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Woody the Woodworm takes you on a trip through...

the Play Attic

Please return this translation.
Thank you.

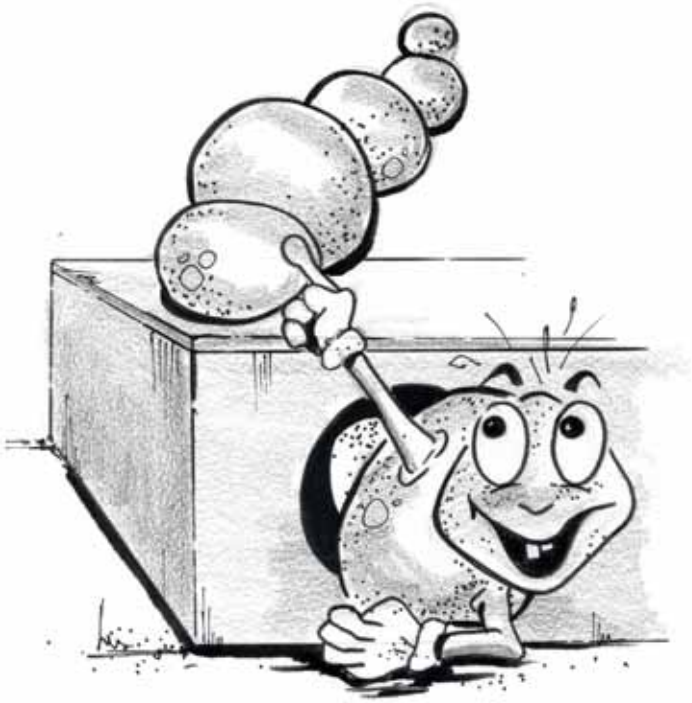
Dear mum, dad, granny, grandad or teacher,

Welcome to our Play Attic!

Here, children can play to their hearts' content at being woodworms themselves, and crawl through the holes in the wood. They will find all kinds of great games to do with wood, the woodworm's favourite "meal".
You can of course join in by giving the children a helping hand with each game.

In this booklet, Woody the Woodworm takes you on a trip through the Play Attic. In each section he has a few interesting things to tell you – great for passing on to the kids!

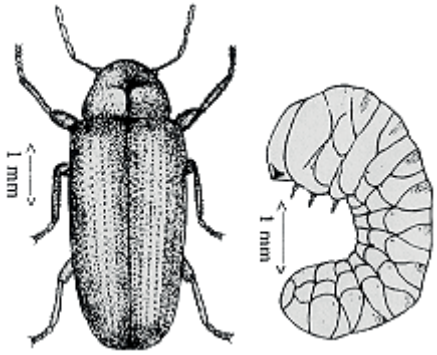
We wish you lots of fun and a great trip!



Follow Woody through the holes!

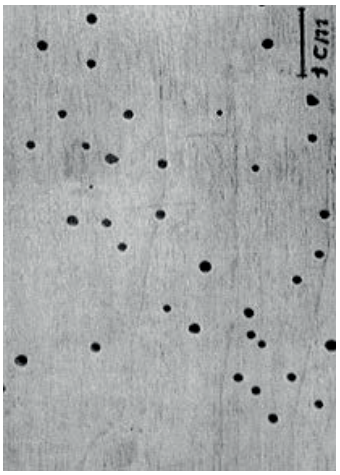
Who exactly is Woody the Woodworm anyway?

Woody isn't actually a worm at all, but a **beetle** in the making.



Beetle and larva of
Anobium punctatum

The common house borer, also known as the common furniture beetle, lays eggs in wood which develop into **larvae**. These larvae are what we call – wrongly – woodworms. The woodworms gnaw their way through the wood until they are large enough to turn into a beetle.



The **holes** you see in damaged wood are not places where worms have got in, but the openings through which the beetles fly out.

Each hole means the birth of a new beetle. Try counting how many there are!

