



ADDIS ABABA CITY ADMINISTRATION TECHNICAL VOCATIONAL TRAINING BUREAU
Addis Ababa City Administration Technical Vocational Training Bureau

WOOD WORK TECHNOLOGY

Level-III

Based on October, 2021, Curriculum Version 1



Module Title: Prepare Bill of Quantity

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Prepared by:- Addis Ababa Technical Vocational and Training Bureau

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Addis Ababa,

Ethiopia

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Introduction to the Module

In woodwork technology, a BOQ is used to estimate the amount of wood, hardware, and other materials needed to complete a project. It can also be used to calculate the labor costs and the total project cost.

The Prepare Bill of Quantity module in woodwork technology will teach you how to create a BOQ for a woodwork project. You will learn how to identify the scope of work, create a list of materials, quantify the materials, and determine the labor costs.

You will also learn how to use a spreadsheet software program to create a BOQ. The module will provide you with a sample BOQ for a simple woodwork project.

This module covers the units:

- nature/ scope of work
- list of specification
- Calculate resource requirements
- approximate quantities and cost Estimate

Learning Objective of the Module

- Identify nature/ scope of work
- Organize list of specification
- Calculate resource requirements
- Estimate approximate quantities and cost

Module Instruction

For effective use this modules trainee are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” giver at the end of each unit and Read the identified reference book forExamples and exercise

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Unit One: - Identify nature/ scope of work

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Communication devices and process
- Applying effective communication
- Identifying nature/scope of work in wood work technology
- Determining and confirming materials for design

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this unit, you will be able to:

- Communication devices and process
- Apply effective communication
- Identify nature/scope of work in wood work technology
- Determine and confirming materials for design

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1.1 Communication devices and process

Communication devices and processes play an important role in woodwork technology. They allow woodworkers to communicate with each other, share information, and collaborate on projects. Some of the most common communication devices used in woodwork technology include:

- **Two-way radios:** Two-way radios are a popular way for woodworkers to communicate with each other while working in a shop or on a job site. They are particularly useful in noisy environments where it can be difficult to hear regular conversation.
- **Cell phones:** Cell phones can also be used to communicate with other woodworkers, but they are not as well-suited for noisy environments. However, cell phones can be used to send text messages, which can be useful for communicating quickly and easily.
- **Email:** Email is a good way to communicate with other woodworkers who are not physically present in the same location. It can also be used to share files, such as drawings, plans, and photos.
- **Online forums and social media:** Online forums and social media platforms can be used to connect with woodworkers from all over the world. This can be a great way to get advice, learn new techniques, and share ideas.

In addition to these communication devices, woodworkers also use a variety of processes to communicate with each other. Some of the most common processes include:

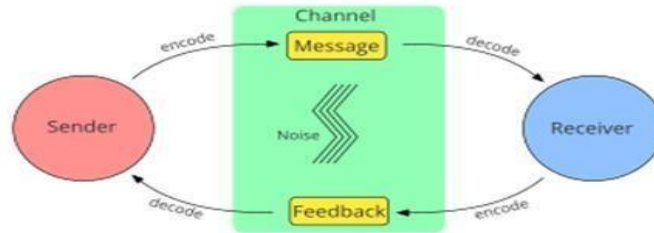
- **Drawings and plans:** Drawings and plans are used to communicate the design of a woodworking project to other woodworkers. They can be drawn by hand or created using computer-aided design (CAD) software.
- **Verbal communication:** Woodworkers often communicate with each other verbally, either in person or over the phone. This can be used to discuss the design of a project, troubleshoot problems, or simply share information.

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- **Non-verbal communication:** Woodworkers also use non-verbal communication to communicate with each other. This can include gestures, facial expressions, and body language. For example, a woodworker might point to a tool or piece of wood to indicate what they are talking about.



Communication is essential for woodworkers to be successful. By using a variety of communication devices and processes, woodworkers can share information, collaborate on projects, and learn from each other.

Here are some specific examples of how communication devices and processes are used in woodwork technology:

- A woodworker might use a two-way radio to communicate with a helper while working on a large project.
- A woodworker might use a cell phone to send a photo of a piece of wood to a friend for advice on how to finish it.
- A woodworker might post a question on an online forum about how to solve a problem they are having with their table saw.
- A woodworker might use email to share a drawing of a woodworking project with a client.
- A woodworking teacher might use a whiteboard or projector to demonstrate a new technique to their students.
- A woodworking student might take notes on a lecture or demonstration so that they can review the information later.

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1.2 Applying effective communication

Effective communication is essential in woodwork technology. It allows woodworkers to share information, collaborate on projects, and learn from each other. It also helps to ensure safety and productivity in the workplace.

Here are some tips for applying effective communication in woodwork technology:

- **Be clear and concise.** When communicating with other woodworkers, it is important to be clear and concise in your message. Avoid using jargon or technical terms that your audience may not understand.
- **Be specific.** When giving instructions or explaining a concept, be as specific as possible. This will help to avoid misunderstandings and ensure that everyone is on the same page.
- **Be an active listener.** When listening to other woodworkers, pay attention to what they are saying and ask clarifying questions if needed. This shows that you are interested in what they have to say and that you are committed to effective communication.
- **Use multiple communication channels.** Don't rely on just one communication channel, such as verbal communication or email. Use a variety of channels, such as drawings, plans, and demonstrations, to reach your audience and ensure that your message is understood.
- **Be respectful and professional.** Even if you disagree with someone, it is important to be respectful and professional in your communication. This helps to create a positive and productive work environment.

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1.3 Identifying nature/scope of work in wood work technology

Woodwork technology is a broad field that encompasses a wide range of tasks and skills. Woodworkers may specialize in a particular area, such as furniture making, cabinetmaking, or carpentry, or they may work on a variety of projects.

Here are some of the different types of work that woodworkers may do:

- **Design and planning:** Woodworkers often start by designing and planning their projects. This may involve creating drawings, selecting materials, and determining the best tools and techniques to use.
- **Woodworking:** Woodworkers use a variety of tools and techniques to shape and join wood. This may include sawing, drilling, planing, sanding, and routing.
- **Finishing:** Once the woodworking is complete, woodworkers will typically apply a finish to the wood to protect it and enhance its appearance. This may involve staining, painting, or varnishing.
- **Installation:** Once a woodworking project is complete, woodworkers may also be responsible for installing it in the customer's home or business. This may involve assembling the project, attaching it to the wall or floor, and making sure that it is level and plumb.

In addition to these general tasks, woodworkers may also perform specialized tasks, such as:

- **Furniture making:** Furniture makers specialize in designing and building furniture, such as chairs, tables, and cabinets.
- **Cabinetmaking:** Cabinetmakers specialize in designing and building cabinets, such as kitchen cabinets and bathroom vanities.
- **Carpentry:** Carpenters specialize in constructing and repairing wooden structures, such as houses, decks, and fences.
- **Joinery:** Joiners specialize in cutting and joining wood using complex techniques to create strong and durable joints.

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- **Woodturning:** Wood turners specialize in using a lathe to create rounded wood objects, such as bowls,spindles, and vases.

Woodwork technology is a versatile field that offers a wide range of career opportunities. Woodworkers can find work in a variety of settings, including woodworking shops, furniture factories, construction companies, and their own businesses.

