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ENGLISH FOR SPECIALTY STUDENTS
" WOODWORKING AND FURNITURE TECHNOLOGIES "

АНГЛІЙСЬКА МОВА ДЛЯ СТУДЕНТІВ СПЕЦІАЛЬНОСТІ
«ДЕРЕВООБРОБНІ ТА МЕБЛЕВІ ТЕХНОЛОГІЇ»
ОС «БАКАЛАВР»

Навчально-методичний посібник

Київ 2024

УДК: 37.091.212:811.111(072)

Англійська мова для студентів ОС «Бакалавр» спеціальності 187 «Деревообробні та меблеві технології» (ОПП «Деревообробні та меблеві технології»): навч.-метод.посіб. Київ: Експодрук,2024.162 с. (10 др.арк.).

Мета навчально-методичного посібника – розвиток професійно-орієнтованої лексичної компетенції, граматичних та комунікативних навичок під час практичних занять та самостійної роботи студентів з навчальною та фаховою літературою

Рекомендовано до друку Вченою Радою гуманітарно-педагогічного факультету Національного університету біоресурсів і природокористування України (проткол № 5 від 19.11.2024)

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CONTENT

Introduction

English for woodworking and furniture technologies is designed to provide industry professionals, technicians, and students with the language skills necessary to effectively communicate in the wood production and furniture industry.

This textbook covers essential vocabulary and language structures specific to this field, including terminology related to wood processing, furniture design, production techniques, quality control, and supply chain management. through a combination of real-world case studies, practical exercises, and industry-specific dialogues, learners will develop the language proficiency needed to succeed in this dynamic and growing sector.

This textbook is ideal for individuals seeking to enhance their English language skills for advancement in the wood production and furniture industry.

UNIT 1. SAWMILLING AND TIMBER PRODUCTION

TIMBER HARVESTING SYSTEMS

The way in which a forest regenerates influences harvesting methods which consist of stages such as: cutting down trees, removing branches and tree tops, transferring logs to the roadside landing, wood classification, short-term storing and transporting them to sawmills or other processing factories. Branches and tree tops are usually left in the forest in order to decompose.
While planning harvesting operations foresters take into account the number of trees that are logged at the same time and the interval between felling called the cutting interval. The choice of a harvesting method depends not only on the way a forest regenerates but also its influence on local habitat, tree health included. En- vironmental, ecological and other multifunctional roles forests play are taken into account as well. There are many harvesting systems and their modifications. Basic ones include: clearcutting, shelterwood system and selection system.

Clearcutting

Clearcutting is the most radical. It means felling all trees in a certain area. It is often used when stands are seriously damaged by wind, fire, insects or diseases. It may create favourable conditions for artificial regeneration of light-demanding spe- cies such as pine or birch and results in even-aged stands.

Selection system

It promotes biodiversity and growth of uneven-aged stands because it is based on felling single trees or their small groups over the whole forest area. The process is gradual and lasts for many years. The selection method is not often used in forest management because it is more complicated, time-consuming and expensive than other systems. It also means us- ing small equipment and manual labour.

Shelterwood system

Shelterwood system is a method that can be placed between the harvesting systems mentioned above. Mature trees of desirable qualities are left on the site to produce seeds and the young trees grow under the canopy of older ones. The system is used for regeneration of shadebearing species.

1. ***Answer the questions.***
   a. What stages does felling trees include?
   b. Name three basic harvesting methods.
   c. What is ‘cutting interval’?
   d. What is clearcutting based on?

e. When is it recommended?

f. Why is selection system not often used?

g. What is shelterwood system based on?

h. When is it recommended?

2. ***In the text find the words that mean:***

1. the process of gathering timber or any other crop
2. a cut down tree trunk, without branches and the top
3. putting things into different categories, groups or classes
4. a place where wood is sawn into planks
5. to rot or break down
6. cutting down all trees in a certain area
7. the same as logging trees
8. an adjective describing plants that do not grow well in the shade
9. an adjective describing something that takes a lot of time
10. an adjective describing plants that tolerate growing in the shade

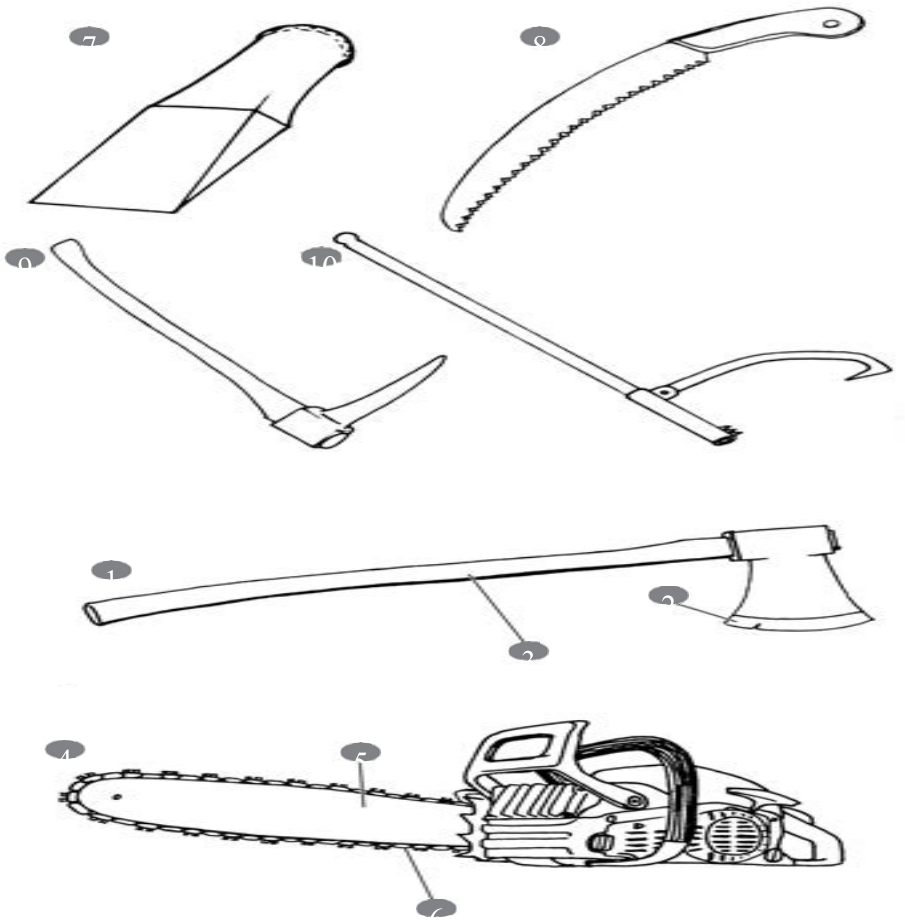
3. ***Match the following terms (A–F) with their definitions (1–6).***

bucking	1. removing branches from a log
skidder	2. a machine that lifts trees from the ground and transfers them into another area
forwarder	3. removing tree tops
harvester	4. cutting felled trees into shorter parts
delimbing	5. a machine that transports trees by dragging
topping	6. a machine that cuts down trees, delimbs and bucks them

4. **Look at the pictures and name logging tools and equipment. Use the words from the box.**

- **axe**

- **saw**
- **wedge**
- **chainsaw**
- **hookeroon**
- **chain**
- **handle**
- **cutting edge**
- **saw guide**
- **cant hook**



5. Look at the pictures and match them with the words from the box.

A.

B. high visibility safety vest
C. ear muffs
D. protective gloves

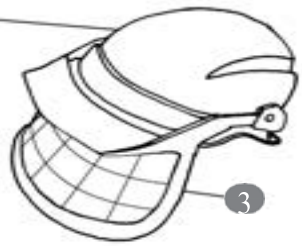
E. **visor**

F. **Wellington boots**

G. **hard hat**

H. **work boots**

1 

2 

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4 

5 

6 

7 

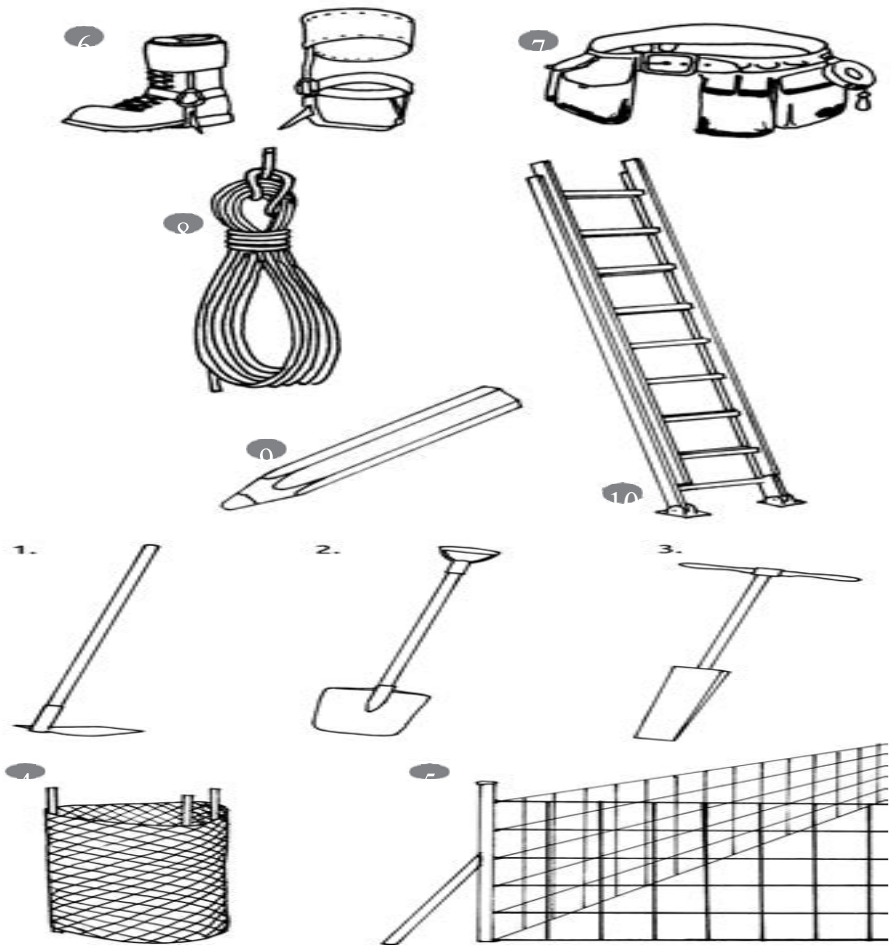
6.Match measuring tools and equipment with their functions.

1. **caliper**	A. **measures tree growth and age**
2. **clinometer**	B. **measures length of cut down trees**
3. **increment borer**	C. **measures tree moisture**
4. **moisture meter**	D. **measures tree height**
5. **tape**	E. **measures tree diameter**

7. Look at the pictures and name forest tools and accessories. Use the words from the box.

- **extension ladder**
- **steel spurs**
- **climbing line**

- **mesh fence**
- **tool belt hoe**
- **tree guard shovel**
- **lumber crayon**
- **planting bar**



FOREST PRODUCTS

Forest products include: wood, bark, coniferous litter, resin, tree sap (usually birch or maple), essential oils, edible plants and others that have ornamental or medicinal properties. They can also include venison.

Forest products can be divided into two categories: wood-based and non-timber ones (NTFPs). However, the definition of forest products as well as their classifica- tion vary in different countries.

The most important and profitable forest product is wood. It is a universal, eco-friendly material

used in the construction industry, production of furniture, musi- cal instruments, household goods or packaging.

Small parts of wood are no longer seen as a waste material but have application as fuelwood (when compressed) or to produce particleboard or fibreboard.

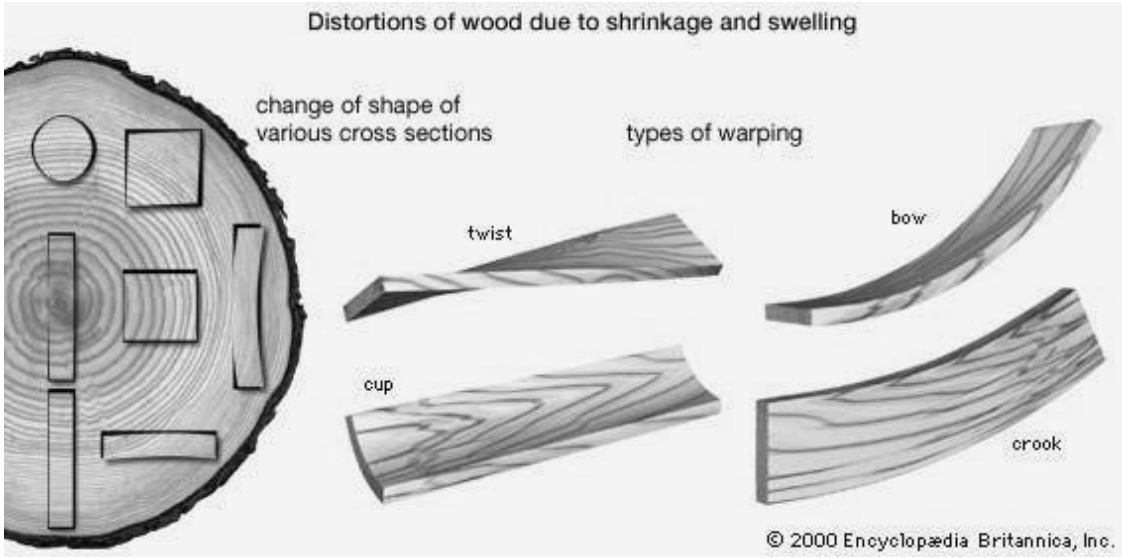
Wood can also be subjected to chemical treatment. The end products of chemi- cal processing include paper, cardboard, cellophane and rayon cloth to mention but a few. Other products such as resin and tannin are obtained from wood by extraction while charcoal is produced by heating wood up to 1,000ºC in the absence of air. This method is called pyrolisis.

1.Answer the questions

1. Give examples of forest products.
2. How can forest products be divided?
3. Why is wood the most important forest product?
4. How is it used?
5. How are small parts of wood used?
6. Name products that are the result of wood chemical treatment.
7. What is produced during pyrolisis?

2.In the text find the words that mean:

1. a layer of coniferous needles covering forest soil
2. juice obtained from trees
3. a sticky substance produced by trees
4. an adjective describing fruit or mushrooms which are eaten
5. game meat
6. wood used for heating
7. a board produced from wood fibres. Wood is first subjected to pulping, later boards are formed
8. a board made of small pieces of wood glued together
9. a thick, stiff piece of paper
10. coal produced from wood
11. he process in which charcoal is produced



UNIT 2. WOOD

3. FACTORS AFFECTING A TREE'S APPEARANCE

There are several factors which influence a tree's appearance. The most obvi- ous are: age of a tree, species, and the place where a tree grows. A tree's appearance can also be modified by weather as well as pathogens and pests.

Age and species

Tree seedlings are different from saplings and mature trees belonging to the same species because first leaves, called cotyledons, usually do not resemble typical leaves which a tree produces. Saplings do not look like older trees either. They are of different shape and their bark does not look like mature tree bark. It is thinner, more delicate, or sometimes it is even not of the same colour, e.g. birch.

A tree's appearance also depends on species. For example, spruce has thinner branches than pine. Tree crowns, bark colour, bud shape also differ and foresters can recognise tree species easily even during winter when deciduous trees are leafless.

The place where a tree grows

If a tree grows alone its branches are compact and the crown is wider and lon- ger. When a tree grows in the middle of a stand the crown is narrower and shorter. Trees growing at a stand periphery better develop the side of the crown which gets more sunlight.

The place where a tree grows means also its habitat, e.g. soil type and nutrients, precipitation and the like. All habitat factors modify a tree's appearance as well.

Weather, pathogens and pests

Weather conditions such as drought, rain, hail, snow, wind, lightning, as well as pathogens and pests can seriously damage the whole tree or its parts. As a result,a tree's shape is changed.

CONIFEROUS TREES

Coniferous trees produce cones that consist of scales and seeds. They have nar- row needle-like leaves that are usually evergreen. In Europe coniferous trees arerepresented by pine, spruce, fir, larch and Douglas fir.

Pine

The most common tree species in Europe constitute almost 70 per cent of all trees

growing in our forests. Pine leaves grow in groups called fascicles. There may be two, three or five needles in one fascicle. Scots pine (*Pinus sylvestris)* has two needles in one fascicle. Pine needs more light to grow than fir.

Spruce

A tree prone to windthrow because of its shallow root system. Spruce is often attacked by the European spruce bark beetles.

Fir

A shade-tolerant tree species whose cones grow upright. It grows slower than pine, spruce, larch or Douglas fir.

Larch

A tree that sheds its leaves in autumn. It has fairly soft needles grouped in fas-cicles.

Douglas fir

A tree native to North America. It was introduced to Europe at the beginning of the 19th century. The tallest coniferous tree with characteristic red-brown cones.

DECIDUOUS TREES

IDeciduous trees do not have leaves in winter. They come into leaf in spring. In autumn leaves turn yellow, red or brown and trees shed their leaves. Deciduous trees usually do not produce cones but different types of fruit. The most common deciduous species in our country include such broad-leaved trees as oak, birch, alder, beech and poplar, as well as larch – the only coniferous tree that is leafless in winter.

1. True or false?

1. Deciduous trees are evergreen.
2. All deciduous trees produce cones.
3. Fir is the most common deciduous tree species.
4. Deciduous trees shed their leaves in autumn.
5. Deciduous trees can be both broad-leaved and coniferous.

2. Next, read the definitions (1–7) and match them with the tree species

alder beech poplar birch willow oak maple

1. a tree that produces acorns and whose dry leaves alder often remain on trees in winter
2. a tree which contains salicylic acid. It is easily propagated from shoot cuttings
3. a fast-growing species, often grown on plantations
4. a pioneering species with white bark
5. a shade-tolerant tree that comes into leaf late in spring. It has smooth, dark grey bark and characteristic long, sharp buds
   a tree whose leaf is the symbol of Canada
6. a tree that prefers very humid soils, grows along streams or rivers. It produces woody fruit resembling small cones

BASIC FOREST TREE CHARACTERISTICS

There are several tree characteristics which are very important for foresters because they determine wood market value or provide useful information in forest management. Basic species characteristics include: longevity, growth rate, shade tolerance, soil and water requirements, and wood hardness.

Longevity

Some species are short-living, e.g. willow and poplar, others are long-living, e.g. oak or fir which can live as long as 700 years.

Growth rate

The information how fast trees grow is very useful, for instance, in establishing plantations. Fast-growing species include: poplar, larch, pine, birch and spruce.

Shade tolerance

In forest management knowledge about shade tolerance or intolerance is very important because it determines stand density and how long young trees can grow under the crowns of older ones. For instance, pine, birch or larch need more light to grow than fir or beech which are shade-tolerant.

Soil and water requirements

Soil and water requirements differ between species. For example, pine grows well on most soils, fir and beech prefer fertile ones, and spruce does not tolerate lack of water because

of its shallow root system.

Type of root system

A root system is often modified by soil. However, some species have a tendencyto develop a deep or shallow root system, e.g. spruce, aspen. Trees with a deep tap- root are more resistant to winds, e.g. pine, oak or elm.

Wood hardness

Some trees have very soft wood, e.g. poplar, willow, spruce, others – hard, e.g. oak, beech, hornbeam.*

1.*Answer the questions*

1. Name basic tree characteristics.
2. Which tree lives longer: fir or willow?
3. Which species are fast-growing?
4. Which trees do not grow well in the shade?
5. Which species is tolerant to soil and water requirements?
6. Why does spruce not tolerate dry soils?
7. Which species are more resistant to winds and why?
8. Give examples of very soft and hard wood.

2.In the text find the words with the opposite meaning:

9. long-living
10. slow-growing
11. shade-intolerant
12. infertile
13. deep
14. soft

BASICS OF THE WOOD STRUCTURE

Take a tree and peel off the outer "skin" or …….(1) and what you'll find is two kinds of wood. Closest to the edge there's a moist, light, living layer called……(2) packed

with tubes called xylem that help a tree pipe water and nutrients up from its roots to its leaves; inside the sapwood there's a much darker, harder, part of the tree called the……..(3), which is dead, where the xylem tubes have blocked up with resins or gums and stopped working. Around the outer edge of the sapwood (and the trunk) is a thin active layer called the…….. (4) where the tree is actually growing outward by a little bit each year, forming those famous……..(5) that tell us how old a tree is. Slice horizontally through a tree, running the saw parallel to the ground (perpendicular to the trunk), and you'll see the annual rings (one new one added each year) making up the cross-section. Cut vertically through a tree trunk and you'll see lines inside running parallel to the trunk formed by the xylem tubes, forming the inner structure of the wood known as its…….. (6).

You will also see occasional wonky ovals interrupting the grain called……..(7), which are the places where the branches grew out from the trunk of a tree. Knots can make wood look attractive, but they can also weaken its structure. Recent wood can often be identified by macroscopic characteristics, particularly by colour,…….. (8), odour, weight and structure. As such characteristics are generally modified or destroyed in fossil, historic or carbonized wood, only a few species or species groups of the indigenous flora can be identified with the naked eye or only with the aid of a magnifier (5 to 20x).

Coniferous wood

In coniferous wood it is possible to distinguish the species which have…….(9) from those which do not. The transition from earlywood to latewood can be sharp or continuous. Within a conifer's trunk, the majority of the wood is comprised of long, thin cells called tracheids.

Ring porous dicotyledonous wood

The diameter of the pores in the earlywood is much greater than the diameter of the pores in latewood. Arrangement and size of pores in the latewood, fine and large……(10) can be differentiated.

Semi-ring to diffuse porous dicotyledonous wood

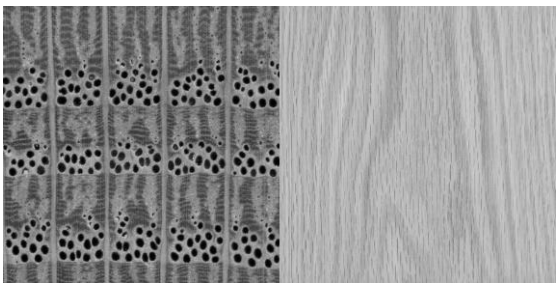
In semi-ring porous woods, the pores are more numerous in earlywood, in diffuse porous woods the size of pores and distribution is more regularly. Arrangement and size of pores, fine and large rays differ from species to species.

1. Fill in the gaps with appropriate term from the following selection.

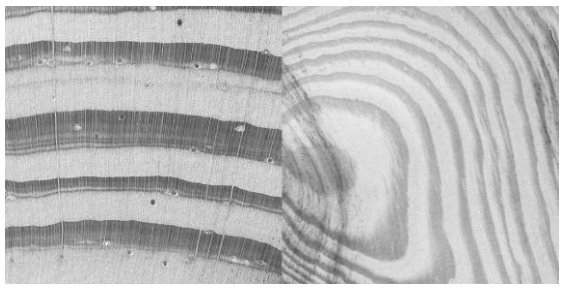
resin canals - bark - cambium - knots - heartwood - latewood - grain - sapwood - annual rings - rays - gloss

2. Try to name following kinds of wood. You can use the latin name to help you. Identify if the wood belongs to the coniferous (C), ring porous dicotyledonous (RPD), semi-ring dicotyledonous (SRD) or diffuse porous (DR) group of woods.

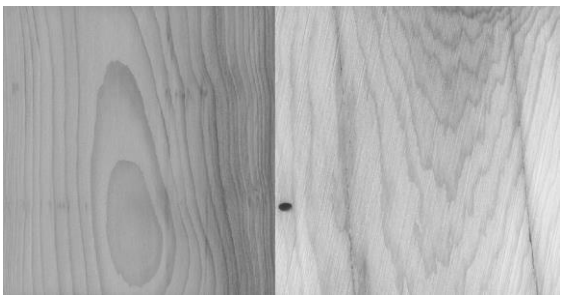
1. *(Quercus)*



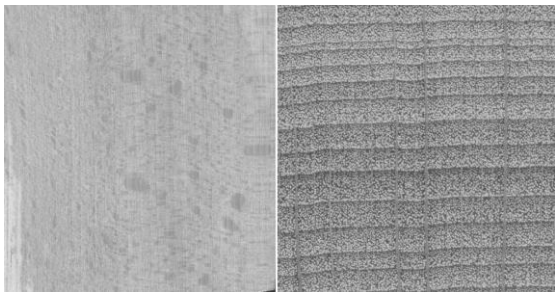
2. *(Pinus)*



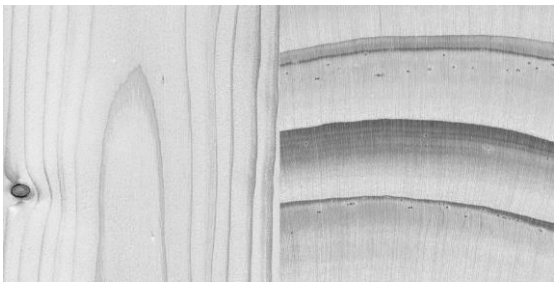
3. *(Taxus)*



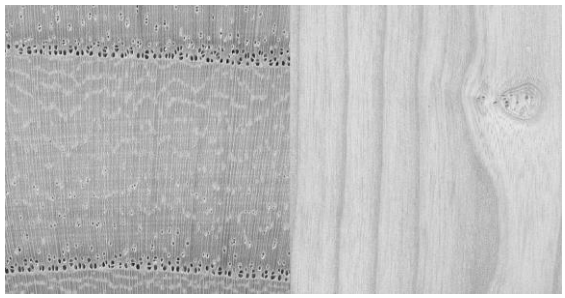
4. *(Fagus)*



5. *(Picea)*

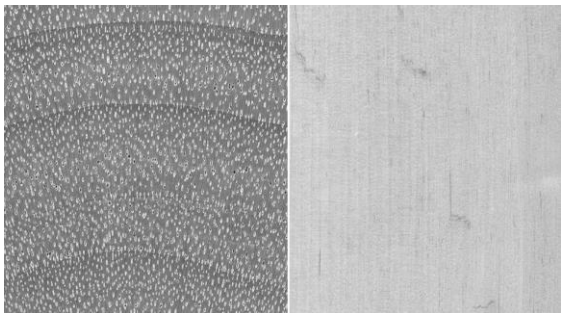


6. *(Fraxinus)*

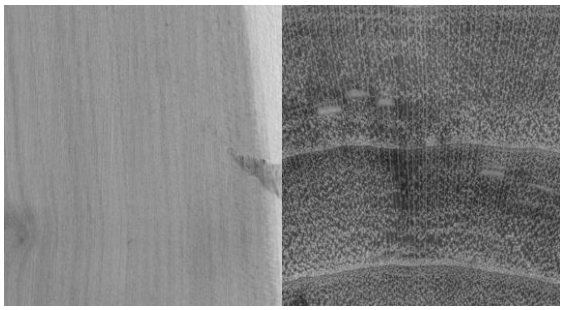


7. *(Betula)*

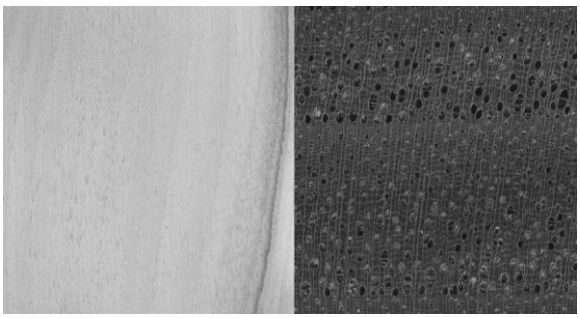
8. *(Prunus)*

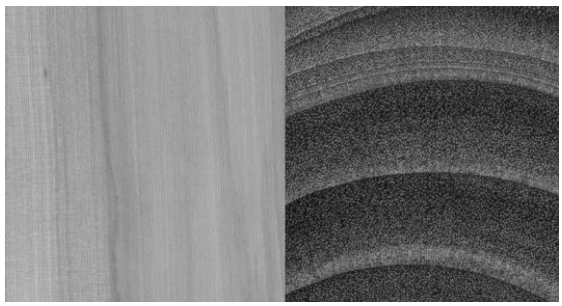


9. *(Juglans)*



10. *(Malus)*





3. Match antonyms

compression wood	lignin
cellulose	broadleaf
latewood	shrinking
needle-leaved	tension wood
swelling	earlywood