1. Wood joints

Do the puzzles by **joining** the wooden pieces together in three different ways:

- Mortise and tenon joint

This wood joint is very strong and is often used for objects such as chairs, beds and also roof trusses.

If you pull on it from the side, the two pieces can sometimes come apart, which is why this joint is often glued.

- Cross-lap joint

By removing material from each piece of wood you can fit them together nicely so that the joint can't be seen from the outside. It looks like a single piece! Nails are often also used with this joint for extra strength.

This is the ideal method for attaching two lengths of equal thickness crosswise, such as where window mullions and transoms meet.

- Dovetail joint

This is real craftsmanship! The carpenter must ensure that one piece exactly fits the other.

This joint is very strong, even if you pull on it! That's why you often find dovetail joints in the drawers of old cabinets.

Want to know more about making wood joints?
Then try our **activity box** on 'joining': you will find it on the next floor down.

2. Which board is stronger?

The two boards in this test are **identical** (15 cm wide and 1.5 cm thick) and are therefore, in principle, equally strong.

Stand on the two boards, one after the other, and you will find that they react differently to your weight. Give it a try!

When the board is lying **on its broad side**, it bends easily and will eventually break.

But put the board **on its narrow side**, and it becomes less flexible and can carry more weight.

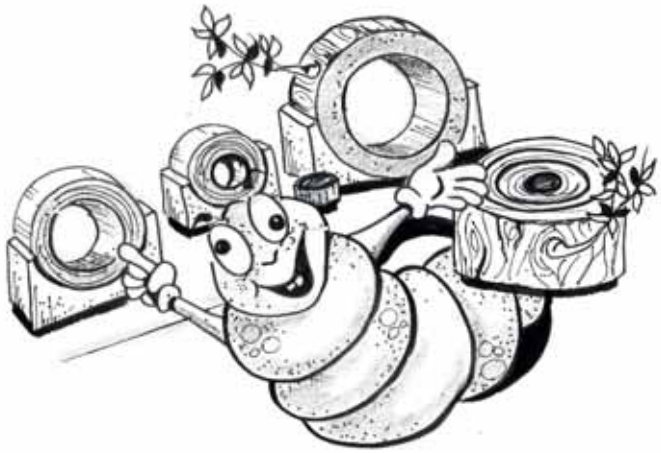
It's therefore the way you lay a board that determines how much weight it can carry. This is why the joists on which floorboards rests always lie on their narrow side. The supporting beams in a roof are also laid in this manner.

3. What makes up a tree trunk?

A **tree trunk** consists of three parts: heartwood, sapwood and bark. Here, they make up a puzzle. Take the three rings out of the containers and try to fit them together until the trunk is complete.

The innermost part of the trunk consists of **heartwood**. This oldest wood is 'dead': it has stopped growing and changing, and sap no longer flows through it.

This wood is the best for building, because it is hard and dry, which means that it is less likely to shrink and crack. As a result, woodworms don't find this wood at all tasty, and it is less likely to be affected by them.



The paler wood around the heartwood is called the **sapwood**; this 'living' wood is usually softer, and sap flows through it. Woodworms like Woody and his friends therefore find it delicious. Holes very quickly appear in it, making it less suitable for building. Every year, new sapwood is added and the trunk thickens. The old sapwood gradually turns into heartwood.

The **bark** is the living 'skin' of the tree, protecting the trunk against diseases and wounds. The bark grows along with the trunk.
For the most part, the bark is not very useful for humans, other than as a fuel. But there is one exception: **cork**. Cork is nothing else than the bark of the cork oak, which grows in Portugal and Spain. Look at the floor and you will find it is made of cork.

4. Construction toy

Wood is an ideal material for **toys**. It is strong, generally non-toxic, light, cheap, and can be sawn into any imaginable form.

Wooden toys such as the spinning top have been around for centuries, but are still very **popular** today.