1.4 Determining and confirming materials for design

Determining and confirming the right materials for a wood work design is an essential step in ensuring the success of the project. There are a number of factors to consider when making this decision, including the intended use of the object, the desired aesthetic, the budget, and the skill level of the woodworker.

Factors to consider when determining materials

- **Intended use:** What will the object be used for? Will it be a piece of functional furniture, a decorative item, or something else entirely? The intended use will help to determine the type of wood, hardware, and other materials that are needed.
- **Desired aesthetic:** What kind of look and feel do you want for the object? Do you want it to be rustic, modern, or something else? The desired aesthetic will help to determine the type of wood, finish, and other materials that are needed.
- **Budget:** How much money are you willing to spend on materials? The cost of wood and other materials can vary widely, so it is important to set a budget before starting the project.
- **Skill level:** What is your skill level as a woodworker? Some types of wood and materials are more difficult to work with than others. It is important to choose materials that are appropriate for your skill level.

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Once you have considered these factors, you can begin to narrow down your choices of materials.

Confirming the suitability of materials

Once you have chosen a few potential materials, it is important to confirm that they are suitable for your project. This can be done by researching the properties of different types of wood and other materials. You can also consult with other woodworkers or ask for help from a lumberyard employee.

Here are some tips for confirming the suitability of materials for a wood work design:

- Consider the strength and durability of the material. Some types of wood are stronger and more durable than others. This is important to consider when choosing materials for a piece of furniture that will be used frequently or that will bear a lot of weight.
- Consider the moisture resistance of the material. If the object will be exposed to moisture, you will need to choose a material that is moisture resistant. Some types of wood are more moisture resistant than others. You can also use a sealant to protect the material from moisture.
- Consider the grain and color of the material. The grain and color of the wood will affect the overall appearance of the object. Choose a material that has the desired grain and color for your project.
- Consider the cost of the material. Wood prices can vary widely depending on the type of wood and the grade. Choose a material that is within your budget.

Once you have confirmed that the materials you have chosen are suitable for your project, you can begin to build your object.

- The importance of choosing the right type of wood for the intended use of the object. For example, a hardwood like oak is a good choice for a piece of furniture that will be used frequently or that will bear a lot of weight, while a softwood like pine is a good choice for a decorative item.

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- The different ways to finish wood. There are many different types of wood finishes, each with its own unique look and feel. The type of finish you choose will depend on the desired aesthetic of your project.
- How to work with different types of wood and other materials. Some types of wood and materials are more difficult to work with than others. It is important to know how to work with the materials you have chosen before you start building.
- The importance of safety when working with wood and other materials. Woodworking can be dangerous if not done safely. It is important to wear the proper safety gear and to use tools properly.

Overall, determining and confirming materials for design in wood work technology is an important step in ensuring the success of a project. There are a number of factors to consider when making this decision, including the intended use of the object, the desired aesthetic, the budget, and the skill level of the woodworker.

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Self-Check

Part-I: Choose the correct answer

1. Which one of the following is a common communication device?

- A. Email B. cell phone C. two- way radios D. All

2. _____ is essential for woodworkers to be safe and productive.

- A. communication B. woodwork C. furniture D. none

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Unit Two: Organize list of specification

This unit to provide you the necessary information regarding the following content coverage and topics:

- Identifying the type of project based on design
- List and Specifications of Materials
- Techniques of specification using specific unit of measurement.
- Types and quality of finishing materials
- Types and quality of assembling and fixing materials

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify the type of project based on design
- List and Specifications of Materials
- Techniques of specification using specific unit of measurement.
- List Types and quality of finishing materials
- Apply Types and quality of assembling and fixing materials

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2.1 Identifying the type of project based on design

The type of wood work project can be identified based on the design of the object. Here are a few examples:

- **Furniture:** Furniture projects are typically designed to be functional and durable. They may also be designed to be aesthetically pleasing. Some examples of furniture projects include tables, chairs, cabinets, and beds.
- **Decorative items:** Decorative wood work projects are designed primarily for aesthetic purposes. They may be simple or complex, and they may be made from a variety of materials. Some examples of decorative wood work projects include picture frames, sculptures, and wall hangings.
- **Toys:** Wood work toys are designed to be fun and safe for children to play with. They may be simple or complex, and they may be made from a variety of materials. Some examples of wood work toys include puzzles, blocks, and cars.
- **Tools:** Wood work tools are designed to be used in woodworking projects. They may be simple or complex, and they may be made from a variety of materials. Some examples of wood work tools include hammers, saws, and chisels.
- **Other:** There are many other types of wood work projects that do not fit into the above categories. For example, some woodworkers build musical instruments, while others build boats or birdhouses.

To identify the type of wood work project based on the design, it is important to consider the following factors:

- The intended use of the object: **What will the object be used for? Will it be a piece of functional furniture, a decorative item, or something else entirely?**
- The materials used: **What type of wood and other materials are used to make the object?**
- The construction methods used: **How is the object constructed?**

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- The overall design of the object: **What is the overall look and feel of the object?**

Once you have considered these factors, you should be able to identify the type of wood work project.

Here are some additional tips for identifying the type of wood work project based on the design:

- Look for clues in the name of the project. If the project is called a "coffee table" or a "birdhouse," it is likely that the project is a piece of furniture or a decorative item, respectively.
- Consider the size and shape of the object. If the object is large and sturdy, it is likely a piece of furniture. If the object is small and delicate, it is likely a decorative item.
- Look at the joinery. The joinery is the way the different pieces of wood are connected together. If the joinery is complex and well-executed, it is likely that the project is a piece of high-quality furniture.
- Look at the finish. The finish is the final coat of paint or varnish that is applied to the wood. If the finish is high-quality and durable, it is likely that the project is a piece of furniture.

If you are still unsure about the type of wood work project, you can always ask the person who designed or built the object.

2.2 List and Specifications of Materials

There are a wide variety of materials used in wood work technology, each with its own unique properties and applications. Some of the most common materials include:

Wood

- **Hardwood:** **Hardwood** is a dense and durable type of wood that is often used for high-end furniture and cabinetry. Some common hardwoods include maple, oak, walnut, and cherry.

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- **Softwood:** **Softwood** is a less dense and durable type of wood that is often used for framing, construction, and other general-purpose applications. Some common softwoods include pine, fir, and cedar.

Other materials

- **Metal:** Metal is often used in woodwork technology for hardware, such as hinges, latches, and screws. Metal can also be used for structural elements, such as frames and supports.
- **Plastic:** Plastic is a versatile material that can be used for a variety of purposes in woodwork technology. For example, plastic can be used for drawer slides, countertops, and edging.
- **Glass:** Glass is often used in woodwork technology for doors, shelves, and inserts. Glass can also be used for decorative elements, such as stained glass.

Specifications

When selecting materials for a woodworking project, it is important to consider the specifications of the materials. The specifications will vary depending on the type of material and its intended use. Some important specifications to consider include:

- **Dimensions:** The dimensions of the material must be appropriate for the project. For example, if you are building a table, you will need to select wood that is thick enough to support the weight of the tabletop.
- **Grade:** The grade of the material indicates its quality and appearance. For example, higher-grade wood will have fewer blemishes and defects.
- **Finish:** The finish of the material will affect its appearance and durability. For example, a pre-finished wood will have a protective coating that will help to protect it from moisture and stains.

It is also important to consider the cost of the materials when selecting them for a woodworking project. Some materials, such as high-grade hardwoods, can be quite expensive.

