LARNE BOROUGH COUNCIL

Published by
Larne Borough
Council

CARNFUNNOCK COUNTRY PARK

ENVIRONMENTAL MATHS WORKSHEETS

This project has been assisted by Causeway Coast & Glens Heritage Trust as part of the Natural Resource Rural Tourism Initiative under the EU Programme for Peace and Reconciliation.

rural Development Programme

CAUSEWAY COAST & GLENS HERITAGE TRUST

Environment & Heritage Service
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Northern Ireland Tourist Board

EU Programme for Peace and Reconciliation

ACTIVITY 1: HOW OLD IS THAT TREE?

WORKSHEET 1A: MEASURING THE AGE OF GROWING TREES

1a

Trees are the longest-living of all plants with some species living for thousands of years. If you know when a tree was planted in Carnfunnock, you can easily and accurately determine its age. But how do you tell its age if you don't know this information? Although trees grow at different rates you can actually estimate the age of a living tree, by measuring the circumference of its trunk (girth) - the older the tree, the greater its girth. On average, trees in Northern Ireland increase their girth by 2.5cm a year.

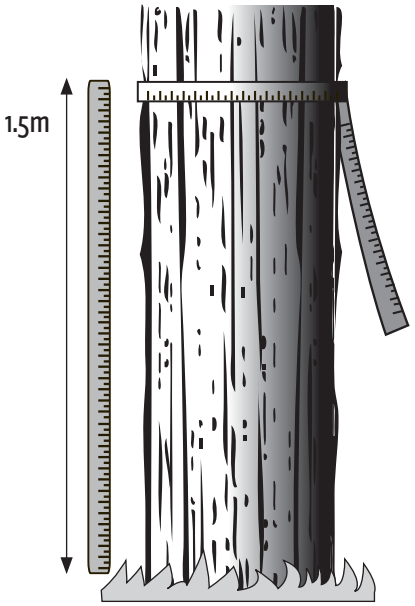
EXPERIMENT 1

Select a **MATURE TREE** within Carnfunnock Country Park. Then try and find out some specific information about it.

What age do you think this tree is? ☐ years old approx.

Now for some measurements to figure out its actual age:

Using your measuring tape, measure the circumference of the tree trunk, at the standard height of 1.5 metres above the ground. If the ground is uneven, measure on the upper side of any slope or the highest part of ground. Remember to change your measurement to centimetres. e.g. 1.5 metres round its trunk multiplying by 100 = 150cm / 2.5 = 60 year old tree.



What is the circumference of your tree's trunk?

☐ cm / 2.5 cm = ☐ years old approx.

Why are you dividing by 2.5cm? ☐

Do you need to make any adjustments because of its species or the thickness of its bark? YES / NO (please circle)

Why? ☐

Repeat this for several trees. Are they all the same age?

☐

EXPERIMENT 2

Select a **YOUNG PINE TREE** within Carnfunnock Country Park. Count the number of layers of branches (whorls) up the trunk.

How many whorls are there? ☐ = ☐ years old approx.

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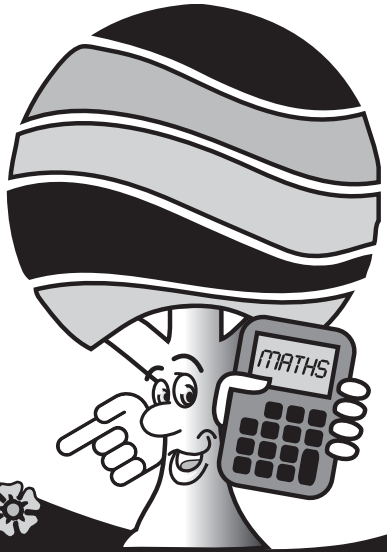