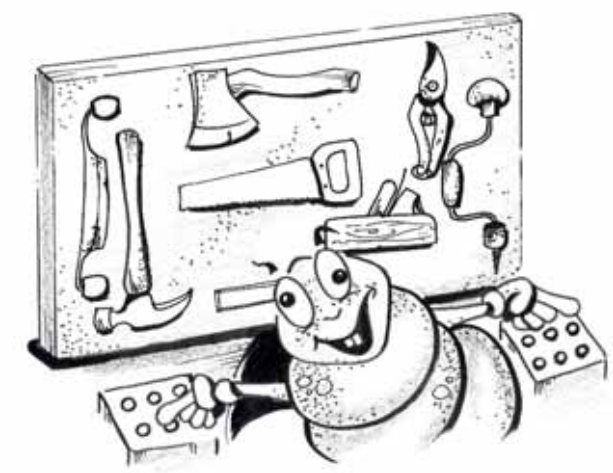
The **Kapla** construction toy is already a classic. Young and old can get creative with it.

By playing this game, children learn the difference between a strong, stable construction and a shaky, unstable one. They also learn what they can do to stop their building from collapsing.

5. What goes with what?

All kinds of **hand tools** are used for working with wood. You can admire them in the room below.

In this game you have to make a **link** between the tool and the job. If the right connection is made, the tool will light up.



Here's an example to make it clear:

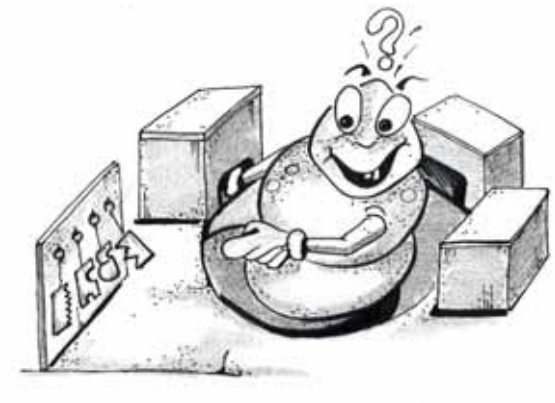
Which tool do you use to make a **hole**? Nowadays we usually use an electric drill, but the job can also be done manually! The right tool for this is a **brace**.

To help you, here are the other combinations:
- a piece of wood can be nicely **rounded off** with a **drawing knife**: for example the legs of a chair or the rungs of a ladder
- you chop down a **tree** with an **axe**
- when you are **pruning**, you cut twigs and small branches with **pruning shears**
- to **saw** wood you use a **handsaw**: can you see the grooves?
- to drive home **nails** and to pull them out again, you use a **claw hammer**
- you can make a **mortise and tenon joint** with a **sash-mortise chisel**: chisels are used for cutting out all kinds of holes, grooves and joints.

6. The detective game

As we have just seen, the woodworker uses all kinds of tools. Sometimes you can still see the **traces** that a tool has left behind, and work out how the object was made.

1. Feel



1. Put your hand through the hole and **feel** the marks.

   What tool would have left these marks?

2. Look

2. **Look** under the lid and you will see all kinds of wood waste such as shavings, sawdust and so on.

3. Put together

3. Now complete the **puzzle**.

   A tool is depicted on each piece. If the piece fits, then you know who did the deed!

To help you, here are the solutions:

You can feel...	You can see...	The tool used is...
A piece of wood with grooves	fine wood chips	the gouge
A block with a cut in it	sawdust	the saw
A chopped down tree trunk	rough wood chips	the axe
Nice round holes	shavings	the brace
A perfectly smooth surface	curled shavings	the plane

7. Rotating puzzle

This puzzle has a different drawing on each side. Rotate the blocks and make the picture !

To help you, you can have a peek here...:

drawing 1

drawing 2

8. The drawing corner

At this drawing table you can **prick out pictures**.

You can also **rub** the wood grain in order to make it appear on your sheet of paper.

