



Investigating Wood

KS2 Investigations
Exploring some of the
Characteristics and
Properties of different
Woods.



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Investigating Woods.

Wood has been an important construction material since humans began building shelters, houses and boats. Nearly all boats were made out of wood till the late 1800s, and wood remains in common use today in boat construction. New domestic housing in many parts of the world today is commonly of timber-framed construction. In buildings made of other materials, wood will still be found as a supporting material, especially in roof construction and interior doors and their frames and exterior cladding. Although plastics and other materials have replaced wood in many applications there are others, such as in musical instruments, that the qualities that wood brings cannot be wholly reproduced.

This pack is designed to explore these qualities and the relationship between the properties of the wood, the tree that produced it and the uses to which it is put. In other words we are looking at the tree as a timber producing unit.

The unit is aimed at KS2 pupils and focuses mainly on developing concepts of questioning, fair testing and evaluating results as well as investigating the characteristics of wood as a material.

The basic requirement is a number of sets of standard pieces of wood from 6 different trees. The selection is important since it should include at least two softwood samples. The samples in the pack are from native British timber trees but this can be varied to meet particular requirements and availability. The inclusion of foreign hardwood samples could yield some rather more pronounced results from the investigations.

The number of sets required will depend on the organisation of the class into groups. Six sets should be sufficient. You will also need sets of thinner standard pieces of the same woods that can be tested to destruction for unit 9.



The investigations should be self explanatory but further background information on aspects of wood science is available on many web sites.



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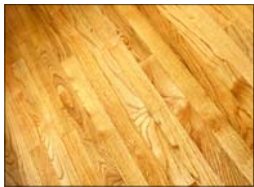
1. Which sort of Wood?



Wood is an important material which has always been used to make many of the things around us.

Here are some pictures of the way that wood is used now and in the past. With your group try making a list of all the uses of wood that you can think of.

Can any of them be made of other materials?



What do you have to think about when choosing a material to make each of the following?

(put a tick in **all** the boxes that you think are important)

Discuss this or compare your results with your group.

	attractiveness	strength	hardness	weight/ density	Other Considerations
A garden fence					
A floor					
A spade handle					
A roof beam					
A violin					
A rowing boat					
A carving of an animal					
A wooden crate					
A table top					
A door					
Xylophone keys					

2. Hardwood and Softwood



You may have heard people talking about two different kinds of wood -

hardwood and softwood.

Surprisingly, these names have almost nothing to do with how hard or soft their woods are! In fact some softwoods are harder than hardwoods! The names hardwood and softwood have to do with the trees that the wood comes from.

Hardwood comes from **broadleaved trees**. These are the sort of typical native British trees like oak, ash and beech. Most of these trees are **deciduous**; they lose their leaves in the winter. There are about a hundred times as many hardwood species as softwoods. Hardwoods are generally far more resistant to decay than softwoods when used for exterior work. In the past, tropical hardwoods were easily available but the supply is now restricted because of the concern about the conservation of tropical forests.



Softwood comes mainly from **evergreen, coniferous trees** which keep their foliage all the year. These are trees like pine and fir trees that are typical of cooler parts of the world.

In general softwood is easy to work and has a huge range of uses. It is the prime material for structural building, but is also found in furniture and other products such as doors and windows. Softwood is also harvested for use in the production of paper.

Put ticks in the correct box to say which of these trees are hardwoods and which are softwoods.



1



2



3



4



5



6

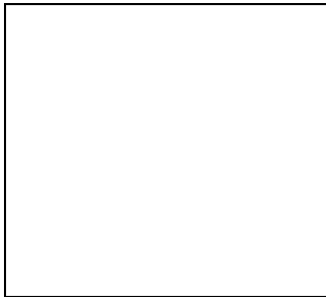
Number	Name of tree	Hardwood	Softwood
1	Ash		
2	Beech		
3	Scots Pine		
4	Sycamore		
5	Larch		
6	Oak		

3. Looking at the Markings



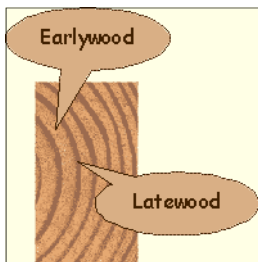
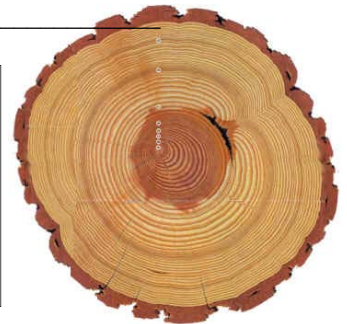
Look very carefully at each face of your samples of different woods. Can you see any patterns in the wood?

Look at the top and bottom ends first. Describe and draw what you can see here.





The pattern that you can see here are growth rings. The tree make one new ring each year it grows. How old do you think the tree on the right was when it was cut down?



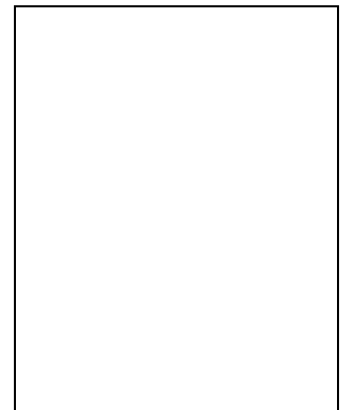
The reason there are two colours in a growth ring is because they are actually two different types of wood! The light wood is known as earlywood because the tree makes it in the early spring. The dark wood is called latewood because the tree makes it in the late summer.