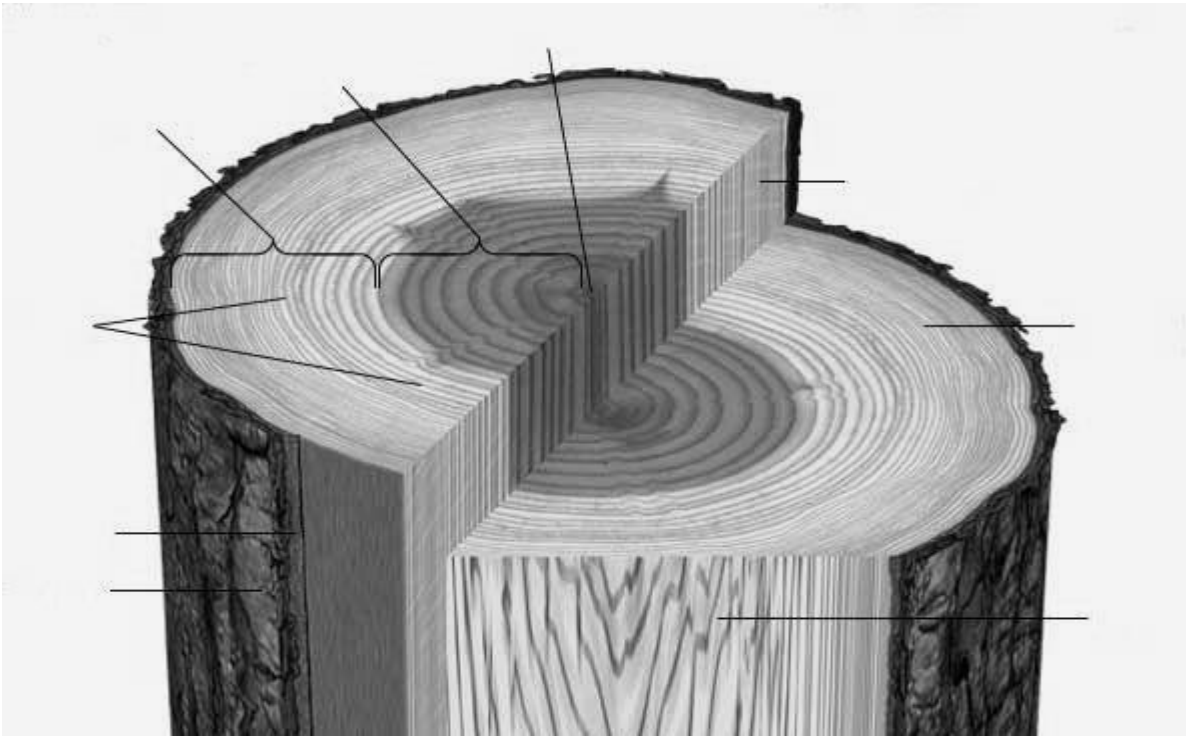
Task 5: Decide whether the expression describes mechanical or physical properties of wood

swelling - shear - shrinking - compression - fatigue - moisture content - modulus of elasticity - equilibrium moisture content - tension - density - acoustic properties - thermal properties - fire retardancy - modulus of rupture - hygroscopicity

Mechanical:
Physical:

5. Complete the picture with the expressions from the box

pith - tangential section - inner bark - outer bark - sapwood - radial section - heartwood - transverse/cross section - annual/growth rings



6. Read the description of walnut wood. Write your own description of your favourite wood. Use 50 - 100 words

Black Walnut is semi-ring porous, with medium-sized pores throughout and larger pores at the edge of its growth rings. The wood has a low level of shrinkage when drying, and suffers very little seasonal movement. At 1000 lbf Janka, the wood isn't exceptionally hard, but can stand up to a fair amount of abuse.

Walnut is straight-grained and remarkably easy to work with in almost every application. The wood cuts and sands evenly, finishes nicely, glues well, and can be steam-bent with stable and predictable results.

UNIT 3. CONSTRUCTION AND JOINERY PRODUCTION

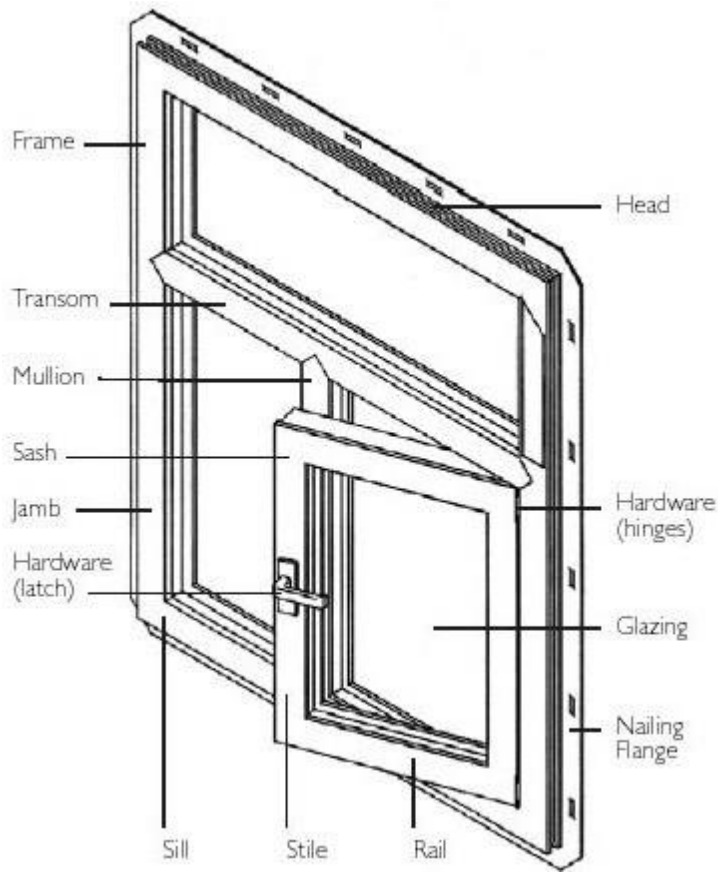
WINDOWS

1.

The horizontal and vertical portions that surround the sash. These are usually made of the same materials as the sash and may be manufactured with or without nailing flanges. Together with sash design and construction are important for both energy efficiency and appearance.

2.

It can be a solid sheet of glass, or several panes divided by a ’muntin”.A muntin is a secondary frame that holds the window-panes in the sash. Some are made of tempered glass, to resist breakage, and some are made of laminated glass, which not only reduces breakage, but if the window does break, the glass shards will be too small to cause injury. There two basic groups of windows according the layers: two glazed or three glazed windows.



3.

Windows come either fixed or operable (openable). Fixed windows do not open. Operable windows have a unit assembly of stiles and rails for holding the glass that moves when the window opens. They are available in a variety of sliding or hinged models. It can be made of wood, vinyl, metal or fiberglass and should make a tight seal with the frame when the window is closed. However, if the seal is too tight, the operable portion of the window may be difficult to operate.

1.Study the picture with the basic anatomy of a window. There are three main components

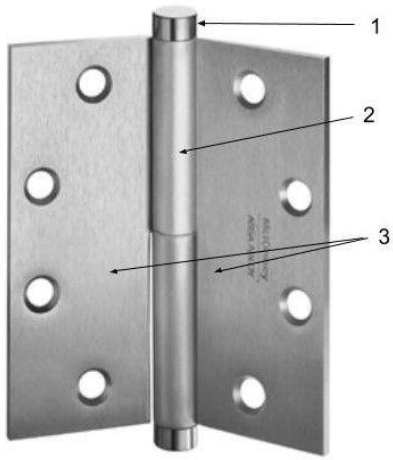
of a standard window. Fill in the paragraph headlines in the reading naming these three components.

2. Match the pictures with the definitions of the windows.

- **Casement window:** Hinged on one or two sides and swings open like a door. This design provides the best seal and has the lowest air leakage for a window that opens.
- **Awning window**: Hinged at the top and opens out from the bottom. With an effective seal, this design minimizes air infiltration.
- **Horizontal slider:** Consist of two sashes, one or both of which slide horizontally in the frame.
- **Hopper window:** Hinged at the bottom and opens in or out from the top. An effective seal minimizes air infiltration.
- **Tilt-and-turn window (also called dual-action)**: swings from the side or pivot from the middle. Others pivot from both the bottom (like a hopper) and the side (like a casement). This allows for cleaning the outside of the window from the inside of the house and can be a valuable feature if a window is in a location where it's difficult to get at from the outside.

3. Read the short description and label the diagram or vice versa.

A. A butt hinge has two **leaves**, connected by a **knuckle** and a **pin** around which the **leaves** can rotate. Apart from butt hinge there are **continuous hinges** and **pivot hinges.**

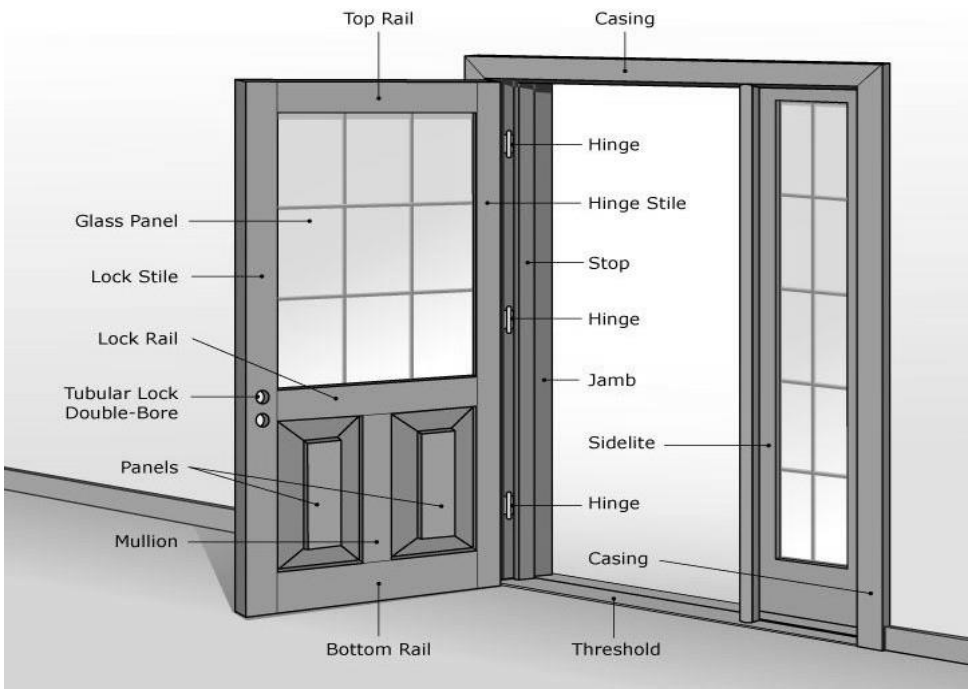


5. **Look at the picture and fill in the gaps**

B. The (1) is a part of door which covers the gap between doors and wall. The door itself are hung on (2)which allow the movement. Two part doors as shown in picture have smaller part called (3) in this case it is glazed. The main part of the door is constructed of hinge and lock (4) which are vertical and horizontal (5)according to its position - top, lock, bottom. The filling parts between the rails and stiles are called (6) glass or wooden. The dividing part of panels are called (7).

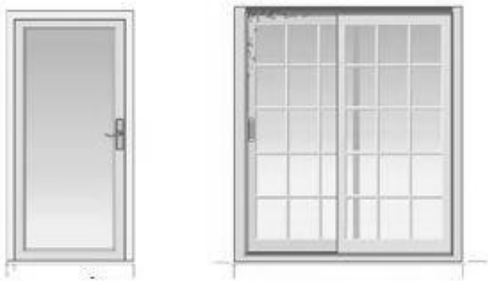
When you go through the door you need to pass (8),

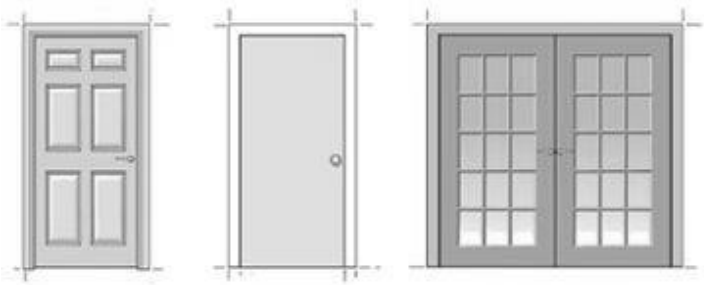
the bottom part of the door frame.

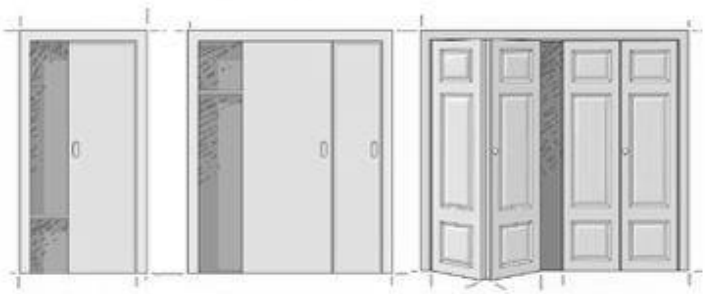


5.Match the names of indoor/outdoor doors with their names. There is one expression which you need to use twice

panel - bifold - windowed - decorative carved - storm - french - flush - patio-sliding - pocket - bypass







6. Read the following description of service provided by Ben Saunders. Focus on the language used.

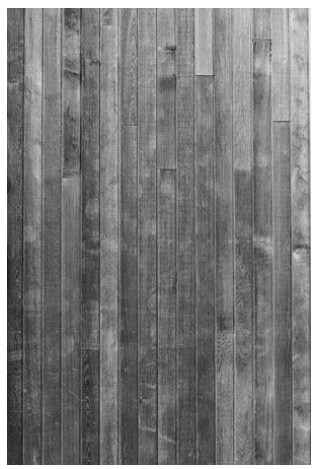
Surrey Flooring Solutions Solid Wood Flooring

Solid wood flooring or real wood flooring which it is also known as is great for that luxury feel. You can find solid wood flooring in a number of finishes and different types of hardwood. With this flooring you will find it is more solid to the touch which will help with sound absorption and warmth underfoot.

Engineered Flooring

Engineered flooring gives the same look of solid wood flooring but is put together in a different way. Engineered flooring is layered flooring designed with a thin hardwood layer on the surface to give you that real wood feel. It can offer more stability to other floors due to the layering of the floor, so it can be used areas where you would like to use under floor heating. Engineered flooring also comes in a variety of finishes and hardwood layers.

Laminate Flooring



Laminate flooring is the most cost effective of the flooring options. It gives the look of real wood flooring and is durable too. With most laminates now coming with glueless click system it can be quick to fit. Laminate flooring can be used in many areas throughout your home.

Sub floor

When looking to fit your new floor Ben will also check the sub floor. He will check this as if the subfloor is not flat or level it will create a problem for the fitting of your new floor. Ben is

more than happy to prepare the floor to get the perfect finish.

Floor Sanding and Maintenance

By a process of sanding and finishing it with a lacquer or stain Ben can bring your floor back to its former glory.

Get In Touch

Please don’t hesitate to get in touch with Ben for any of your flooring needs. If you have a query about a job you would like undertaking Ben would be more than happy to answer any questions.

UNIT 4. VENEERS AND PLYWOOD

Veneer is a thin sheet of wood either sliced or peeled from a log or flitch.
Plywood is an engineered panel, typically composed of an odd number of thin layers of wood veneers, called plies, bonded together with a rigid adhesive and with the grain direction of adjacent layers perpendicular to each other.

VENEER MANUFACTURE

Log Preparation

The logs are first 'debarked' after delivery from the plantation. This is achieved by a machine which mechanically scrapes the bark from the log. It is good practice to 'condition' the log before peeling. This can be achieved by water sprays, immersing in cold or heated water, or by steam treatment. This ensures the log is at a high and consistent moisture content throughout which facilitates peeling and helps yield smooth veneer with less tendency to split or tear. Heating the log softens the timber fibres and further improves veneer quality and yield. Before peeling the logs need to be 'docked' or cut into 'blocks' or 'billets' around 100mm longer than the finished plywood panel, i.e. usually 2½ metres. The log is now ready to be conveyed into the plant for peeling.

Peeling

The initial process in peeling is to load and centre the peeler block in the spindles of the veneer lathe. The peeler block must be centred with the axis of the log along the centre line of the lathe spindles to obtain maximum veneer recovery. This can be done manually, but is best achieved by an 'x - y charging system'. This system uses a laser scanner to measure the block three dimensionally and uses a computer to calculate the largest perfect cylinder within the block. The system then locates the block in the best position for the lathe. The lathe effectively rotates the block against the lathe blade or 'knife' which peels the veneer off in long continuous veneer ribbon of consistent thickness.

Clipping

The ribbon of veneer passes from the lathe through manual or automated clipping machines which cut or 'clip' the veneer to size, or into smaller strips if defective material has been removed. In some mills producing high quality thin veneer, clipping is done after the continuous ribbons of veneer have been dried so as to maximise the number of full sheets obtained.

Drying

The wet veneer is fed through a drier to reduce its moisture content to about 8% from the 'green' moisture content of between 40-140%. The optimum moisture content for gluing depends on the species and density of the veneer, and the adhesive and gluing procedures being used. In mechanical driers the veneer is conveyed through a long chamber in which hot air is circulated. Driers can have one, or as many as five separate conveyors, one above the other. The drying time is regulated by adjusting the speed of the conveyors and/or the temperature of the hot air.

Jointing or Veneer Repair

Small strips of veneer may be jointed into full size sheets by edge gluing, stitching or using perforated tape. Open defects may be repaired by using plugs to upgrade the veneer.

Grading

The dried, clipped and perhaps jointed or repaired veneers are graded in preparation for use in plywood manufacture.

Sliced Veneer

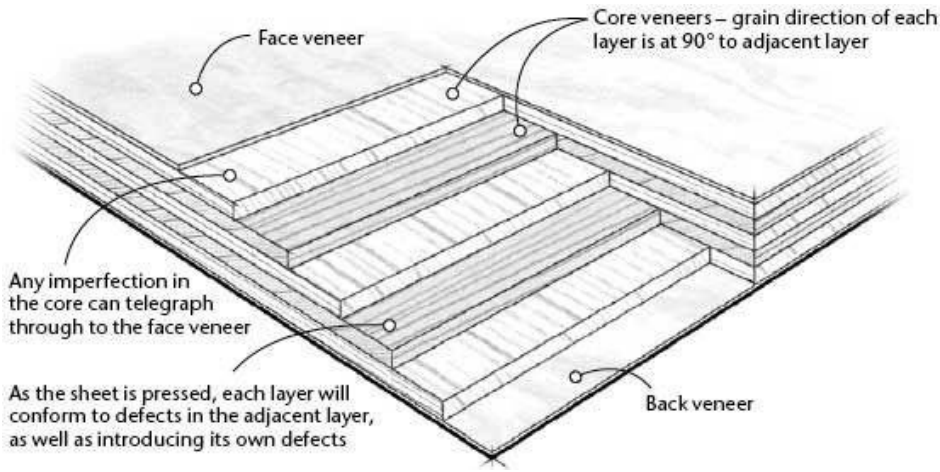
In general plywood manufacture the veneer is rotary peeled. It is used because of its lower cost and higher yield. However, sliced veneer can be produced by a 'slicer', the strips of veneer being cut in a straight line action. Sliced veneers are generally used for decorative faces to highlight the natural timber grain pattern or 'figure'. This pattern can be varied depending on the angle of the slice through the log.

1. Read the text and find the words which fit the description:

1. The wood which has been peeled.
2. The section of a tree which can be used for veneers or sawn.
3. A machine which turns logs into veneer. It has two spindles and needs to be centered.
4. The procedure when veneer is adjusted to the required size.
5. The amount of water in the wood.
6. The process in which the veneer is glued or stitched together
7. The veneer which is manufactured by different machine than lathe and is generally used for decorative purposes.

2. Look at the picture and fill the short text below:

On the top of the plywood, there is a layer of…… (1). It is glued to the……(2) which are always positioned at…….. (3) to the layers above and below. The bottom veneer is called … … … (4). Even if the core is not visible it has to fulfil the standards because its ……(5) will affect the adjacent layer.



Designers can choose from the various wood species and beyond this, from the range of figure and grain patterns within each species. "**Matching**" refers to the arrangement of veneer strips of similar or varying grain patterns within a given panel or from panel to panel.

3. Match the most common veneer matching with the description:

Pleasing Match

Veneer is matched by color but not by grain pattern.

Random Match

Random matching is just what it sounds like. Usually done with lower grades of veneer, the leaves may be of varying width, colors and grains.

Book Matching

Alternating pieces of veneer are flipped over so they face each other as do the pages within a book. This creates a pleasing, symmetrical pattern.

Slip Matching

Veneer slices are joined in sequence without flipping the pattern. If the grain is straight, the joints will not be obvious.

4. Match following expressions concerning types of veneer and their appearance with their definition and check your answers with the glossary.

backing	side of the sheet of knife-cut veneer that was in contact with the knife as the sheet was being cut (with lathe checks)
burl	veneer from the portion of the tree just below the point where it forks into two limbs - the grain is twisted, creating a variety of flame figures and sometimes resembles a well-formed feather
birdseye	uneven contour of the annual rings
streak, mineral	side of the sheet of the knife-cut veneer that was farthest from the knife as the sheet was being cut and containing no cutting checks (lathe checks)
crotch veneer	lowest grade veneer which is generally only used as cross band veneer or for non-visible surfaces
loose-side	term given to the small to large eye-shaped marking of figure found throughout select sheets of Maple
checks	log where the element development is in the root and the element is either completely or partially under the ground

tight-side natural discolorations of the wood substance

underground burl feature swirling grain around clusters of dormant buds, rings or eyes **blister** small slits running parallel to the grain of wood, caused chiefly by strains produced in seasoning

5. Gluing is an important procedure in plywood manufacture. Match the most common adhesives with their definitions:

1. **Urea formaldehyde glues**
2. **Polyvinyl acetate glues or polyvinyl acetate/urea formaldehyde**
3. **Phenol-formaldehyde glues**
4. **Resorcinol-formaldehyde or phenol/resorcinol-formaldehyde glues**
5. **Melamine formaldehyde glues**

A. They have similar properties to phenolic glues in quality of performance but being more reactive, can be cured at room temperature. They are more expensive than phenolic glues, and therefore limited in use to special applications.

B. These are not extensively used for plywood gluing but are used where a high grade bond is required, and where black phenolic glues cannot be tolerated. They are used to fortified urea-formaldehyde glues to increase the weathering resistance of the bond. The largest application is in the production of decorative overlays.

C. Adhesives are extensively used for interior and intermediate grade bonding, which covers the majority of plywood produced. Standard for exterior bonds. They are also used for impregnating veneers and paper overlays for plywood.

D. These are used for edge jointing and veneering and are resistant to boiling water..

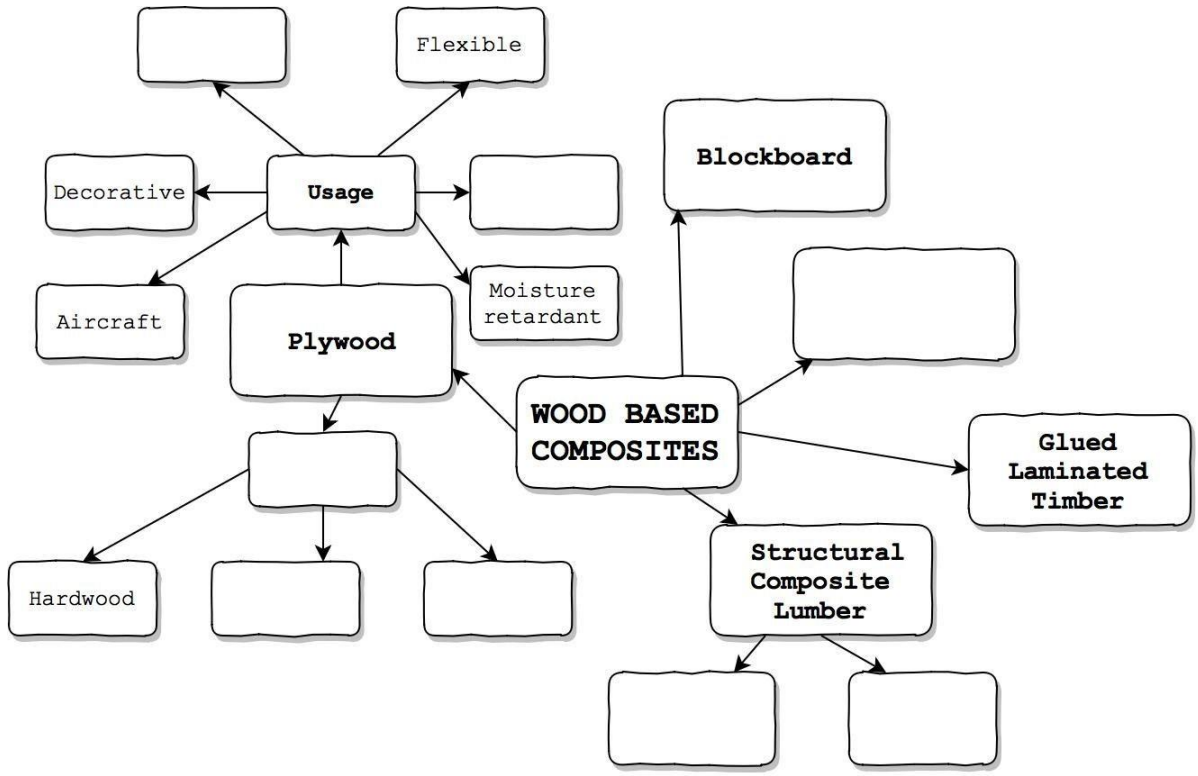
6. There are additional components in the glue mixture. Explain the difference between fillers and extenders and try to come up with two examples for both groups. Work in pairs.

Fillers:

Extenders:

7. Fill in this diagram which summarizes engineered wood products based on solid wood or veneers. Some of the expressions has their definitions or pictures below, match them.