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By carefully considering the specifications and cost of the materials, woodworkers can select the right materials for their projects and create beautiful and durable pieces.

2.3 Techniques of specification using specific unit of measurement.

Woodworkers use a variety of techniques to specify the materials they need for their projects. These techniques include using specific units of measurement, such as inches, feet, and yards, as well as using specific terms and abbreviations.

One common technique is to specify the dimensions of the material using specific units of measurement. For example, a woodworker might specify a piece of wood that is 24 inches long by 12 inches wide by 1 inch thick.

Another common technique is to use specific terms and abbreviations to specify the material. For example, a woodworker might specify a piece of 1/2" thick plywood or a 2x4 board.

Here are some examples of how woodworkers use specific units of measurement and terms to specify materials:

- 2x4 board: A 2x4 board is a piece of lumber that is 2 inches thick and 4 inches wide.
- 1/2" thick plywood: Plywood is a type of wood that is made up of thin layers of wood that are glued together. 1/2" thick plywood is plywood that is 1/2 inch thick.
- 12" long by 8" wide by 1" thick piece of wood: This is a piece of wood that is 12 inches long, 8 inches wide, and 1 inch thick.

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- 1/4" round dowel: A dowel is a cylindrical piece of wood. A 1/4" round dowel is a dowel that is 1/4 inch in diameter.
- #8 x 1" screw: A screw is a type of fastener that has a helical thread and a pointed tip. A #8 x 1" screw is a screw that is #8 in diameter and 1 inch long.

It is important to be specific when specifying materials for a woodworking project. This will help to ensure that you get the right materials for the job and that your project is successful.

Here are some additional tips for specifying materials in woodwork technology:

- Use specific units of measurement. This will help to avoid confusion and ensure that you get the right size materials.
- Use specific terms and abbreviations. This will help to communicate your needs to others clearly and concisely.
- Be specific about the grade and finish of the materials you need. This will help to ensure that you get the right quality materials for your project.
- Consider the cost of the materials when making your selections. Some materials, such as high-grade hardwoods, can be quite expensive.

Woodworkers in Ethiopia use a variety of techniques to specify the materials they need for their projects, including using specific units of measurement, such as the metric system.

One common technique is to specify the dimensions of the material using specific units of measurement. For example, a woodworker might specify a piece of wood that is 60 centimeters long by 30 centimeters wide by 2.5 centimeters thick.

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Building Elements

Item number	Description	Unit of measurement	Quantity
1	Kitchen cabinets: frame and carcass	m ³	2.5
2	Kitchen cabinets: doors and drawers	m ²	10
3	Kitchen countertops	m ²	5
4	Kitchen island	m ³	1
5	Dining table	m ²	1
6	Dining chairs	pcs	6
7	Coffee table	m ²	1
8	Sofa	m ²	2
9	Side tables	pcs	2
10	Bookshelves	pcs	2
11	Bedframe	m ²	2
12	Mattress	pcs	1
13	Headboard	m ²	1
14	Nightstands	pcs	2

Notes:

- The unit of measurement for cabinetry is typically cubic meters (m³) for the frame and carcass, and square meters (m²) for the doors and drawers.
- The unit of measurement for countertops is typically square meters (m²).
- The unit of measurement for kitchen islands is typically cubic meters (m³).
- The unit of measurement for other furniture items, such as tables, chairs, sofas, and bookshelves, is typically square meters (m²).
- The quantity of each item will vary depending on the specific project.

This is just a sample bill of quantities for furniture. The specific items and quantities included will vary depending on the needs of the project.

Woodwork Essentials

Item number	Description	Unit of measurement	Quantity
1	Solid wood	m ³	1
2	Plywood	m ³	0.5
3	Hardboard	m ³	0.25
4	Veneer	m ²	5
5	Hardware	Pcs	100
6	Glue	Kg	5
7	Finish	L	2
8	Labor	Hrs	100

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Notes:

- The unit of measurement for solid wood, plywood, and hardboard is typically cubic meters (m³).
- The unit of measurement for veneer is typically square meters (m²).
- The unit of measurement for hardware is typically pieces (pcs).
- The unit of measurement for glue and finish is typically kilograms (kg) and liters (l), respectively.
- The unit of measurement for labor is typically hours (hrs).
- The quantity of each item will vary depending on the specific furniture project.

This is just a sample bill of quantities for furniture. The specific items and quantities included will vary depending on the size, complexity, and finish of the project.

For example, a simple bookshelf might only require a few pieces of solid wood, plywood, and hardware. A more complex piece of furniture, such as a dining table, might require a larger quantity of materials and more labor hours.

It is important to carefully consider the specific needs of each project when creating a bill of quantities. This will help to ensure that all of the necessary materials and labor are accounted for, and that the project stays on budget and on schedule.

2.4 Types and quality of finishing materials

There are a variety of types and qualities of finishing materials available for wood work technology. The type and quality of finishing material that you choose will depend on the specific project you are working on, as well as your desired aesthetic and budget.

2.4.1 Types of finishing materials

Some of the most common types of finishing materials for wood work technology include:

- **Oil finishes:** Oil finishes penetrate the wood and protect it from moisture and dirt. They also enhance the natural beauty of the wood. Common oil finishes include Tung oil, linseed oil, and Danish oil.

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- **Varnish:** Varnish is a clear finish that protects the wood from moisture, dirt, and abrasion. It is also available in a variety of sheens, from matte to glossy.
- **Shellac:** Shellac is a natural finish that is made from lac resin. It is easy to apply and dries quickly, but it is not as durable as other finishes.
- **Lacquer:** Lacquer is a synthetic finish that is very durable and resistant to moisture and abrasion. It is also available in a variety of sheens.
- **Polyurethane:** Polyurethane is a synthetic finish that is very durable and resistant to moisture, abrasion, and chemicals. It is also available in a variety of sheens.

2.4.2 Quality of finishing materials

The quality of finishing materials can vary widely. It is important to choose high-quality finishing materials if you want your project to look its best and last for many years.

When choosing finishing materials, consider the following factors:

- **Durability:** How durable do you need the finish to be? If you are building a piece of furniture that will be used heavily, you will need to choose a more durable finish.
- **Appearance:** What type of appearance do you want? Some finishes, such as oil finishes, will enhance the natural beauty of the wood, while others, such as lacquer, will give the wood a more polished look.
- **Cost:** Finishing materials can range in price from relatively inexpensive to very expensive. Set a budget before you start shopping so that you don't overspend.

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Tips for applying finishing materials

Here are some tips for applying finishing materials: -

- Prepare the wood properly. The wood should be clean and smooth before you apply any finish. Sand the wood with fine-grit sandpaper to remove any imperfections.
- Apply the finish in thin coats. It is better to apply multiple thin coats of finish than one thick coat. This will help to ensure that the finish dries evenly and without any bubbles.
- Allow the finish to dry completely between coats. This may take several hours or even days, depending on the type of finish you are using.
- Buff the finish. Once the final coat of finish has dried completely, you can buff it with a soft cloth to bring out the shine.

By following these tips, you can achieve a beautiful and durable finish on your woodworking project.

2.5 Types and quality of assembling and fixing materials

There are a variety of types and qualities of assembling and fixing materials available for woodwork technology. The type and quality of assembling and fixing material that you choose will depend on the specific project you are working on, as well as the strength and durability requirements of the joint or assembly.