Count the rings to see how long it took for your block to grow.

Now look at the sides of your block. Describe the pattern and draw it here.



The pattern of lines that you can see running up the block is the grain direction



This pattern is created because a growing tree is mainly composed of long, hollow, water-filled cells like tubes (roughly 1 mm long in hardwoods and 5 mm long in softwoods) glued together in bundles (like drinking straws) running up the trunk of the tree.



Use a magnifying glass to look carefully at the top and bottom edges.

Can you see any tiny, round holes? If you can this wood is a hardwood, if not it is a softwood.

Look at the grain and growth rings of all the wood samples. Which has the most distinctive patterns?

4. Getting a Feeling for Wood



Which of your senses can you use to describe the differences between your samples of wood?



Use a magnifying glass to look really carefully at the pattern on each one.

Which do you like the best? _____

Draw the pattern here.



Record your observations in this table.

Number	Name of tree	Description of colour	Shade (1-6 darkest to lightest)	Description of Pattern	Has it a smell?
1	Ash				
2	Beech				
3	Scots Pine				
4	Sycamore				
5	Larch				
6	Oak				

5. Making Music with Wood



Many musical instruments are made of wood. Here are some of them. Can you name them?



1



2



3



4



5



6



9



7



8

	Name of Instrument	How is it played?	What does the wooden part do?
1			
2			
3			
4			
5			
6			
7			
8			
9			

6. Wood and Water



When wood is in a standing tree it is almost completely saturated with water.

Before the wood can be used to make anything it needs to be dried. We call this seasoning the timber.

Wood can be seasoned in 2 ways



- slowly in the air in a carefully constructed stack.

This is a very slow process. To "air-dry" fresh sawn hardwood takes about 1 year per inch of thickness. This gives moisture content of about 18%.

- drying in a kiln (a kind of oven).

This is quicker and dries out more of the moisture. It needs to be done very carefully so that the wood doesn't warp (bend). It takes only 8 days to reduce the moisture content right down to 4%.



Dry wood will absorb water from the air and will swell. This can be a nuisance for wooden windows and doors. This is a nuisance for **two reasons**.

Can you think what these reasons are? _____

Your challenge is to find out which of your woods is the most absorbent.

Weigh each block carefully and record the weight. Now soak the blocks weighted down under water for a standard amount of time. Weigh the blocks again. Have the weights changed? Why? Do all woods take up the same amounts of water?

Number	Name of tree	Weight of block	Weight after an hour in water	Weight after 1 day in water	Woods in order of absorbency 1-6 most absorbent first.
1	Ash				
2	Beech				
3	Scots Pine				
4	Sycamore				
5	Larch				
6	Oak				

What do we do to treat wood so that it will not absorb water?

7. How Heavy is your Wood?



Feel the weight of each of the blocks of different wood. Try to put them in order from the heaviest to the lightest and fill them in 1 to 6 on the table below.

Now **weigh** them carefully. Record the weights in the table. Are the weights in the same order as you estimated?

Number	Name of tree	Estimated weight order (1 to 6 heaviest first)	Measured Weight	Float the Best (1-6 best floater first)	Weight in Water
1	Ash				
2	Beech				
3	Scots Pine				
4	Sycamore				
5	Larch				
6	Oak				

If a material is heavy for its size we say that it is dense. To compare how dense the woods are you will need to see how well they float.

Put each one carefully in a tank of water and see how far down it floats. Put the blocks in order according to how high up they float and record the order in the table above.

Now try weighing the blocks with a spring balance while it is in the water. Are they lighter or heavier than when you weighed them in the air?

Why do you think this happens?

Record the weights in the table.

What do you think you have found out?

Are hardwoods heavier than softwoods? _____

Are hardwoods denser than softwoods? _____



Does it matter which sort of wood you use to build boats?

8. How Hard is your Wood?



Some kinds of wood are easier to work with than others. Feel your wood samples and try to guess which ones are harder and which are softer. What makes you think this?

Your challenge now is to make a fair test to see if your observations were correct.

These are some of the things that you might use-



Make absolutely sure that your test is fair (the same) every time. Record your results in the table below

Number	Name of tree	Thumb nail scratch test (1-6 hardest first)	Sandpaper test	Nail push test	Your own test
1	Ash				
2	Beech				
3	Scots Pine				
4	Sycamore				
5	Larch				
6	Oak				

What do you think the hardest wood could be used for?

Why? _____

What do you think the softer woods are useful for?

9. How Strong is your Wood?



Architects, structural engineers and builders need to know the strength of different timbers that they use for constructing buildings.

What parts of buildings and constructions do you think need to be particularly strong? _____



Are some woods stronger than others?

Your challenge is to make a fair test to find out.

Use the long samples. Hang increasing weights on each one until it breaks.

Make sure that each test is exactly the same. Be very careful that you do this very safely. Don't let the weights fall far and put something soft underneath to protect the floor.

Record your results in the table below.

Number	Name of tree	Weight at which sample breaks	Order of Strength (1-6, Strongest first)
1	Ash		
2	Beech		
3	Scots Pine		
4	Sycamore		
5	Larch		
6	Oak		

Can you think how wood can be made to hold more weight? (the picture is a clue!)