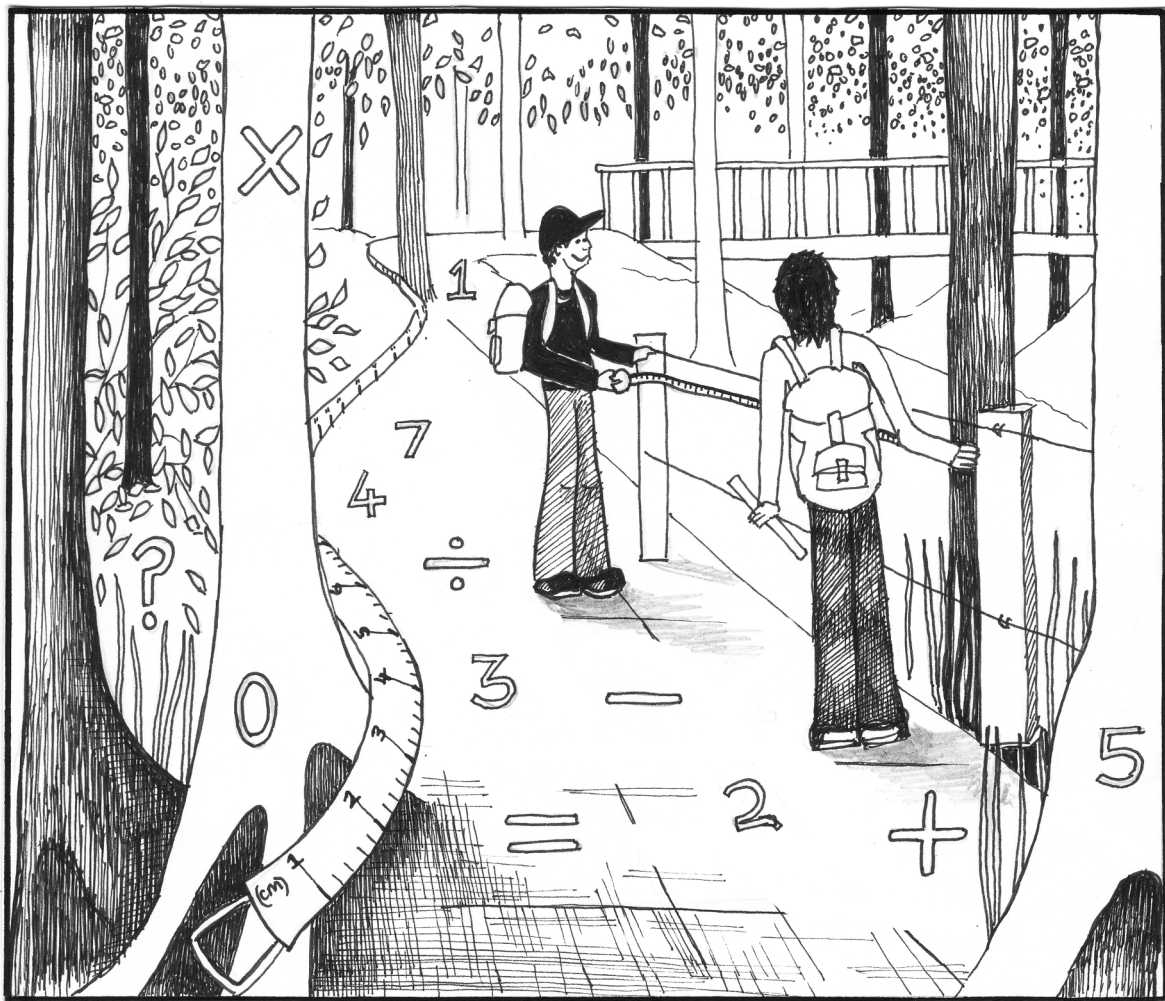


# Woodland Maths Trail



Anna Craigen

Written by Amanda Findlay, St. Ronan's Primary School, Innerleithen



# Teachers' Notes

## Introduction

Welcome to Harestanes and the **Woodland Maths Trail**. The trail has been developed with the aims of reinforcing the maths taught in school and making links with a woodland environment.

The pack contains a variety of practical activities to be used on the trail. Teachers may do as many of the activities as they wish, using their own discretion to adapt the activities to suit the ability of their children. The use of the **Extension Activities** and **Problem Solving Activities** can provide differentiation within a class or group. 'Did you know' facts help to demonstrate the links between maths and the outdoor environment.

On each activity a link to the 5-14 Maths Curriculum is indicated as well as the most appropriate levels.

For practical reasons it is suggested that pupils work in groups of 6-8, supervised by an adult.

Each activity is likely to take 15-20 mins.




## Equipment Required

The pupils are expected to wear suitable outdoor clothing. A kit containing the required maths equipment is provided but schools should bring their own pencils and clipboards. The kits are available from Harestanes Visitor Centre (01835 830306) or Melrose Resource Centre (01896 823517). Please phone either Centre to ensure that kits are available before your visit.

Participating schools will be expected to photocopy the relevant sheets according to their group organisation.