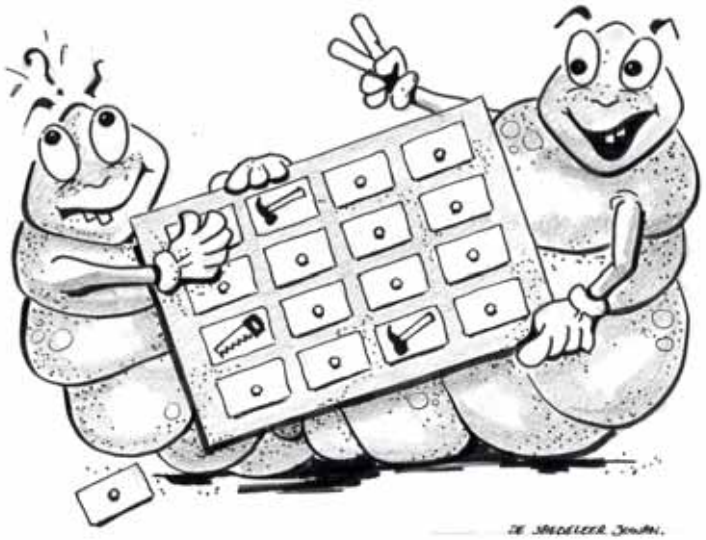
The veins in wood are sometimes fine and sometimes coarse. This is called the grain, and it is different in each kind of wood.

9. Wooden toys

10. Memory game (ideally for 2 players)

A **tool** is depicted on the back of each block. There are two identical blocks with each tool. In this game you have to **find the pairs**.

Take it in turns to turn over two blocks and try to **remember** what you have seen as much as you can. If the blocks you have turned over are not the same, turn them face-down again.



Now try to find two identical pictures in the same turn. Whenever you find a pair, leave the blocks face-up and have another go.

The one who can turn over all the blocks first is the winner !

Now climb up the tree pyramid to the MUSIC ATTIC!

11. Rubbing instrument

Some instruments are not at all complicated. By simply rubbing a **stick on a bamboo** stem you can make an impressive sound.

Give it a try!

By the way, did you know that bamboo isn't a tree, but an oversized grass species? This is why we talk about a stem, not a trunk.

12. African slit drum or 'tom-tom'

Long ago, in prehistory, a **hollow tree** gave someone a musical idea. When the trunk was struck, it resounded loudly. A new musical instrument was born...

Later, people started hollowing out trunks for themselves, and making slits and holes in them in order to produce different sounds.

The **slit drum** is still often played in Africa, and also serves as tom-tom – meaning 'talking drum' – to communicate over long distances (up to 10 km!).

13. Large xylophone

You can make your own xylophone. You need logs of different types of **wood** to do so, because each type makes a different sound.

What matters is the **hardness** of the wood: the harder the wood, the higher the sound. Play the big xylophone and you can hear for yourself!

From left to right and from bottom to top:

elder - lime - poplar - ash - hornbeam

14. Rainstick from the Andes

Tip the rainstick up and **it** imitates the sound of falling rain.

The rainstick is made from withered sections of **cactus**. While these sections are still green, the needles are pushed inside, creating a network of needles inside the cactus. The cactus is then dried and filled with small seeds or pieces of gravel before being closed up again.

Curanderos (healers) use the rainstick to relax their patients. In Chile, parents lull their children to sleep with the sound of the rainstick.

15. The weightlifter

The **weight** of different types of wood can vary considerably. Here you can experience this for yourself. The two weights are the same size, but can you feel the difference?

Heavy timbers are often also very hard, because the wood grows slowly and has a fine structure. The hardest wood in the world is the African ebony. It's so heavy it doesn't even float! In northern Europe, the hardest woods are walnut, boxwood, oak, beech and blackthorn.