Fire Retardant - Laminated Veneer Lumber (LVL) - Marine - Paralel Strand Lumber (PSL) - Softwood - Wood - Tropical Wood - Joint Board



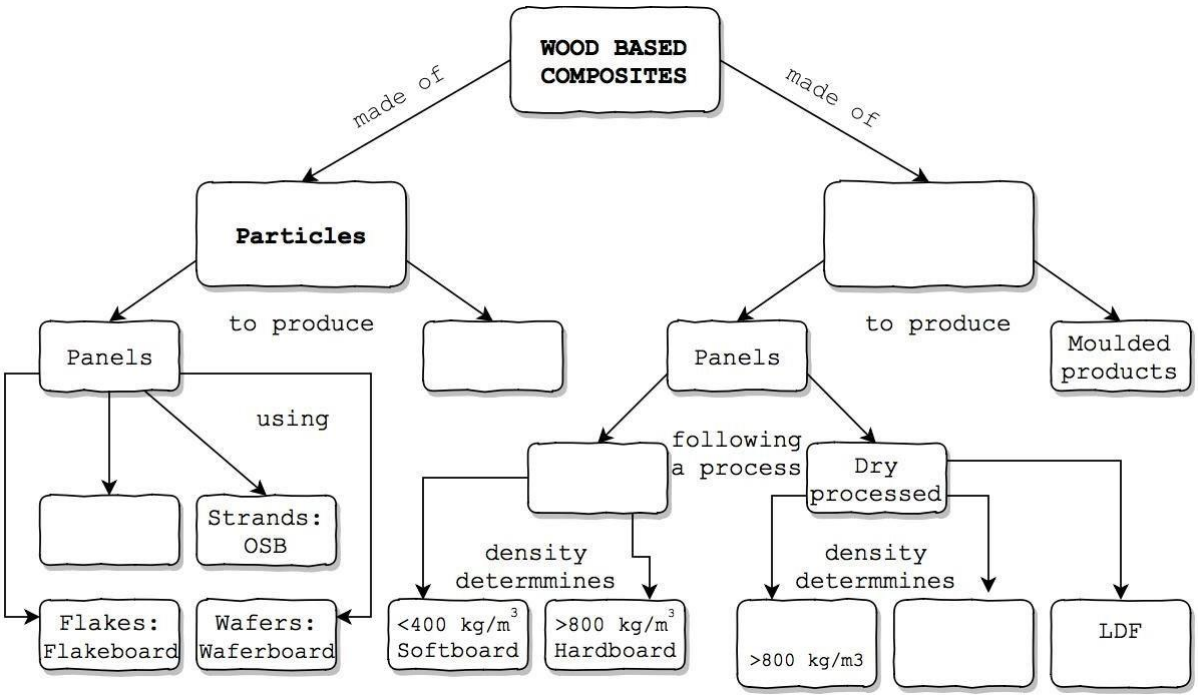
UNIT 5. PARTICLEBOARDS AND FIBREBOARDS

Particleboard is a non-structural composite panel product composed of wood particles bonded with a synthetic resin.
Fibreboard is a composite panel where the building unit is a fibre and the bonding is mediated by activation of lignin adhesive properties and synthetic resin.

Vocabulary

Task 1: Fill in the diagram concerning the distribution of particleboards and fibreboards. Together, with the diagram in unit 3, it gives you outline of the most common wood based materials.

Moulded products - Wet processed - Chips: Chipboard - High density board (HDF) - Middle density board (MDF) - 500-800 kg/m^3 - <500 kg/m^3 - Fibres



Reading: OSB Manufacture

To manufacture OSB, debarked logs are sliced into long, thin wood elements called strands. The strands are dried, blended with resin and wax, and formed into thick, loosely consolidated mats that are pressed under heat and pressure into large panels. A more detailed description of each

individual manufacturing step follows.

During stranding, logs are debarked and then sent to a soaking pond or directly to the stranding process. Long log disk or ring stranders are commonly used to produce wood strands typically measuring 114 to 152 mm

long, 12,7 mm wide, and 0,6 to 0,7 mm thick. Green strands are stored in wet bins and dried in a traditional triple-pass dryer, a single-pass dryer combination triple-pass/single-pass dryer, or a three-section conveyor dryer. A recent development is a continuous chain dryer, in which the strands are laid on a chain mat that is mated with an upper chain mat and the strands are held in place as they move through the dryer.

Dried strands are blended with adhesive and wax in a highly controlled operation, with separate rotating blenders used for face and core strands. Typically, different resin formulations are used for face and core layers. Face resins may be liquid or powdered phenolics, whereas core resins may be phenolics or isocyanates. Several different resin application systems are used; spinning disk resin applicators are the most common. The strands with adhesive applied are sent to mat formers.

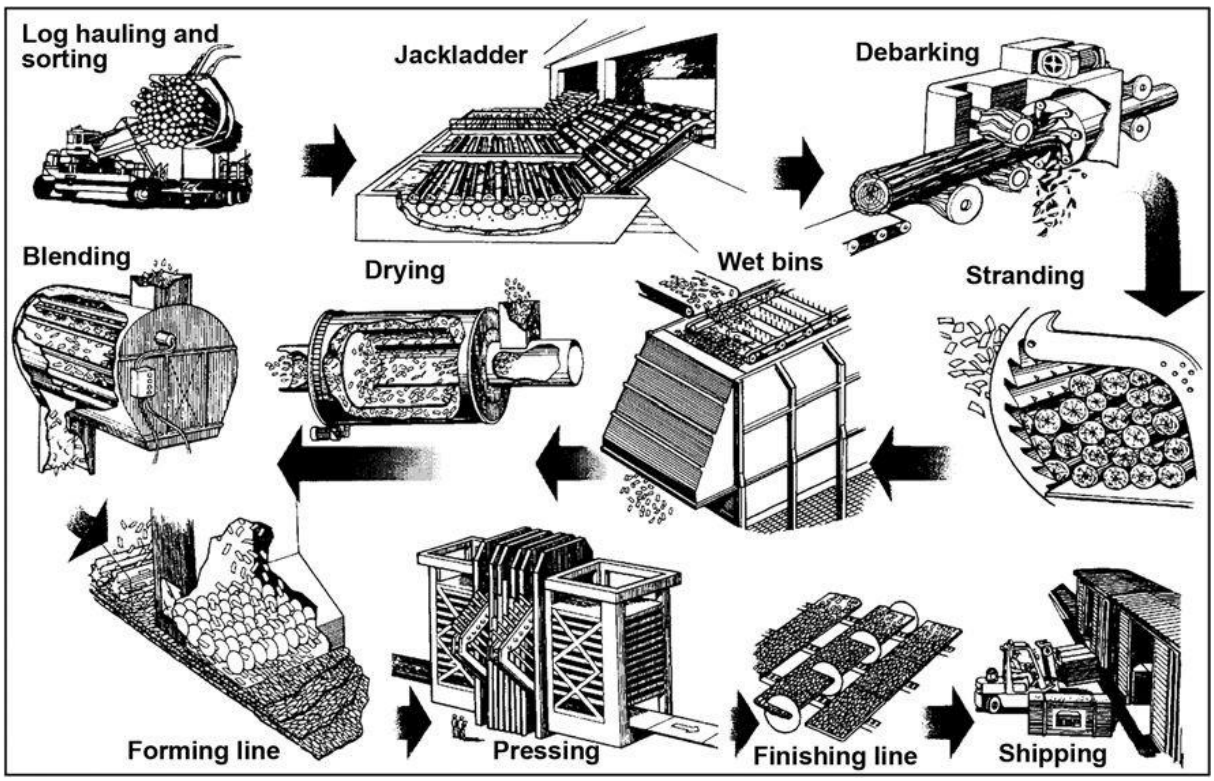
Mat a number of configurations, ranging from electrostatic equipment to mechanical devices containing spinning disks to align strands along the panel's length and star-type cross-orienters to position strands across the panel's width. All formers use the long and narrow characteristic of the strand to place it between spinning disks or troughs before it is ejected onto a moving screen or conveyor belt below the forming heads.

Oriented layers of strands within the mat are dropped sequentially onto a moving conveyor. The conveyor carries the loose, layered mat into the press. Once the mat is formed, it is hot-pressed.

Hot-pressing consolidates the mat by heating it at 177 to 204°C, which cures the resin in 3–5 minutes. As many as sixteen 3,7 by 7,3 m panels may be formed simultaneously in a multiple-opening press. A more recent development is the continuous press which presses the mat between rollers as it is conveyed.

1. Read the text and answer following questions:

1. What are the most common drying machines used during the production?
2. What is the recent development is the strand drying?
3. What resins are used for bonding of the core?
4. What is the usual length of the single strand?
5. What is the name of the machine which continuously moves the material?
6. What is the name of the machine which can process up to sixteen panels at one time?
7. What is the most common resin application machine



OSB Production

2. Match the names of the boards with their pictures, moisture resistant boards are green.

particleboard

fibreboard

veneered

particleboard

hardboard

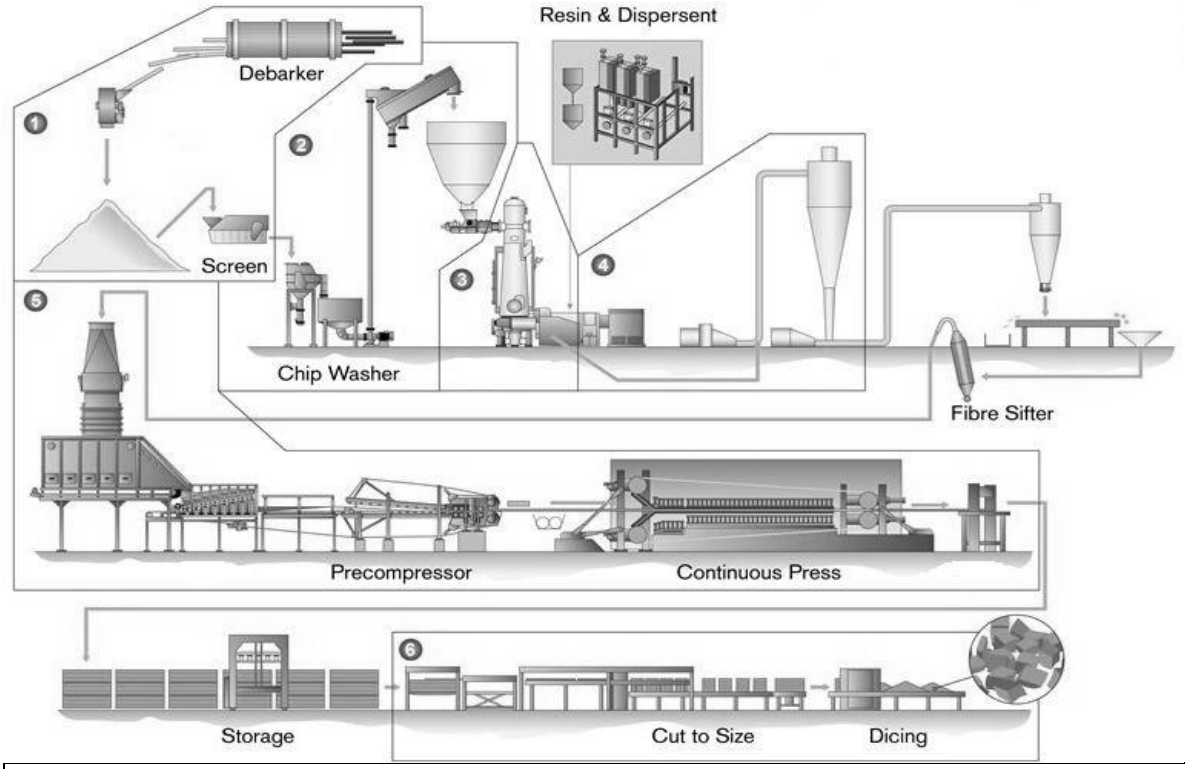
3-ply
plywood
blockboa
rd
moisture-resistant MDF
moisture-resistant
particleboard 5-ply plywood
MDF
multiply plywood

3. Read the following statements. Each group of statements describes one engineered wood based material. The expressions in bold are key. Decide whether it is plywood, MDF, OSB or particleboard.

1. **Denser** than particle board. Smooth finish that takes **paint** very well. Ideal for interior projects such as built-ins, cabinets, raised panels or simple furniture.
2. Most **economical** of all engineered wood. **Weakest** engineered wood. Ideal for utility **shelves** or inexpensive garage or workshop projects. **Stronger** than particle board as it's made with larger pieces of wood, the strands of which are reversed for each layer. Can be used in all applications where you would use **lower grade** plywood.
3. Produced in large, standard sized **sheets,** in a dozen thicknesses and a **wide variety** of finishes and wood species. **Stronger** and less costly than **solid wood. Resistant** to shrinking, twisting, warping and cracking.

4. ***Study the process of MDF manufacture. Then fill in the machines which are missing.***

5. **defibrator - saw - chipper - dryer**



The **defibrator** is a thermo mechanical pulping refiner in which the pulp material, such as wood chips, is ground in an environment of steam between a rotating grinding disc (rotor) and a stationary disc (stator) each with radial grooves that provides the grinding surface. Wood chips are fed into the centre and are broken down as the centrifugal force pushes them towards the circumference of the discs where the grooves are finer to produce wood fibre.

Reading: Sawmilling history

Sawmills seem to have existed in the medieval period, as one was sketched by Villard de Honnecourt in c.1250. On the other hand, people think they were introduced to Madeira following its discovery in c.1420 and spread widely in Europe in the 16th century.

The Dutchman Cornelis Corneliszoon (1550-1607) invented his type of sawmill by applying a pitman arm onto a (1), which converted a turning motion into an up-and-down motion. Corneliszoon patented the sawmill on December 15, 1593 and the pitman on December 6, 1597. He built the first sawmill there in 1594.

Before to the invention of the sawmill, boards were sawn by two men with a (2), using saddle blocks to hold the log. Early sawmills simply adapted the whipsaw to mechanical power, generally driven by a water wheel to speed up the process. The circular motion of the wheel was changed to back-and-forth motion of the saw blade by a connecting rod known as a pitman.

Generally, only the saw was powered, and the logs had to be loaded and moved by hand. An early improvement was the development of a (3), also water powered, to steadily move the log through the saw blade.

A small mill was the center of many rural communities in wood-exporting regions, e.g. the Baltic countries and Canada. The output of these mills was be quite low, around 500 (4)per day. They were also generally only operated during the winter, the peak of the logging season.

In the United States, the sawmills were introduced soon after the colonization of Virginia by recruiting skilled men from Hamburg. Later, the metal parts were obtained from the Netherlands, where the (5)was far ahead of that in England.

Early mills were taken to the forest, where a temporary shelter was built, and the logs were skidded to the nearby mill by horse or ox teams, often when there was some snow to provide lubrication. As mills grew larger, they were usually established in more permanent facilities on a (6), and the logs were floated down to them by log drivers.

Technology has changed sawmill operations significantly in recent years, emphasizing increasing profits through (7) minimization and increased energy efficiency as well as improving operator (8).

1.Read the article about the sawmilling history and fill in the following expressions.

technology - movable carriage - boards - waste - river - windmill - safety - whipsaw

2. Match following expressions concerning the timber products with their definitions. Check your answers with the glossary.

Edging of timber

edged timber	type of cant with wane on one or both sides
cant	sawn timber without wanes
wane	partially sawn log such as sawn on two sides or squared to a large size and later resawn into lumber
flitch	original rounded surface of a log - with or without bark - on any face or edge of sawn timber

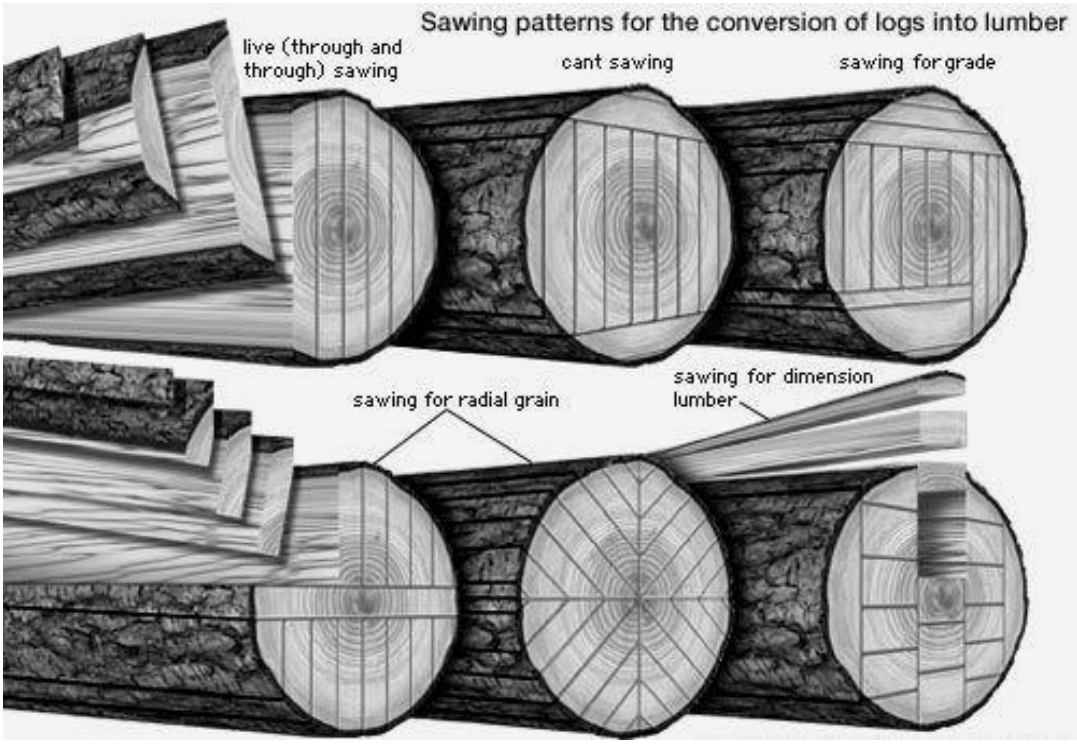
Dimensional timber

batten	squared timber, more than 40 mm wide
plank	less than 38 mm thick, more than 80 mm wide
board	less than 38 mm thick, less than 80 mm wide
lath	more than 38 mm thick, width is three times bigger than thickness

Different use of timber

joist	structural timber bearing the load
post	timber with the larger dimension not more than 51mm greater than the smaller dimension and usually graded for use as a column
beam	horizontal supporting member, usually plank

Task 3: Study the picture and then fill in the gaps in the description of different sawing/cutting patterns.



1. During the first sawing machine cuts the log into side boards and a cant. The cant is then rotated by 90° and cut by the second sawing machine into side boards and centre boards. The second cutting can be also done by the first machine.

2. improves the value of the wood by putting as many defects as possible in as few boards as possible. This is more common in hardwood lumber where random widths are allowable, but can be used with dimension lumber if the sawmill operation has access to an edger.

Wood drying (wood seasoning) reduces the moisture content of wood before its use. When the drying is done in a kiln, the product is known as kiln-dried timber or lumber, whereas air drying is the more traditional method. **Unseasoned** timber is classified according to its moisture content. Any timber with a moisture content > 25% is said to be unseasoned or 'green'. **Seasoned** timber has a moisture content between 10 and 15 % according to its future use.

3. is the most common type of cut. The annual rings are generally 30 degrees or less to the face of the board; this is often referred to as tangential grain. The resulting wood displays a cathedral pattern on the face of the board.

4. There are three kinds of water present in the wood. Match the words from the box and the short descriptions.

chemically bond water – free water – bound water

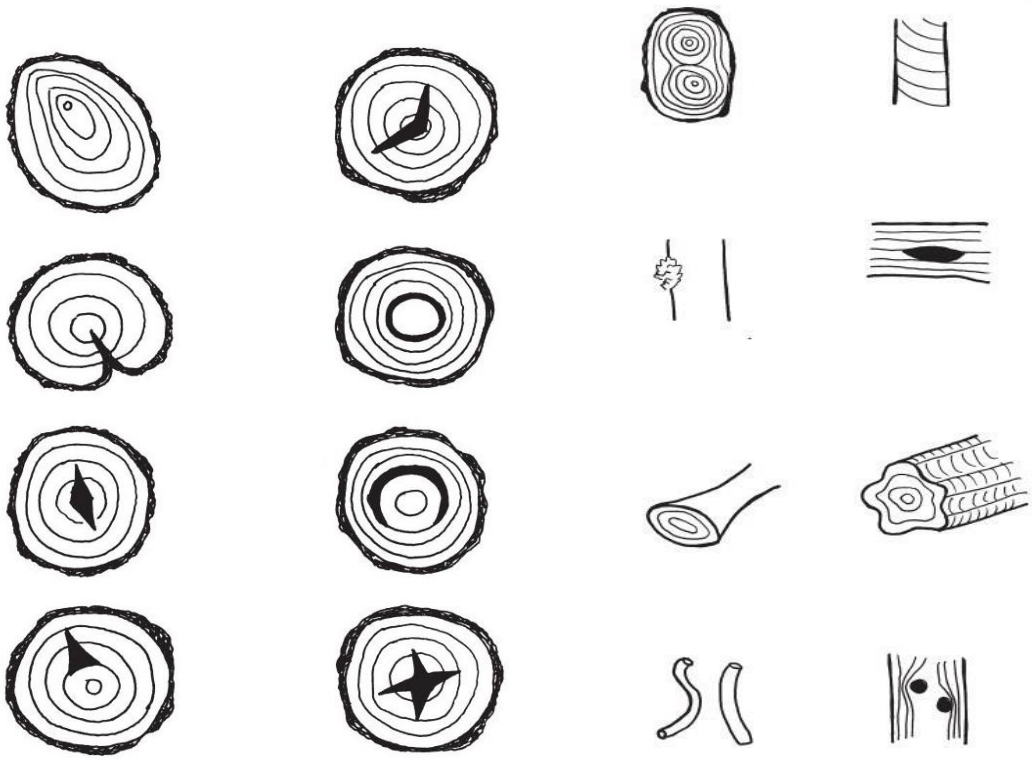
1. This type of water is part of the chemical molecules. It does not play any role in mechanical nor physical properties.

2. The water in the cell walls. It plays significant role in the further processing of the wood. It is bonded to cellulose and hemicellulose.

3. The water in cell lumina which is not chemically bounded.

5. Match the following defects of timber. Use the words from the box.

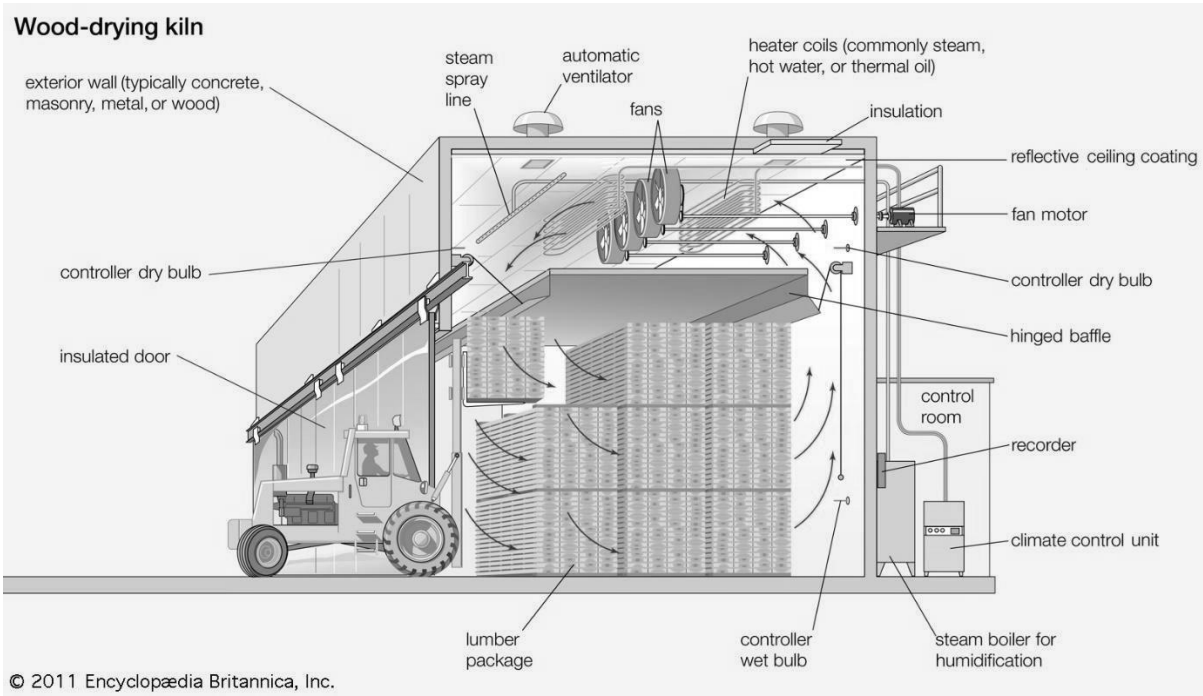
bark pocket 2x - simple heart shake - knot - ovality - cup shake - burl - flutes - fork-shake - grain slope - ring shake - resin pitch - butt swell - multiple pith - star heart shake - curvature/crookedness



6. Read the article about the wood drying and find 11 expressions concerning the wood drying in the puzzle.

Air drying

The traditional method of seasoning timber was to stack it in air and let the heat of the atmosphere and the natural air movement around the stacked timber remove the moisture. The process has undergone a number of refinements over the years that have made it more efficient and reduced the quantity of wood that was damaged by drying too quickly near the ends.



The basic principle is to stack the timber so that plenty of air can circulate around each piece. The timber is stacked with wide spaces between each piece horizontally, and with stickers of wood between each layer ensuring that there is a vertical separation too. Air can then circulate around and through the stack, to slowly remove moisture. In some cases, weights can be placed on top of the stacks to prevent warping of the timber as it dries.

Kiln drying timber

The most common commercial processes for seasoning of timber is kiln-drying. Kiln seasoning accelerates the process of seasoning by using external energy to drive the moisture out. The timber is stacked in much the same way as it is for air drying, and is placed inside a chamber in which the conditions can be varied to give best seasoning results. Air is circulated around the charge (stacked timber) and the temperature and humidity can be varied to give optimum drying. Each species has different cell characteristics and therefore requires different drying schedules.

Typically, the timber may be in the kiln for a period of between two days to one week.

Generally, it is not feasible to kiln-dry structural timber in thicknesses greater than 45 mm, although there are limited amounts of 70 mm thick kiln-dried softwood members in the market place. Kiln-seasoning of softwoods such as pine can be done fairly quickly, however seasoning of hardwoods tends to be a much longer process, due to the different cell structure of hardwoods.

W D F Z P D Y U P H J I
R G D J W X K X L R X G
Z G N I N O S A E S W W
I A N R V R H R W A E T
A W H I S C U R R E C S
I I J X Y T M P L G H L
S A M G S R I U C Q A S
S O K I L N D C C C M J
D W O R G E I R K J B I
W M W J H A T H I E E N
S T A C K X Y F M A R Y
B O S B J F T Q P E H E

7.With your partner, discuss and write down reasons for possible defects of the timber due to shrinking and swelling. You can inspire with the picture.

U

NIT 6. WOODWORKING MACHINES AND TOOLS

Reading: Basic saw types and blades

A variety of saws is used to break logs into boards or larger dimension timber: circular saws, bandsaws, frame saws and chipper canters. The first three saws generate a saw kerf. The saw kerf is the width of cut that a saw blade produces when sawing lumber . The wood in the kerf is reduced to coarse sawdust. Chipper canters function differently. They chip the edges of logs, cants or flitches to dimensions. The nominal size allows for sawing variation, generate two parallel faces while reducing the waste material to chips that can be sold to the pulp and paper industry. The choice of machinery is influenced by the log resource (quality, size and volume).

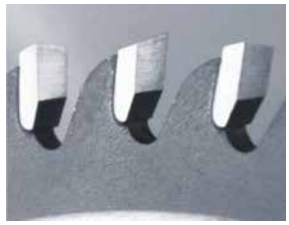
A variety of saws are used to progressively cut the logs into timber of the desired dimensions. The first saw to cut a log as it enters the mill is the headrig. Other saws are resaws, which further process material coming from the headrig, and edgers, which edge material. Once the wood is faced on four sides it only needs to be crosscut with circular docking saws, either trimming to length or, where necessary, cutting out defects such as large knots. The knowledge and experience of the saw doctor is crucial to an efficient sawmill, if only because a change in any one of a number of factors affects the ability of the saw blade to produce a straight cut.

Only when the balance of factors is optimized does the saw run at its most efficient, with minimum power consumption, highest production, and high quality cuts for the maximum time between blade sharpenings.