## The Value of the Trail

The main aims of the Woodland Maths Trail are as follows;

-  to provide opportunities for the application of maths skills in practical situations.
-  to encourage pupils to work together to complete a task.
-  to show the relevance of maths in a woodland environment.

# Health and Safety

While the route follows a formalised footpath there are outdoor hazards that the children and helpers should be made aware.

The Woodland Maths Trail starts at the Visitor Centre Carpark where children should be made aware of cars in the Carpark, on surrounding roads and also of tractors that may have occasion to access fields. It is also possible that cyclists may use the path.

Attention should be given to uneven ground conditions and children advised of Nettles and Thorn bushes. Children should be instructed not to run, take care and stay in their group.

The children should be instructed **not** to climb trees and **not to climb on woodpiles**.

Exercise 9 involves measuring the depth of a gully bellow a bridge. **Only the Teacher, helper or children old enough to understand the danger and tall enough to work above the handrail should take measurements – P6&7.** Pupils should not climb or hang over the rail. The bridge is sturdy with railings and good footing.

The trail continues past a pond which is safeguarded behind a fenced off minibeast viewing platform.

The able-bodied trail turns right down a flight of steps with handrail. At this point the disabled route continues to meet the tarred road, which is private access. Activity 12 can be accessed by assisted wheel chair from further down the road as shown on map.

The trail follows the burn to a second crossing point over a sleeper bridge which has good footing but no handrail. Young children may require their hand held.

There are low branches crossing the path at this point. Tall persons need to take care.

Children should be advised to stand well away from the playpark equipment when doing their drawing and advised that in the Courtyard people could be carrying hot drinks.

Do not use the Trail in windy conditions, and avoid periods of extreme temperature.

The equipment provided has been designed with safety in mind but supervision to ensure correct use is still essential. E.g. children should pass tape measures around trees (not swing them round) and the clinometer should be held away from the eye. There are no sharp points on the callipers but they operate in a scissor fashion so careless use could result in a nip.

# GENERAL RISK ASSESSMENT

Page ..1. of ..1

Form GA1/...

Department: **Forest Education Initiative** ..... Location: **Harestanes Visitor Centre** ..... Date: **23-08-04**  
 Assessed by: **Greg Macfarlane** ..... Signature: ..... Review Date:

ACTIVITY/TASK		Woodlands Maths Trail (route of the yellow trail)												TOTAL NUMBER EXPOSED TO RISK:				
Ref No	HAZARDS	Persons at Risk						Likelihood				Severity				Total Risk	EXISTING CONTROL MEASURES	Adq Control
		Emp	Serv	Pub	Cont	Y/P	Mthr	Impr	Rem	Poss	Prob	No.In	Min	Maj	Fatal			
1	Knocked over by road vehicle or agricultural traffic.	,	,			,				,					,	H	Tractor warning sign at field access.	Yes
2	Slips, trips and falling.	,	,			,				,					,	M	Advice to Teachers in packs Health and Safety notes.	Yes
3	Falling from height.	,	,			,				,					,	M	Bridge crossing burn and gully is sturdy with railings and good footing. Teachers advised that only pupils who are old enough to understand the dangers and tall enough to take measurement from above hand rail may take measurements – P6&7.	Yes
4	Falling into water.	,	,			,				,					,	H	Pond is fenced off with designed mini beast viewing platform. Sleeper bridge has good footing.	Yes
5	Biological Agents (including nettle stings, scratches, insect bites/stings.	,	,			,				,					,	M	Most of the route and activities are on the maintained track. Teachers warned that there might be nettles and thorns.	Yes
6	Weather conditions.	,	,			,				,					,	H	Advised not to use trail in inclement weather.	Yes
7	Use of Equipment.	,	,			,				,					,	M	Tools and equipment designed and modified for children’s use. Teachers advised to supervise use.	Yes

# Woodland Maths Trail Activities

## 1. Fence Posts

Estimating, measuring length and costing.

N,M and M Level B-D

## 2. Numberline

Adding, subtracting, multiplying, dividing.

N,M and M Level A-D

## 3. Circumference of a Tree.

Measuring, finding averages.

N,M and M Level B-D

## 4. Tree Rings

Estimating and measuring the age of trees.

N,M and M Level A-D

## 5. Timber!

Estimating and measuring the height of trees.

N,M and M Level C-D

## 6. 2D Shapes

Making 2D shape.

S,P and M Level A-D

## 7. The Cricket Pavilion.

Identifying 2D shape. Fractions.

S,P and M Level A-D

## 8. Chestnut Palings.

Estimating and calculating number and cost.

N,M and M Level B-D

## 9. The Bridge.

Measuring and recording depths.

N,M and M Level D

## 10. Grid References.

Using grid references.

S,P and M Level B-D

## 11. Diameter of a Tree.

Measuring diameter and creating a graph.

IH Level C-D

## 12. Compass Points.

Identifying compass points.

S,P and M Level D

## 13. Measuring Speed.

Calculating speed.

N,M and M Level D

## 14. Courtyard.

Identifying symmetry.