2.5.1 Types of assembling and fixing materials

Some of the most common types of assembling and fixing materials for woodwork technology include:

- **Nails:** Nails are a simple and inexpensive way to assemble wood pieces. They are available in a variety of sizes and types, including brad nails, finish nails, and common nails.

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- **Screws:** Screws are stronger and more durable than nails. They are also easier to remove and replace if necessary. Screws are available in a variety of sizes and types, including wood screws, drywall screws, and lag screws.
- **Joints:** Joints are a more complex way to assemble wood pieces, but they are also stronger and more durable than nails or screws. Some common types of joints include butt joints, dado joints, and dovetail joints.
- **Adhesives:** Adhesives can be used to assemble wood pieces, but they are not as strong or durable as joints. Adhesives are typically used in conjunction with other fixing materials, such as nails or screws.

2.5.2 Quality of assembling and fixing materials

The quality of assembling and fixing materials can vary widely. It is important to choose high-quality materials if you want your project to be strong and durable.

When choosing assembling and fixing materials, consider the following factors:

- **Strength:** How strong do you need the joint or assembly to be? If you are building a piece of furniture that will be used heavily, you will need to choose stronger materials.
- **Durability:** How durable do you need the joint or assembly to be? If the project will be exposed to the elements, you will need to choose materials that are resistant to moisture and rot.
- **Cost:** Assembling and fixing materials can range in price from relatively inexpensive to very expensive. Set a budget before you start shopping so that you don't overspend.

Tips for assembling and fixing wood pieces

Here are some tips for assembling and fixing wood pieces:

- Use the right tools for the job. This will help to ensure that you make clean and accurate cuts and that you don't damage the wood.

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- Follow the manufacturer's instructions for the assembling and fixing materials you are using. This will help to ensure that you use the materials correctly and that you get the best results.
- Pre-drill holes for screws and nails. This will help to prevent the wood from splitting.
- Use a level and square to make sure that your joints are straight and true.
- Allow the glue to dry completely before using the project. This will help to ensure that the joint is strong and durable.

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Self-Check

Part-I: Choose the correct answer

1. _____ is a synthetic finish that is very durable and resistant to moisture and abrasion
A. Lacquer B. Oil finishes C. varnish D. shellac
2. What are factors to be consider When choosing assembling and fixing materials
A. Durability B. stability C. cost D. all

Part-II: Give the answer the following questions.

1. what are materials used in wood work technology?

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Unit Three: Calculate resource requirements

This unit to provide you the necessary information regarding the following content coverage and topics:

- Interpreting resource requirements
- Types and quantity of supplies, materials and labor requirements
- Obtaining materials Cost
- Types of suppliers
- Performing basic calculation and measurement
- Materials/Supplies Estimates and labor requirements
- Methods in Obtaining Cost of Materials and applying correct formula
- Cause of equipment depreciation

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Interpret resource requirements
- Identify Types and quantity of supplies, materials and labor requirements
- Calculate Obtaining materials Cost
- List Types of suppliers
- Perform basic calculation and measurement
- Materials/Supplies Estimates and labor requirements
- Apply Methods in Obtaining Cost of Materials and correct formula
- Cause of equipment depreciation



3.1 Interpreting resource requirements

Interpreting resource requirements in wood work technology is the process of understanding the materials, tools, and equipment needed to complete a woodworking project. This includes understanding the quantity of materials needed, the size and specifications of the tools and equipment required, and the cost of the resources.

To interpret resource requirements in wood work technology, it is important to have a good understanding of the following:

- The type of woodworking project being undertaken.
- The materials being used.
- The tools and equipment available.
- The budget for the project.

Once these factors are understood, it is possible to start to interpret the resource requirements.

For example, if you are building a simple birdhouse, you will need to consider the following resources:

- Materials: Wood, nails, screws, glue, paint or stain.
- Tools and equipment: Saw, hammer, screwdriver, measuring tape, paintbrush.
- Cost: The cost of the materials and tools will vary depending on the quality of the materials and the type of tools used.

However, if you are building a complex piece of furniture, you may need to consider additional resources, such as:

- Materials: More expensive or specialized wood, hardware, finishes.
- Tools and equipment: Power tools, jigs, and fixtures.

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- **Cost:** The cost of the materials and tools will be higher for a more complex project.

Once you have interpreted the resource requirements, you can start to plan your project and gather the necessary resources.

Here are some tips for interpreting resource requirements in wood work technology:

- Read the project plans carefully. The project plans should list all of the required materials, tools, and equipment.
- Do your research. If you are not familiar with a particular material, tool, or piece of equipment, do some research to learn more about it.
- Ask for help. If you are unsure about how to interpret the resource requirements, ask a more experienced woodworker for help.

3.2 Types and quantity of supplies, materials and labor requirements

The types and quantity of supplies, materials, and labor requirements in woodworking technology vary depending on the specific project. However, there are some general categories of resources that are commonly used in woodworking.

Supplies

- **Wood:** Wood is the primary material used in woodworking. There are many different types of wood available, each with its own unique properties. The type of wood you choose will depend on the specific project you are working on.
- **Hardware:** Hardware includes items such as nails, screws, bolts, nuts, hinges, and latches. Hardware is used to assemble and secure wooden pieces together.

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- **Adhesives:** Adhesives are used to bond wooden pieces together. There are many different types of adhesives available, each with its own unique properties. The type of adhesive you choose will depend on the specific project you are working on.
- **Finishes:** Finishes are used to protect and enhance the appearance of wood. There are many different types of finishes available, such as paints, stains, and varnishes. The type of finish you choose will depend on the specific project you are working on.

Materials

- **Woodworking tools:** Woodworking tools are used to cut, shape, and assemble wood. There are many different types of woodworking tools available, both manual and power tools. The specific tools you need will depend on the project you are working on.
- **Woodworking equipment:** Woodworking equipment includes items such as sawhorses, workbenches, and clamps. Woodworking equipment is used to support and hold wood in place while it is being worked on. The specific equipment you need will depend on the project you are working on.

Labor

The amount of labor required for a woodworking project will vary depending on the complexity of the project. Simple projects, such as building a birdhouse, may only take a few hours to complete. More complex projects, such as building a piece of furniture, may take several weeks or even months to complete.

Here are some examples of types and quantities of supplies, materials, and labor requirements for common woodworking projects:

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Birdhouse:

- Supplies: Wood, nails, screws, glue, paint or stain.
- Materials: Saw, hammer, screwdriver, measuring tape, paintbrush.
- Labor: 2-3 hours.

Bookshelf:

- Supplies: Wood, shelves, hardware, finish.
- Materials: Saw, drill, sander, measuring tape, level.
- Labor: 8-10 hours.

Dining table:

- Supplies: Wood, table legs, hardware, finish.
- Materials: Table saw, router, sander, measuring tape, level.
- Labor: 16-20 hours.

Dresser:

- Supplies: Wood, drawers, hardware, finish.
- Materials: Table saw, router, sander, measuring tape, level.
- Labor: 24-28 hours.

These are just a few examples. The types and quantities of supplies, materials, and labor requirements for any given woodworking project will vary depending on the specific project.

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3.3 Obtaining materials Cost

Obtaining materials cost in woodworking technology is the process of estimating and budgeting for the cost of the materials used in a woodworking project. This includes considering the cost of the wood, hardware, adhesives, finishes, and any other supplies that may be needed.

There are a few different ways to obtain materials cost for a woodworking project. One way is to simply add up the cost of each individual item that will be used in the project. This can be a time-consuming process, especially for complex projects.