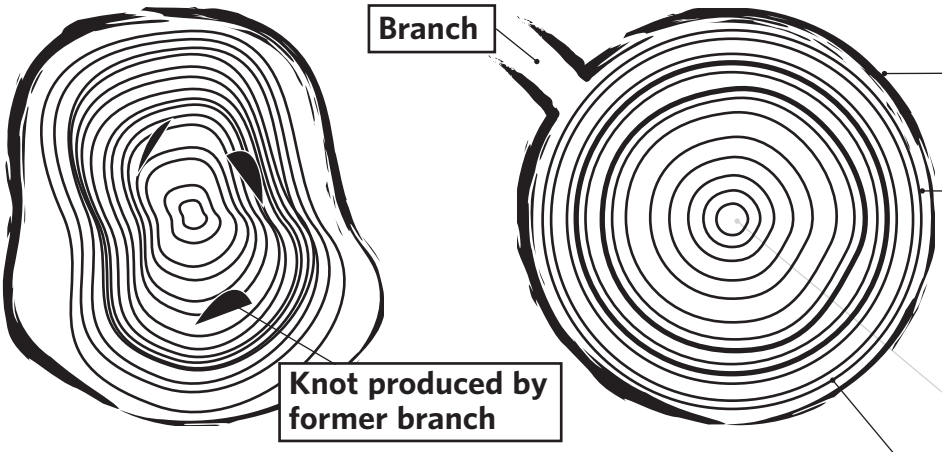
ACTIVITY 1: HOW OLD IS THAT TREE?

WORKSHEET 1B: MEASURING FELLED TREES

1b

The age of a tree can be measured accurately after it has been felled, by counting the growth rings. Some of the rings are much wider than others. In other words, the tree grew more in some years than in others.
Why do you think this might be?

Below are examples of **ring porous species** of trees which have distinct annual rings e.g. oak, ash, elm, chestnut, larch, yew and pine. In **diffuse porous woods**, it is much more difficult to see where the rings begin and end as the pores are scattered throughout the growth ring instead of being collected in a band or row. For example: beech, sycamore, alder, willow, maple and birch.



Unbalanced Growth
The rings are off centre and tightly packed. The left side of the trunk has grown faster than the right.

Balanced Growth
This shows even growth. Although it is the same size as the other, it has fewer rings because it has grown more quickly.

Bark: Protective external covering of the stems, roots, trunk and branches.

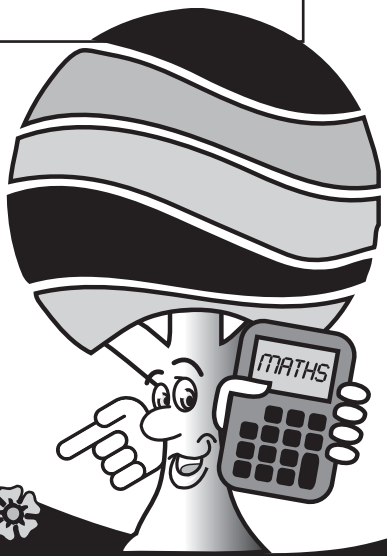
Cambium: Tissue produces **phloem cells** that channel the food made by leaves around the tree and **xylem cells** which suck water and nutrients up from the soil and take them to the leaves.

Heartwood: Dead central portion of wood in a tree.

Sapwood: Newly formed, outer layer of wood between heartwood and bark containing the living elements of the wood.

Each ring is a layer of wood that took a season to grow i.e. each year has a light ring (springwood) and dark ring (summerwood) together. Trees do not grow at the same speed all year. **In which season do you think trees in Northern Ireland will grow most? Why?**

Look for stumps of felled trees within Carnfunnock. Why do you think some stumps have a strong ring pattern and others do not?



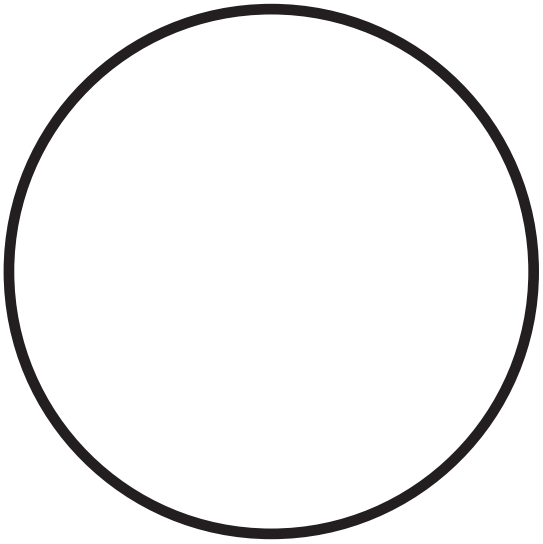
EXPERIMENT 1 INVESTIGATING TREE AGE

1b

Find a felled tree stump within Carnfunnock Country Park which shows clear growth rings. **Look closely and draw roughly its ring pattern and any special features. For example a knot produced by a former branch.**

Insert the following labels:

- ☐ Bark
- ☐ Heartwood
- ☐ Sapwood
- ☐ Cambium



To find the age of the tree when it was cut down just count the dark rings. So this tree is how many years old?