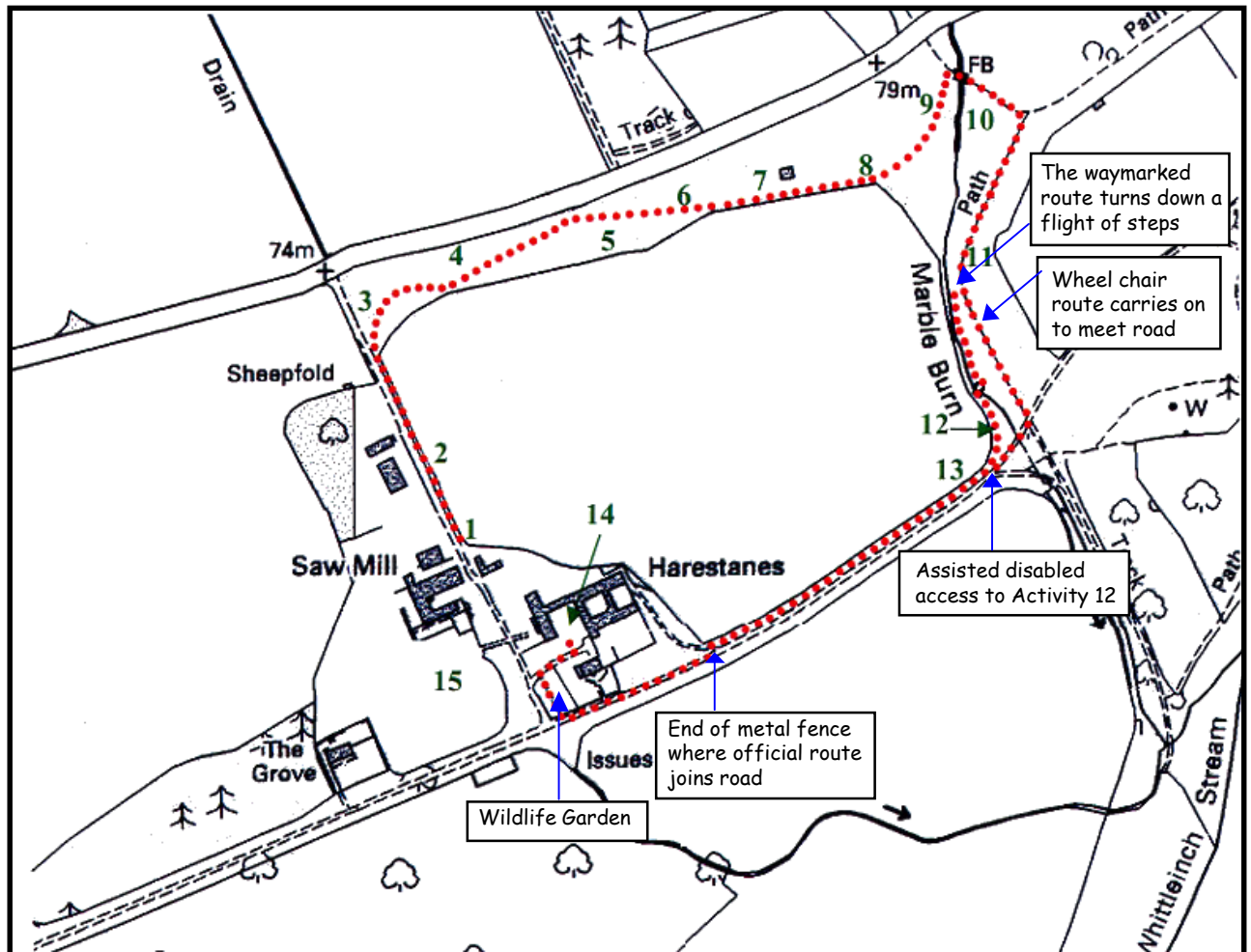
S,P and M Level B-D

## 15. Playpark.

Identifying 2D and 3D shapes.

S,P and M Level B-D

# Trail Map



- |                            |                        |
|----------------------------|------------------------|
| 1. Fence Posts             | 9. The Bridge          |
| 2. Numberline              | 10. Grid References    |
| 3. Circumference of a tree | 11. Diameter of a Tree |
| 4. Tree Rings              | 12. Compass Points     |
| 5. Timber!                 | 13. Measuring Speed    |
| 6. 2D Shapes               | 14. Courtyard          |
| 7. The Cricket Pavilion    | 15. Playpark           |
| 8. Chestnut Palings        |                        |

# Fence Posts

Look at the posts that make up the long fence. Estimate, then measure the distance along the dark brown fence posts using the following methods...

Footsteps		Strides		Metres	
Estimate	Answer	Estimate	Answer	Estimate	Answer
				m	m

## Problem

The manager at Harestanes is looking to replace the posts between the brown markers. How much would it cost to use these different types of wood?

Oak £3.50 each	Spruce £1.20 each	Pine £1.70 each
£	£	£

## Did You Know?

*The wood used for these posts is mainly Scots Pine but includes some Spruce. Pine is more expensive but the timber is much more durable and longer lasting which means better value for money. Oak is very durable and looks the best. If you were the manager what would you choose?*

## Extension Activity

Go to the Spanish Fir Tree at the end of this activity. Estimate and then measure the circumference of the tree. Use the following methods.