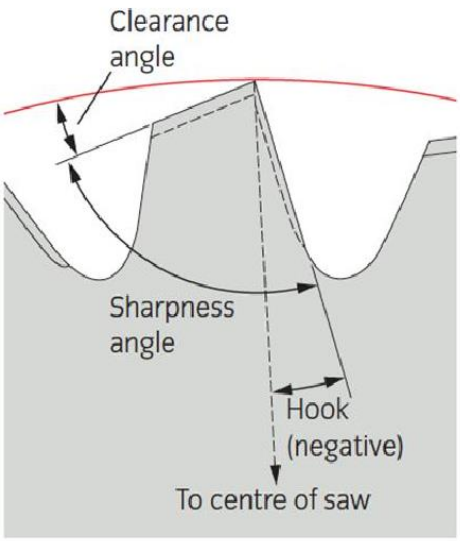
When cutting along the grain the process is termed '**ripping**'. When cutting across the grain the process is termed '**cross-cutting**'. In ripping the removal of the chips is akin to chiselling parallel to the grain, whereas when cross-cutting the individual fibres are being severed by side-pointing teeth moving across the grain. To avoid the saw binding in the cut causing friction and heat, clearance must be provided. This clearance is known as '**set**'. The total width of the saw cut is known as '**kerf**'.

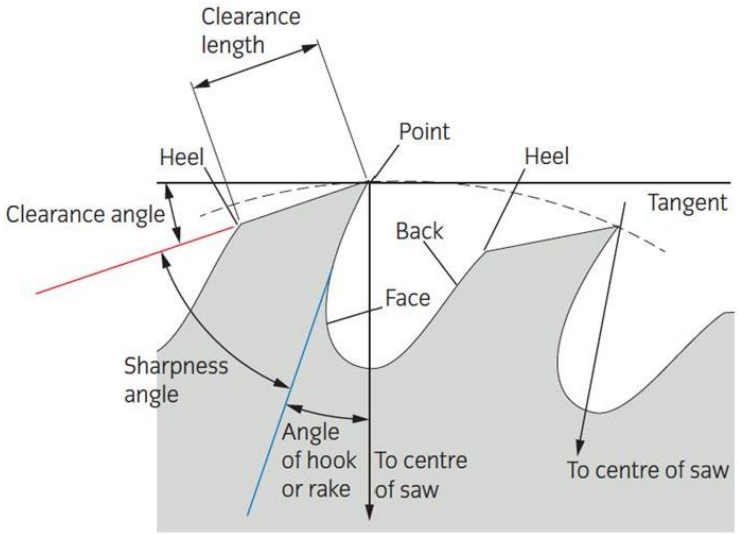
1. Try to think of factors which must be considered for right functioning of saw. e.g.: blade material

Superior sawing can be achieved by **tipping** the teeth. Wear resistance is substantially increased by having tungsten carbide (very hard but brittle) or cobalt/chrome stellite tips (not so hard, but resistant to chemical corrosion, e.g. eucalypts). The advantages are particularly noticeable when sawing hard and abrasive woods of species with a high silica content.



2. Read a short paragraph about blade types, study the pictures and then decide which picture shows teeth more suitable for ripping and which for cross-cutting.

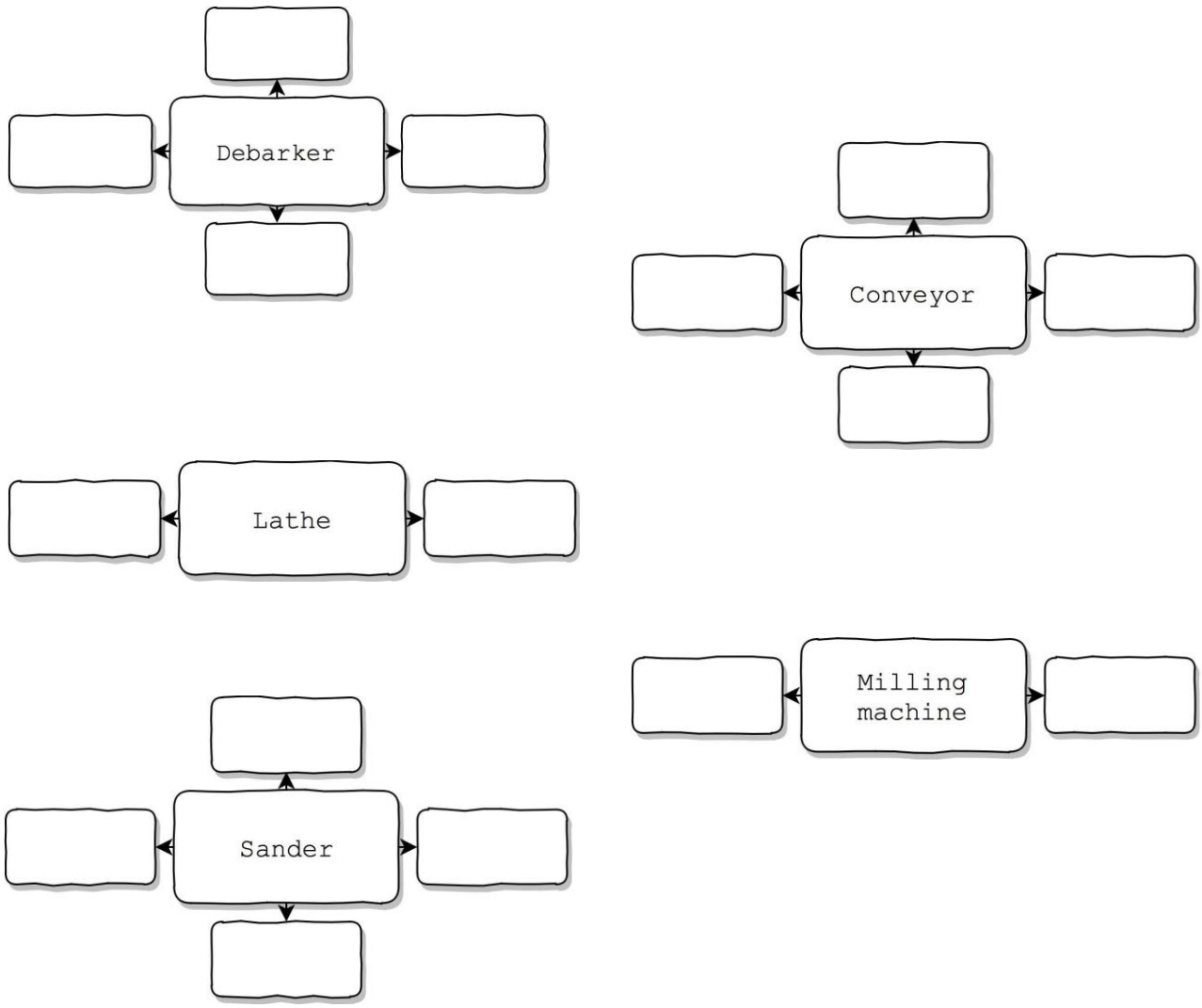




Ripping down the grain requires a different tooth design compared to cutting across the grain. The most important difference between the two is known as the angle of 'hook' or 'rake'. This angle is referred to as **positive** or **negative** angle of hook. Positive angle of hook teeth should only be used for ripping along the grain. They have a tendency to drive and bite progressively into the timber and may cause them to snatch when crosscutting. A negative hook angle can tend to push the timber away from the saw blade. It also makes a stronger tooth point which is capable of withstanding the rigours of cutting across the grain of the timber.

3. Fill in the diagrams with the adjectives from the box concerning machines in the woodworking industry. There are more correct solutions and the variety is more diverse than shown here.

drum - belt - roller - turret - horizontal - angle - rosser head - engine - snail - ring - vertica - flail - chain - belt - cylindrical - surface



Milling cutters are cutting tools typically used in milling machines or machining centres They remove material by their movement within the machine or directly from the cutter's shape. Most common operations are plain, side, form and end milling.

4. Match following pictures of milling cutters and their descriptions.

Plain milling cutters are used to produce flat surface

Side milling cutters are used for cutting slots and for face and straddle milling operations ans designed with cutting teeth on its side as well as its circumference

Form milling cutters are used to produce exact shapes and small parts.

Angular milling cutters are used for milling angular surface.

End milling cutters are used in a similar way to drillers but are without the direction limitation.

5. Read the article about maintenance of a frame saw and write your own maintenance guide which will describe a maintenance process of any machinery or tool within the woodworking industry. Use a point structure. 150 - 250 words.

Frame saws, or gang saws as they are often called, can, when properly maintained, produce very accurate well-sawn timber. Due to the vibration which is set up by the actual working motion of any frame saw, the need for well-organized planned maintenance competently carried out is of paramount importance. Automatic oiling and greasing systems and saw tensioning devices have made this a less difficult task but the need for the machine to be operated by skilled personnel remains just as essential. A frame saw should be kept working at all times as running empty is far more likely to cause mechanical problems. A constant work load of logs or cants well within the feed speed capacity of the machine relevant to the species of timber being sawn is therefore a priority objective of the sawyer. Some machines have setting bars which are bolted across the top and bottom of the sash before fitting another set of saws. This or any other type of fixture which speeds up the change of saws is an advantage but accuracy should never be sacrificed for saving a few moments in time. Before fitting a change of saws it is most important to make sure the spacer blocks which are fitted between the saws are free of sawdust and the top and bottom hangers are also clean. A small deposit of sawdust or gum deposit will put the saws out of alignment. Like

bandsaws or circular saws the performance of frame saws is, to a large degree, dependent on the condition of the saws themselves. It is always better to change any saw before it gets really dull as this will only cause mis-sawn lumber, cause damage to the saw blade itself and possible mechanical problems with the machine. Running dull saws in frames saws should be avoided even though they continue to cut straight. A good indication of the need to change saws is when the fibres of the timber start to raise up on the faces of the boards being produced. Planned maintenance programmes for frame saws should always be in strict accord with the recommendations of the manufacturer. Log carriage track rails should be kept clean and in good alignment, likewise, the fence and infeed rolls for machines sawing cants.

Dai1y checks

(a) Before sawing

Check lubrication systems and level in lubricant tanks before starting the machine. Make sure infeed and outfeed rolls are clean and pressure rolls are working freely. Lubricate rolls or grease as necessary, making sure grease nipples and grease gum nozzles are cleaned beforehand and old grease is forced out. Check air pressure or hydraulic pressure for correct operational requirements. Check saw blade tension and setting.

(b) After sawing

Thoroughly clean the machine when the saws are removed and make sure no small pieces of timber are hung up anywhere near or on the machine which could fall into feed chains or sash frames when the machine is started up again. Check connecting rod bearings and sash block guides by touch for overheating. If they are too hot to handle remedial action is necessary. Connecting rod bearings may need washing out and regreasing or the cause may be due to lack of lubrication to the guide blocks which has caused them to overheat and overload the connecting rod bearings.

Weekly checks

Carefully check the connecting rods after they are thoroughly cleaned and make sure they have not suffered damage resulting in deep cuts or scratches which should be ground out. Check chain and belt drives for tension.

Monthly checks

Check and tighten all bolts. Check sash blocks for wear and side play in guides. Check all chains

and adjust as necessary. Check feed roll bearings and check rolls for alignment. Check fence for alignment in the case of a machine sawing cants. Check feed mechanism. The need to adjust sash blocks and eliminate excess side play in the guides is usually indicated by a shallow groove left in the face of the boards when the feed is stopped with the saws still running in the cant or log. A chalk mark at this position will prove the point if the groove is obvious on the board faces. The side play can then be checked by placing a piece of timber of suitable size and length between the sash and guides, applying pressure and getting an assistant to check the amount of clearance by inserting feeler gauges. Sash guides should not be adjusted too tight which will make them over heat. If the feed mechanism is a friction drive it is essential that the faces of the friction wheel and the friction rollers are kept clean and dry. Oil or grease on these faces can cause intermittent feeding and loss of drive.

Six-monthly checks

All bearings should be checked according to the recommendations of the machine manufacturer and replaced if necessary. One very essential requirement regarding frame saw operation and maintenance, which cannot be designated as a routine check, is also explained and illustrated as follows: After retoothing or regrinding ensure the ends of the blade are cut or ground off at an angle to prevent overloading the end gullets and also to make sure the untoothed section of the top of the blade does not hammer against the top of the log or cant when the sash is at the bottom of its travel.

Annual checks

This particular check should be in the form of a general overhaul when the machine is thoroughly cleaned and all moving parts are inspected for wear or damage. Repairs or replacements must be in strict accordance with the recommendations of the manufacturer. A careful check on all lubrication pipes for leaks or insufficient supply to the various destinations should now be carried out.

MATERIALS FOR SELF STUDY

The global furniture sector: an overview

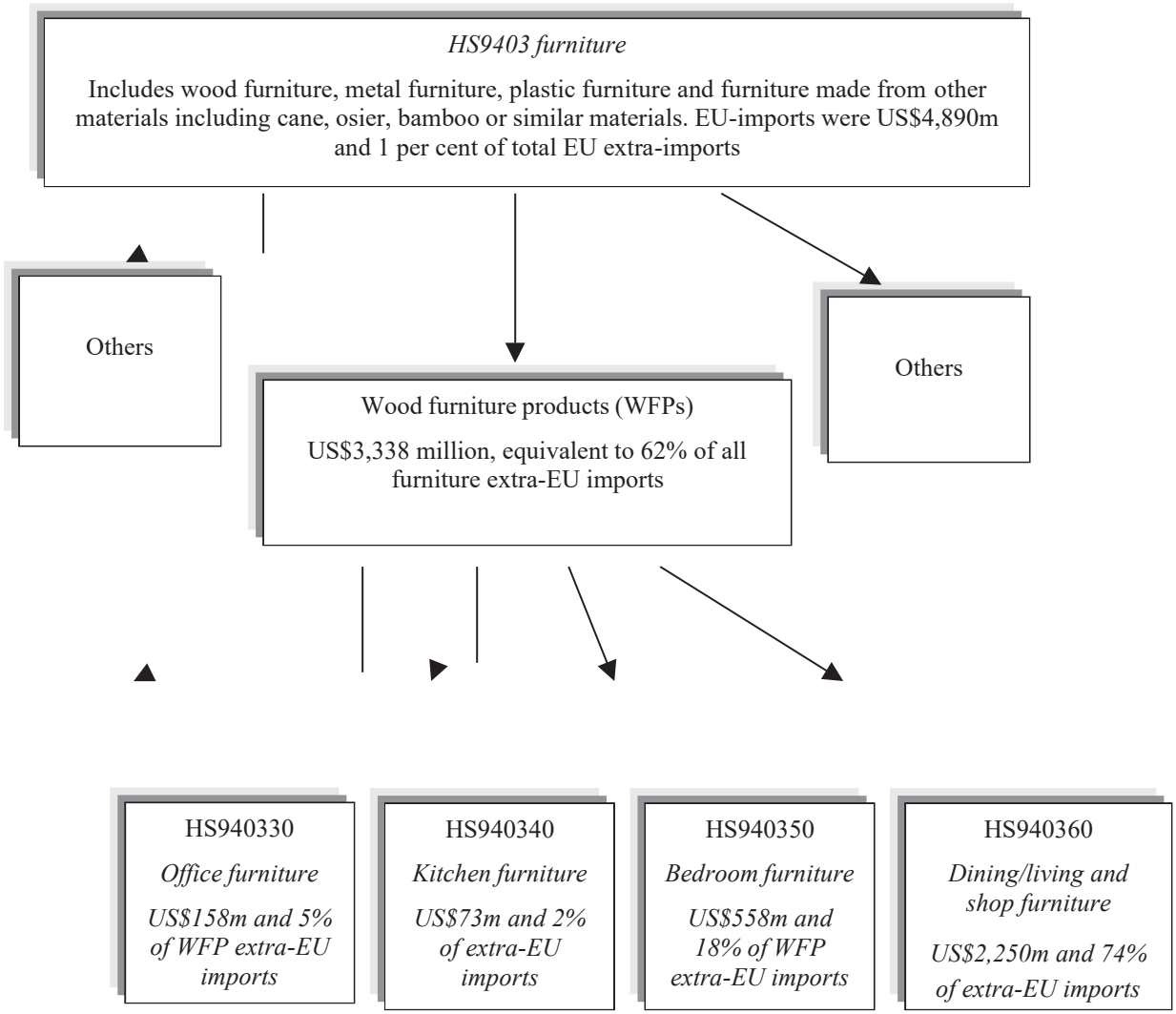
Furniture is a hugeglobal business

Furniture is big business. Between 1995 and 2000 trade in furniture worldwide grew by 36 per cent, faster than world merchandise trade as a whole (26.5 per cent), apparel (32 per cent) and footwear (1 per cent). By 2000 it was the largest low-tech sector, with total global trade worth US$57.4 billion, exceeding apparel (US$51 billion) and footwear (US$36.5 billion). In the European Union (EU), extra-intra furniture imports grew by 20 per cent from 1995 to 2000 compared with 17 per cent for total extra-intra EU imports.3 Furniture has traditionally been a resource and labour-intensive industry that includes both local craft-based firms and large volume producers.

Mass- producing furniture became a viable manufacturing strategy with the advent of flat-pack or ready-to-assemble designed furniture. This product innovation paved the way for firms to design, manufacture and ship products in large quantities. Firms that mass-produce flat-pack furniture tend to supply products for the low- to medium-price markets. Solid wood furniture manufacturers have retained important niche market segments primarily for high-end, expensive and design-led products.

These specialized products tend to be purchased locally while mass-produced, large-volume products are sold locally and for export. As can be seen from Table 1, out of the 15 major exporters, six are developing countries (viz. Brazil, China, Indonesia, Malaysia, Mexico and Thailand) and four transition economies (viz. Czech Republic, Poland, Romania and Slovenia). These 10 countries tend to be large-volume exporters and low-volume importers of furniture (thereby being large net exporters). Industrialized countries on the whole export and import large volumes of furniture with Italy by far the largest net exporter, with Canada, Denmark, Spain and Sweden in third, seventh, tenth and fourteenth places respectively.

Figure 1 Furniture imports into the EU (extra) in 2000 (US$ million)



Sources: UNCTAD (www.unctad.org/trains/index.htm); WTO (www.wto.org/).

Note: m = million; HS = Harmonized System.

Wood furniture is becoming increasingly competitive, with more producers entering the market and prices falling, as can be seen from Figure 2.4 A detailed analysis of the data by product sub-group and countries of origin highlights a number of other points.

In all sub-sectors (viz. office, kitchen, bedroom and dining/living and shop furniture) the unit prices of imports from the four categories of country (using the World Bank's distinction between low-income, lower-middle, upper-middle and high-income countries) tended to converge, that is, a world price was developing.

The unit price of EU imports decreased, except in the bedroom category where they remained broadly stable (Figure 2).

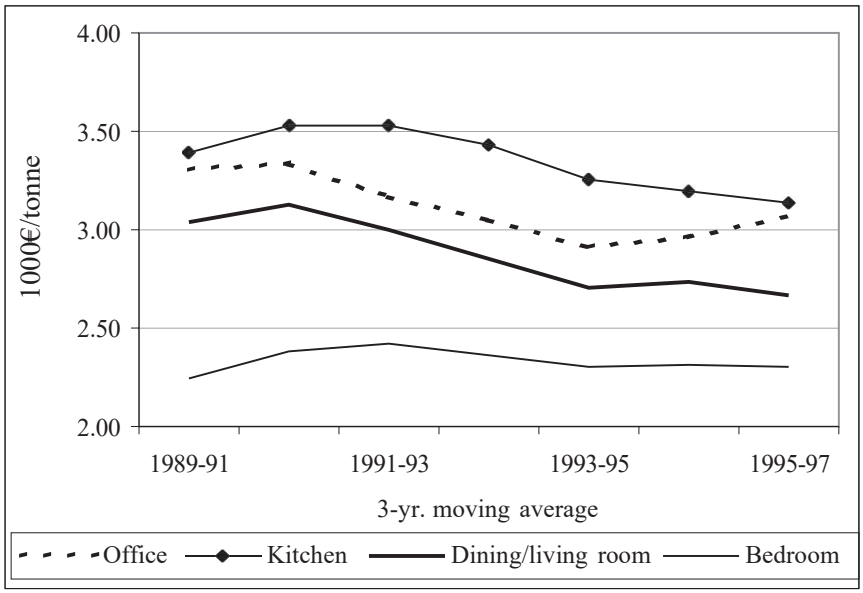
While the unit price of imports from high-income countries fell, those from middle-income countries rose (Table 1), suggesting that middle- income producers, particularly Czech Republic, Poland, Romania, and Slovenia (Table 1), were moving into product groups formerlydominated by high-income countries.

Nevertheless, in 1995-1997 the unit price of imports from high-income countries remained significantly higher than those from upper-middle-income countries, by 144 per cent, 73 per cent, 72 per cent and 94 percent respectively in the four sub-sectors.

In all four sub-sectors, while exporting relatively low volumes, the unitvalue of imports from low-income countries was the next highest afterthe high-income countries. This suggests that firms from low-income countries concentrated on high-value, low-volume craft segments of these markets. In the two largest segments (bedroom and dining/livingand shop furniture) unit prices rose, while in the other two they fell sharply.

These results show an industry in the throes of intense global competition,and therefore moving towards a common and falling global price. This suggests either lower barriers to entry and new entrants, or increasing efficiency and falling costs (or both). Countries can participate in the global market in market segments with sustained price declines, as in furniture, butin this scenario rising exports will not necessarily result in profitable production or in national income growth. For this to happen, the ability to upgrade is critical.

Figure 2 Extra-EU unit furniture import prices, 1989-1997



Different categories of buyers in the value chain

Gaining access to final markets through global buyer.

Value chain analysis throws light on the way in which producers enter global markets. This affects the price margins at which they can sell and their ability to upgrade. In some sectors, such as footwear, there is evidence that global buyers block producers from moving into more profitable activities such as design and branding but support the growth of their manufacturing capabilities. However, the growing capabilities of independent producers result not only from the promotional efforts of independent buyers, but also from the increasing tendency of multinational companies (MNCs) to outsource manufacturing activities, and to concentrate on areas such as design, technology, branding, logistics, marketing and after-sales service.

If upgrading initiatives by buyers are a general global trend, how is it working in the wood furniture sector? The number of market segments, and within these, different market niches (high-volume, price-sensitive, design-intensive, brand-intensive and so on) make this a complex issue. Moreover, markets vary from region to region. For example, softwoods are strong in Europe, but in Japan particleboard and hardwood products dominate the market. While retailing in France, Germany and the United Kingdom consists of a concentration of large, multi-store outlets, in Italy most furniture is sold in small independent outlets.

Despite this market complexity, three major buying agents, who facilitate the entry of wood furniture producers into final markets, can be identified.

- Large multi-store retailers, with outlets and suppliers in many countries. IKEA, for example, sources from 2,000 suppliers in 52 countries and has more than 300 outlets in three continents.
- Small-scale retailers, which buy directly from a limited number of suppliers in a limited number of countries.
- Specialized medium-sized buyers, which source from many countries and sell on to retail outlets, usually in a single country or region. These buyers may have over 1,500 suppliers, located in many countries. Even the smaller specialized buyers will typically source from more than 100 suppliers.

Who does what in the downstream of the wood furniture value chain?

The research on these buyers encompasses a sample of three very large multi- store retailers, eight one-store retailers and six specialized buyers and is based on a combination of questionnaire responses and interviews. All of these buyers address the United Kingdom market, but two of the multi-store retailers have extensive global operations.

The high-value activities in the downstream end of the value chain are shown in Table 3. They include customer support, retailing, distribution in final markets, marketing, product design, purchasing, international transport, and furniture production. Each of these buyers has a different presence in their chains (see also notes to Table 3). It is evident from this that: a. the only activity which all three types of buyers undertake in common is the buying activity itself;

a. multi-store retailers outsource least; not only do they have a strong presence across a range of activities in the chain, but in IKEA's case this includes

its own manufacturing facilities —“ we need to learn about production in order to be a good buyer”;

b. specialized buyers tend to outsource most, their core competencies being buying and marketing; they do, however, also play a role in design;

c. one-store retailers vary most in their range of activities; in the sample they tended to take responsibility for logistics and distribution, but in some cases (involving relatively small retailers and relatively large suppliers) these functions were assumed by furniture suppliers.

Table 3 The spread of downstream value chain activities undertaken by different types of buyers

Activity	*Multi-store retailer*	*One-store retailer*	*Specialized buyer*
After-sales service			
Retailing			
Distribution			
Marketing			
Design			
Purchasing			
International transport			
Production			

All buyers outsource some activities but which and to whom? Table 4 illustrates certain points. Although all three buyer-types use developing-country producers, large global retailers tend to source a major share of their purchases from high-wage economies. In the case of the largest multi-store retailers, the overwhelming proportion of furniture, more than 85 per cent, comes from middle- and upper-income countries, although imports from China, Indonesia and Viet Nam are projected to grow rapidly during the early part of the second millennium.

The role of producers from middle-income East European economies and Russia has shown strong growth in since the mid-1990s especially for the European market.5 Only very small independent retailers depend upon low-income country suppliers for the design of their products, which tend to be low-margin and price-sensitive, like garden furniture. In so far as other activities are outsourced, the only other case where a low-income country producer will be directly involved is the control of deliveries to the store in the consuming country.

Table 4 Do firms from low-income countries participate in activities other than production?

Activity	*Multi-store retailer*		*One-store retailer*		*Specialized buyer*	
	High-wage economies	*Low-wage economies*	*High-wage economies*	*Low-wage economies*	*High-wage economies*	*Low-wage economies*
After-sales service						
Retailing						
Distribution						
Marketing						
Design						
Purchasing						
International transport						
Production						

How Furniture Manufacturers Make Wood Furniture

Wood furniture is timeless. It has a natural appeal, durability, and a warm inviting nature that is difficult to achieve with any other furniture material. It is no wonder that it is in such high demand and furniture manufacturers have to continuously create more pieces to satisfy consumer needs.

That said, manufacturing quality wood furniture is a complex process that requires precision, innovation, and skill. Even the best types of wood would make

poor furniture if they are not properly processed. This is why training and constantly learning the new trends in the market is so essential.

Production Processes

There are 3 main types of wood that are used to make furniture:

- Hardwood- obtained from maple, oak, cherry, and mahogany trees among others. It is highly durable, has interesting shades and grains, costs more, and takes longer to grow.

- Softwood- obtained from cedar, pine, and spruce dressing others. They are lightweight, easy to process, and are cheaper because they mature faster.

- Engineered woods- they include MDF, particleboard, plywood. They are man-made types of wood made by stacking multiple layers of wood boards, particles, or fibers using high-grade adhesives and pressure bombardment to bind them. They are lightweight, affordable, and quite versatile.

Natural wood is typically purchased as logs which are cut into pieces called lumber using a wood milling machine. The lumber may also be dried in an industrial kiln for preservation purposes. It is important to purchase wood from genuine and eco-friendly sources. The quality of the wood determines the quality of the furniture.

CNC processing is also known as CNC milling. It entails using computer-controlled power tools to cut lumber into specific sizes and shapes based on the design of furniture to be produced. It occurs in a couple of steps.

- The furniture designer begins by creating the design on a computer using CAD software.
- Once the 3D design is complete, they route it to the CNC wood milling machine. It is akin to sending a design to print only in this case you are not using a printer but a machine.
- The CNC machine is thus guided by the 3D routed design and cuts the lumber in exactly the same shape.

CNC machining provides way more accuracy and is more efficient in achieving complex shapes like those of elegant sofas or ornate office furniture. It is quite fast and comes in handy when handling dense woods like hardwood.

Surface Finishing

Surface furnishings on wood furniture are mostly used to give the furniture character. You can make furniture look older, more refined, or match a color scheme by using the right surface finish. Some popular surface finishes in wood furniture production include:

- Painted- this is an easy way to achieve a desired color of wooden furniture. Most furniture paints are also effective in protecting wood from weather damage.