Light timbers are often soft and have a rough texture. This is because the wood grows quickly. The lightest wood in the world is balsa wood: it floats really well, which makes it ideal for floats, rafts and so on! In northern Europe, the lightest woods are lime and poplar.

Heavier woods **burn** much more slowly than the lighter ones. They are best for the stove or the fireplace.

16. Fibres

You can bang a piece of wood on a stone here in order to detach the fibres. You have to bang hard, though, because the wood is very tough! Then you can look at the fibres in detail through the magnifying glass.

Knock the fibres off!

Can you see them?

Wood consists of **fibres**, which can be detached by striking or chewing. Try chewing a piece of liquorice, your pencil or the stick of your iced lolly and you will notice the fibres yourself.

It's these fibres that make wood so **strong** and **flexible**. Heat and steam can be used to bend wood, for instance to make a walking stick.

People sometimes use wood fibres as a **paintbrush**, or even as a **tootbrush**!

a natural toothbrush

The 'miswak' or natural toothbrush is the root of the arak tree (Salvadora persica). The ancient Egyptians were already using this wood to make a kind of brush for cleaning the teeth, and for a long time it was the only form of oral hygiene. It wasn't until 1938 that our modern toothbrush with nylon fibres was developed. However, the miswak is still widely used in many parts of Asia and Africa and some areas of the United States.

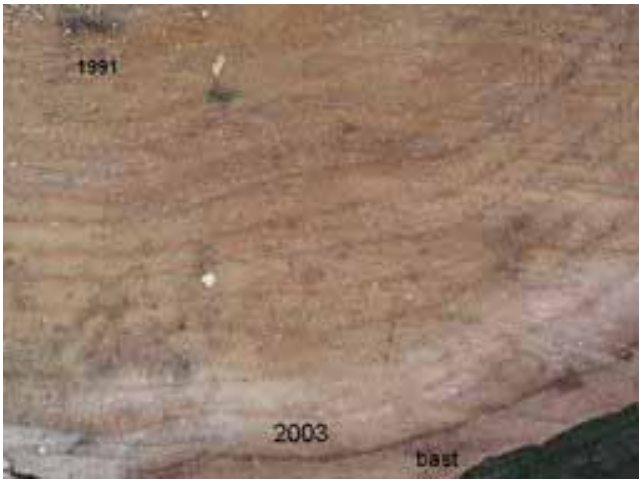
P.S. Don't forget to ask for your piece of liquorice at the reception!

17. Growth rings

On the wall hangs a large section from a tree trunk. Count the rings in this tree to find out how old it was!

A tree in a temperate climate has an annual **growth cycle**: during the warmer time of year it grows rapidly, and during the winter hardly at all. This growth cycle can be clearly seen in the wood: if you saw through a trunk you can see the **growth rings**.

In the warmer period of each year, a wide, pale ring is formed. During the winter, growth slows down or stops, resulting in a thin, darker ring. This enables you to distinguish the years. If you add up all the rings, you know how long the tree lived.



growth rings in a tree

Dendrochronology is the science that deals with dating wood using growth ring research. It allows **archaeologists** to date the timber that is found in an excavation – for example from a building, a coffin, a ship or a cart.

So how does it work? The rings vary every year, not in number but in thickness: in a good season, a broad ring develops, while in a bad season only a thin ring is produced. This creates a ring pattern that is unique to a particular region and time period. By observing overlapping ring pattern samples, it is possible to date wood back over thousands of years.

18. Ball test

In this test, you can experience for yourself which material feels warmer: wood or stone. Put your hands on the balls and feel the difference. In fact, though, they are the same temperature!

One important property of wood is that it **insulates**. It resists both heat and cold, because it is a poor conductor.

Wood naturally feels **warmer** than stone, even though it is the same temperature. This is because wood does not immediately absorb your body heat when touched; your hand therefore continues to feel warm.