Handspans		Armspans		Centimetres	
Estimate	Answer	Estimate	Answer	Estimate	Answer
				cm	cm



# Numberline

Below are a number of suggested activities you can do with the numberline.

1. Stand next to an even/odd number.
  2. Find a multiple of 3,4,5 etc.
  3. Add/subtract 4,5,6 to your number.
  4. Pick a number and half it; double it, treble it.
  5. Walk up the numberline. Hop on the multiples of 3,4 etc.
- Stand next to a two digit number that ends with an odd/even number

## Problem

Everyone must stand at a post. More than one person can stand at each post. However you cannot stand at an even number. You cannot stand at a number that divides by 3. Which numbers can you stand at?

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## Extension Activity

Arrange your group in order of age, oldest to youngest, so that the oldest stands at number 1.

Stand in order of birth months with January birthdays at number 1.

Stand in order of height with the smallest at number 1.

## Did You Know?

*Foresters have to do certain jobs in order. Once trees are felled the ground needs to be prepared before it can be planted. The trees then need to be protected and weeded and when they get older pruned and then thinned before they are finally felled. Then the process is repeated.*

**FELLING -PREPARE THE GROUND-PLANT THE TREES-PROTECT THE TREES-WEEDING-PRUNING-THINNING-FELLING**



# Circumference of a Tree

Note: Circumference. In this activity it is the distance around the tree trunk.

Six of the trees in this area have a line marked around them. The trees with a green line are softwood. Those with a yellow line are hardwood. Measure the circumference of the trees to the nearest centimetre and record your results here.

Softwood		Hardwood	
1.	cm	1.	cm
2.	cm	2.	cm
3.	cm	3.	cm
<i>Total</i>	cm	<i>Total</i>	cm
<i>Average</i>	cm	<i>Average</i>	cm

Now answer these questions.

Which tree has the largest circumference? \_\_\_\_\_

Which tree has the smallest circumference? \_\_\_\_\_

What is the difference between their circumferences? \_\_\_\_\_

## Problem

All these trees are the same age. Why do you think they have different circumferences. (Think about how it grows.) \_\_\_\_\_

## Extension Activity

Add up the circumferences in each group.

Which type of tree has the greatest total? \_\_\_\_\_

Find the average circumference for each type of tree. (Total divided by 3.)

## Did You Know?

*Softwood trees grow quickly. Their rings are wider and because of this the wood is softer.*

*Hardwood trees are slower growing. Their rings are closer together and the wood is harder.*

# Tree Rings

## Did You Know?



Counting the rings of a tree can tell you how old the tree was when it was cut down. Each ring shows one year of growth.

Look at the first 4 tree stumps. Count the rings and record how old these trees were when they were cut down.

Softwood (Green)		Hardwood (Yellow)	
Green 1.	years	Yellow 1.	years
Green 2.	years	Yellow 2.	years

Try to answer these questions.

Why do you think the rings are different distances apart? (Think about how they grow.)

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Why do you think the rings are not perfect circles? (Think about the position of the tree.)

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## Extension Activity

Go to the next tree stump. The tree was planted in 1943. How old was this tree when it was cut down? \_\_\_\_\_.

Use the cards provided to make a timeline of events on the tree stump.

↓	19		↓	19	
	19			19	
	19			19	
	19			19	

## Did You Know?

Most hardwood trees are **broadleaved** trees and softwood trees are mainly **conifers**.

# Timber!

Look at the tallest tree ahead of you. If it fell towards you where do you think it would fall?

Tick your estimate.:      A(20 m)      B(25 m)      C(30 m)      D(35 m)      E(40 m)

**Figure 1**



Note: Clinometer. In this activity it is used to measure the height of trees.

Working in pairs stand next to the activity marker. Hold the clinometer as shown.

Look at the top of the tree along the "sight line". (Figure 1)

**Figure 2**

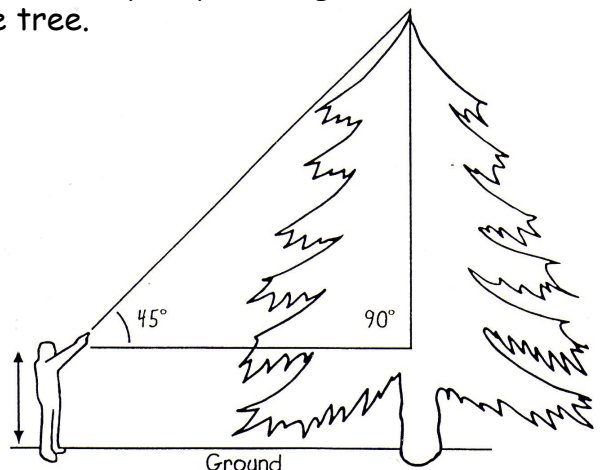


Move forward until your partner tells you when the pendulum is hanging vertically as shown. (Figure .2)

The pendulum is hanging at  $90^\circ$  to the bottom of the clinometer and the sight line is at  $45^\circ$ . This is the point where you have created a right-angled triangle. Stay at this point.