- Distressed- this involves scuffing furniture to make it look rustic.

- Stained- if a furniture piece is said to have a cherry finish or a maple finish it means that it has been stained to look like cherry or maple wood. The piece itself may be made of pine or any other wood.

- Lacquered- lacquers are a special liquid that dries to form a protective layer on wooden furniture. There are clear and tinted types and you can also opt for matte or glossy lacquers.

Assembly

At this stage, the lumber has been cut using the CNC machine into shapely pieces and the surface finishes have been applied. When the finish is complete and dry, furniture assembly can begin. It involves joining the individual wood pieces to form the furniture design.

Different types of joinery are used to achieve a particular look of furniture or certain functionalities. Joints are additionally useful in ensuring structural stability although some joints are more stable than others. The most common types include:

- Dowelling - a circular peg is inserted in round holes to secure the joint from coming apart.
- Mortise and tenon- a square peg is inserted in a square hole with a tight fit to secure a joint between two wood planks.
- Dowelling and dovetailing- one plank of wood would have a wedge-shaped tenon and the other would have a wedge-shaped insertion point. They overlap to form a very strong joint.

Quality Testing

Furniture testing is done once assembly is complete and any rough details are perfected. The goal here is to test for production flaws or any problems the consumer might experience with the furniture piece. The tests can be divided into two; aesthetic quality testing and functional quality testing.

Aesthetic quality testing is all about appearance. Are the edges smooth? Are there any nails jutting out? Was the furniture properly sanded and painted or lacquered? These issues are important because the appearance of the furniture either draws or turns away potential buyers.

Functional testing is about how the piece of furniture performs. For instance, if it is a storage chest, do the hinges open and shut with ease? If it is a wooden chair, how does it cope when weight is exerted on it? Signs such as creaks or wobbling indicate structural flaws and have to be addressed.

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A Beginner's Guide To Wood Furniture Making Process Flow

The flow of the process used to make wood furniture has grown more important in recent years in order to produce durable, high-quality goods. Every stage of the procedure, from gathering raw materials to packing the finished good, is important. It is possible to produce furniture that satisfies industry standards and lasts longer by having a thorough understanding of each stage of the process. This article walks you step-by-step through the full process of making wood furniture, from logs to packaging.

Log

Log wood, the raw material hewn from trees, is where the journey of wood furniture starts. The entire process of making furniture starts with logs. After being harvested, the logs are sent to a sawmill and processed in order to be ready for further processing.

In order to guarantee that the wood is appropriate for additional processing, log preparation is necessary. At this point, variables such as the kind of tree, the size of the log, and the moisture level are taken into account. The logs are examined and sorted at the sawmill based on their type and quality. In this stage of production, careful handling avoids waste and harm to the wood later on. After the logs are prepared, the sawmilling procedure is the following stage.

Sawmilling Process

The sawmilling process is the first major step in furniture production. Logs are cut into smaller panels and blocks based on the required size. It is now easy to position the wood panels for drying because the type and thickness are known.

The wood is left outside to let moisture evaporate naturally before it is placed inside the kiln. To prepare wood for kiln drying, it should be exposed to outside temperatures for a minimum of one week.Proper sawmilling ensures smooth processing in later stages, as panels and blocks are arranged according to their size and type. This step ensures efficient drying and reduces the chance of wood damage.

Kiln Dry Process

The wood must be dried in a kiln in order to eliminate moisture. Reducing the moisture content to approximately 12–15% stops damage such as warping and cracking. It takes between two to four weeks for this process, depending on the type of wood, panel thickness, and size of drying space.

Both hardwood and softwood are guaranteed to be stabilized through proper kiln drying. Softwoods are particularly vulnerable to cracking when they dry out too soon. It is essential to use the proper tools for this process in order to preserve

the wood's quality. A well-run kiln drying procedure reduces the possibility of deformed or fractured wood, guaranteeing the material is prepared for the following phase of production.

Splitting & Cutting Process

The splitting and cutting process is where the wood takes shape. Panels and blocks are cut into the specific sizes required for furniture production using CNC machines or saw cutters. Precise cutting ensures that the components fit together perfectly during assembly.

Accurate splitting and cutting are important for reducing waste and saving time in later steps. If the pieces are not cut correctly, they may not align during assembly, leading to defects or delays. CNC machines play a vital role in this stage by providing precision and efficiency. After this process, the cut components are ready for planing and drilling.

Planing & Drilling Process

In this step, small wooden blocks are sent through a planer machine to achieve a smooth, line-free surface. Proper planing ensures that the components are even and ready for further processing.

After planing, the components are drilled using tenoners and mortisers to create precise joints for construction. These tools are essential for ensuring the strength and stability of the furniture. Accurate drilling also ensures the components fit together properly during assembly. The final step before sanding is to inspect the pieces for defects to ensure they meet quality standards.

Sanding Process

Sanding is essential for smoothing out the surfaces of all components before assembly. It ensures the pieces are properly refined, with the correct dimensions and smooth finishes. This step also removes any small imperfections that may have been missed during planing and cutting.

Thorough sanding ensures a polished, finished product and facilitates the application of coatings later on. Additionally, furniture that has been properly sanded is more resilient to deterioration. The parts are prepared for assembly into completed goods after sanding.

Assembling Process

One of the most important phases in the manufacture of furniture is assembly. To form the finished product, the components must be joined. Certain pieces may need to be pre-assembled prior to final finishing, while other sections may be assembled after finishing, depending on the design.

To make sure that the components fit precisely, this method calls for patience and precision. Applying glue correctly is crucial to making sure the furniture is sturdy and solid. In order to preserve quality, any flaws or holes in the joints are fixed during this phase. Although assembly can take some time, it is essential to the product's robustness and longevity. The furniture goes to the finishing stage after assembly is finished.

Finishing Process

The furniture is given the finishing touch, which improves its beauty and guards against harm. To preserve the wood surface from moisture and insect damage, protective coatings are layered on top of it.

The type of furniture will determine whether finishing should be done before or after assembly. Proper application of the finish guarantees longer-lasting and aesthetically pleasing results. Customization is also possible with this procedure because different finishes can be utilized to achieve different styles. After completing, the product is prepared for packaging.

Packing Process

After finishing, the furniture moves to the packaging area, where it is prepared for shipment. Accessories like handles, keys, or wheels are attached if required. The packaging depends on the product’s quality and destination.

High-end furniture or products shipped to distant locations require strong packaging to prevent damage during transportation. Proper packing ensures the furniture reaches customers in perfect condition, maintaining the manufacturer's reputation. With the product packed and ready, the furniture-making process is complete.

What is Furniture Manufacturing?

Furniture manufacturing is the process of creating furniture, which refers to any movable object that is designed to support various human activities such as seating, sleeping, eating, and storage.

The process of furniture manufacturing involves designing, cutting, shaping, joining, finishing, and assembling various materials such as wood, metal, plastic, and glass to create a final product that is both functional and aesthetically pleasing.

Furniture manufacturing involves several stages, including design, engineering, prototyping, production, quality control, and shipping. The design process involves creating a blueprint or a 3D model of the furniture, which is then used to create a prototype. The prototype is then tested for functionality, durability, and safety before it is put into production.

In the production stage, skilled workers use a variety of tools and equipment to cut, shape, and join the various components of the furniture. The materials used

in furniture manufacturing vary depending on the type of furniture being produced.

For example, wooden furniture may use hardwoods, softwoods, or engineered wood products like particleboard or medium-density fiberboard (MDF). Metal furniture may use various metals such as steel, aluminum, or brass.

Quality control is an essential part of furniture manufacturing, as it ensures that each piece of furniture meets the required standards for safety, durability, and functionality. Once the furniture has passed quality control, it is packed and shipped to the retailer or directly to the customer.

Furniture Manufacturing Process: How Furniture is Made?

The furniture manufacturing process involves several stages, including design, engineering, prototyping, production, quality control, and shipping. Here's a brief overview of each stage:

Design

Design is a crucial part of the furniture manufacturing process, as it determines the form, function, and aesthetic appeal of the furniture.

The design process involves several steps, including:

1. **Research and ideation:** The design process begins with research and ideation. Designers research current trends, buyer persona and customer preferences, and the target market to gather insights and inspiration. They may also sketch and brainstorm different concepts and ideas for the furniture.

2. **Concept development:** Once designers have gathered insights and ideas, they begin to develop the furniture's concept. This stage involves creating sketches, 3D models, and technical drawings that outline the furniture's shape, size, materials, and functionality.
3. **Material selection:** After the concept is developed, the designers select the appropriate materials for the furniture. The materials selected depend on the furniture's design and purpose, as well as the available manufacturing methods.
4. **Design refinement:** The furniture's design is then refined based on the feedback received from engineers, manufacturers, and customers. Designers may need to adjust the furniture's shape, size, materials, or functionality to ensure it meets manufacturing and customer requirements.
5. **Prototyping:** Once the design is finalized, a prototype is created to test the furniture's functionality, durability, and safety. The prototype is reviewed, tested, and refined until it meets the required standards.
6. **Final design:** After the prototype is approved, the final design is created, which includes technical drawings, specifications, and instructions for manufacturing the furniture.

In summary, the design process is a critical part of the furniture manufacturing process as it determines the furniture's form, function, and aesthetic appeal.

Designers work closely with engineers, manufacturers, and customers to create furniture that is functional, safe, and visually appealing while meeting customer expectations and manufacturing requirements.

Engineering

Engineering is a crucial part of the furniture manufacturing process, as it ensures that the furniture is functional, safe, and meets the required standards.

The engineering process involves several steps, including:

1. **Design review:** Engineers review the furniture's design to ensure that it meets the required functional, safety, and quality standards. They review the furniture's technical drawings, dimensions, materials, and manufacturing processes to identify any potential issues or areas for improvement.
2. **Materials selection:** Engineers help select appropriate materials for the furniture based on the design requirements, manufacturing processes, and functional needs. They ensure that the materials selected are durable, safe, and meet the required standards.
3. **Manufacturing process design:** Engineers design the manufacturing processes that are required to produce the furniture. They determine the appropriate tools, machines, and processes needed for each stage of the manufacturing process.
4. **Prototyping and testing:** Engineers work with designers to create a prototype of the furniture, which is then tested to ensure that it meets the required functional, safety, and quality standards. They identify any design or manufacturing issues and work to address them to ensure that the final product is safe and functional.
5. **Quality control:** Engineers develop and implement quality control processes that ensure that each piece of furniture meets the required standards for safety, functionality, and durability. They may develop inspection checklists, testing protocols, and certifications to ensure that each piece of furniture is of high quality.
6. **Continuous improvement:** Engineers work with designers and manufacturers to continually improve the furniture's design and

manufacturing processes. They seek feedback from customers and other stakeholders to identify areas for improvement and work to incorporate these improvements into future designs.

In summary, engineering is an essential part of the furniture manufacturing process as it ensures that the furniture is safe, functional, and of high quality.

Engineers work closely with designers, manufacturers, and customers to develop and improve furniture designs and manufacturing processes, ensuring that the final product meets the required standards and customer expectations, thereby ensuring customer retention and higher revenues.

Prototyping

Prototyping is a critical part of the furniture manufacturing process as it allows designers and engineers to test the furniture's functionality, durability, and safety before it goes into full production.

The prototyping process involves several steps, including:

1. **Creating a prototype:** The first step in the prototyping process is to create a prototype of the furniture. This may involve creating a scale model, 3D printing a miniature version, or building a full-sized mock-up of the furniture.
2. **Testing functionality:** Once the prototype is created, it is tested to ensure that it functions as intended. This may involve testing the furniture's ergonomics, usability, and overall performance. Designers and engineers may also test the furniture's structural integrity and load-bearing capacity to ensure that it is safe and durable.

3. **Refining the design:** Based on the results of the functional testing, designers and engineers may need to refine the furniture's design. They may need to adjust the furniture's shape, size, materials, or functionality to ensure that it meets customer requirements and manufacturing standards.
4. **Testing durability and safety:** After the design has been refined, the prototype is tested again to ensure that it is safe and durable. This may involve subjecting the furniture to various stress tests, such as impact, vibration, and temperature testing, to ensure that it can withstand real-world conditions.
5. **Finalizing the design:** Once the prototype has been tested and refined, the final design is created, which includes technical drawings, specifications, and instructions for manufacturing the furniture.

In summary, prototyping is an essential part of the furniture manufacturing process as it allows designers and engineers to test the furniture's functionality, durability, and safety before it goes into full production.

The prototyping process ensures that the final product meets customer expectations and manufacturing standards, resulting in a safe, durable, and functional piece of furniture.

Production

Production is a crucial part of the furniture manufacturing process as it involves the actual manufacturing and assembly of the furniture.

The production process involves several steps, including:

1. **Materials preparation:** The first step in the production process is to prepare the materials that will be used to create the furniture. This may involve

cutting, shaping, and sanding the raw materials, such as wood, metal, or upholstery fabric.

2. **Assembly:** Once the materials are prepared, the furniture is assembled according to the final design. This may involve using tools, machines, and manual labor to assemble the furniture, including attaching legs, frames, and hardware.
3. **Finishing:** After the furniture is assembled, it undergoes finishing, which involves applying a protective coating, such as paint, varnish, or stain, to enhance its appearance and protect it from wear and tear.
4. **Quality control:** During the production process, the furniture undergoes quality control checks to ensure that it meets the required standards for safety, functionality, and durability. Quality control checks may include visual inspections, functional testing, and load-bearing tests.
5. **Packaging and shipping:** After the furniture has passed quality control checks, it is packaged and shipped to customers. Packaging may involve wrapping the furniture in protective material to prevent damage during shipping.
6. **After-sales service:** After the furniture is delivered, manufacturers may provide after-sales service, such as installation, repair, or replacement of defective parts, to ensure customer satisfaction and maintain their reputation.

In summary, production is a crucial part of the furniture manufacturing process as it involves the actual manufacturing and assembly of the furniture.

The production process ensures that the final product meets the required standards for safety, functionality, and durability, resulting in a high-quality piece of furniture that meets customer expectations, and therefore encourages returning customers as well as higher returns on investment.

Finishing

Finishing is an important part of the furniture manufacturing process as it enhances the appearance of the furniture and protects it from wear and tear.

The finishing process involves several steps, including:

1. **Sanding:** The first step in the finishing process is sanding the furniture. This involves using a sanding machine or sandpaper to smooth out any rough edges or imperfections in the furniture.
2. **Staining:** After the furniture is sanded, it may be stained to enhance its appearance. Staining involves applying a thin layer of color to the furniture's surface, which can give it a natural wood look or a vibrant color.
3. **Sealing:** Once the stain has been applied, the furniture is sealed to protect it from wear and tear. Sealing involves applying a clear coat of protective material, such as varnish or polyurethane, to the furniture's surface.
4. **Buffing:** After the sealant has dried, the furniture is buffed to create a smooth, shiny finish. Buffing involves using a buffing machine or polishing cloth to remove any imperfections or rough spots on the furniture's surface.
5. **Final inspection:** After the finishing process is complete, the furniture undergoes a final inspection to ensure that it meets the required standards for appearance and quality. This may involve visual inspections, functional testing, or load-bearing tests.

In summary, finishing is an important part of the furniture manufacturing process as it enhances the appearance of the furniture and protects it from wear and tear.

The finishing process involves several steps, including sanding, staining, sealing, buffing, and a final inspection to ensure that the finished furniture meets the required standards for appearance and quality.

Quality Control

Quality control is a critical part of the furniture manufacturing process as it ensures that the final product meets the required standards for safety, functionality, and durability.

The quality control process involves several steps, including:

1. **Incoming materials inspection:** The first step in the quality control process is to inspect the raw materials that will be used to create the furniture. This may involve checking the materials for defects, such as warping or cracks, to ensure that they are of high quality and meet the required specifications.
2. **In-process inspection:** During the furniture manufacturing process, the furniture is inspected at various stages to ensure that it meets the required standards. This may involve visual inspections, functional testing, and load-bearing tests to ensure that the furniture is safe and functional.
3. **Final inspection:** After the furniture has been assembled and finished, it undergoes a final inspection to ensure that it meets the required standards for appearance, functionality, and safety. A final inspection may involve visual inspections, functional testing, and load-bearing tests to ensure that the furniture meets customer requirements and manufacturing standards.
4. **Corrective action:** If any defects or issues are found during the quality control process, corrective action is taken to address the issue. This may involve repairing or replacing defective parts, adjusting the manufacturing

process, or making design changes to prevent similar issues from occurring in the future.

5. **Documentation and record-keeping:** Throughout the quality control process, documentation and record-keeping are important to ensure that the furniture meets the required standards and that any issues are addressed in a timely manner. Documentation may include inspection reports, corrective action plans, and other quality control records.

In summary, quality control is a critical part of the furniture manufacturing process as it ensures that the final product meets the required standards for safety, functionality, and durability.

The quality control process involves several steps, including incoming materials inspection, in-process inspection, final inspection, corrective action, and documentation and record-keeping.

The goal of the quality control process is to produce high-quality furniture that meets customer expectations and manufacturing standards.

Shipping

Shipping is an important part of the furniture manufacturing process as it involves delivering the finished product to the customer or retailer.

The shipping process involves several steps, including:

1. **Packaging:** The first step in the shipping process is to package the furniture for transportation. This may involve disassembling the furniture, wrapping it in protective materials, and placing it in a sturdy container for transportation.

2. **Shipping method:** Once the furniture is packaged, the next step is to choose a shipping method. This may include ground transportation, air freight, or sea freight, depending on the distance and location of the customer.
3. **Logistics:** Logistics plays an important role in the shipping process, as it involves coordinating the delivery of the furniture from the manufacturing facility to the customer or retailer. This may involve working with third-party logistics providers or shipping companies to ensure that the furniture is delivered on time and in good condition.
4. **Delivery and assembly:** Once the furniture has been delivered, it may need to be assembled at the customer's location. This may involve providing detailed assembly instructions or sending a technician to assemble the furniture on-site.
5. **Customer service:** Finally, customer service is an important part of the shipping process. This may involve answering customer questions or concerns about the shipping process, providing tracking information, or addressing any issues that arise during delivery or assembly.

In summary, shipping is an important part of the furniture manufacturing process as it involves delivering the finished product to the customer or retailer. The shipping process involves several steps, including packaging, choosing a shipping method, logistics, delivery and assembly, and customer service.

The goal of the shipping process is to ensure that the furniture is delivered to the customer on time and in good condition and that any issues or concerns are addressed in a timely and professional manner.

How to Ensure Quality Control in the Furniture Manufacturing Process?

Ensuring quality control in the furniture manufacturing process involves implementing a comprehensive quality control system that covers all aspects of the manufacturing process.

Here are some steps that can be taken to ensure quality control in the furniture manufacturing process:

1. **Develop quality control standards:** The first step in ensuring quality control is to develop clear and comprehensive quality control standards that define the required specifications for the furniture. This may involve specifying materials, dimensions, finishes, and other requirements.
2. **Train employees:** All employees involved in the furniture manufacturing process should be trained on the quality control standards and the procedures for inspecting and testing furniture during the manufacturing process.
3. **Inspect incoming materials:** Raw materials should be inspected upon receipt to ensure that they meet quality control standards. Any defective or substandard materials should be rejected or returned to the supplier.
4. **Conduct in-process inspections:** Throughout the manufacturing process, the furniture should be inspected and tested at various stages to ensure that it meets the quality control standards. This may involve visual inspections, functional testing, and load-bearing tests.
5. **Conduct final inspection:** Once the furniture has been assembled and finished, it should undergo a final inspection to ensure that it meets the quality control standards. This may involve visual inspections, functional testing, and load-bearing tests.
6. **Document quality control activities:** All quality control activities should be documented, including inspection reports, corrective action plans, and other quality control records.

7. **Continuously improve the quality control system:** The quality control system should be reviewed periodically to identify areas for improvement and to ensure that it continues to meet the needs of the business and the customer.

In summary, ensuring quality control in the furniture manufacturing process involves developing clear quality control standards, training employees, inspecting incoming materials, conducting in-process and final inspections, documenting quality control activities, and continuously improving the quality control system.

By implementing these steps, furniture manufacturers can produce high-quality furniture that meets customer expectations and manufacturing standards.

Challenges Associated with the Furniture Manufacturing Process

The furniture manufacturing process can be challenging and complex, and there are several key challenges that manufacturers may face. Some of these challenges include:

1. **Raw material availability:** One of the biggest challenges in the furniture manufacturing process is sourcing high-quality raw materials at an affordable price. Fluctuations in raw material prices and availability can impact the cost and quality of the final product.
2. **Design and engineering:** The design and engineering process can be complex and time-consuming, and ensuring that the final product meets customer expectations and regulatory requirements can be a challenge.
3. **Production efficiency:** The furniture manufacturing process requires a high degree of precision and attention to detail, and ensuring that the production

process is efficient and streamlined can be a challenge. Factors such as equipment breakdowns, labor shortages, and production delays can impact production efficiency.

4. **Quality control:** Ensuring that the final product meets quality control standards can be challenging and requires a comprehensive quality control system that covers all aspects of the manufacturing process.
5. **Environmental concerns:** Furniture manufacturing can have a significant impact on the environment, and manufacturers must ensure that their operations are sustainable and environmentally responsible.
6. **Shipping and logistics:** Shipping furniture can be challenging and requires careful coordination and planning to ensure that the product is delivered on time and in good condition.
7. **Competitive market:** The furniture market is highly competitive, and manufacturers must continually innovate and adapt to changing customer preferences and market trends to remain competitive.

In summary, the furniture manufacturing process can be challenging and complex, and manufacturers must navigate a range of issues related to raw material availability, design and engineering, production efficiency, quality control, environmental concerns, shipping and logistics, and a highly competitive market.

By addressing these challenges and implementing best practices, furniture manufacturers can produce high-quality products that meet customer expectations and regulatory requirements.

Opportunities Associated with the Furniture Manufacturing Process

The furniture manufacturing process presents several opportunities for manufacturers to innovate, grow their businesses, and create value for customers. Some of the opportunities associated with the furniture manufacturing process include:

1. **Customization:** The ability to offer customized furniture can be a significant opportunity for furniture manufacturers. By leveraging the digital design and manufacturing technologies, manufacturers can offer a wide range of customization options to meet the specific needs and preferences of individual customers.
2. **Sustainability:** Sustainable manufacturing practices and the use of eco-friendly materials can be significant opportunities for furniture manufacturers. By adopting environmentally responsible practices and promoting sustainable products, manufacturers can differentiate themselves from competitors and appeal to environmentally conscious customers.
3. **Digital technologies:** The adoption of digital technologies, such as 3D printing, robotics, and augmented reality, can enable furniture manufacturers to streamline their operations, reduce manufacturing costs, and improve quality control. Digital technologies can also enhance the customer experience by allowing customers to visualize and customize furniture before purchasing.
4. **Global market:** The global furniture market presents significant opportunities for manufacturers to expand their customer base and increase sales. By leveraging e-commerce platforms and online marketing strategies, manufacturers can reach customers in new markets and grow their businesses.
5. **Collaborative partnerships:** Collaborating with other manufacturers, designers, and suppliers can be an opportunity for furniture manufacturers to

share expertise, reduce costs, and create value for customers. By working together, manufacturers can develop innovative products and processes that differentiate them from competitors and meet customer needs more effectively.

In summary, the furniture manufacturing process presents several opportunities for manufacturers to innovate, differentiate themselves from competitors, and create value for customers.

By adopting sustainable manufacturing practices, leveraging digital technologies, expanding into global markets, and collaborating with other stakeholders, furniture manufacturers can position themselves for long-term success in the industry.

Areas of Improvement in the Furniture Manufacturing Process

There are several areas where furniture manufacturers can focus on improving their manufacturing processes to increase efficiency, reduce costs, and improve product quality. Some areas of improvement in the furniture manufacturing process include:

1. **Supply chain management:** Improving supply chain management can help furniture manufacturers to optimize their procurement processes, reduce material waste, and lower costs. By working closely with suppliers and adopting lean manufacturing principles, manufacturers can streamline their supply chain and improve production efficiency.
2. **Automation and technology:** Implementing automation and technology solutions can help furniture manufacturers to improve production efficiency, reduce labor costs, and improve product quality. By adopting digital

technologies such as 3D printing, robotics, and machine learning, manufacturers can streamline their manufacturing processes and improve their competitive position in the market.

3. **Process optimization:** Continuously optimizing the manufacturing process can help furniture manufacturers to reduce production cycle times, eliminate waste, and improve product quality. By analyzing data and using process improvement methodologies such as Six Sigma or Lean Manufacturing, manufacturers can identify areas for improvement and implement changes to optimize the manufacturing process.
4. **Quality control:** Improving quality control processes can help furniture manufacturers to reduce the number of defects in their products, improve customer satisfaction, and reduce costs associated with returns and repairs. By implementing a comprehensive quality control system that covers all aspects of the manufacturing process, manufacturers can ensure that their products meet customer expectations and comply with regulatory requirements.
5. **Employee training and development:** Providing ongoing training and development opportunities to employees can help furniture manufacturers to improve production efficiency, reduce errors, and improve product quality. By investing in employee training and development, manufacturers can create a culture of continuous improvement and continuous innovation that drives the success of their businesses.

In summary, furniture manufacturers can improve their manufacturing processes by focusing on areas such as supply chain management, automation and technology, process optimization, quality control, and employee training and development.

By making these improvements, manufacturers can increase efficiency, reduce costs, improve product quality, and position themselves for long-term success in the industry.

How have Technological Advancements Affected the Furniture Manufacturing Process?

Technological advancements have had a significant impact on the furniture manufacturing process, improving efficiency, product quality, and customization options. Some of the ways in which technological advancements have affected the furniture manufacturing process include:

1. **Digital design:** The use of computer-aided design (CAD) software allows furniture manufacturers to create detailed, precise designs quickly and accurately. This technology enables manufacturers to visualize and test designs before production, reducing the risk of errors and reducing production costs.
2. **Automation:** Automation technologies such as robotics and machine learning have enabled furniture manufacturers to automate many of the tasks traditionally performed by human workers, reducing labor costs and improving production efficiency.
3. **Additive manufacturing:** Additive manufacturing technologies, such as 3D printing, have enabled furniture manufacturers to produce highly customized, intricate designs that were previously impossible to create. This technology also allows manufacturers to produce small batches of products quickly and cost-effectively, reducing production lead times and inventory costs.
4. **Sustainable materials:** Technological advancements have enabled furniture manufacturers to use sustainable, eco-friendly materials in their products,

reducing their environmental impact and appealing to environmentally conscious consumers.

5. **Augmented reality:** Augmented reality technology allows customers to visualize furniture in their homes before purchasing, improving the customer experience and reducing the likelihood of returns. This technology also allows manufacturers to offer highly customized products, enabling customers to personalize their furniture to their specific needs and preferences.

In summary, technological advancements have revolutionized the furniture manufacturing process, improving efficiency, product quality, and customization options. By adopting these technologies, furniture manufacturers can reduce costs, improve product quality, and position themselves for long-term success in the industry.

Role of Automation in the Furniture Manufacturing Process

Automation plays a significant role in the furniture manufacturing process, improving efficiency, reducing labor costs, and improving product quality. Some of the ways in which automation is used in the furniture manufacturing process include:

1. **Cutting and shaping:** Automated cutting and shaping machines can cut and shape wood, metal, and other materials with precision and speed, reducing production time and improving product quality.
2. **Assembly:** Automated assembly lines can assemble furniture components quickly and accurately, reducing labor costs and improving efficiency.