If you look at the bark is it smooth, rough, lined or lumpy?

What tree species do you think It is?

Do you think there were any changes to its environment? YES / NO (please circle) **Why?**

For example: Young trees tend to lay down wider rings as the tree grows more quickly in youth, while older trees lay down narrower rings in later years. Sudden increases in thickness in later years usually indicates more light due to thinning of woodland.

The oldest ring is the small one in the middle and the youngest is the last ring just below the bark. **If you know that the majority of mature trees were felled in Carnfunnock in spring 2006 can you figure out what year your particular tree may have been planted?**

Can you also see any particular years that:

- **Were good growing years:**
- **Were bad growing years:**

At what time of the year should trees be planted? Why?

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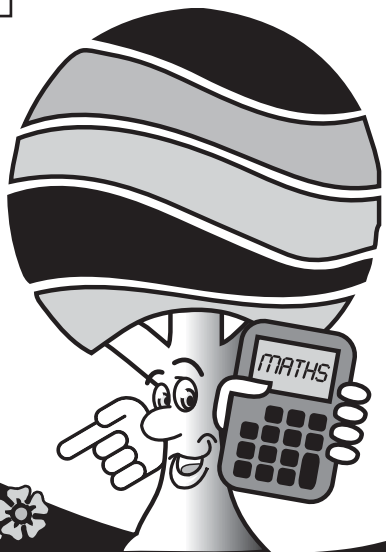

EXPERIMENT 2 CALCULATIONS USING ANNUAL RINGS

1b

There is also another way to find out the age of a tree. Try the following calculations:

Definition:

Diameter: **the width of the cross section of the trunk directly through the middle. Remember to exclude the bark!**

Radius: **the distance from the centre of the tree (in the heartwood) out to the bark.**

STEP A: CALCULATE THE AVERAGE WIDTH OF AN ANNUAL RING

①	Use your tape and measure the **radius** just inside the bark to the centre of the trunk.		cm
②	Count the number of rings.		rings
③	Divide the radius ① by the number of rings ② .		cm / rings
④	The result will be the **average width per ring**		cm = average width

For example: 25cm / 50 rings = 0.5 cm per ring

STEP B: CALCULATE THE APPROXIMATE AGE OF THE TREE (using the figures above)

Divide the radius (r) by the average width (w) of one annual growth ring to get the approximate age of the tree i.e. r / w = approximate age

Radius ① ____ **/ Average Width** ④ ____ **=** ____ years old approx.

For example: 60 cm / 0.5 cm per year = 120 years

Is there a pattern between the size of the tree trunk and its age rings?

What is the circumference of your trunk (as per living tree calculation)?

____ cm / 2.5 cm = ____ years old approx.

What is the difference between the tree trunk age above and the ring age calculated in Step B? ____ years

Make a list of what you think trees need in order to grow:

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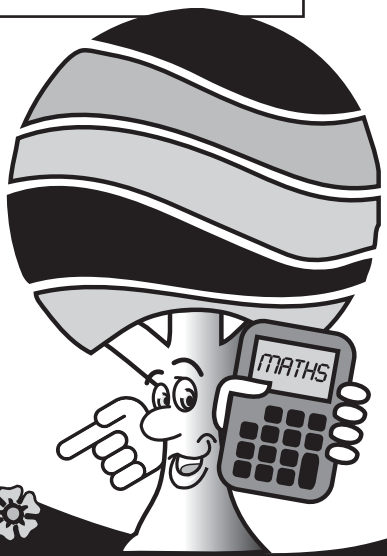

EXPERIMENT 3 COMPARE TRUNK MEASUREMENTS

1b

Now that you know how to find out the age of a tree we can try to see if there is a pattern between its age and the size of the trunk. For this you will need to record your results in the table below. Remember the difference between the radius and diameter!