The distance to the tree plus your height will be about the height of the tree.

Distance to Tree		m
+ Your Height		m
Height of Tree		m



To work out where the tree will fall add your height to where you are now standing.

Was your estimate correct? \_\_\_\_\_

## Did You Know?

*The Nuthatch is the only British bird to walk headfirst down a tree. They are about 15cms from head to tail with a grey back and orange tummy.*

# 2D Shapes

Use the sticks in your kit to make these shapes. Sketch your shapes as a record.

Square	Rectangle	Triangle	Right-angled triangle
Hexagon	Pentagon	Octagon	Isosceles triangle

Which shape used least sticks? \_\_\_\_\_

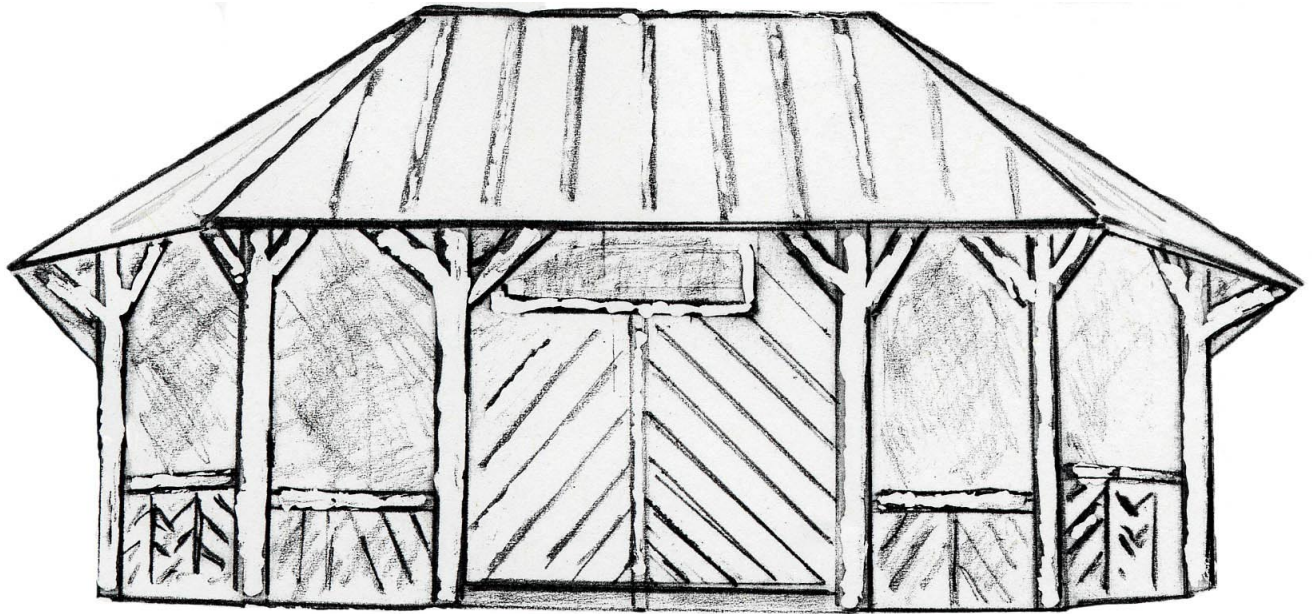
Which shape used most? \_\_\_\_\_

## Problem

Can you make 4 equilateral triangles using only 9 sticks?

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# The Cricket Pavilion



Mark on the diagram above:

Squares

Triangles

Rectangles

Parallelograms

Label a horizontal line

Label a right angle

a vertical line

an obtuse angle

perpendicular lines

and acute angle

## Extension Activity

Look at the wooden stools. Each one has a fraction missing. Use the fractions in the kit to make the stools complete

## Did You Know?

*The cricket pitch used to be where the field is now. During the 2<sup>nd</sup> World War it was ploughed up to grow food.*

# Chestnut Palings

Note: the chestnut palings make up the fence that leads to the bridge.  
Estimate the number of chestnut palings between the.....

	Estimate	Calculation
Yellow and green post		
yellow and red post		
yellow and brown post		

Now count the number of palings in the first section of fence.

Instead of counting the rest of the palings think of a quicker way to calculate the number between the other posts.  
Show how you worked it out.

Record your answers in the table above.

## Problem

A section of the fence is broken. Each paling costs 20p to replace. The manager at Harestanes gets a bill for £10.