3. **Finishing:** Automated finishing machines can sand, stain, and coat furniture components with precision and consistency, improving product quality and reducing the risk of errors.
4. **Quality control:** Automated quality control systems can detect defects in furniture components quickly and accurately, reducing the number of defective products that reach customers and improving customer satisfaction.
5. **Inventory management:** Automated inventory management systems can track raw materials and finished products, reducing the risk of stockouts and overstocking and improving supply chain efficiency.

By adopting automation technologies, furniture manufacturers can improve efficiency, reduce labor costs, and improve product quality. However, it is important to note that automation should be used strategically, with a focus on optimizing the manufacturing process and improving the customer experience.

Additionally, it is important to ensure that automation technologies are integrated with human workers, enabling workers to focus on tasks that require creativity and critical thinking while allowing machines to handle repetitive or dangerous tasks.

Ensuring Sustainability in the Furniture Manufacturing Process

Ensuring sustainability in the furniture manufacturing process is becoming increasingly important as consumers become more environmentally conscious and demand products that are made with sustainable materials and methods.

Here are some ways that furniture manufacturers can ensure sustainability in their manufacturing process:

1. **Sustainable materials:** Furniture manufacturers can use sustainable materials such as reclaimed wood, bamboo, recycled plastic, and non-toxic finishes, reducing their environmental impact.
2. **Efficient use of resources:** Manufacturers can optimize their use of resources such as water, energy, and raw materials, reducing waste and reducing their environmental impact.
3. **Waste reduction and recycling:** Manufacturers can implement waste reduction and recycling programs, ensuring that waste materials are recycled or reused rather than being sent to landfills.
4. **Eco-friendly manufacturing processes:** Furniture manufacturers can adopt eco-friendly manufacturing processes, such as using low-emission adhesives, reducing packaging waste, and minimizing transportation emissions.
5. **Sustainable sourcing:** Manufacturers can ensure that they source materials from suppliers who use sustainable practices, reducing the environmental impact of their supply chain.
6. **Product design:** Manufacturers can design furniture products with sustainability in mind, such as using modular designs that allow for easy disassembly and recycling at the end of the product's life.

By adopting sustainable practices in the furniture manufacturing process, manufacturers can appeal to environmentally conscious consumers and improve their brand image.

Additionally, sustainable practices can help manufacturers reduce costs, improve supply chain efficiency, and ensure long-term success in the industry.

New Trends in the Furniture Manufacturing Process

There are several new trends emerging in the furniture manufacturing process, driven by changing consumer preferences and technological advancements. Here are some of the notable trends:

1. **Sustainable materials:** As mentioned earlier, there is a growing trend toward using sustainable materials such as reclaimed wood, bamboo, and recycled plastics.
2. **Customization:** Consumers are increasingly looking for customized furniture that meets their specific needs and preferences. Furniture manufacturers are responding by offering customizable options, such as selecting the color, fabric, and finishes.
3. **3D printing:** 3D printing is becoming more common in furniture manufacturing, allowing for the creation of complex and unique designs that were previously difficult to produce using traditional methods.
4. **Smart furniture:** With the rise of the Internet of Things (IoT), furniture manufacturers are incorporating smart features into their products, such as built-in charging ports, sensors, and other tech-enabled features.
5. **Lightweight and modular furniture:** With an increasing emphasis on flexibility and mobility, furniture manufacturers are creating lightweight and modular furniture that can be easily assembled and disassembled, making it easier to move and store.
6. **Multifunctional furniture:** With the trend towards smaller living spaces, furniture manufacturers are creating multifunctional furniture that serves multiple purposes, such as a sofa bed or a coffee table that doubles as a storage unit.

By embracing these new trends, furniture manufacturers can meet the changing needs and preferences of consumers and stay competitive in the market.

GLOSSARY OF FORESTRY TERMS

- Acre

An area of land measuring 43,560 square feet. A square 1-acre plot measures 209 feet by 209 feet; a circular acre has a radius of 117.75 feet.

- Amphibian

Any of a class of vertebrates that regulate their body temperature externally; lay shell-less eggs in wet areas; live in water during early development and live both in water and on land as adults; and use lungs, gills and their skin for breathing. Most have four legs and smooth, moist skin without scales.

- Angiosperm

A plant that has true flowers and bears its seeds in fruits. In temperate zones, many angiosperms are deciduous trees, while in tropical zones, many are evergreen trees. Examples include oaks, willows, maples and birches.

- Annual Ring

The combination of one earlywood layer (light colored) and one latewood layer (dark colored) seen in a cross-section of a tree. One annual ring usually represents one year of growth.

- Artificial Regeneration

The growth of new trees through seeding and planting.

- Bark

The tough exterior covering of a woody root or stem that protects the tree from injury caused by insects and other animals, by other plants, by disease and by

fire.

Best Management Practices
Procedures employed during harvesting and/or timber stand improvement activities that reduce erosion and prevent or control water pollution.

Biltmore Stick
A stick similar to a yardstick in appearance, but usually about 25 inches long. One side is scaled to read a tree's diameter by holding the stick horizontally at arm's length and against the tree at breast height. A Merritt hypsometer runs along one edge of the stick and is scaled to read a tree's height from 66 feet away from the tree's base. These two measurements are then used to find the tree's volume according to the volume table printed on one face of the stick.

Biodiversity
The variety of life forms in a given area; can be categorized in terms of number of species, variety of plant and animal communities, genetic variability or some combination of these categories.

Bird
Any of a class of vertebrates that regulate their body temperature internally, have bodies that are covered almost entirely with feathers and have forelimbs modified as wings that enable most to fly.

Board Foot
A unit of measure equal to a board that is 1 inch thick, 12 inches long and 12 inches wide, or 144 cubic inches.
Bole

The main trunk of a tree.

Broadleaf

A class of trees that have broad, flat leaves of many different shapes; most are deciduous; also called hardwood because most broad-leaved trees have harder wood than do conifers. Examples include oak, hickory, maple and ash.

Buffer Strip

A narrow zone or strip of land, trees or vegetation bordering an area. Common examples include visual buffers, which screen the view along roads, and streamside buffers, which are used to protect water quality. Buffers may also be used to prevent the spread of forest pests.

Cambium

A thin layer of specialized cells within a tree's trunk that divide to produce new inner bark cells to the outside and new sapwood cells to the inside. The narrow band of cells that is responsible for the tree's growth in circumference.

Canopy

The "roof" of the forest formed by the crowns of the tallest trees.

Carrying Capacity

The maximum number of healthy wildlife that a given habitat or area can support without degradation of the habitat.

Cellulose

The scientific name for wood fiber.

Chain

A distance of 66 feet.

Clearcut
A harvesting and regeneration method that removes all trees within a given area. Most commonly used in pine and hardwood forests that require full sunlight to regenerate and grow efficiently.

Clinometer
An instrument that is held at eye level to read stump height and merchantable or total height when standing 50 and 66 feet from the base of the tree. The difference between the two readings yields the height.

Competition
The struggle between trees to obtain sunlight, nutrients, water and growing space. Every part of the tree, from the roots to the crown, competes for space and food.

Conifer
A class of trees that are evergreen, have needle or scalelike foliage and conelike fruit; often called softwood. Examples include pine, hemlock, cedar and cypress.

Conservation
Planned management and wise use of natural resources for present and future generations.

Cord
A standard unit of measure equivalent to 128 cubic feet of round or split wood.

A standard cord measures 4 feet by 4 feet by 8 feet. A face cord or short cord is 4 feet by 8 feet by any length of wood under 4 feet.

Cover

(a) Any plant that intercepts rain drops before they reach the soil or that holds soil in place;

(b) a hiding place or vegetative shelter for wildlife from predators or inclement weather.

Crown

The branches and foliage at the top of a tree.

Cruise

A survey or inventory of forestland to locate timber and estimate its quantity by species, products, size, quality or other characteristics.

Deciduous

A group of trees that lose all of their leaves every year.

Decomposition

The process by which organic material such as leaves and branches are broken down by bacteria, fungi, protozoans and the many different kinds of animals that live in the soil.

Dendrology

The study of trees; tree identification.

Diameter at Breast Height (DBH)

Tree diameter measured at 4.5 feet above ground level.

Diameter Tape
A steel measuring tape that has a scale calibrated to read a tree's diameter when wrapped around the tree's circumference.

Earlywood
Wood cells produced at the beginning of a tree's growing season that are generally light in color. Also called springwood.

Ecology
The science or study of the relationships between organisms and their environment.

Ecological Succession
The gradual change of plant and animal communities over time.

Ecosystem
A loosely defined area consisting of numerous habitats.

Edge
The transition between two different types or ages of vegetation.

Endangered Species
Any species that has been classified by the U.S. Fish and Wildlife Service or a state wildlife agency as being in danger of extinction throughout all or a significant portion of its range. A species is endangered when the total number of remaining members may not be sufficient to reproduce enough offspring to

ensure survival of the species.

Environment
The sum of all external living and non-living conditions and influences that affect the development and survival of an organism.

Erosion
The wearing away or removal of land or soil by the action of wind, water, ice or gravity.

Even-Aged Management
A forest management method used to produce stands that are all the same age or nearly the same age by harvesting all trees in an area at one time or in several cuttings over a short time. This management method is commonly applied to shade-intolerant conifers and hardwoods.

Evergreen
A group of trees that do not lose all of their leaves every year but go through a gradual replacement by dropping only their oldest leaves each year. Instead of being bare in winter, these trees have leaves all year.

Foliage
The leaves of a tree or other plant.

Forage
Vegetation such as leaves, stems, buds and some types of bark, that can be eaten for food and energy.
Forb

Any herb other than grass.

Forest Floor
The lowest level of the forest that is made up of tree seedlings, dead leaves and needles, grasses, ferns, flowers, fungi, and decaying plants and logs.

Forest Management
Caring for a forest so that it stays healthy and vigorous and provides the products and values the landowner desires.

Forest Stewardship Plan
A written document listing activities that enhance or improve forest resources (wildlife, timber, soil, water, recreation and aesthetics) on private land over a five-year period.

Forest Type
A designation or name given to a forest based on the most abundant tree type or types in the stand; groups of tree species commonly growing in the same stand because their environmental requirements are similar. Examples of North Carolina forest types include (a) pine; (b) mixed hardwood; (c) cypress, tupelo and black gum; and (d) oak and hickory.

Forestry
The art and science of managing forests to produce various products and benefits including timber, wildlife habitat, clean water, biodiversity and recreation.

Fuel Loading

A buildup of easily ignited leaves, pine straw, branches and trees on the forest floor.

Group Selection
(a) The removal of small groups of trees to regenerate shade-intolerant trees in the opening (usually at least 1/4 acre);
(b) a specific type of selective cutting.

Gymnosperm
A plant whose seeds are not enclosed in flowers. Most gymnosperms produce their seeds on the surface of the scales of female cones and are pollinated by wind. Conifers are the most common type of gymnosperm.

Habitat
An area in which a specific plant or animal naturally lives, grows and reproduces; the area that provides a plant or animal with adequate food, water, shelter and living space.

Hardwoods
Trees with broad, flat leaves as opposed to coniferous or needled trees. Wood hardness varies among the hardwood species, and some are actually softer than some softwoods.

Heartwood
The central core of a tree, which is made up of dense, dead wood and provides strength to the tree.

High-Grading

A harvesting technique that removes only the biggest and most valuable trees from a stand and provides high returns at the expense of future growth potential. Poor quality, shade-loving trees tend to dominate in continually high-graded sites.

Hypsometer
Any device used for measuring tree height.

Increment Borer
A hollow auger-like tool with a screw bit used to remove core samples from trees.

Latewood
Wood cells produced at the end of the growing season that make up the darker section of an annual ring. Also called summerwood.

Limiting Factor
Any requirement for wildlife survival that is in limited supply.

Mammal
Any of a class of higher vertebrates whose bodies are covered with hair, who give birth to live young, nourish their young with milk from mammary glands, regulate their body temperature internally, have four types of well-developed teeth and typically have four well-developed legs with toes that have nails, claws or hoofs.

Mast
Fruits or nuts used as a food source by wildlife. Soft mast includes most fruits

with fleshy coverings, such as persimmon, dogwood seed or black gum seed. Hard mast refers to nuts such as acorns and beech, pecan and hickory nuts.

Merritt Hypsometer
A scale that measures the number of 16-foot logs in a tree.

Multiple-Use Management
The management of land or forest for more than one purpose, such as wood production, water quality, wildlife, recreation, aesthetics and clean air.

Natural Regeneration
The growth of new trees in one of the following ways without human assistance: (a) from seeds carried by wind or animals, (b) from seeds stored on the forest floor, or (c) from stumps that sprout.

Naval Stores
Products such as turpentine, pitch and rosin that come from pine trees and are used in the construction and maintenance of wooden sailing vessels.

Phloem
The part of a tree that carries sap from the leaves to the rest of the tree. Also called inner bark.

Photosynthesis
The process by which a plant or tree combines water and carbon dioxide with energy from the sun to make glucose and oxygen.

Plant Succession

The progression of plants from bare ground to mature forest.

Prescribed Burning
The practice of using regulated fires to reduce or eliminate material on the forest floor, for seedbed preparation or to control competing vegetation. Prescribed burning simulates one of the most common natural disturbances. Also called controlled burning.

Pulpwood
Wood used in the manufacture of paper, fiberboard or other wood fiber products. Pulpwood-sized trees are usually a minimum of 4 inches in diameter.

Reforestation
Reestablishing a forest by planting or seeding an area from which forest vegetation has been removed.

Release
To free a tree from competition with its immediate neighbors by removing the surrounding trees. This occurs naturally and artificially.

Renewable Resource
A naturally occurring raw material or form of energy that has the capacity to replenish itself through ecological cycles and sound management practices.

Reptile
Any of a class of vertebrates that regulates its body temperature externally, has dry, glandless skin covered with scales, breathes through lungs and lays large eggs that develop on land.

Resin

A group of sticky liquid substances secreted by plants that appear on the plant's external surface after a wound.

Roots

The underground portion of a tree that helps anchor the tree in the ground and absorbs water and nutrients from the soil.

Rotation

The number of years required to establish and grow trees to a specified size, product or condition of maturity. A pine rotation may range from as short as 20 years for pulpwood to more than 60 years for sawtimber.

Salvage Cut

The harvesting of dead or damaged trees, or the harvesting of trees in danger of being killed by insects, disease, flooding or other factors in order to save their economic value.

Sawtimber

Wood of large enough size to be used to produce lumber for construction and furniture.

Sedimentation

The deposition or settling of soil particles suspended in water.

Seed Tree Cut

A harvesting method in which a few scattered trees are left in the area to

provide seeds for a new forest stand. Selection of seed trees is based on growth rate, form, seeding ability, wind firmness and future marketability. This harvesting method produces an even-aged forest.

Selective Cutting
The periodic removal of individual trees or groups of trees to improve or regenerate a stand.

Shade-Intolerant Species
Trees that require full sunlight to thrive and cannot grow in the shade of larger trees.

Shade-Tolerant Species
Trees that have the ability to grow in the shade of other trees and in competition with them.

Shelterwood Cut
Removing trees in the harvest area in a series of two or more cuttings so that new seedlings can grow from the seeds of older trees. This method produces an even-aged forest.

Silviculture
The art, science and practice of establishing, tending and reproducing forest stands of desired characteristics. It is based on knowledge of species' characteristics and environmental requirements.

Site Index
A relative measure of forest site quality based on the height (in feet) of the

dominant trees at a specific age (usually 25 or 50 years, depending on rotation length). Site index information helps estimate future returns and land productivity for timber and wildlife.

Snag
A standing dead or dying tree.

Softwood
A tree belonging to the order Coniferales. Softwood trees are usually evergreen, bear cones and have needles or scalelike leaves. Examples include pines, spruces, firs and cedars. See conifer.

Species
A group of related organisms having common characteristics and capable of interbreeding. Loblolly and Virginia pine are common tree species that can interbreed.

Springwood
See earlywood.

Stand
A group of trees that are sufficiently the same in species composition and arrangement of age classes and condition so that they can be managed as a unit.

Streamside Management Zone (SMZ)
An area adjacent to a stream in which vegetation is maintained or managed to protect water quality.
Summerwood

See latewood.

Suppression
The process by which a tree loses its vigor due to inadequate light, water and nutrients.

Thinning
A tree removal practice that reduces tree density and competition between trees in a stand. Thinning concentrates growth on fewer, high-quality trees, provides periodic income and generally enhances tree vigor. Heavy thinning can benefit wildlife through the increased growth of ground vegetation.

Threatened Species
Any species that has been classified by the U.S. Fish and Wildlife Service or a state wildlife agency as likely to become endangered within the foreseeable future throughout all or a significant portion of its range. A threatened species has declining or dangerously low populations but still has enough members to maintain or increase numbers.

Transpiration
The loss of water through leaves.

Tree Caliper
A metal or wooden device consisting of an arm and two prongs, one of which is free to slide along a graduated scale on the arm. The prongs are placed against opposite sides of a tree to read its diameter on the scale.

Turpentine

A distilled chemical produced from tapping into a living pine and harvesting the sap.

Understory
The area below the forest canopy that comprises shrubs, snags and small tree. Because the understory receives little light, many of the plants at this level tolerate shade and will remain part of the understory. Others will grow and replace older trees that fall.

Wildlife
A broad term that includes nondomesticated vertebrates, especially mammals, birds and fish.

Wood
The solid interior of a tree.

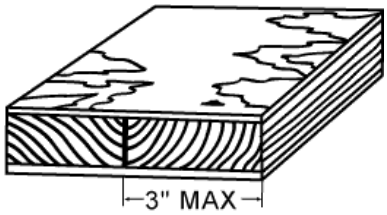
Wood Chemicals
Chemicals that are found naturally in the various parts of a tree.

Xylem
The part of a tree that transports water and nutrients up from the roots to the leaves. Older xylem cells become part of the heartwood. Also called sapwood.

GLOSSARY OF WOOD AND WOODWORKING TERMS

Battenboard

A variation of laminboard with the core formed of strips.



BATTEN BOARD

Baluster

One of a set of posts supporting a stair handrail.

Balustrade

The protective barrier alongside a staircase or landing.

Banister

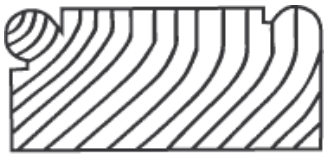
See Balustrade.

Batten

A narrow strip of wood.

Beaded wood

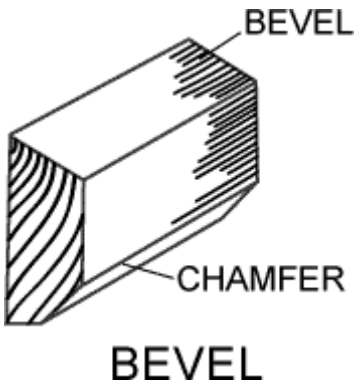
A simple round moulding. Also see **Moulded wood**.



BEAD

Bevel

An angle but not a right angle. A sloping or canted surface.



Bole

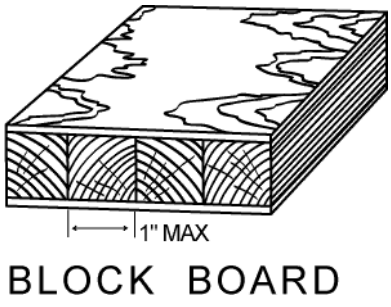
The tree trunk is sometimes also called the bole. After felling, the branches are removed, leaving the trunk - at this stage it's known as a log.

Broad-leaved trees

Broad-leaved trees produce hardwood timber. Their seeds are in an enclosed case or ovary, such as an acorn or walnut. In temperate climates they're usually deciduous - they lose their leaves in winter.

Blockboard

A variation of laminboard with a core formed of square wood strips glued together.



Casing

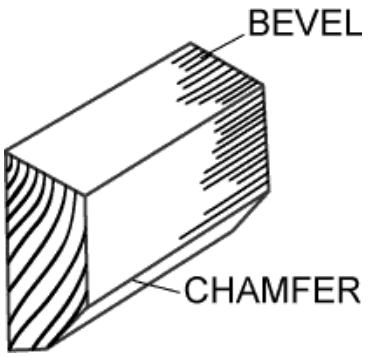
The timber lining of a door opening.

Cellular wood panel

Similar to blockboard and battenboard panels but the battens and laths form the core and are spaced either parallel or in lattice form. Panels are relatively light but have some strength.

Chamfered

The edges have been removed lengthwise at an angle.



Composites

"Structural timber composites" is the collective name for engineered wood-based materials or components. Those currently available include:

- glued laminated timber or glulam
- laminated veneer lumber (LVL)
- parallel strand lumber (PSL)
- laminated strand lumber (LSL)

Conversion

The process of cutting logs by sawing them into usable sections of timber, such as beams and planks.

Counterbore

To cut a hole that allows the head of a bolt or screw to sit flush with or lie below the level of a surface.

Countersink

To cut a tapered recess that allows the head of a screw to lie flush with a surface.

Cup

To bend as a result of shrinkage, specifically across the width of a piece of wood.

Dado

The lower part of an interior wall, usually defined with a moulded rail.

Densification

A chemical or physical treatment - layers are bonded together with treatment in excess of that needed to ensure a good bond - to increase hardness and improve mechanical strength or resistance to chemical or electrical agencies.

Density

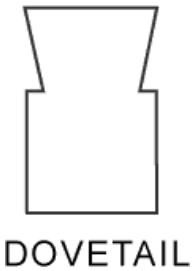
The mass per unit volume of a substance, usually expressed in kilograms per cubic metre.

Distortion

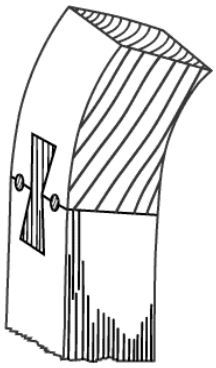
The change in the shape of a piece of timber or timber-based material brought about by shrinkage as the timber dries. It includes bowing, twisting and cupping.

Dovetail

A type of joint. One piece has a splayed shape - like a dove's tail - and fits into the socket or eye of the second piece.



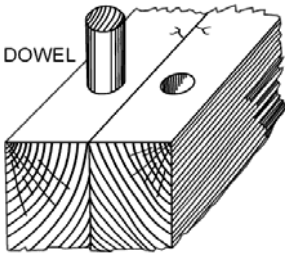
DOVETAIL



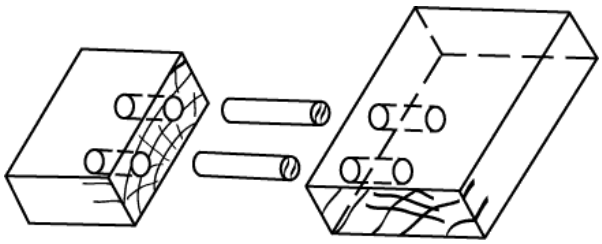
DOUBLE DOVETAIL

Doweling

Cylindrical piece or length of wood. Also known as rounded wood.



DOWEL JOINT



Drip groove

A groove cut or moulded in the underside of a door or window sill to prevent rainwater running back to the wall.

Dry board

See **Wet processing**.

Earlywood

The less dense wood formed during the early stage of a growth season.

Eaves

The edges of a roof that project beyond the walls.

Edge and end spacing

Spacings between fasteners and the edges and ends of the components that are being joined.

End grain

The exposed face of timber produced when it's cut through a plane that's perpendicular to the grain.

End-jointed

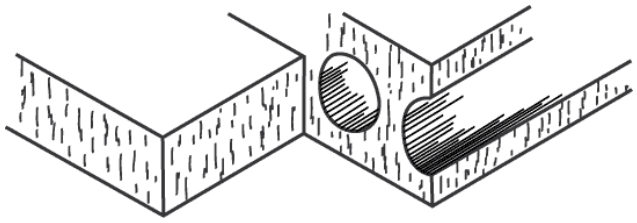
See **Finger-jointed**.

Engineered wood

Layers of hardwood compressed together.

Extruded particle board

Particle board made using extrusion. This may have holes running internally from end to end.



Face edge

In woodworking, the surface planed square to the face side.

Face side

In woodworking, the flat planed surface from which other dimensions and angles are measured.

Fascia board

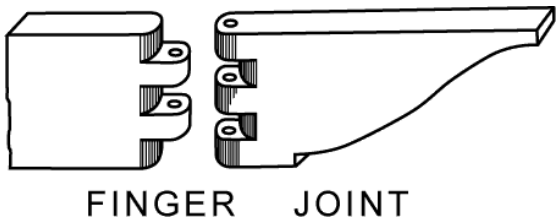
A strip of wood that covers the ends of rafters and to which external guttering is fixed.

Fibreboard

Wood chips bonded together by their own adhesive properties - lignin. Known as hardboard, mediumboard and softboard.

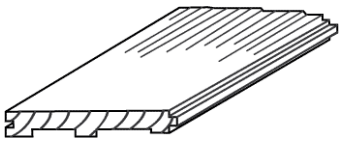
Finger-jointed

Also called end-jointed. Shorter pieces of wood are joined to create a longer piece of wood. The joint looks like interlaced fingers.

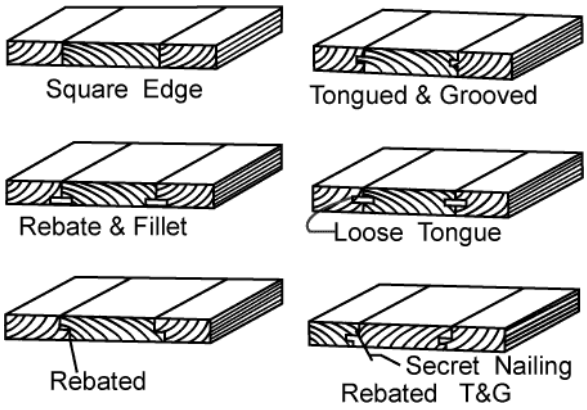


Floor board

Material for forming the surface of floors.



HOLLOW BACKED
T&G.FLOORING



Foliage

Leaves.

Furring battens

Parallel strips of wood fixed to a wall or ceiling to provide a framework for attaching panels.

Glulam

Glulam or glued laminated timber is one of a range of structural timber composites. Glulam is made by gluing together strength graded laminates to produce large section structural components that can be straight or curved. Beams are manufactured in stock or bespoke sizes.

Going

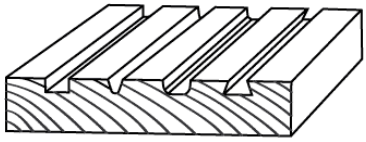
The horizontal measurement between the top and bottom risers of a stair or the depth of one stair tread.

Grain

The general direction of wood fibres or the pattern produced on the surface of timber by cutting through the fibres. Also see **End grain** and **Short grain**.

Groove

A long narrow channel. Also see **Tongued and grooved**.



GROOVES

Hardboard

See **Fibreboard**.

Hardwood

Timber produced from broad-leaved trees.

Head

The top horizontal member of a wooden frame.

Head plate

The top horizontal member of a stud partition.

Heartwood

The inner area of a tree trunk or log that - when the tree was growing - had stopped containing living cells and reserve materials, such as starch. The heartwood may be darker in colour than the outer sapwood though not all species show a clear difference between the two. The heartwood is often more durable than sapwood.

Horns

Extended door or window stiles designed to protect the corners from damage while in storage.

Impregnation or injection

The injection and impregnation of wood are treatments to preserve the wood and give it durability, to make it fire resistant and protect against shrinkage. The treatment ensures the long-term preservation of poles of coniferous wood. The treatment involves soaking the timber for a long period in open vats of hot liquid in which the poles are left until the liquid cools down. Alternatively, they can be treated in an autoclave through a vacuum or under pressure or the wood can be deeply impregnated - usually with thermosetting plastics or molten metal.

Impregnation with thermosetting plastics - for example amino-resins or phenolic resins - is often applied to very thin veneers that are built up into laminated wood but **not** to solid wood.