Recording your results

Here is a table that you could use with your groups results.

TRUNK MEASUREMENT COMPARISONS

Group	Diameter of the tree (in cms)	Age of the tree (number of rings)	Bad Growth Years	Good Growth Years
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Drawing a graph

When you get back to the classroom, take your results and draw them into a graph to enable you to see a pattern more clearly:

1. On the bottom or X axis put the diameter of the tree in centimetres (cms). The scale will need to go from 0 to 40.
2. On the up or Y axis put the age (number of rings). The scale will need to go from 0 to 50.
3. Plot your answers from the table.

The pattern

Is there a pattern on your graph? Try to describe what you see. What happens to the size of the tree as it gets older? Are there signs of consistently bad / good weather conditions in certain years?

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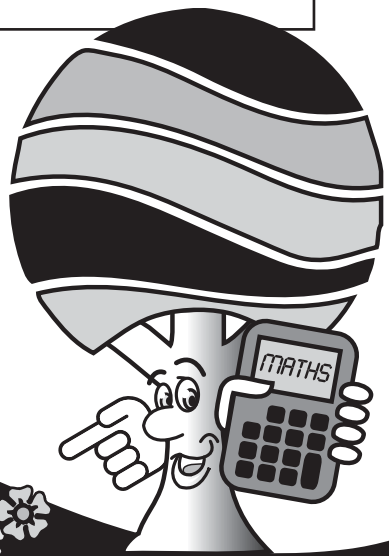
WORKSHEET



ACTIVITY 2: MEASURING THE HEIGHT OF A TREE

WORKSHEET 2: HOW TALL IS MY TREE?

2

Using the same tree (Worksheet 1A), how tall do you think it is? _____ metres

You will now need the help of a friend to take some measurements to figure out its actual height.

What is your friend's height? _____

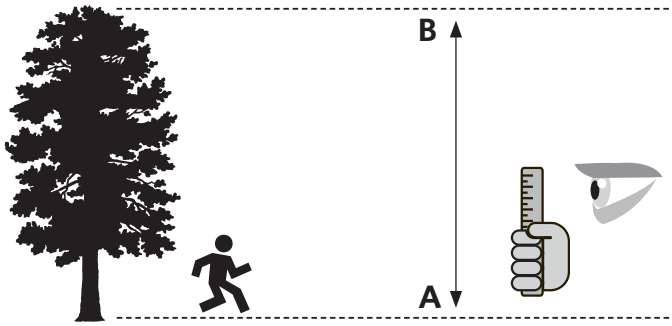
EXPERIMENT 1

Ask your friend to stand at the base of the tree. With a pencil in one hand, hold out a ruler at arm's length in the other hand, lining up the top with your friend's head. With the pencil make a mark on the ruler that lines up with his or her feet.

Standing in the same place move the ruler upwards so that the top lines up with the top of the tree. Make another mark on the ruler, this time in line with the bottom of the tree. Now you can work out the tree's height as the 2 marks on the ruler show how much taller the tree is than your friend.

A. What is the measurement for the base of your friend's feet? _____

B. What is the measurement for the base of the tree? _____



C. What is the difference between A and B? _____

D. Divide C by your friends height:
This tells you how many times taller it is than your friend. _____

E. What height do you calculate the tree to be? _____

Example: If your friend is 1.5 metres tall and a tree is 20 times taller than the tree must be 30 metres tall.

Was there anything that made this difficult to measure?