How many palings have been replaced? \_\_\_\_\_

## Did You Know?

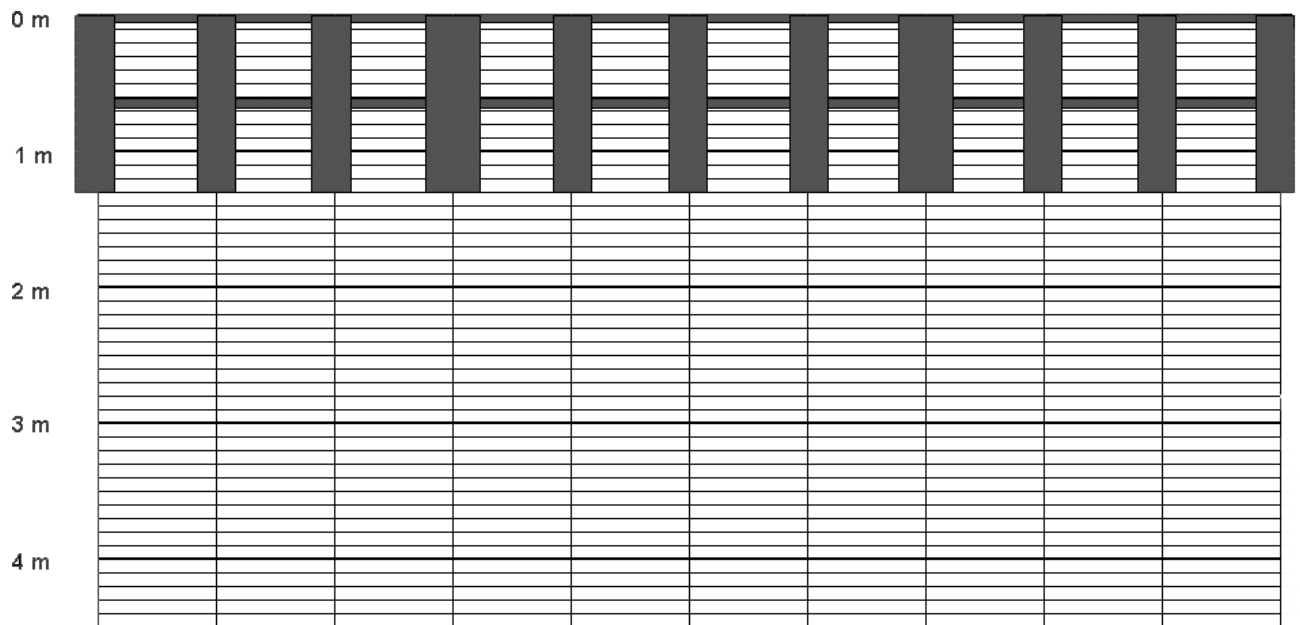
*The Romans introduced the Sweet Chestnut (*Castanea sativa*) into Britain to produce the nuts which were ground up and made into 'polenta' a basic food of the legionaries. Roasted sweet chestnuts are tasty and nutritious, but most are imported as the British climate is too cold for them to ripen properly.*

# The Bridge

Stand at the post for this activity. Look at the shape of the gulley under the bridge.

Send one or two people on to the bridge. Using a measuring tape measure the depth of the gulley from the top of each of the posts on the bridge.

Plot the depths on this diagram. Join up the points to see the shape of the gulley.



## Problem

Over time the gulley erodes so that at each point the depth is 0.2m more. Record what the new depths will be.

1	2	3	4	5	6	7	8	9	10	11
cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm

## Did You Know?

*Otters frequently travel along this watercourse to hunt for frogs and eels*



# Grid References

Write down the co-ordinates for the following animals

Woodpecker	Osprey	Bat	Squirrel
Roe Deer	Badger	Hare	Owl

## Extension Activity

Can you match these facts to the silhouettes of the animals?



There are two types of these birds found in the Scottish Borders, the 'Great Spotted' and the larger 'Green'. Because they feed on insects that live in dead and dying wood it is important that Foresters allow some of their woodlands to become old and decayed

These animals roost upside down.

They can eat thousands of midges in a night and they echo locate (use sonar) to seek their prey. Children can hear bats, but adults can't. As we get older we hear less of a range of sounds.



The Red type of this animal is native to Britain but is becoming scarcer. Due to competition from the Grey type, introduced from America they are now restricted to the coniferous woodlands which provide a range of foods such as cones, buds, bark, needles and pollen from the trees plus fungi, roots, eggs and insects.

This animal has 360° vision. It can turn its head right round. It also has really good hearing. It can hear the rustle of a mouse in the distance and it has soft feathers for silent flight.



In recent years this bird has returned to Scotland and into the Borders where they have been successful in rearing young. They are very large birds, they build their nest in tall trees and they eat fish.

This animal eats worms. It sharpens its claws on tree trunks.



# Diameter of a Tree

Note: In this activity callipers are the instrument used to measure the diameter of a tree.

Using the callipers provided, measure the diameter of the identified trees. Measure at the height shown.

Record your results on this tally chart

Less than 10cm	
10 to 15cm	
16cm or more	

Now make a bar graph of your results.