Another way to obtain materials cost is to use a woodworking cost calculator. Woodworking cost calculators are online tools that can help you estimate the cost of materials for your project. These calculators typically ask you to input the type of wood you will be using, the quantity of each item, and the desired finish. The calculator will then generate an estimate of the total cost of materials for your project.

Once you have obtained materials cost for your project, you can start to budget for the project. When budgeting for materials cost, it is important to consider the following factors:

- The quality of the materials you want to use. Higher-quality materials will typically cost more, but they may also last longer and look better.
- The quantity of materials you need. If you are building a large project, you will need more materials than if you are building a small project.
- The availability of materials. Some materials may be more difficult to find and more expensive than others.

By carefully considering all of these factors, you can create a budget for your woodworking project that is realistic and affordable.

Here are some tips for obtaining materials cost in woodworking technology:

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- Shop around for the best prices. Compare prices from different retailers before you buy your materials.
- Consider buying materials in bulk. This can save you money on the overall cost of materials.
- Use coupons and discounts. Many retailers offer coupons and discounts on woodworking materials.
- Look for recycled or salvaged materials. This can be a great way to save money on materials and reduce your environmental impact.

Example:

- Wood: \$100
 - Hardware: \$50
 - Adhesives: \$20
 - Finishes: \$10
- Total cost of materials: \$180

This is just an example, and the actual cost of materials will vary depending on the specific project.

Once the total cost of materials has been estimated, the carpenter can create a budget for the project. The budget should include the cost of materials, as well as the cost of labor and other expenses.

3.4 Types of suppliers

There are many different types of suppliers in woodworking technology. Some of the most common types of suppliers include:

- **Wood suppliers:** Wood suppliers sell a variety of types of wood, including hardwoods, softwoods, and engineered woods.
- **Hardware suppliers:** Hardware suppliers sell a variety of hardware items, such as nails, screws, bolts, hinges, and latches.
- **Adhesive suppliers:** Adhesive suppliers sell a variety of adhesives, such as glues, epoxies, and caulks.

- **Finish suppliers:** Finish suppliers sell a variety of finishes, such as paints, stains, and varnishes.
- **Woodworking tool suppliers:** Woodworking tool suppliers sell a variety of woodworking tools, both manual and power tools.
- **Woodworking equipment suppliers:** Woodworking equipment suppliers sell a variety of woodworking equipment, such as sawhorses, workbenches, and clamps.

In addition to these general types of suppliers, there are also a number of specialized suppliers that sell specific types of woodworking materials or equipment. For example, there are suppliers that specialize in selling exotic woods, specialty hardware, or high-end woodworking tools.

Woodworkers can choose to purchase their supplies from a variety of different suppliers. Some woodworkers prefer to shop at local lumberyards or hardware stores. Others prefer to purchase their supplies online from specialty suppliers.

Here are some tips for choosing woodworking suppliers:

- Consider the quality of the materials and equipment. Make sure that the suppliers you choose sell high-quality materials and equipment.
- Compare prices. Shop around to compare prices from different suppliers.
- Consider the convenience of the supplier. Make sure that the suppliers you choose are convenient for you to reach.
- Read reviews. Read online reviews of different suppliers to get feedback from other woodworkers.
- By following these tips, woodworkers can choose woodworking suppliers that meet their needs and budget.

Examples of specialized woodworking suppliers:

- **Knife suppliers:** Knife suppliers sell a variety of woodworking knives, including chisels, planes, and saws.

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- **Lathe suppliers:** Lathe suppliers sell a variety of woodworking lathes, as well as accessories such as chucks and tools.
- **Veneer suppliers:** Veneer suppliers sell a variety of veneers, which are thin sheets of wood that can be used to decorate woodworking projects.
- **Inlay suppliers:** Inlay suppliers sell a variety of inlay materials, such as mother-of-pearl, abalone, and ivory.
- **Custom woodworking suppliers:** Custom woodworking suppliers can provide woodworkers with custom-made materials and equipment.

3.5. Performing basic calculation and measurement

Performing basic calculation and measurement for furniture requires a basic understanding of geometry and algebra. Some of the most common calculations that woodworkers need to make for furniture projects include:

- **Area:** The area of a flat surface is calculated by multiplying the length and width of the surface. For example, the area of a rectangular tabletop would be calculated by multiplying the length of the tabletop by the width of the tabletop.
- **Volume:** The volume of a three-dimensional object is calculated by multiplying the length, width, and height of the object. For example, the volume of a rectangular box would be calculated by multiplying the length of the box by the width of the box by the height of the box.
- **Perimeter:** The perimeter of a closed curve is the total length of all of the sides of the curve. For example, the perimeter of a square would be calculated by adding up the lengths of all four sides of the square.
- **Angles:** Angles are measured in degrees. The sum of all of the angles in a triangle is always 180 degrees.

In addition to these basic calculations, woodworkers may also need to make more complex calculations, such as calculating the strength of a joint or the amount of force required to support a load.

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Here are some examples of how basic calculations and measurements can be used in furniture making:

- To calculate the amount of wood needed to build a table, the woodworker would need to calculate the area of the tabletop and the area of the legs.
- To calculate the amount of hardware needed to build a cabinet, the woodworker would need to calculate the number of screws, nails, and hinges needed.
- To calculate the size of a hole that needs to be drilled in a piece of wood, the woodworker would need to measure the diameter of the drill bit.
- To calculate the amount of force required to hold a shelf in place, the woodworker would need to consider the weight of the items that will be placed on the shelf and the type of joint that is being used to support the shelf.

By understanding basic calculation and measurement, woodworkers can ensure that their furniture projects are successful.

Here are some tips for performing basic calculation and measurement for furniture:

- Use a tape measure to accurately measure all of the dimensions of your project.
- Use a calculator to perform any necessary calculations.
- Double-check your calculations to make sure that they are correct.
- Use a square to ensure that your cuts are square.
- Use a level to ensure that your surfaces are level.

Task: Build a square coffee table with a tabletop that is 24 inches in length and 18 inches in width. The legs of the coffee table should be 20 inches in height.

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Calculations:

- Area of the tabletop: 24 inches * 18 inches = 432 square inches
- Volume of the coffee table: 24 inches * 18 inches * 20 inches = 8640 cubic inches
- Perimeter of the tabletop: 2 * (24 inches + 18 inches) = 84 inches
- Angles of the coffee table: All of the angles in the coffee table will be 90 degrees.

Measurements:

- Tabletop: 24 inches long, 18 inches wide
- Legs: 20 inches high

Construction:

- The woodworker would need to cut four pieces of wood to the dimensions of the tabletop.
- The four pieces of wood would then be glued and screwed together to form the tabletop.
- The legs of the coffee table would then be cut to the specified height and attached to the tabletop.

By performing basic calculations and measurements, the woodworker can ensure that the coffee table is built to the correct dimensions and that it is structurally sound.

Here are some additional tips for performing basic calculation and measurement for furniture:

- Use a drawing or blueprint to help you visualize your project and to make sure that all of the dimensions are correct.
- Use a reference book to learn about the different types of joints and how to calculate their strength.

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- Ask a more experienced woodworker for help if you are unsure about any of the calculations or measurements.