Interlocking joint

Interlocking is a way of jointing timber. Each piece is cut to fit against or into another to prevent displacement and to transfer forces. The joint must either be in compression or pinned or keyed after assembly.

Jamb

The vertical side member of a door or window frame.

Kerf

The groove cut by a saw.

Knot

The remains of a branch in timber. A branch sawn off close to the trunk or shed naturally forms a sound or live knot. A broken branch stub that becomes surrounded by new growth produces a loose or dead knot in the timber.

Laminated veneer lumber (LVL)

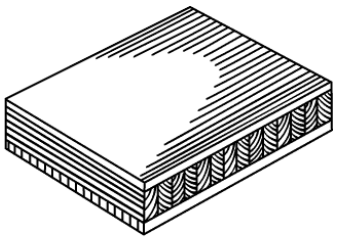
LVL is a layered composite of wood veneers and adhesive and can be considered as a veneer based product. It's made up of parallel laminations of veneer, glued and processed together to form a material that's similar to sawn timber. Debarked spruce logs are soaked in hot water. Blocks are cut into a thick veneer and then cut into sheets and lengths. Veneers are dried to a moisture content below 5 per cent. The veneers are ultrasonically graded, with the higher grade placed on the outer faces of the plank. A scarf saw makes long chamfers in both ends of the veneers. Thermosetting phenolic resin glue is spread on the upper side of each sheet - except on the upper faces - and laid up so the grain direction is all the same. The veneers are pressed to spread the glue evenly before entering a hot-press. LVL is very similar to parallel strand lumber.

Laminated wood

Several thin layers of wood and adhesives that are built up to make a single board.

Laminboard

Thick compound board with a core that's usually made up of small strips, glued together at right angles and with a surface of other woods.



LAMINBOARD

Ligneous

Of wood or resembling wood, woody. Examples of ligneous materials other than wood are bagasse, bamboo, cereal straw, and flax or hemp shives.

Lignin

The natural adhesive and bonding properties found in the cellular structure of wood and used for bonding together fibreboard and similar products.

Marquetry

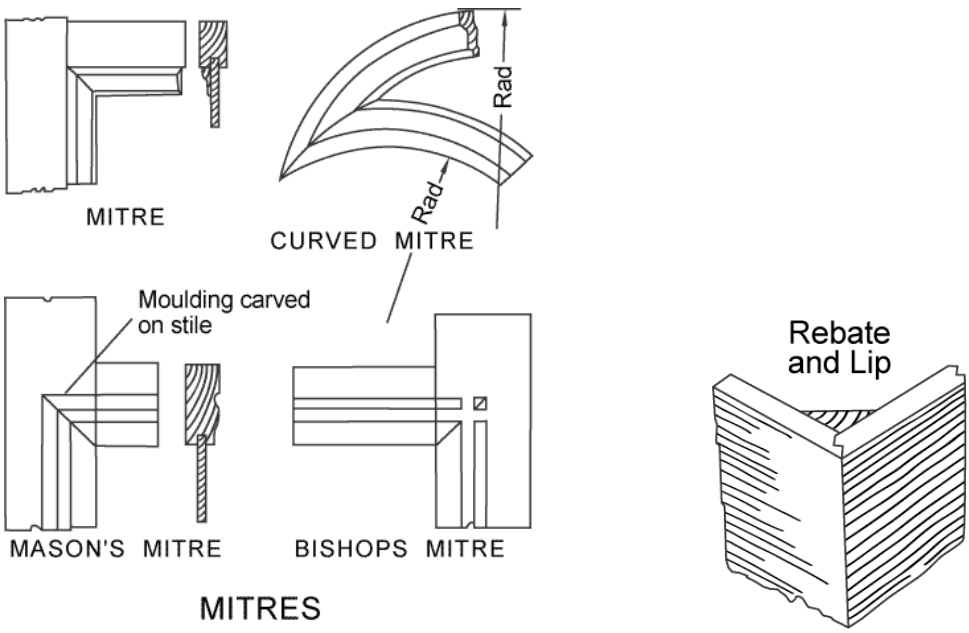
A pattern of inlaid veneers that usually consists of thin pieces of wood or other material - such as base metal, shell or ivory - glued to a wooden backboard for decoration.

Microporous

Used to describe a type of finish that allows timber to dry out while protecting it from rainwater.

Mitre

Two pieces forming an angle, or a joint formed between two pieces of wood by cutting bevels of equal angles at the ends of each piece.

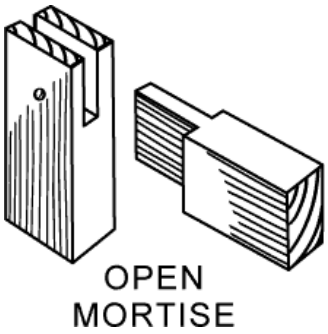


Mediumboard

See Fibreboard.

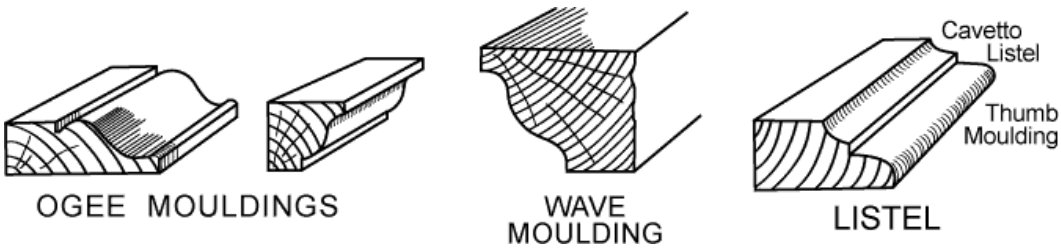
Mortise

A recess or hole, formed in one piece to receive a projection or tenon on the end of another piece.



Moulded wood

Strips of wood - known as mouldings or beadings - shaped with contours for decoration or ornament.



Movement

The swelling and shrinkage of wood as a result of changing moisture content. Movement in length is always negligible. Movement parallel with the growth rings is greater than at right angles to them. The degree of movement varies between species.

Mullion

A vertical dividing member of a window frame.

Muntin

A central vertical member of a panel door.

Newel

The post at the top or bottom of a staircase that supports the handrail.

Nogging

A short horizontal wooden member between studs.

Nosing

The front edge of a stair tread.

Oriented strand board (OSB)

To make OSB, logs are fed into a lathe-like machine where the bark is removed and the machine chews up the logs completely to produce flakes of wood. These flakes are sifted to eliminate the very tiny particles, then mixed thoroughly with a dust of waxes and heat-triggered resin glues. Layers of the fibres are placed in alternating directions - alternately at right angles - until the desired thickness is achieved. This is placed in a thermal press that activates and compresses the loose materials at the same time, causing the wax covered resin to activate and bond. The panels are trimmed and grade stamped.

Parallel strand lumber

This is a structural wood product made from softwood veneer that has been sized into long and narrow strips that are then glued into parallel laminations. It's very similar to laminated veneer lumber.

Particle board

Woodchips, sawdust, wood residues and so on that are bound or glued together to form a flat board.

Peeling

See **Rotary cut**.

Permeability

The ease with which liquids - such as preservatives or flame retardants - can be impregnated into timber. Permeability varies with species, although the sapwood of all species is more permeable than the heartwood. Permeability ratings relate to the heartwood of the species.

Planed

Smooth surfaced.

Planking

Planking is available in various widths and is available with tongue and groove in lengths or as plain

square edged planks that simply butt up against one another.

Plywood

To create plywood, the bark is removed from a log and the bare log is placed on a lathe-type machine that peels off thin layers of wood, usually after the wood has been steamed or soaked in hot water. The sheets of wood are sorted according to the number of knot holes, grain imperfections and so on. The best sheets become the outside - face sheet or veneer sheet - of the plywood. These layers are laid down edge to edge with their grain running perpendicular to the panel's grain, then spliced, taped, stitched or glued together. The rough-edged panel then goes to the trimming area where it's cut to the appropriate size and grade stamped.

Pointside

The piece of timber in a joint that receives the point of a nail or screw. The other section is known as the headside.

Preservative treatment

The treatment of timber with chemicals to improve its resistance to attack by biological organisms, such as fungi, insects and marine borers. The chemicals can be brushed or sprayed onto the surface of the timber but treatment is more effective if the chemicals are impregnated into the timber under vacuum and/or pressure in special treatment vessels.

Purlin

A horizontal beam that provides intermediate support for rafters or sheet roofing.

Rafter

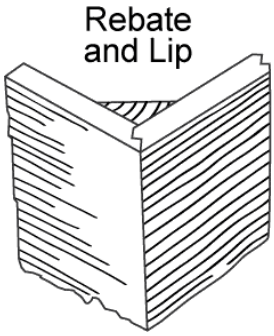
One of a set of parallel sloping beams that form the main structural element of a roof.

Ray

A narrow ribbon of cells that conducts and stores food in a tree. Rays run across the grain of timber.

Rebated

The edge has been cut to form a step, usually as part of a joint.



Reveal

The vertical side of an opening in a wall.

Riser

The vertical part of a step.

Rotary cut

The log is mounted in a large lathe and turned against the blade which peels the veneers in long sheets. Also called peeling or slicing.

Rounded wood

See **Dowelling**.

Sanded

Smooth surfaced - smoother than a planed surface.

Sandwich construction

A warm roof construction where the insulation is located above the roof deck but below the weatherproof membrane. May also refer to composite panel products - known as sandwich panels - where panels are built up from layers of different materials.

Sap

Liquid - mostly water - contained within cells in a tree or timber. Sap is the means by which dissolved food and salts are moved around the tree.

Sapwood

The outer area of a tree trunk or log, which in the growing tree contains living cells and reserve materials such as starch. Sapwood is generally lighter in colour than the inner heartwood, although not all species show a clear difference between the two. The sapwood is more vulnerable to attack

by biological organisms but is also usually more permeable than the heartwood - this makes it easier to treat with preservatives.

Sash

A type of window or the opening part of a window.

Shake

Wood that's split to reveal its natural texture.

Shingle

Wood sawn lengthwise that's thicker at one end - the butt - and thinner at the other end - the tip.

Short grain

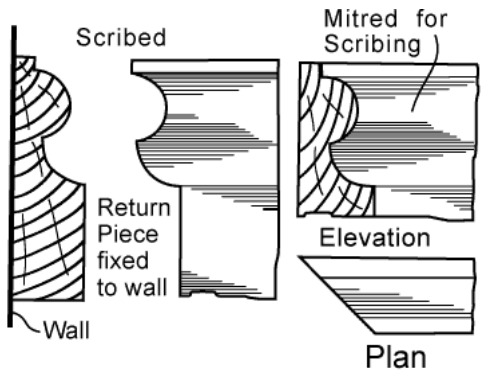
When the general direction of wood fibres lies across a narrow section of timber.

Sill

The lowest horizontal member of a stud partition or the lowest horizontal member of a door or window frame.

Skirting or skirting board

A moulded base board or plinth to an inside wall. Also called a washboard.



SCRIBED SKIRTING BOARD

Slicing

See **Rotary cut**.

Soffit

The underside of a part of a building such as the eaves or archway.

Softboard

See **Fibreboard**.

Softwood

This is usually obtained from pine, fir, spruce or larch. Most structural timber used in the UK is softwood.

Spandrel

The triangular infill below the outer string of a staircase.

Species

The botanical classification of trees and timber. The Latin species name defines a timber more accurately than its common name as these are sometimes used for more than one species of timber. They may also vary between countries.

Staff bead

The innermost strip of timber holding a sliding sash in a window frame.

Stave

A planed plank - bent to some degree - pared or chamfered at one end at least, with a groove called a "croze" to assist with putting together casks and barrels.

Stile

A vertical side member of a door or window sash.

Stopper

A wood filler which matches the colour of the timber.

Strength grade

The strength of timber varies with the species and is also affected by characteristics like knots, slope of grain and splits. Each piece of timber used structurally has to be strength graded, either by visual inspection or by machine. The timber is marked with its grade and other information such as its species, whether the timber was graded wet or dry, the company responsible for the grading and the certification body responsible for overseeing the grading operation.

String

A board that runs from one floor level to another, into which staircase treads and risers are jointed. The one on the open side of a staircase is the outer string, the one against the wall is the wall string.

Structural timber composites

See **Composites**.

Stud partition

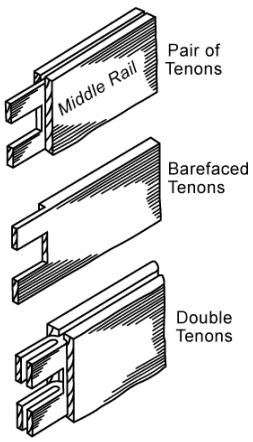
An interior timber-framed dividing wall.

Stud

A vertical member of a timber-framed wall.

Tenon

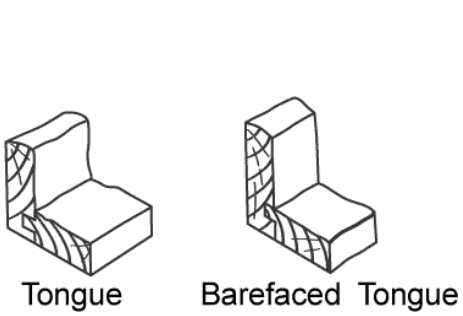
The end of a piece of wood that's been reduced in section to fit in a recess or cavity of the same size or a projecting tongue on the end of a piece of wood which fits into a corresponding mortise.

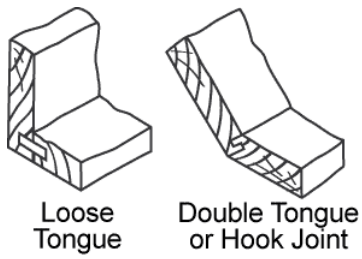


TENONS

Tongue

A reduction of the thickness of the edge of a board. Also see **Tongued and grooved**.





TONGUES

Tongued and grooved

Boards with one edge that's grooved and the other that's flanged with a tongue or extended edge. When assembled side by side the tongue fits into the groove.

Touch-sanding

Used on the outer ply merely to deal with irregularities due to patching, plugging or filling.

Transom

A horizontal dividing member of a window frame.

Tread

The horizontal part of a step.

Trunk

The trunk of a tree, sometimes also called the bole. After felling, the branches are removed, leaving the trunk - at this stage known as a log.

V- jointed

Usually tongued and grooved wood with a V-shaped channel in the center of the board.

Veneer

A thin or fine sheet of wood produced by rotary-cutting, peeling or slicing.

Waferboard

Thin wafers of wood that look like small pieces of veneer that are bonded together under heat and pressure with glue, resulting in a solid uniform panel that gives strength and water resistance.

Wall plate

A horizontal timber member placed along the top of a wall to support joists and to spread their load.

Wane

The original rounded surface of a log - with or without bark - on any face or edge of sawn timber.

Waney edge

A natural wavy edge on a plank. It might still be covered by tree bark.

Warp

To bend or twist as a result of damp or heat.

Wet processing

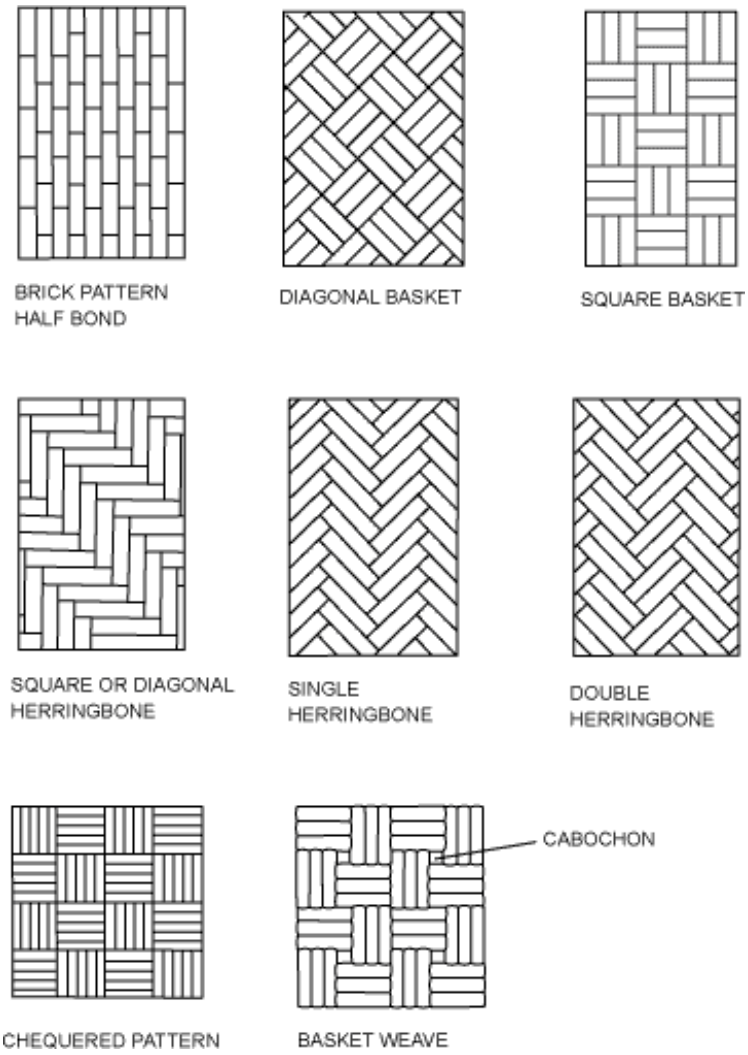
Hardboard is produced by reducing wood to fibres, which gives the name fibreboard. With wet processing, the fibres are suspended in water, then laid out on a mat to dry. This releases the natural resins which bond the fibres together, instead of an artificial bonding agent - although some wet processed boards have additional bonding agents added to give them certain properties. It's generally possible to tell the difference between dry and wet processed hardboard as dry board is typically smooth on both sides. Wet board has one smooth side and one "mesh" side. The mesh finish is a result of water draining out of the mesh side after pressing. One exception is hardboard for furniture which has usually been sanded. This doesn't have a mesh finished side but there's still a noticeable difference as one side is polished and the other side has a matt finish.

Wood-based board

Wood-based board materials are manufactured from layers, particles or fibres of wood that's glued or compressed together to produce a flat board. The most common examples include plywood, chipboard and various types of fibre building board, including hardboard and MDF.

Wood block

Wood block is flooring made up from small strips or blocks of wood, around three inches wide and nine inches long, arranged in herringbone, basket-weave and other geometric patterns.



Wood planks

Planks in long lengths with widths of four inches or more.

Wood strip

Boards that are narrower and shorter than planks and have up to three strips of wood per board.

VOCABULARY TESTS

WHERE TREES COME FROM

1. Fill in the blanks.

Trees grow from 1. ..... . A young plant that has just germinated from its seed is called a seedling. Next, a 2. ..... grows for some time, is bigger and stronger and becomes a sapling. Such a young tree, after many years depending on species, is mature enough and ready to be 3. ..... .The described above method of tree reproduction from seeds is very common in forestry. Such a way of plant propagation is called 4. ..... because it requires gamete formation and fertilisation. In contrast, asexual reproduction known also as 5. ..... does not require gamete formation because a young plant is a part of the 6. ..... plant, e.g. shoot cuttings.

PARTS OF A TREE

1. Fill in the blanks with the words from the box.

A. ĸoot hairs
B. nutrients
C. mycorrhiza
D. symbiotic
E. buds
F. root system
G. species
H. branches
I. taproot
J. trunk

Each tree consists of a 1. ....., a trunk and a crown. A root system may have different size and shape depending on tree 2. ....., soil and climate conditions. There are several types of roots forming a root system. A 3. ..... is the main root of a tree. It grows downwards. Lateral roots are the ones that grow from the taproot. 4. ..... are the smallest parts of a root system. Some species, e.g. pine does not usually have root hairs but their roots form a 5. ..... relationship with fungi instead. Such symbiosis is known as 6. ..... . A 7. ..... is the heaviest and the most valuable part of a tree. It is covered by bark. A trunk transports water and 8. ..... upwards (from roots to leaves) and photosynthesis products

downwards. A crown consists of 9. ....., twigs and leaves that take part in photosynthesis. Other parts of a crown include: flowers, fruit and 10. ..... .

FACTORS AFFECTING A TREE'S APPEARANCE

1. Fill in the blanks.

1. Factors which influence a tree's appearance include: ..... of a tree, species, and the ..... where a tree grows.
2. Sapling bark is ....., more delicate, or sometimes it is even not of the same colour, e.g. ..... .
3. Spruce has thinner branches than ..... .
4. The place where a tree grows means also its ....., e.g. soil type and nutrients, precipitation and the like.

CONIFEROUS TREES

I. Match the two parts of a sentence.

A.Cones consist of
B.In Poland coniferous trees are represented by
C.Pine leaves grow in groups
D.Spruce is often attacked by
E.Fir is a
F .Larch sheds its leaves
G.Douglas fir is a tree

1. in autumn.
2. native to North America.
3. scales and seeds.
4. pine, spruce, fir, larch and Douglas fir.
5. called fascicles.
6. shade-tolerant tree species.
7. the European spruce bark beetles.

DECIDUOUS TREES

I. Fill in the blanks.

Deciduous trees are not as numerous in Europe as 1. ..... ones. Deciduous trees do not have 2. ..... in winter. They come into leaf in pring. In utumn leaves turn yellow, red or 3. ..... and trees shed their leaves. Deciduous trees do not produce 4. ..... but different types of fruit. The most common deciduous species in our country include: 5. ....., birch, alder, beech and poplar.

BASIC FOREST TREE CHARACTERISTICS

I. Fill in the blanks.

1. Basic species characteristics include: longevity, growth rate, shade tolerance, ... and water requirements, and ..... hardness.
2. Some species are ..... , e.g. willow and poplar, others are long-living, e.g. oak or fir which can live as long as 700 years.
3. Fast-growing species include: poplar, larch, pine, ... and spruce.
4. Pine, birch or larch need more light to grow than fir or beech which are ..... .
5. Pine grows well on most soils, fir and beech prefer fertile ones, and spruce does not tolerate lack of water because of its shallow ..... system.

TREE TYPES

I. True or false?

1. Saplings are younger than small poles.
2. Poles can be divided into high poles and mature trees.
3. Codominant trees are the tallest in a stand.
4. Trees that cannot develop properly because they get not enough sunlight are called suppressed.

1. A snag is a dominant tree in a stand.

FOREST STANDS

I. Fill in the blanks with 1–3 words.

A. A forest stand is a part of a forest. It consists of a relatively uniform group of trees that grow 1. ..... together and cover a particular area. There are several ways a stand can be described.

B. The basic characteristics include: 2. ....., species composition, stratification, stand density and stand origin. Stand age can be described in many ways.

C. The most common is based on 3. ..... .

D. Twenty years is a usual period of time limiting one class so typical age classes include trees 4. ..... old, 21–40, 41–60 and so on.

E. If trees in a stand belong to one age class such a stand is called even-aged. When they belong to 5. ..... – uneven-aged.

F. Species composition tells us if the stand is single-species or mixed. In mixed stands there are dominant tree species and admixture, which in Polish forests usually constitute 6. ..... .

G. Stratification refers to the numbers of tree layers from the forest floor to tree tops. Stands can be divided into single-storey and multi-storey.

H. Stand density depends on a number of trees per hectare, their sizes (height and diameter) as well as canopy closure which tells us 7. ..... the crowns of

I. neighbouring trees are. Stand origin tells us if the stand regenerated naturally or artificially (was planted or sown).

FOREST FLORA

Revise the words:

fern, lichen, fungi, alder buckhorn, lily of the valley

I. Choose the correct answer a, b or c.

1. The amount of light reaching the forest floor

a. is always the same all year round

b. is bigger in spring

c. depends on species forming a tree canopy

2. Ferns grow best

a. on sandy soils

b. in the shade

c. in the sun

3. Lichens

a. may cover tree bark

b. grow in polluted areas

c. consist of mosses and fungi

4. Fungi

a. don't form symbiotic relationships

b. are forest pests

c. can be both harmful and beneficial

5. Alder buckhorn is a

a. shrub

b. plant disease

c. type of fungi

6. Lily of the valley produces

a. tasty fruit

b. cones

c. sweet-smelling flowers

FOREST ANIMAL KINGDOM

I. Fill in the blanks.

1. Spiders are ..... because they build ..... to catch insects.

2. Ticks prefer ....., ... areas.

3. ..... are beneficial insects.

4. ..... and the European spruce ..... beetle are forests pests.

5. Snails and slugs are ..... and clean the forest floor.

II. True or false?

1. Toads and frogs are amphibians.

2. Reptiles live close to water because their skin can dry out easily.

3. Lizards are reptiles.

4. Reptiles help in seed dispersal.

5. Beavers can fly.

6. The deer is a big mammal.

HUNTING

I. Choose the correct answer: a, b or c. What is the Ukrainian for ‘poaching’, ‘game’ and ‘the open season’?

1. Poaching means:
    a. taking care of forest animals
    b. killing forest animals illegally
    c. the same as hunting
2. Animals that are hunted are called:
    a. poachers
    b. game
    c. the injured
3. Animals can be hunted:
    a. during the open season
    b. during the closed season
    c. all year round
4. Animals are hunted when they are weak, ... or injured.
    a. old
    b. young
    c. ill
5. Some animals are hunted for their ..... or fur.
    a. meat
    b. mates
    c. meatloaf

A FOOD CHAIN

I . Fill in the blanks with 1–2 words.

1. A food chain consists of ....., ... and ..... .

2. Plants use carbon dioxide and ..... to produce ..... and oxygen.

3. Primary consumers eat ..... and are called herbivores.

4. Secondary consumers are carnivores because they eat ..... .

5. Nutrients are released in the decomposition process and returned to the ecosystem for plants to ..... again.

II. What is the Ukrainian for ‘food chain’, ‘carbon dioxide’, ‘oxygen’, ‘herbivore’, ‘carnivore’ and ‘nutrients’?

WHAT DESTROYS FORESTS

I Fill in the blanks.

1. Air pollution: damages ....., changes ..... quality, lowers its ..... .

2. Forest fires are caused by: burning ....., irresponsible ..... behaviour or ..... .

3. Improper use of forest includes: ....., wood theft, artificial regeneration preferring ..... and even-aged plantation, harmful harvesting practice, e.g. clearcutting.

4. Invasive alien species: often have no ..... enemies, reduce the number of or may even replace ..... species.

5. Forests around cities are treated as ..... dumps. What is more, people visiting forests often destroy plants or drive vehicles which make ..... and frighten animals.

II. Fill in the blanks.

Weather conditions such as 1. ....., snow, hail, drought, flood, strong 2. ....., frost, changing temperatures or lightning can damage the whole tree or its parts such as 3. ....., leaves, twigs, branches, trunks, 4. ..... or even roots. Strong wind or avalanche can uproot the whole tree or 5. ..... it.

Most dangerous for forest organisms are bacteria and 6. ..... because they cause

numerous tree diseases, and insects which are the most common forest 7. .....

.Apart from these, trees are also damaged by bigger animals such as: 8. ..... which destroy bark or young plants, 9. ..... that fell trees and flood the area, or wild boars that dig along streams and contribute to soil 10. ..... .

THE FOREST BIOLOGICAL CLOCK

I. True or false?

1. Phenology is the study of periodical, biological changes.
2. There are nine phenological seasons in Poland.
3. Hazel blooms in the same season as snowdrop.
4. Beech blooms in very early spring.
5. Dogwood blooms in early summer.
6. Linden blooms earlier than black elder.
7. Plants are dormant in early autumn.
8. Beechnuts ripen in autumn.