8			
7			
6			
5			
4			
3			
2			
1			
	less than 10cm	10 to 15 cm	16cm or more

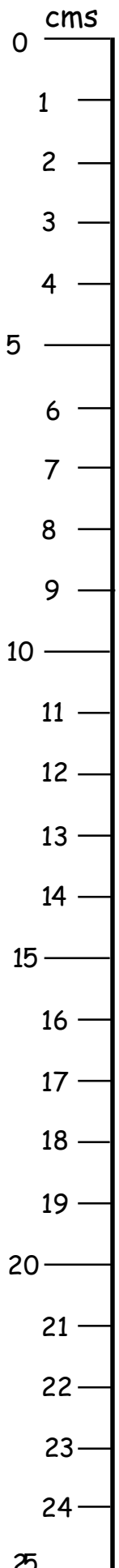
## Extension Activity

Which category had the most trees? \_\_\_\_\_

Which category had the least trees? \_\_\_\_\_

## Did You Know?

*Foresters measure and record the diameters of trees in a similar way. They need this information to estimate how much timber will be produced. It also tells them what size the timber will be so they can identify what it can be used for.*



# Compass Points

Using the compass record the direction of these landmarks to the nearest compass point.

Harestanes Visitor Centre	Cricket Pavilion	Spanish Fir Tree	Direction of the road	Sun

## Extension Activity

Face North.

Which direction would you be facing if you turned...

90° clockwise	
180° anti-clockwise	
45° anti-clockwise	
135° clockwise	
270° clockwise	
315° anti-clockwise	
225° clockwise	
45° clockwise	
90° anti-clockwise	
360° clockwise	

## Did You Know?

*Lichens do not grow on the south side of a tree because it is too hot and dry. If you are erecting bird or bat boxes you should avoid fixing to the south side of the tree to avoid overheating of the young.*

# Measuring Speed

## Problem

Start at the activity post.

From the start to the end of the metal fence the distance is 200m.

Use the stopwatch in the kit to record how long it takes you to walk this distance.  
Now calculate your speed.

(Distance divided by your time.)

Distance	200 m
÷ Your time	seconds
Speed	m per second

Who was fastest in your group and what was their speed?

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Who was slowest and what was their speed?

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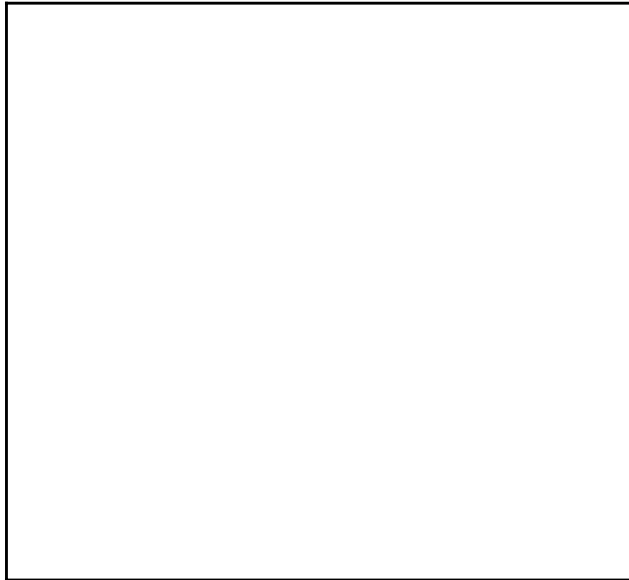
## Did You Know?

*To escape their enemies rabbits and hares rely chiefly on speed. The brown hare can reach speeds of 55-70km per hour.*

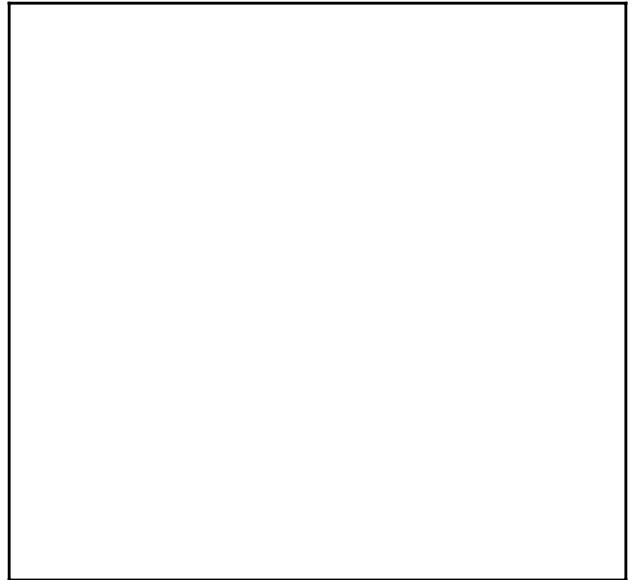
# Courtyard

Look around the courtyard. There are lots of examples of symmetry. On each of your sketches mark the lines of symmetry.