By contrast, **stone** is a good heat conductor: it stores the heat (from the sun, for example) quickly and releases it later on. This is why lizards like lying for hours drowsing on a sun-baked stone.
If you touch a cold stone, it will immediately 'absorb' your body heat; this is why it feels **cold**. Has anyone ever told you that it's unhealthy to sit on a stone floor?

Did you know that...

- because wood resists heat so well, it is commonly used for the **handles** of cooking pots and utensils?

- because wood resists cold so well, it is used as a **building material** for windows, doors, floors and walls? In cold parts of the world, people build with wood more than in warm regions. Log cabins in the far North are an obvious example.

19. Start filing!

Some timbers are harder than others. You can test that here by filing a groove in the logs. Can you feel which wood is the softest and which is the hardest?

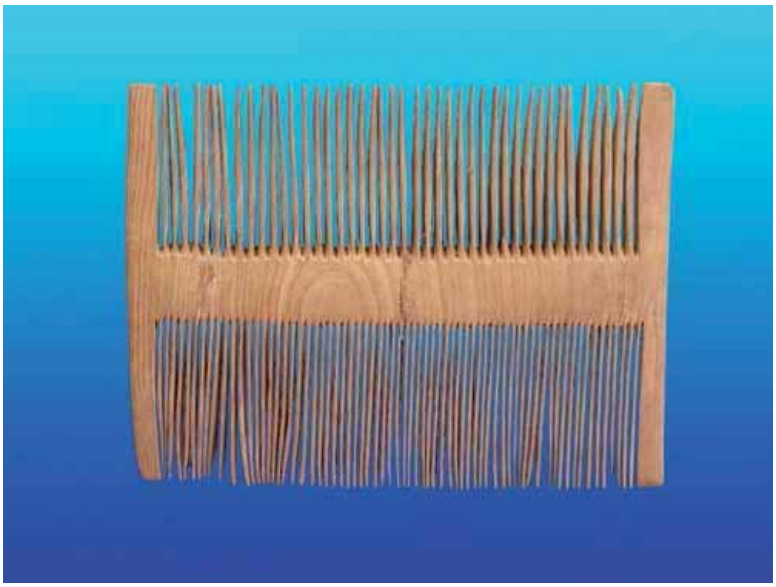
Why the difference?

Trees that grow quickly have softer wood than trees that grow slowly, because the rapid growth means that the wood is less compact. You can see this from the structure or grain of the wood. Hardwoods, such as beech, have a fine grain, while softwoods, such as pine, have a coarse grain.

Native hardwood, such as oak and beech, is still widely used in construction and for furniture manufacturing. These days a lot of tropical hardwoods are also used, such as teak.

Very hard wood, such as box, is suitable for special applications, such as making fine utensils, recorders and elaborately carved decorative objects.

16th century boxwood comb, excavated in in Dordrecht (NL)



20. Do you know how to saw wood into boards?

plain-sawn wood

The easiest and cheapest way is to cut the trunk into boards of equal width. This is called **'plain sawing'**

The **advantage** is that you get the largest number of boards.

The **disadvantage** is that as the boards dry out, they shrink irregularly due to the uneven distribution between the sapwood and heartwood. This makes them liable to warp.

quarter-sawn wood

A second way to get boards is to divide the trunk into wedge-shaped sections. This is known as **'quarter sawing'**

This method has the **advantage** that the wood shrinks regularly over the entire width as it dries, because heartwood and sapwood are well distributed. The boards are therefore less prone to warping, and are thus of higher quality.

The **disadvantage** is that in order to end up with nice boards you have to cut away a lot of wood, which takes time and wastes wood. As a result, this kind of timber is more expensive.

21. From tree to cabinet

Woody would like to make a cabinet. Can you help him?

On the puzzle pieces in the tray, the various steps are shown that are necessary to make a cabinet from a tree.

Put them in the right order, and the lamp will light up!

START

FINISH

Congratulations, you've completed the entire visit! We hope you had fun, and maybe we'll see you again some time...

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