maze, and get back to the entrance, having travelled through every passage way twice (but not necessarily in the same order), and touched every piece of wall. You can use your left hand instead of your right.



Mazes made from thin materials.



Escher



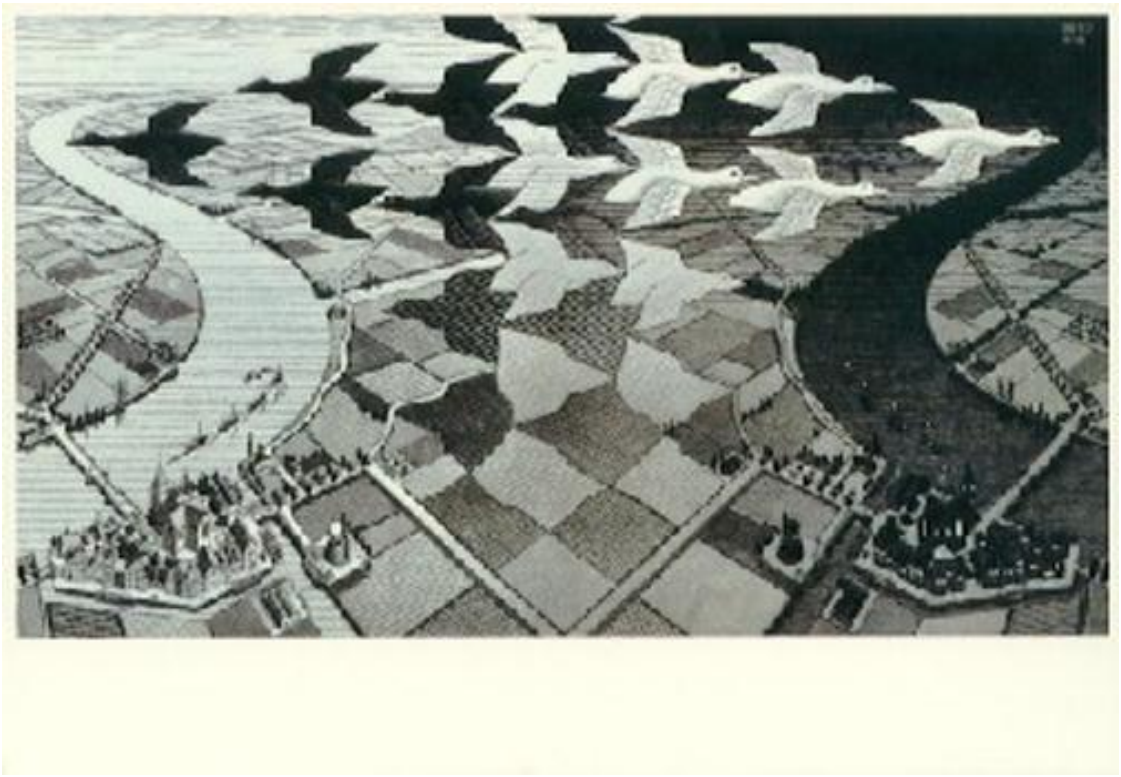
- This is called "Castrovalva", a mountainside village, and was finished in 1930

- Have you ever noticed how mathematical ideas are often used in patterns that we see all around us? Sometimes it is hard to decide when maths becomes art, or vice-versa.

  One artist who may have agreed with this is **Maurits Cornelius Escher** . He was born in 1898, in the Netherlands, and showed great artistic talent from an early age. At first Escher concentrated on sketching scenery and things around him. However, on a visit to Alhambra in Spain, he became fascinated by the Arabic tessellating patterns contained in the tiles, and started to experiment more with shapes and mirror images. In the late 1920s people began to recognise his style.

  [Article by Jenni Back and Liz Pumfrey]

Gradually, Escher's work began to change. Rather than drawing what he saw, Escher started to express ideas he had in his mind. He was able to create spatial illusions and detailed repeating patterns.



- This picture was completed in 1930 and is called "Day and Night". Can you see how Escher has used black and white bird silhouettes to show the change from day to night?