Symmetry in a building



Symmetry in the paving



Symmetry in a window



Symmetry in a door



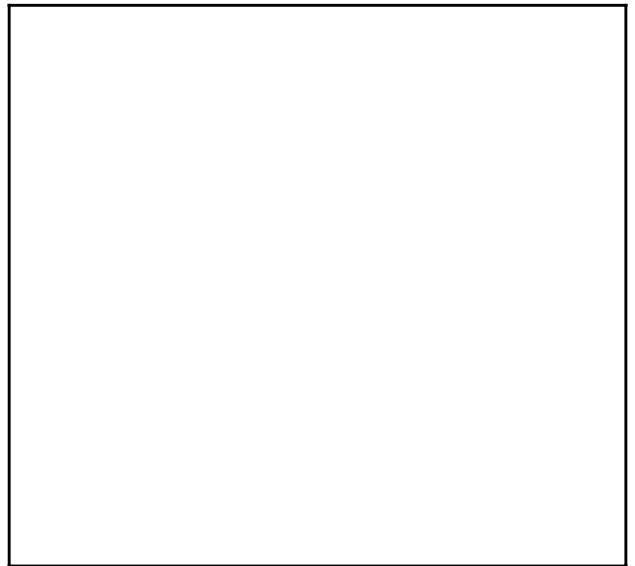
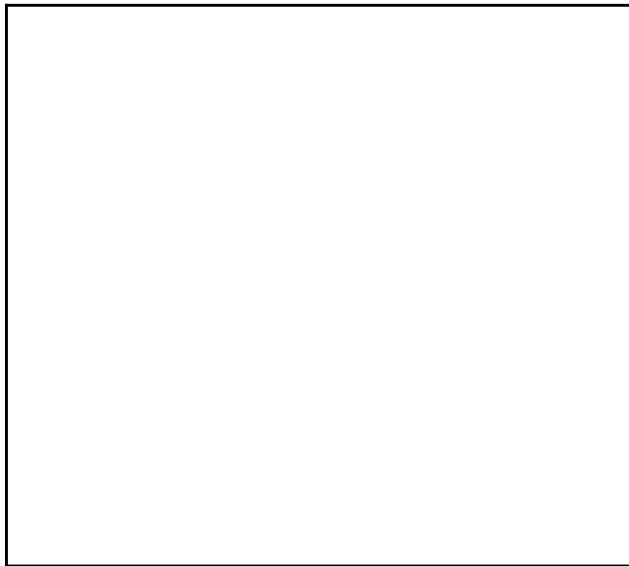
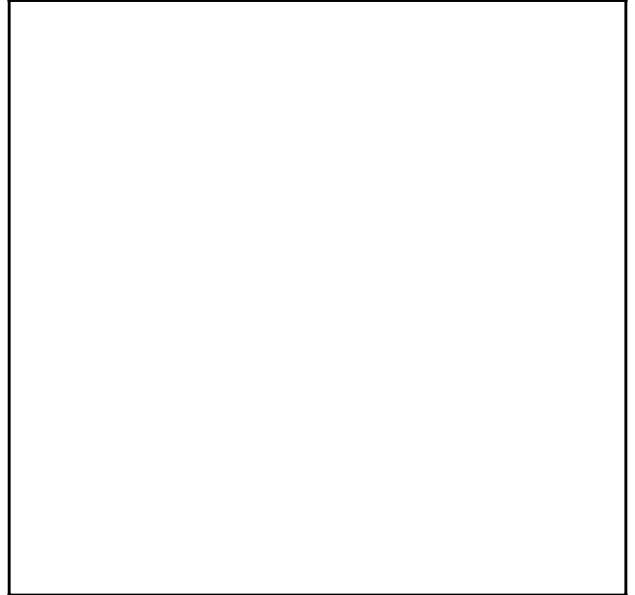
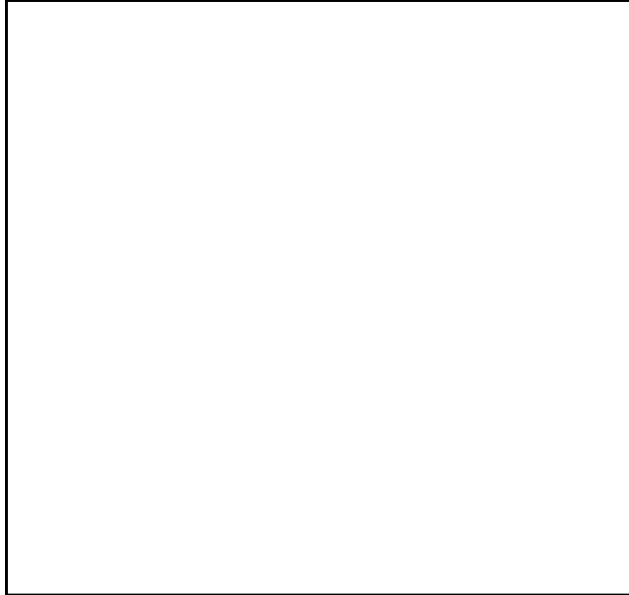
## Did You Know?

*There are good examples of symmetry in nature.  
Look at this sycamore leaf.  
Can you draw a line of symmetry on the leaf.  
Look for other examples in nature.*



# Playpark

Look around the playpark. There are lots of examples of 2D and 3D shapes. Choose one of the frames in the playpark. Sketch the shapes you see from four different sides.



## Extension Activity

Back in the classroom you could try...

...making the 2D shapes you have seen using straws or other construction material.

Can you name all the shapes you can see.

...building 3D models of the frames in the playpark using junk or construction material. Can your class reproduce all the frames in the playpark?