



**Learning**  
in your forest

## Free downloadable lesson plan: Forest Maths Skills

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visit [www.forestry.gov.uk/england-learning](http://www.forestry.gov.uk/england-learning)

The Forestry Commission (FC) looks after more than 1500 woods and forests in England - together they make up the public forest estate. Forests provide endless learning opportunities, and are great places for studying many aspects of the key stage 1 and 2 maths curriculum, including number, shape, symmetry, estimation and measuring.

### Curriculum links KS1:

Estimating, shapes, patterns, symmetry, number recognition and counting.

### Curriculum links KS2:

Measuring, recording, estimating, bar charts and pie charts.

### Before your visit:

- Make distance estimation cards – several laminated cards with different distances written on them, e.g. 0.5m, 1m, 2m, 5m, 15m (see end of lesson plan for examples).
- Make animal shape cards – print several sets of the animal pictures at the end of this lesson plan. Cut each image into a variety of different shapes, e.g. a circle, square, triangle, hexagon or star.
- Discuss what the children expect to find when they get to the forest.
- Ask the children if any of them have been to the forest before, and if so, what did they do there? Make a tally chart of each activity and show the children how to create a bar chart using the information.
- For a great introduction to the forest and how it is cared for by the Forestry Commission visit [www.forestry.gov.uk/england-learning](http://www.forestry.gov.uk/england-learning) and look at the downloads page, where you will find an informative child-friendly photo show, with notes and discussion questions. You will also find some useful health and safety advice for your visit.

### You will need to bring:

- Distance estimation cards
- Animal shape cards
- Copies of daisy sampling sheets (see end of lesson plan)
- Copies of tree age forms (see end of lesson plan)
- Tape measures
- Pencils
- Clipboards and paper
- String
- Quadrats (if these are not available, you could use PE hoops, or the children can make a square out of sticks in the forest)
- Calculators

## Forest Lesson Plan

### Starter activity: Tallying

Ask the children to get into pairs.

Each pair has a clipboard, paper and pencil, and spends 5-10 minutes counting cars in the car park, people having picnics, or trees in a set area.

As they count, they should make a tally, then work out the total.

**How many did they count?**

**Did every pair get the same answer?**

#### Extension

The children could make the tally chart on the ground, using twigs for each one counted.

Cars in the car park	Total
	6

## Estimating

### 1. Estimating length and distance

- Divide the children into groups of three or four.
- Give each group one of the distance estimation cards, and check that everyone knows what estimating means.
- From a starting point, ask each child in the group to estimate the length of the first distance on their card, walk to where they think it is, and put a marker (stone or stick) down.
- When all the children have guessed, ask them to use a tape measure to see who was the closest to the correct distance.
- Ask the children to do the same thing 3 or 4 times with different measurements.

**Do they get better at estimating the more they practise doing it?**

#### Extension

Once they have mastered estimating and measuring in metres, ask the children to make their own measuring 'device', e.g. a stick or pine cone. They can then try estimating and measuring, e.g.

**How many sticks long is the picnic table?**

**How many pine cones wide is the bench?**



## 2. Estimating the height of a tree.

- Find a big tree.
- Ask the children to estimate how tall they think the tree is, then discuss how you could measure it (without climbing it!)

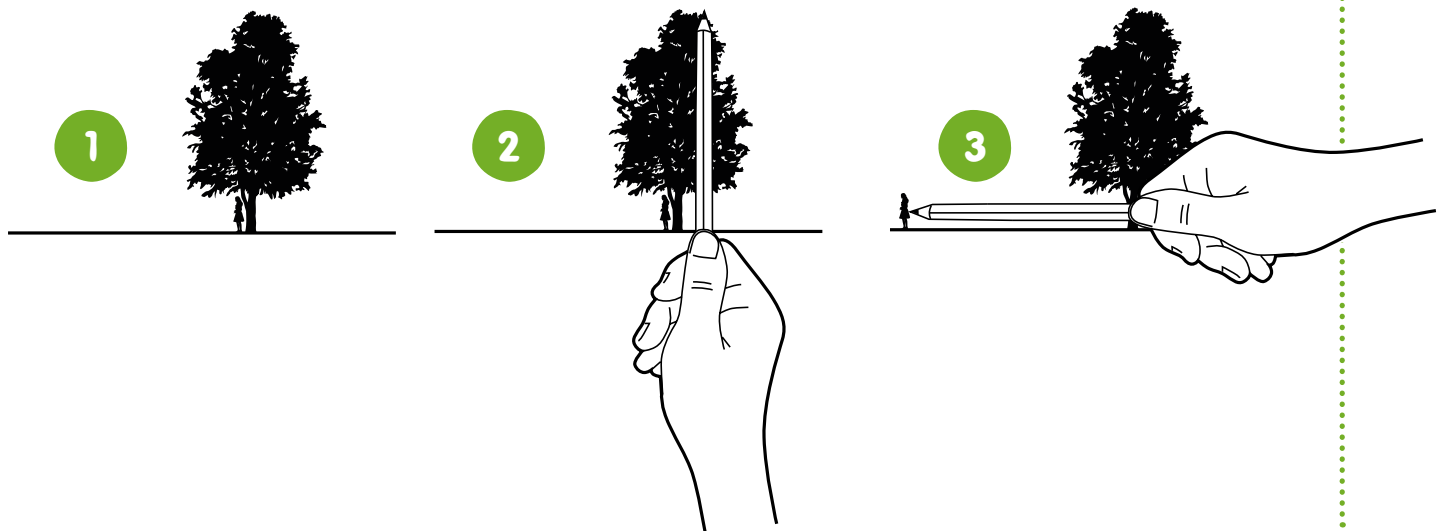
### This is one way to estimate the height of a tree:

- The children need to work in pairs or small groups.
- Child 1 stands with their back against the tree trunk (fig.1).
- Child 2 faces their partner, but moves back a distance.
- Child 2 closes one eye and holds a pencil between thumb and first finger, vertically at arm's length, so that the point is level with the top of the tree, and their thumb is level with the base of the tree (fig.2).
- Child 2 stays in the same place and turns their hand until the pencil is horizontal, keeping their thumb level with the base of the tree.
- Child 1 walks away from the tree to the side so that they appear to be walking along their partner's pencil.
- When they reach the end of the pencil, Child 1 should stop (fig.3).
- Now, using a tape measure, Child 2 or another member of the group measures the distance between Child 1 and the tree. This measurement is approximately the same as the height of the tree.



Demonstrate this a few times with volunteers, then ask the children to work in small groups to estimate and measure the height of a number of trees.

- **Are they able to estimate the tree height accurately?**



## Shapes and patterns

### 3. Shapes and patterns in nature

- Divide the children with an adult in each group.
- Encourage the groups to go for a short walk, discussing what shapes they can find and see in the forest.

#### Look for:

- Spirals and cone shapes in pine cones and snail shells.
- Vein patterns in leaves.
- Is the pattern that leaves make when growing on a tree symmetrical or asymmetrical?
- Knots in tree trunks – are they circular?
- Woodpecker holes.
- Also look for symmetry – butterflies, leaf patterns.
- How are the trees planted?  
Are they in rows?  
Are all the trees the same or are they different?
- Look for shadows from fences and other structures – do you recognise any shapes in them – rectangles, squares, circles?

**Discuss what sort of shapes each group found.**



### 4. Make your own 'natural' pattern

Working in groups, children choose a tree with plenty of space around the base.

Using material from the woodland, create concentric circles around the tree using a variety of patterns and textures. E.g. they could use stones for the first circle, then leaves, then cones and so on.

Discuss how each group has made up their circles.

**What shapes and textures did they choose?**

**What patterns or sequences have been used?**



## Shapes and patterns

### 5. Animal shape relay

- Scatter the animal shape cards around an area in the forest. Put the children into teams.
- Then ask each team to look for a certain card e.g. a square card with a fox on it, or a triangular card with a squirrel on it.
- The first person to find the card each time wins that round, and acquires a point for their team.
- You can keep playing until all the cards are found, or until everyone has had a go. The winning team is the one with the most points.

#### Extension

Discuss the animals and birds on the cards – they all live in England's forests. Has anyone seen any of these animals and birds today? Does anyone know any other animals and birds that live in England's forests?

## The following activities are suitable for KS2

### 6. Daisy sampling using a quadrat

**The aim of this activity is to practice counting and estimation skills and recording accurate data. It will also determine the best conditions for daisies to grow successfully. Consider - how will you test your ideas? Which places will you sample to make comparisons?**



This can be used for other plants such as buttercups or dandelions.

Before the activity, discuss with the children what a plant needs to grow successfully and what would happen if the plant does not get what it needs to thrive.

- Find a suitable area with a covering of daisies or other flowers.
- Divide the children into small groups.
- Give each group a quadrat and a recording sheet.
- Ask one of the group to drop the quadrat randomly on the ground.
- One of the group should make a note of the location, e.g. is it in open space, under a tree, in the shade or next to a bench?
- Before counting, the group should agree on an estimate of how many daisies there are within the quadrat. Record the estimate on the sheet.
- Next, count the daisies and record the number on the form.
- What is the difference between the estimated number and the actual number? Record this on the sheet.
- Repeat at other locations.
- Compare your results to determine the best conditions for daisies to grow.

You can choose how many quadrats each group should drop, and then answer the questions on the sampling sheet.

#### Does it get easier to estimate the number of daisies?

#### Extension

Back at school, you can have more discussion about how plants grow successfully. The children can also draw pie charts or bar charts to show how location affects plant growth.