TREE DISEASES

I. Fill in the blanks.

Tree pathogens include viruses, bacteria and 1. ..... However, they do not have the same impact on tree health. For instance, viral and bacterial diseases are not very numerous. The most dangerous are fungi because they cause the majority of tree 2. ..... . Diseases weaken plants and, as a result, trees grow slower or even die. What is more, commercial wood value is lowered.

Viruses, bacteria and fungi can damage all parts of a tree: leaves, shoots, bark or roots. Pathogens can attack 3. ..... and older trees, living or dead plant tissues and damage stored 4. ..... .

Pathogens can cause, for example, spots on leaves, their 5. ....., necrosis, wilting, shoot dieback, 6. ..... rot or deformation of different parts of a tree. Fungi are also to blame for vascular diseases. For example, Ophiostoma ulmi, which causes Dutch 7. ..... disease, blocks vascular tissues. As a result, plants do not get enough water so they wilt and die.

Trees can be also weakened by parasitic 8. ..... plants, e.g. European dodder (Cuscuta europaea) and mistletoe (Viscum album).

TREE PESTS

I. Choose the correct answer a, b or c.

1. Tree insect pests are:
    a. not numerous
    b. the main pests attacking trees
    c. less numerous than other pests
2. Oligophages:
    a. eat everything
    b. attack the same species as monophages
    c. feed on fewer species than polyphages
3. Primary pests attack:
    a. healthy trees
    b. weakened or dead trees
    c. healthy, weakened and ill
4. Defoliators eat:
    a. inner bark
    b. leaves
    c. wood
5. The most dangerous for forest trees are:

a. pupae and adults

b. pupae and larvae

c. larvae and adults

HOW TO CONTROL FOREST PESTS AND DISEASES

I. Fill in the blanks with 1–2 words.

Forests are constantly being weakened by anthropogenic and abiotic factors. Anthropogenic damage is caused by people whereas 1. ..... refers to unfavourable weather conditions. As a result, trees are not as strong as they should be to resist diseases and pest attack.

2. ..... today is aimed at creating the best conditions for trees to grow and 3. ..... for pests and diseases to develop. It means, for example, preferring uneven-aged stands, conserving biological diversity, removing ill trees, choosing tree species that grow the best in the local climate and soil conditions, protecting 4. ..... of forest pests (biological control).

5. ..... (pesticide application) is used in forests when other methods of fighting pests and diseases fail. Pesticides are substances that are used against 6. ..... organisms for plants such as fungi, insects, weeds.

Pesticides are not used in forests as often as in gardening because they reduce 7. ..... population. They fight not only pests and diseases but other organisms, e.g. beneficial ones or natural enemies that help to reduce

8. ..... population. What is more, pesticides may 9. .....
animals, edible mushrooms, fruit and herbs that are picked in forests. That is why
their use in forests is limited.

Foresters know that using one method is not enough to control forest pests and diseases. They use as many different methods as possible because one method complements the other and together they are more effective. Such a way of controlling pests and diseases is called 10. ..... pest and disease management.

NATURAL AND ARTIFICIAL REGENERATION

I. Fill in the blanks with 1–3 words.

NATURAL REGENERATION

1. New trees start to grow from ....., ... and
..... .

2. Foresters control and plan ..... .

3. Pluses of this method: preserves .... to local
conditions, ..., results in ....., uneven-aged
and ..... stands.

ARTIFICIAL REGENERATION

1. New trees start to grow from ..... and
..... .

2. Foresters control and plan ...., arrangement
of plants, ... quality and quantity.

3. Pluses of this method: more plants ....., ...

REFORESTATION AND AFFORESTATION

I. Choose the correct answer a, b or c.

1. Forest establishment on former forest land is called:

a. afforestation

b. reforestation

c. deforestation

2. Forest establishment on non-forest land is called:

a. deforestation

b. reforestation

c. afforestation

3. A plough pan:

a. stimulates the growth of trees

b. can be observed in soils in agricultural use

c. does not influence the growth of trees

4. Afforestation may take place:

a. on wasteland, farmland, areas degraded by industry or wetland

b. only on areas degraded by industry

c. is not allowed on farmland

5. Soils are contaminated :

a. by pesticides, heavy metals and other chemicals

b. by soil salinity, organic matter and soil organisms

c. only in post-industrial areas

AFFORESTATION OF FARMLAND

I. True or false?

1. The European Union gives farmers money to plant trees.

2. Subsidies are given only for trees and their planting.

3. Trees grow well on farmland.

4. A plough pan is a soil characteristic that is not typical for forest soils.

5. Forest soils have a little lower pH than soils used for growing agricultural crops.

6. Mycorrhizal fungi cause fungal diseases.

II. What is the Ukrainian for: ‘subsidy’, ‘plough pan’, ‘mycorrhizal fungi’ and ‘fungal diseases’?

FAST-GROWING TREE PLANTATIONS

I. Fill in the blanks with 1–2 words.

1. Tree plantations have been known since ..... times.
2. They provided wicker used for making ..... and shields.
3. Plantation usually form single-species and even-aged stands typical for ..... .
4. Plantations consist of ..... tree species such as poplar, willow, birch, larch or, sometimes, ... and spruce.
5. Trees in plantations grow from ..... to even ..... years.
6. .....is usually obtained from coppicing, which is grown for 2–10 years.

DIRECT SEEDING VERSUS PLANTING

I. True or false?

1. Direct seeding is a very common method of forest regeneration in Poland.
2. Ploughing is very important in preparing soil for sowing seeds.
3. The amount of seeds needed to regenerate one hectare of forest is the same in all regeneration methods.
4. Direct seeding is used for oak and beech.
5. Planted seedlings do not suffer from transplant shock.
6. Planting seedlings is not as reliable as sowing seeds.

PLANTING SEEDLINGS

I. Fill in the blanks with 1 or 2 words.

1. Only such species are planted which are best adapted to ..... .
2. Seedlings produced in nurseries are either ..... or ..... .
3. As a planting material one-year-old seedlings can be used, e.g. pine, ..., ..., ...

4. Species like fir, spruce or ash need ..... to produce seedlings proper for planting.

5. Seedlings should be planted as soon as possible after they have been transported from a ..... .

6. Species that break their dormancy first, e.g. ....., ..., ..., should be planted the earliest.

SEEDLING PRODUCTION

I. Fill in the blanks with 1–2 words.

Seedling production may take place outdoors or indoors in plastic tunnel or 1. ..... . Growing plants under cover allows modification and control of light, 2. ..... and moisture and lengthening the 3. ..... . As a result, seedlings produced this way are larger and stronger than those produced 4. ..... .

Seeds are sown in spring or in autumn. The spring sowing should take place as 5. ..... as possible because then seedlings have more time to grow before winter. Seeds should be sown when soil is not frozen but still 6. .....after winter. In contrast to the spring sowing, the autumn one should take place as 7. ..... as possible to avoid germination because young, delicate plants are easily damaged by 8. ..... and may not survive winter.

When seeds are sown outdoors they are often covered with different types of material, e.g. 9. ....., in order to protect them from 10. ..... and unfavourable weather conditions. Covering seedbeds also reduces evaporation and cooling off of the soil. After 11. ..... the cover is removed. Taking care of young seedlings involves: protecting them from seed predators, pests, diseases, very strong wind, frost and sunshine, keeping soil moist and free of 12. ....., providing nutrients in the form of fertilisers.

SEEDLING LIFTING AND OUTPLANTING

I. Choose the correct answer a, b or c.

1. Seedlings are grown in nurseries:

a. outdoors

b. outdoors or indoors

c. indoors

2. During hardening off plants:

a. spend more and more time outdoors

b. are protected from lower temperatures, moisture, wind and direct sunshine

c. adapt to plastic tunnel conditions

3. Lifting takes place when:

a. soil is not frozen

b. soil is frozen and covered by snow

c. in summer

4. After lifting:

a. seedlings are kept on seedbeds for 1–2 weeks

b. seedlings are sown

c. seedling roots are kept moist

5. Inoculation with mycorrhizal fungi means:

a. application of fungi to seedling leaves

b. using fungicides

c. application of fungi to forest soil nurseries or to seedling roots before outplanting

FROM SEEDLINGS TO MATURE TREES

I. Choose the correct answer a, b or c.

1. Practices between a seedling stage and mature trees are called:

a. forest intermediate improvement

b. tending improvement

c. forest stand improvement

2. Foresters try to improve the quality of the stand as a whole by:

a. logging

b. creating the best conditions for tree growth

c. removing additional seedlings

3. Gradual reduction of stand density is caused by:

a. foresters

b. tree competition for light, nutrients and the like

c. both

4. Sanitation cutting means removing from the stand trees:

a. attacked by pests or diseases or dead ones

b. which are too tall

c. representing undesirable species

5. Tree maturity refers to:

a. tree age when a tree starts to die

b. ability to produce seeds and wood

c. ability to produce seeds, wood of proper quality or the beginning of natural gradual tree death

TIMBER HARVESTING SYSTEMS

I. F fill in the blanks with 1–2 words.

1. All harvesting systems consist of: ..... trees, removing ..... and tree tops, transferring logs to the roadside landing, ..., short-term storing and transporting them to sawmills or other processing ..... .

2. Basic harvesting systems include: clearcutting, shelterwood system and ..... system.

3. Clearcutting is the most ..... . It results in ..... stands.

4. Selection system promotes ..... and growth of ..... stands because it is based on felling single trees or their small groups over the whole forest area.

5. Shelterwood cutting is a method that can be placed between the mentioned above harvesting systems. ..... trees of desirable qualities are left on the site to produce ..... and the young trees grow under the ..... of older ones.

FOREST PRODUCTS

I. Fill in the blanks (1–10).

Forest products include: 1. ....., bark, coniferous 2. ....., resin, tree sap (usually birch or maple one), essential oils, edible plants and others that have ornamental or 3. ..... properties. They can also include venison.

Forest products can be divided into two categories: 4. ..... and non-timber ones (NTFPs).

The most important and profitable forest product is wood. It is a universal, eco-friendly material used in 5. ..... industry, production of furniture, 6. ..... instruments,

packaging or household goods. Small parts of wood are no longer seen as a waste material but have application as 7. ..... (when compressed) or to produce plywood, particleboard or fibreboard.

Wood can also be subjected to chemical treatment. The end products of chemical processing include paper, 8. ....., cellophane, rayon cloth to mention but a few. Other products such as resin and tannin are obtained from wood by

9. ..... while charcoal is produced by heating wood up to 10. .....in the absence of air. This method is called pyrolisis.

GRAMMAR REVISION.

1. Complete the sentences using the verbs in correct forms.

1. I (learn) English for seven years now.
2. But last year I (not / work) hard enough for English, that's why my marks (not / be) really that good then.
3. As I (pass / want) my English exam successfully next year, I (study) harder this term.
4. During my last summer holidays, my parents (send) me on a language course to London.
5. It (be) great and I (think) I (learn) a lot.
6. Before I (go) to London, I (not / enjoy) learning English.
7. But while I (do) the language course, I (meet) lots of young people from all over the world.
8. There I (notice) how important it (be) to speak foreign languages nowadays.
9. Now I (have) much more fun learning English than I (have) before the course.
10. At the moment I (revise) English grammar.
11. And I (begin / already) to read the texts in my English textbooks again.
12. I (think) I (do) one unit every week.
13. My exam (be) on 15 May, so there (not / be) any time to be lost.
14. If I (pass) my exams successfully, I (start) an apprenticeship in September.
15. And after my apprenticeship, maybe I (go) back to London to work there for a while.
16. As you (see / can), I (become) a real London fan already.

2. Complete the sentences using the verbs in correct forms.

1) We _____TV when it started to rain. (to watch)
2) I _____to visit you yesterday, but you _____not at home. (to want) (to be)
3) Look! It _____, so we can't _____to the beach. (to rain) (to go)
4) There are a lot of clouds! It _____soon. (to rain)
5) The sun _____in the East. (to rise)
6) Since 2003 they _____their son every year. (to visit)
7) While the doctor _____Mr Jones, his son _____outside this morning. (to examine) (to wait)
8) I _____for my girlfriend for two hours. (to wait)
9) After Larry _____the film on TV, he decided to buy the book. (to see)
10) Wait a minute, I _____this box for you. (to carry)

3. Change the sentencesusing them in tne given tenses.

1.Do you like the film? (past simple)

_____the film?

2.My father loves seafood. (past simple)

My father _____seafood.

3.He speaks four languages. (past simple)

He _____four languages.

4.My sister doesn't have a job. past simple)

My sister _____a job.

5.He reads a lot of books in his spare time. (simple)

He _____a lot of books in his spare time.

6.I saw a great film. (present perfect simple)

I _____a great film.

7.Elizabeth isn't at home. past simple)

Elizabeth _____at home.

8.He liked his job. (present simple)

He _____his job.

9.He liked the job. (future simple)

He _____the job.

10.Are they here? (future simple)

_____here?

4. Choose the correct variant .

1. Who_____food in your family when your Mom is away?

- cooks
- is cooking
- has been cooking
- cooked

2. Where is John? - He _____his car in the garage.

- repairs
- is repairing
- has repaired
- repaired

3. Anna is my best friend. I_____her for twenty-five years. (

- know
- have known
- knew
- had known

4. My son had a great time at the summer camp last year. They_____a lot of interesting things there.

- did
- were doing
- had done
- had been doing

5. She_____ the living room when she heard a strange noise in the kitchen.

- cleaned
- was cleaning
- has cleaned
- has been cleaning

6. Mr. Smith, could I leave at 5:30 today? I_____to the concert and don't want to be late.

- go
- am going
- will go
- will be going

7. You arrived 2 days ago. You are going to leave next Sunday. By the time you leave, you _____9 days here.

- spend
- will spend
- have spent
- will have spent

8. Where have you been? I _____for you since 3 o'clock!

- am waiting
- have been waiting
- was waiting
- had been waiting

9. I went to Belgium last month. I_____there before. It's a beautiful country.

- have never been
- had never been
- never was

- never were

5. Complete the sentences using the verbs in correct forms.

1. The British explorer James Cook was born in the village of Marton, Yorkshire, on 27 October, 1728. But his family soon (move) to another village, called Great Ayton, where Cook (spend) most of his childhood.
2. As a teenager James Cook (develop) a fascination for the sea and (travel) to Whitby where he (find) employment on a coal ship.
3. While he (serve) in the Royal Navy during the Seven Years' War (1756-1763), Cook (have) the command of a ship.
4. After the war (end), Cook (take) command of the vessel Grenville and (go) to Newfoundland to survey the coasts there.
5. While he (map) the coasts of Newfoundland, he (observe) a solar eclipse off the North American coast.
6. Cook (send) the details to the Royal Society, England's leading scientific organisation, and (win) their attention.
7. After Cook (publish) his observations of the solar eclipse, the Royal Society (ask) him to lead a scientific expedition to Tahiti and (put) him in command of of the HMS Endeavour.
8. From Tahiti Cook then (go on) to explore the South Pacific.
9. He also (reach) New Zealand, which only the Dutchman Abel Tasman (visit) before Cook.
10. After Cook (map) New Zealand's complete coastline, he (sail) to Australia's east coast.
11. Cook (name) the area New South Wales as it (remind) him of the south coast of Wales in Great Britain.
12. In 1772, one year after Cook (return) from his first voyage to the Pacific, the Royal Society (hire) him for another expedition to find the mythical Terra Australis.
13. On his journey, Cook (discover) several islands and almost (go) as far as the continent of Antarctica.
14. He (make) maps of the South Pacific and (prove) that Terra Australis (exist / not).
15. His third and last voyage for the Royal Society (take) him to the west coast of North America where he (try) to find a passage between the Atlantic and Pacific.
16. He (not / can / pass) the Bering Strait, however; the ice (force) him to return to Hawaii, which he (discover) earlier.
17. While he and his crew (rest) in Hawaii, some Hawaiians (steal) one of his boats.

18. When Cook and his men (try) to get the boat back from the natives, a violent fight (break out) in which the natives (stab) James Cook to death.

6.Choose the correct variant .

1. Jane drives _____ car to work on Saturdays.

(a) my (b) her (c) their

2. This painting is _____ than his last one.

(a) best (b) good (c) better

3. I understand _____ you want to learn English.

(a) but (b) because (c) that

4. Jane would like _____ to the cinema.

(a) going (b) go (c) to go

5. "I'm a doctor. And _____ do you do?"

(a) how (b) what (c) who

6. _____book is by Hemingway.

(a) Those (b) These (c) This

7. We're hungry! Are there _____ sandwiches left?

(a) a lot (b) any (c) some

8. I go to the mountains _____ in the summer.

(a) a lot of (b) many (c) very often

9. They're the books _____ the table.

(a) on (b) in (c) in front

10. They want to visit England _____ they like British culture.

(a) but (b) because (c) that

11. Can I have _____ fruit, please?

(a) a lot (b) any (c) some

7. Choose the correct variant .

1. I _____ TV when the telephone rang.

watched

was watching

are watching

have watched

2. I'm afraid I'm not hungry. I've _____ eaten lunch.

yet

still

already

ever

3. Would you like _____ chicken?

any

a

some

one

4. He has _____ friends in Chicago.

few

few of

a lot

much

5. She _____ lunch by the time we arrived.

had finished

finished

have finished

finishing

6. What shall we do tonight? How about _____ a film?

to see

see

seeing

going

7. If I _____ you, I would wait a while to begin investing.

was

am

were

would be

8. I think San Francisco is ____ exciting ____ New York.

as ... as

so ... than

as ... than

so ... as

9. If she _____ that he was coming, she would have prepared the guest room.

knew

has known

had known

knows

10. I'm hungry! Just a moment, I_____ make you a sandwich.

'm going to

'll

'm

should

11. : _____, we won't have much to talk about.

If he not comes

Unless he comes

If he didn't come

If he came

12. Oh, look at those clouds! It _____ rain.

's going to

won't

sure will

shall

13. Jack told her that he _____ come the next day.

is going to

will come

wants

was going to

14. If you want to be healthy, you _____ smoke.

needn't

couldn't

shouldn't

mustn't to

15. I missed the train, so I _____ take the next one.

musted

must
had to
had
16. Why are your hands so dirty? - Well, I _____ in the garden for the last two hours.
have worked
worked
am working
have been working
17. Yes, we have bought the tickets to the concert and we _____ next Friday. I'm so excited.
will go
won't go
shall be going
are going

8. 1-10 Complete the sentences using the verbs in correct forms. 11-15 Answer the questions.

1. When Carol (call) last night, I (watch) y favorite show on television.

2. I (work) for this company for more than thirty years, and I intend to stay here until I retire!

3. Sharon (love) to travel. She (go) abroad almost every summer. Next year, she plans to go to Peru.

4. Thomas is an author. He (write) mystery novels and travel memoirs. He (write) since he was twenty-eight. Altogether, he (write) seven novels, three collections of short stories and a book of poetry.

5. We were late because we had some car problems. By the time we (get) to the train station, Susan (wait) for us for more than two hours.

6. Sam (try) to change a light bulb when he (slip) and (fell).

7. Everyday I (wake) up at 6 o'clock, (eat) breakfast at 7 o'clock and (leave) for work at 8 o'clock. However, this morning I (get) up at 6:30, (skip) breakfast and (leave) for work late because I (forget)

to set my alarm.

8. Right now, Jim (read) the newspaper and Kathy (make) dinner. Last night at this time, they (do) the same thing. She (cook) and he (read) the newspaper. Tomorrow at this time, they (do, also) the same thing. She (prepare) dinner and he (read). They are very predictable people!

9. By this time next summer, you (complete) your studies and (find) a job. I, on the other hand, (accomplish, not) anything. I (study, still) and you (work) in some new high paying job.

10. The students (be, usually) taught by Mrs. Monty. However, this week they (be) taught by Mr. Tanzer.

* * * * * * * * * * *

11.
Jane talks on the phone.
Bob has been talking on the phone for an hour.
Mary is talking on the phone.

Who is not necessarily on the phone now? _____

12.
I'm going to make dinner for Frank.
I'm making dinner for Judy.
I'll make dinner for Mary.
I make dinner for Ted.
I will be making dinner for Tony.

Who are you offering to make dinner for? _____

13.
Jane left when Tim arrived.
Bob left when Tim had arrived.
Tim arrived when Mary was leaving.

John had left when Tim arrived.

After Tim arrived, Frank left.

Who did not run into Tim? _____

14.

Jane is talking in class.

Bob always talks in class.

Mary is always talking in class.

Whose action bothers you? _____

15.

Jane never left Jamestown.

Bob has never left Jamestown.

Who is still alive? _____

9. Complete the questions with suitable words and answer them.

1. How often do you go……..?
2. How often do you do……..?
3. How often do you watch……..?
4. How often do you eat……..?
5. How often do you meet……..?
6. What is your favorite……?
7. Who is your best……?
8. What is your least favorite……?
9. What was the best……?
10. What was the worst……?
11. What was the longest……?
12. Who is the prettiest……?

13. What do you usually……..?
14. What do you often……..?
15. What do you rarely……..?
16. What do you never……..?
17. What time do you……?
18. What time do you ……..?
19. When do you……..?
20. Why do you……..?
21. Who do you……..?
22. How do you……..?
23. How long do you……..?
24. When did you last go……..?
25. When did you last do……..?
26. When did you last see……..?
27. When did you last have……..?
28. When did you last meet……..?
29. When did you last ask……..?
30. When did you last feel……..?
31. Have you ever been……..?
32. Have you ever eaten……..?
33. Have you ever wanted……..?
34. Have you ever drunk……..?
35. Can you……..?
36. Can you……..?
37. Can you……..?
38. Do you have to……?
39. Do you have to……?
40. Do you have to……?
41. What will you do if…….?
42. What will you do if…….?
43. What will you do if…….?
44. What will you do if…….?
45. What would you do if…….?
46. What would you do if…….?
47. What would you do if…….?

48. What would you do if…….?
49. Is there ……..?
50. Is there ……..?
51. Is there ……..?
52. Are there……..?
53. Is there ……..?
54. Should people……?
55. Should students……?
56. Should children……?
57. ……..in…….?
58. ……..at…….?
59. ……..on…….?
60. ……..to…….?
61. ……..since…….?
62. ……..during……?
63. ……..for…….?
64. ……..from…to…….?
65. Will you…….?
66. Will you…….?
67. What are you going to…….?
68. What are you going to…….?
69. ……..this year?
70. ……..next year?
71. ……..last year?
72. ……..today?
73. ……..yesterday?
74. ……..tomorrow?
75. What……?
76. Who……?
77. When……?
78. Why……?
79. Where……?
80. What kind of……?
81. How……?

10. Complete the sentences using correct articles and the fwollowing words.

Bicycle, capital, cigarette, play, difficult language, kitchen, nice day, next train, roof, small hotel.

1. Rome is_____ of Italy.
2. When we were in London, we stayed at _____.
3. Can you ride _____?
4. What's that man doing on _____ of that house? Is he repairing something?
5. We went to the theatre last night but _____ wasn't very good.
6. Do you think English is _____ for people to learn?
7. "Would you like _____?" "No, thanks. I don't smoke".
8. "Where is jack?" "He's in _____. He's cooking something."
9. Excuse me, what time is_____ to London?
10. It's _____ today. Let's go out.

11. Fill in some or any.

1.There's ..... chocolate in the cupboard.

2.Do you have ..... brothers or sisters?

3.Did you make ..... mistakes?

4.Would you like ..... cake?

5.I am going to buy ..... fruit and vegetables.

6.I would like ..... white paper, please.

7.And do you have ..... envelopes?

8.I found ..... money this week.

9.Do you have ..... of his records?

10.Do you know ..... of her friends?

11.I don't have ..... sisters but I have one brother.

12.She hadn't ..... money, so I left her ..... .

13.We don't have ..... coffee today but we have tea.

14.I am going out to send ..... letters.

15.Can you make us ..... lunch while I finish this work?

16.Did you have ..... problems with the exam?

17.I don't know ..... good restaurants in our town.

18.Do you have ..... more questions or is that everything?

19.He can't help us. He hasn't ..... free time.

20.She doesn't like ..... of his friends. Not one.

21.The teacher gave us ..... homework.

22.He didn't pass ..... of the exams, even though ..... of them were easy.

12. Choose the correct variant.

1. There are____French students in The Language Projest at the moment.
2. We only have____ time between the first and second lesson - not enough to drink coffee.
3. We've got____homework to do tonight. We have to write five essays and read two chapters of the book.
4. I haven't got____money to go to the cinema tonight.
5. There's____crime in this part of Bristol but the City Centre is quite dangerous.
6. I live in a quiet part of the city so there____to do in the evening.
7. You need to take with you on the trip to London, to pay for lunch.
8. At five o'clock every evening, there are ____cars on Whiteladies road. It's the rush hour.
9. If you travel to work at six o'clock in the morning____traffic on the road and you can get there quickly.
10. We don't have____students in this class to make a football team.
11. How____pairs of shoes do you take when you go on a business trip.
12. Our teacher doesn't drink a lot of alcohol but he has____wine on Saturday nights - usually about half a glass.

1. A much B a lot of C too much D little
2. A a few B few C a little D not many
3. A not enough B too much C too many D many
4. A too much B too many C much D enough
5. A a few B not much C not enough D too much
6. A isn't much B isn't any C aren't enough D aren't any
7. A not much pounds B much money C a few pounds D little pounds
8. A too much B not much C little D too many
9. A there is not much B there are few C there are not enough D there are too few
10. A many B much C enough D too many
11. A much B many C few D enough
12. A too few B not enough C a few D a little

13. Finish the following sentences.

1. I have too many……..
2. I have too much……..
3. There are enough……
4. There are not enough……
5. A few years ago……
6. In a few days…….
7. I need a little……..
8. Only few people……..
9. I want to…….some…….
10. If you have little money…….
11. If you have little time……
12. I don't like any……
13. I……very much.
14. I don't know many…….

14. Choose the correct variant.

1.) _____ watch on my wrist says it is noon. (These, This)
2.) _____ cat across the street has a striped tail. (That, Those)
3.) Whose skates are _____ by the stairs? (this, those)
4.) I don't know why I'm wearing my hair _____way. (this, those)
5.) Did you eat _____ cookies on the table? (those, that)
6.) _____ tests on my desk don't have names on them. (these, this)
7.) Remember _____ movie we watched yesterday? (that, those)
8.) _____ trees are going to grow very tall. (These, This)
9.) _____ storm we had last night kept me awake. (Those, That)
10.) Did you buy _____ grapes at the market? (that, those)
11.) Ask _____ policeman for directions. (that, those)
12.) How many of _____ napkins here do you need? (these, this)

15. Fill in: somebody, anybody, nobody, something, anything, nothing, somewhere, anywhere or

nowhere.

1. I know _____ about this issue that you may find interesting, but if I tell you, you must promise to keep a secret.

2. _____ lives here. There is no water.

3. I spent the night _____ near the beach.

4. _____ could have jumped over this wall, and stole your rake. It's very low.

5. _____ scares him. He's very brave.

6. There is _____ to park here. Let's go _____ else to park.

7. Would you like _____ to wash your hands?.

8. May I have _____ for dessert, please?

9. They took him _____ in London, and he never returned.

10. Please don't leave _____ behind at home. We'll be away for a fortnight.

11. She needs _____ to love. She's very lonely.

12. They will not sing _____ in this city. They said that they would never come back.

13. There isn't _____ you can do to help them. _____ can help them.

14. We do not need _____ else to run this department. We can do it ourselves.

15. _____ is ringing the bell. Go and see who it is.

16. _____ phoned while we were out, but they did not leave a message.

17. _____ tells me that there is _____ fishy going on .

18. They are looking for _____ to settle down and have children. They want to find a quiet place to lead a quiet life.

19. "Where would you like to stay?"

"_____ will do provided it is a clean place."

20. "Is there _____ at home?"

"I don't think there is _____. Mum and dad must have gone out."

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