3.6 Materials/Supplies Estimates and labor requirements

Materials/Supplies Estimates and Labor Requirements in Furniture

Materials and supplies estimates and labor requirements in furniture vary depending on the type of furniture being made, the complexity of the project, and the experience of the woodworker. However, there are some general guidelines that can be followed.

Materials/Supplies

The following materials are commonly used in furniture making:

- **Wood:** The type of wood used will depend on the desired look and durability of the furniture. Common woods used for furniture making include oak, maple, walnut, and cherry.
- **Hardware:** Hardware includes items such as screws, nails, hinges, and latches. Hardware is used to assemble and secure the pieces of furniture together.
- **Adhesives:** Adhesives are used to bond the pieces of wood together. Common adhesives used for furniture making include glue and epoxy.
- **Finishes:** Finishes are used to protect and enhance the appearance of the furniture. Common finishes used for furniture making include paint, stain, and varnish.

The amount of materials needed will depend on the size and complexity of the furniture project. For example, a simple bookshelf will require less materials than a large dining table.

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Labor Requirements

The labor requirements for furniture making will also vary depending on the type of furniture being made, the complexity of the project, and the experience of the woodworker. However, there are some general guidelines that can be followed.

Simple furniture projects, such as a bookshelf or a coffee table, can be completed in a few hours. More complex furniture projects, such as a dining table or a sofa, may take several days or even weeks to complete.

The following factors will affect the labor requirements for furniture making:

- The type of wood being used: Some woods are easier to work with than others. For example, softwoods are generally easier to work with than hardwoods.
- The complexity of the project: More complex projects will require more time and labor to complete.
- The experience of the woodworker: An experienced woodworker will be able to complete a project more quickly and efficiently than a less experienced woodworker.

Estimating Materials and Labor

There are a number of ways to estimate the materials and labor required for a furniture project. One way is to use a woodworking calculator. Woodworking calculators can be used to calculate the amount of wood needed, the amount of hardware needed, and the amount of time required to complete a project.

Another way to estimate the materials and labor required for a furniture project is to consult with a more experienced woodworker. An experienced woodworker will be able to provide you with a more accurate estimate based on their experience.

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Tips for Estimating Materials and Labor

Here are some tips for estimating materials and labor for a furniture project:

- Be as accurate as possible when measuring the dimensions of the furniture project.
- Consider the type of wood being used and the complexity of the project when estimating the amount of materials needed.
- Factor in the experience of the woodworker when estimating the amount of labor required.
- Get estimates from multiple sources to get a better idea of the materials and labor costs.

Example: Build a simple bookshelf with two shelves and four legs. The bookshelf will be 36 inches tall, 12 inches wide, and 18 inches deep.

Materials:

- Wood: 4 pieces of 3/4-inch thick plywood, each measuring 36 inches by 12 inches
- Hardware: 8 screws, 4 hinges, and 4 shelf supports
- Adhesive: Wood glue
- Finish: Paint or stain (optional)

Labor:

- Cutting the wood to size: 1 hour
- Drilling holes for the screws and hinges: 30 minutes
- assembling the bookshelf: 2 hours
- sanding and finishing the bookshelf (optional): 2 hours

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This is just a sample estimate, and the actual cost and labor requirements will vary depending on the specific materials and finishes used. Here are some tips for reducing the cost and labor requirements of your furniture project:

- Use recycled materials. There are many ways to use recycled materials to make furniture. For example, you can use old pallets to make a coffee table or use old doors to make a bookshelf.
- Use simple designs. Simple designs are easier to build and require less materials.
- Use pre-cut wood. Pre-cut wood can save you time and labor, but it will cost more than buying wood in bulk.
- Use power tools. Power tools can make the job of building furniture easier and faster.
- Get help from a friend or family member. Building furniture with someone else can make the job more fun and less daunting.

3.7 Methods in Obtaining Cost of Materials and applying correct formula

There are two main methods for obtaining the cost of materials for furniture:

1. **Get quotes from suppliers.** This is the most accurate method, but it can be time-consuming. You will need to contact multiple suppliers and get quotes for the specific materials you need.
2. **Use a materials calculator.** Materials calculators can be used to estimate the cost of materials for a furniture project. These calculators typically take into account the type of wood, the dimensions of the project, and the quantity of materials needed.

Once you have obtained the cost of materials, you can apply the following formula to calculate the total cost of the project:

Total cost = Cost of materials + Cost of labor +overhead cost+ profit

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The cost of labor will vary depending on the complexity of the project and the experience of the woodworker. You can estimate the cost of labor by consulting with a more experienced woodworker or by using a labor calculator.

Here is an example of how to apply the formula to calculate the total cost of a furniture project:

Example: Build a simple bookshelf with two shelves and four legs. The bookshelf will be 36 inches tall, 12 inches wide, and 18 inches deep. The wood used will be 3/4-inch thick plywood.

Cost of materials:

- Wood: \$40
 - Adhesive: \$5
 - Hardware: \$10
 - Finish (optional): \$10
- Total cost of materials: \$65

Cost of labor:

- Cutting the wood to size: 1 hour
- assembling the bookshelf: 2 hours
- Drilling holes for the screws and hinges: 30 minutes
- sanding and finishing the bookshelf (optional): 2 hours

Total labor: 6 hours

Cost of labor: \$120

Wage rate: \$20 per hour

Total cost of the project: **\$185**

This is just a sample calculation, and the actual cost of the project will vary depending on the specific materials and finishes used, as well as the experience of the woodworker.

By following the methods and formula above, you can accurately calculate the cost of materials and labor for your furniture project. This will help you to budget for the project and to ensure that you have enough money to complete it.

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Practical example-

BILL quantity						
No	Material kind	Unit	Qty	Unit price	Total price	Remark
1	Ply wood (weyra)	Pcs	04	220	880 birr	
2	Ply wood (mahagony)	Pcs	03	150	450 “	
3	Solid wood(2cmx30cmx4m)	Pcs	03	360	1080 “	
4	Glue	Kg	03	100	300 “	
5	Varnish	Kg	05	90	450 “	
6	Nail	Kg	1/2	35	17.5 “	
7	Hinge	Pcs	08	08	64 “	
8	Glass	M ²	02	520	1040 “	
9	Handle	Pcs	04	05	20 “	
10	Lock & key	Pcs	03	15	45 “	
Total Material cost = 4346.5						

Cost calculation

- Wastage cost = Material cost X 5/100 = $4346.5 \times 5/100 = 217.3$ birr
- Total material cost = 4346.3 birr
- Over head cost = Material cost X 10% = $4346.3 \times 10/100 =$
- Labor cost = Material cost X 15% = $4346.5 \times 15/100 = 651.975$ birr
- Profit = Material cost X 20% = $4346.3 \times 20/100 = 869.3$ birr
- Selling price = total material cost + profit + overhead cost + labor cost
 $= (4346.5 + 869.3 + 651.975 + 434.65)$ birr
 $= \underline{\underline{6301.9}}$ birr

Practical example-

Lumber list

No	Name of parts	Kinds of wood	Qty.	Rough Dimension in cm			Final Dimension in cm			Remark
				L	W	T	L	W	T	
01.	Top	Laminated MDF	01	122	61	1.8	120	60	1.8	
02.	Leg	Laminated MDF	03	75	51	1.8	73	50	1.8	
03.	CPU holder	Laminated MDF	01	51	38.6	1.8	49	37.6	1.8	
04.	Key board holder	Laminated MDF	01	72	31	1.8	71	30	1.8	
05.	Key board holder front	Laminated MDF	01	73	06	1.8	71	05	1.8	
06.	Wind protector	Laminated MDF	01	73	41	1.8	71	40	1.8	
07.	Outer drawer front	Laminated MDF	01	52	21	1.8	50	20	1.8	
08.	Inner drawer front and drawer back	Laminated MDF	02	35	13	1.8	33	12	1.8	