_____

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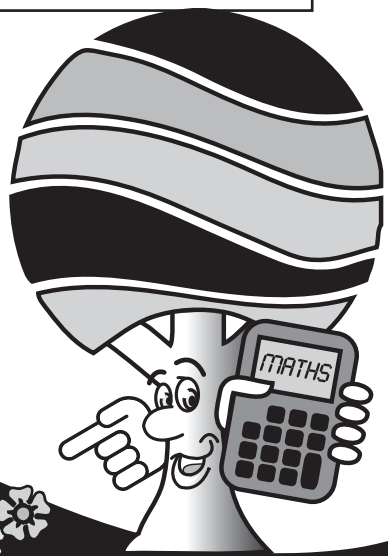
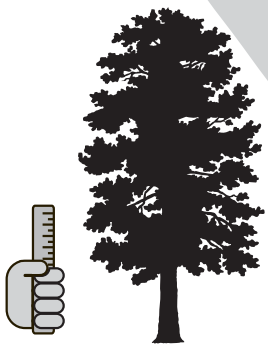


EXPERIMENT 2

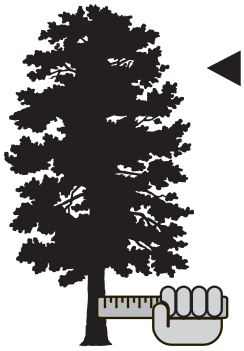
2

1. Get a ruler and a tape measure then go to your tree. Start from the side where there is a clear space, because you need to walk away from the tree. Make sure that you will not be walking into the road!

2. Walk backwards away from the tree, holding the ruler upright at arms length. STOP when the tree appears to be the same height as the ruler. ▶

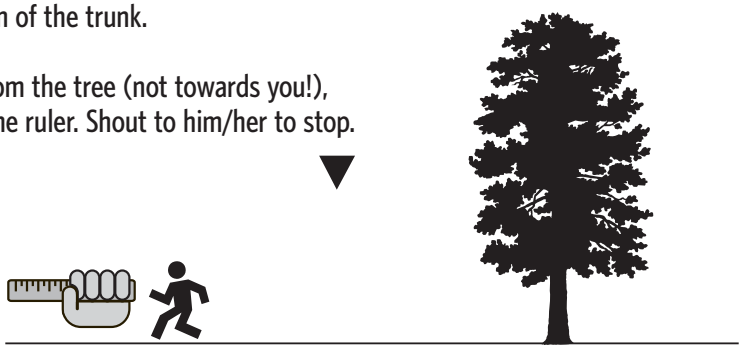


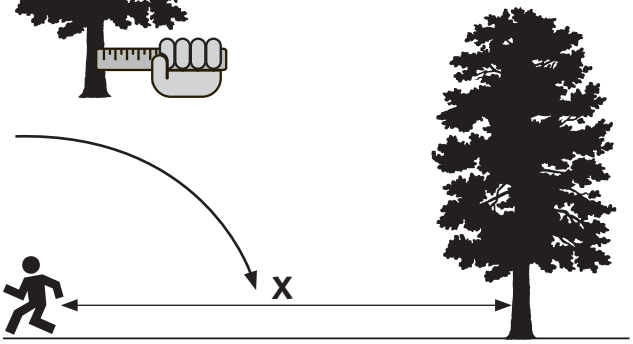
◀ 3. Now turn the ruler sideways until it is parallel with the ground. Keep one end on the apparent bottom of the trunk.



4. Get your partner to walk sideways from the tree (not towards you!), until he/she is level with the end of the ruler. Shout to him/her to stop.

▼





◀ 5. Now using your tape measure, walk along and measure the distance from your partner to the base of the real tree. This is the rough height of the tree. X = height of tree

E. What height do you calculate the tree to be? ____

Compare your height measurement between Experiment 1 and Experiment 2. Was there a difference? YES / NO (please circle)

Why? ____

Were there any signs of damage to the tree e.g. storms or tree surgery?

____

Based on the information you have about the age and height of this tree do you think it is nearing the end of its life cycle or will it continue to grow older and taller?

____

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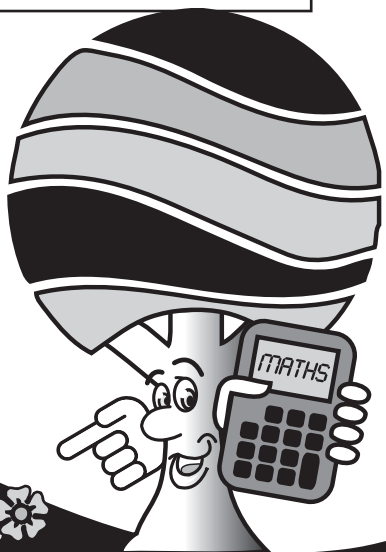
WORKSHEET