## 7. How old is that tree?

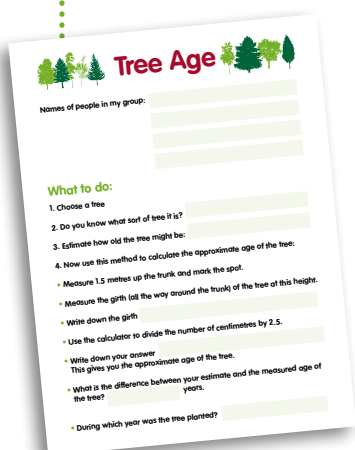
### Counting rings

- You can tell how old a tree is by counting the rings on the inside of a trunk after the tree has been felled. Each ring represents a year of its growth.
- Take the children to an area with felled trees, and ask them to count the rings.
- Are all of the trees in the area the same age?  
Or are there trees of different ages?



### Measuring and calculating

- Here is a way to calculate the age of a tree without cutting it down:



1. Divide the children into small groups and give out one 'tree age' sheet to each group.
2. Choose a tree.
3. Estimate (guess) how old it might be.
4. One member of the group measures 1.5 metres up the trunk (with a tape measure) and another person marks the spot by putting their finger on it.
5. Someone else uses the tape measure to measure the girth of the tree in cm (all the way around its trunk) at that height.

- **Top Tip – if the tape measure doesn't reach around the tree, use string and then measure how much string you used.**

6. Now the groups can use a calculator to divide the girth measurement by 2.5 which will give you the approximate age in years.
7. Was the children's estimation of age anywhere near the actual age?
8. Each group can estimate and measure more trees, seeing if their estimates get better with practice.

### Discussion

- In which year were the trees planted?
- Are all of the trees in the area the same age?
- Can the children see any trees that are obviously much younger or older?  
How can they tell?

## Plenary

**What sort of maths skills have the children used in the forest?**

**What sort of mathematical equipment have they used?**

**Have they learned anything about the forest itself e.g. about the trees or plants or wildlife?**

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## Follow up work - back at school

Compile pie charts or bar charts to show your results.

Design a symmetrical butterfly that illustrates some of the patterns you saw in the forest.



### Some simple questions to discuss:

**Did you see any people in the forest?**

**What were they doing?**

**Make a poster to show what sort of activities people could do in the forest.**

Note: people can do all sorts of activities in the forest e.g. cycling, walking, playing, having a picnic.

**Did you see any areas of the forest that had been felled, where trees had been cut down to provide timber (wood)?**  
**How many things can you think of that are made of wood?**

Note: the Forestry Commission manages the forest very carefully, so that new trees are planted to replace those that have been felled for timber. Timber is used to make all sorts of things including fences, bird boxes, furniture, pencils and toilet roll.



**Did you see any animals or birds in the forest?**

**Why do you think forests are good places for animals to live?**

Note: forests are really important for all sorts of animals and birds; the forest provides food, water, oxygen, shelter and shade.

For more information about this, and further activities to learn about the forest cycle, please look at the Forestry Commission learning downloads at [www.forestry.gov.uk/england-learning](http://www.forestry.gov.uk/england-learning).

**Tell us  
what you think...**

We'd like to know what you thought of this Forestry Commission learning resource.

Please visit [www.forestry.gov.uk/learning](http://www.forestry.gov.uk/learning) and follow the link to our online questionnaire.

Many thanks for your help.

# Distance estimation card

0.5m 3m 15m 10m 7m

# Distance estimation card

1m 12m 19m 10m 5m

# Distance estimation card

0.5m 10m 12m 25m 4m

# Distance estimation card

0.5m 3m 15m 10m 7m

# Distance estimation card

1m 12m 19m 10m 5m

# Distance estimation card

0.5m 10m 12m 25m 4m



# Photos for Animal Shape Cards





# Tree Age



Names of people in my group:

## What to do:

1. Choose a tree
2. Do you know what sort of tree it is?
3. Estimate how old the tree might be:
4. Now use this method to calculate the approximate age of the tree:
  - Measure 1.5 metres up the trunk and mark the spot.
  - Measure the girth (all the way around the trunk) of the tree at this height.
  - Write down the girth in cm.
  - Use the calculator to divide the number of centimetres by 2.5.
  - Write down your answer  
This gives you the approximate age of the tree.
  - What is the difference between your estimate and the measured age of the tree?  
 years.
  - During which year was the tree planted?



# Tree Age

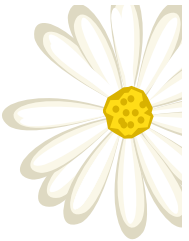


Names of people in my group:

## What to do:

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  - During which year was the tree planted?



# Daisy Sampling



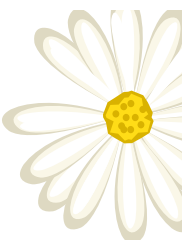
Date:

Location	Estimated number of daisies	Daisy count	Difference

Which location had the most daisies?

How many more daisies did it have compared to the other locations?

How many daisies did you count altogether?



# Daisy Sampling



Date:

Location	Estimated number of daisies	Daisy count	Difference

Which location had the most daisies?

How many more daisies did it have compared to the other locations?

How many daisies did you count altogether?