09.	Drawer side	Laminated MDF	02	50	13	1.8	48	12	1.8	
10.	Drawer bottom	Ply wood	01	52.1	36	0.3	50.1	35	0.3	
11.	Back	Ply wood	01	72	40.6	0.3	70	39.6	0.3	

Non-wooden materials list

No	Types of materials	Specification	Unit	Quantity	Unit cost	Total cost	Remark
01.	Spider connector	30*30*15mm	Pcs	18	35	630	
02	Wooden Screw	3.5*15mm	Packet	0.08	850	68	
03.	plastic pin	5 mm thick	Pcs	08	05	40	
04.	Plastic veneer	1mm thick and 18mm width	Meter	20	25	500	
05.	Glue	Edge binder glue	Kg	0.4	600	240	
06.	Wooden Screw	3.5*35mm	Packet	0.03	850	25.5	
07.	Wooden screw	3.5*40mm	Packet	0.02	850	17	
08.	Drawer slider	25cm long	Pcs	01	350	350	
09.	Drawer slider	30cm long	Pcs	01	350	350	
10.	Drawer handle	15 cm	Pcs	01	120	120	
11.	Drawer key	Two time lock	Pcs	01	105	105	
Total						2,445.50	
						ETB	

Cost of wooden materials (Lumber Order)

No	Name of pieces in an article	Kinds of Materials	Qty.	Cut out size, cm			No. of m ³ or m ²	Cost per m ³ or m ²	Total cost in ETB
				L	W	T			
01.	Top	Laminated MDF	01	122	61	1.8	0.744	872.48	649.13
02.	Leg	Laminated MDF	03	75	51	1.8	0.38	872.48	994.63
03.	CPU holder	Laminated MDF	01	51	38.6	1.8	0.20	872.48	174.50
04.	Key board holder	Laminated MDF	01	72	31	1.8	0.22	872.48	191.95
05.	Key board holder front	Laminated MDF	01	73	06	1.8	0.042	872.48	36.64
06.	Wind protector	Laminated MDF	01	73	41	1.8	0.3	872.48	261.74
07.	Outer drawer front	Laminated MDF	01	52	21	1.8	0.11	872.48	95.97
08.	Inner drawer front and drawer back	Laminated MDF	02	35	13	1.8	0.05	872.48	87.25
09.	Drawer side	Laminated MDF	02	50	13	1.8	0.07	872.48	122.15
10.	Drawer bottom	Ply wood	01	52.1	36	0.3	0.20	402.68	80.54
11.	Back	Ply wood	01	72	40.6	0.3	0.29	402.68	116.78
Total								2,811.28	ETB



Manufactured board cost = **2,811.28 ETB**

Total material cost = cost of material + 5% of material cost for manufactured board wastage
 Total material cost = **2,811.28 + 2,445.50 + 140.56 = 5,397.34 ETB**

Production cost = total materials cost +30% of total materials cost for labor cost + 15% of total materials cost for overhead expense + 10% of total materials cost for miscellaneous cost

Production cost = **5,397.34 + 1,619.20 + 809.60 + 539.75 = 8,365.89ETB**

Selling cost = production cost + 25% of production cost for profit
 Selling cost = **8,365.89 + 2,091.47 = 10,457.36 ETB**

3.8 Cause of equipment depreciation

The following are some of the causes of equipment depreciation in furniture:

- **Physical wear and tear:** Furniture equipment is used to cut, saw, sand, and finish wood. Over time, this equipment will wear down and become less efficient. This is especially true for equipment that is used heavily or in harsh environments.
- **Technological obsolescence:** New furniture manufacturing technologies are constantly being developed. As a result, older furniture equipment becomes less valuable. This is because new equipment is often more efficient, reliable, and easier to use than older equipment.
- **Economic factors:** Changes in economic conditions can also affect the value of furniture equipment. For example, if the demand for a particular type of furniture decreases, the value of the equipment used to manufacture that furniture will also decrease.

Here are some specific examples of how each of these factors can cause equipment depreciation in furniture:

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- **Physical wear and tear:** A table saw that is used to cut wood all day long will wear down more quickly than a table saw that is used less often. This will cause the value of the table saw to decrease over time.
- **Technological obsolescence:** A CNC router that was state-of-the-art five years ago is now considered to be outdated. This is because new CNC routers are more powerful, have more features, and are easier to use. As a result, the value of the older CNC router has decreased.
- **Economic factors:** If the demand for a particular type of furniture decreases, the value of the equipment used to manufacture that furniture will also decrease. For example, if the demand for wooden furniture decreases, the value of woodworking equipment will also decrease.

Furniture equipment depreciation is a normal part of owning furniture equipment. However, there are a number of things that furniture manufacturers can do to slow down the depreciation of their equipment, such as:

- Regularly maintain and inspect equipment: This will help to extend the lifespan of equipment and reduce wear and tear.
- Upgrade equipment as needed: This will help to ensure that furniture manufacturers are using the most efficient and reliable equipment available.
- Sell or lease out obsolete equipment: This can help to recoup some of the investment in the equipment before it becomes completely worthless.

By taking these steps, furniture manufacturers can minimize the financial impact of equipment depreciation.

In addition to the above, furniture equipment depreciation can also be caused by:

- **Accidents and damage:** Furniture equipment can be damaged in accidents, such as fires or floods. This can reduce the value of the equipment.

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- **Poor maintenance:** Furniture equipment that is not properly maintained will wear down more quickly and become less valuable.
- **Lack of care:** Furniture equipment that is not properly cared for, such as by not cleaning it regularly, can become damaged and less valuable.

Furniture manufacturers can help to prevent equipment depreciation by taking steps to reduce the risk of accidents and damage, properly maintaining their equipment, and caring for their equipment.

Best example of equipment depreciation in furniture:

A CNC router that was state-of-the-art five years ago is now considered to be outdated. This is because new CNC routers are more powerful, have more features, and are easier to use. As a result, the value of the older CNC router has decreased significantly.

This is a good example because it shows how technological obsolescence can cause equipment depreciation in furniture. New CNC routers are able to produce furniture more quickly and accurately than older CNC routers. They also have features that make them easier to use, such as touchscreen interfaces and automatic tool changers. As a result, furniture manufacturers are more likely to purchase new CNC routers than older CNC routers. This drives down the value of older CNC routers.

Another example of equipment depreciation in furniture is a table saw that is used to cut wood all day long. Over time, the table saw will wear down and become less efficient. The blades will become dull, the table will become warped, and the motor may become less powerful. As a result, the value of the table saw will decrease over time.

Furniture manufacturers can slow down the depreciation of their equipment by properly maintaining and inspecting it regularly. They can also upgrade their equipment as needed. However, it is important to note that all equipment will eventually depreciate. Furniture manufacturers should factor this into their financial planning.

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Self-Check

Part-I: Choose the correct answer

- _____ the primary material used in woodworking?
A. Varnish B. wood C. screw D. oil
- furniture equipment depreciation can also be caused by:
A. Accidents and damage B. Poor maintenance C. Lack of cared. D. all

Part-II: give the answer the following questions.

- What are the basic calculation and measurement for furniture?



Unit Four: Estimate approximate quantities and cost

This unit to provide you the necessary information regarding the following content coverage and topics:

- Determining resource requirements
- Determining the quantity of materials
- Estimating tools and equipment for product work
- Estimating resources quantities
- Resource quantities estimates
- Bill of Materials, supplies, labor and overhead warranty cost
- Presenting estimated results

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Determine resource requirements
- Determine the quantity of materials
- Estimate tools and equipment for product work
- Estimate resources quantities
- Resource quantities estimates
- Apply Bill of Materials, supplies, labor and overhead warranty cost
- Present estimated results

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4.1 Determining resource requirements

Determining resource requirements is the process of identifying and estimating the types and quantities of resources needed to complete a project. This includes both human resources (people) and non-human resources (equipment, materials, money, etc.).

Why is it important to determine resource requirements?

- **To create a realistic project plan.** Resource requirements are a key input into the project schedule and budget. By accurately estimating resource requirements, project managers can develop a plan that is feasible and achievable.
- **To identify potential risks.** Resource shortages can lead to delays, cost overruns, and other problems. By identifying resource requirements early in the project lifecycle, project managers can develop contingency plans to mitigate potential risks.
- **To make informed decisions about resource allocation.** Once resource requirements are known, project managers can make informed decisions about how to allocate resources across the project. This includes decisions about staffing, equipment procurement, and budget allocation.

Steps to determine resource requirements

1. **Define the scope of the project.** What work needs to be done to complete the project? Once the scope is defined, project managers can begin to identify the resources needed to accomplish each task.
2. **Break down the project into smaller tasks.** This will make it easier to identify the specific resources needed for each task.
3. **Identify the types of resources needed.** This may include people, equipment, materials, money, time, and knowledge.
4. **Estimate the quantity of each resource needed.** This will depend on the specific tasks that need to be completed and the skills and experience of the people who will be doing the work.

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5. **Consider resource availability.** Are the resources that are needed actually available? If not, project managers may need to develop contingency plans.

Tips for determining resource requirements

- **Use historical data.** If the project is similar to previous projects, project managers can use historical data to estimate resource requirements.
- **Consult with experts.** Project managers can consult with subject matter experts to get their input on the types and quantities of resources that are needed.
- **Be realistic.** Project managers should not underestimate or overestimate resource requirements.
- **Document the resource requirements.** The resource requirements should be documented in the project charter and project plan.

Determining resource requirements for woodwork technology can be broken down into the following categories:

- **Human resources:**
 - Woodworking teachers and technicians
 - Workshop attendants
 - Cleaners
- **Infrastructure:**
 - Wood workshops
 - Stores
 - Libraries
 - Staff offices
- Toilets
- Boreholes
- **Library resources:**
 - Woodwork textbooks
 - Teacher guides
 - Woodwork curriculum
- **Utilities:**
 - Fire extinguishers
 - Work benches
- **Hand tools:**
 - Marking gauges
 - Marking knives
 - Try squares
 - Mitre squares
 - Sliding bevels
 - Measuring tapes
 - Jack planes
 - Smoothing planes



- Multi-plough planes
- Spoke shaves
- Rip saws
- Crosscut saws
- Tenon saws
- Panel saws
- Coping saws
- Keyhole saws
- Dovetail saws
- Sets of firmer chisels
- Sets of mortise chisels
- Sets of turning chisels
- Sets of twist bits
- Countersinks
- Roses
- Ratchet braces
- Breast drills
- Sets of drill bits
- Sets of screw drivers
- Mallets
- Claw hammers
- Pein hammers
- Warrington hammers
- Bradawls
- Pincers
- F-cramps
- Sash cramps
- G-cramps
- Bench-hold fasts
- Sets of triangular files
- Flat files
- Scrapers (flat)
- Dividers
- Sets of round files
- ½ round files
- Scrapers (cabinet)
- Calipers (set) inside and outside
- Dowelling jigs
- Rasps
- Woodworking machines:
 - Planers
 - Jointers
 - Shapers
 - Sanders
 - Saws
 - Routers
 - Lathes
- **Consumables:**
 - Wood
 - Glue
 - Finishes
 - Hardware

The specific resource requirements for a woodwork technology program will vary depending on the size and scope of the program, as well as the specific types of projects that students will be working on. However, the above list provides a good starting point for determining resource requirements.

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Once resource requirements have been determined, project managers can use this information to develop a project plan and budget. They can also use this information to identify potential risks and develop contingency plans.

4.2 Determining the quantity of materials

To determine the quantity of materials needed for a project, you need to:

1. Identify all of the materials that will be needed. This may include raw materials, components, subassemblies, and finished goods.
2. Estimate the quantity of each material that will be needed. This will depend on the size and complexity of the project, as well as the specific specifications of the materials.
3. Allow for waste and spoilage. It is important to factor in some extra material to account for waste and spoilage.

There are a number of different methods that can be used to estimate the quantity of materials needed for a project. Some common methods include:

- **Quantity takeoff:** This involves measuring the dimensions of the project and multiplying them by the appropriate coverage rates to determine the quantity of materials needed.
- **Bill of materials (BOM):** A BOM is a list of all of the materials that will be needed for a project, along with the quantity of each material. BOMs can be created from scratch or they can be used from previous projects.
- **Historical data:** If the project is similar to previous projects, project managers can use historical data to estimate the quantity of materials needed.

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Once the quantity of materials has been estimated, project managers can use this information to develop a project budget and schedule.

Here is an example of how to determine the quantity of materials needed for a simple woodworking project:

Project: Build a wooden box

Materials:

- Wood (pine)
- Glue
- Screws
- Finish

Quantity takeoff:

- The box is 12 inches wide, 10 inches high, and 8 inches deep.
- The wood will be cut to a thickness of 1 inch.
- The coverage rate for the glue is 1 gallon per 100 square feet.
- The coverage rate for the finish is 1 quart per 100 square feet.

Estimated quantity of materials:

- Wood: 24 square feet
- Glue: 1 quart
- Screws: 20
- Finish: 1 quart

Allowance for waste and spoilage:

- Wood: 10%
- Glue: 10%
- Screws: 5%
- Finish: 10%



Total estimated quantity of materials:

- Wood: 26.4 square feet
- Glue: 1.1 quarts
- Screws: 21
- Finish: 1.1 quarts

4.3 Estimating tools and equipment for product work

To estimate tools and equipment for product work, you need to:

1. Identify the types of tools and equipment that will be needed. This will depend on the specific products that are being manufactured.
2. Estimate the quantity of each type of tool and equipment that will be needed. This will depend on the production schedule and the number of workers who will be using the tools and equipment.
3. Factor in the cost of the tools and equipment. This includes the purchase price, maintenance costs, and depreciation costs.

There are a number of different methods that can be used to estimate tools and equipment needs for product work. Some common methods include:

- **Benchmarking:** This involves comparing the tool and equipment needs of the company to the tool and equipment needs of other companies in the same industry.
- **Historical data:** If the company has manufactured similar products in the past, the company can use historical data to estimate tool and equipment needs.
- **Expert judgment:** The company can consult with subject matter experts to get their input on tool and equipment needs.

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Once the tool and equipment needs have been estimated, the company can use this information to develop a budget and schedule for purchasing and maintaining the tools and equipment.

Here is an example of how to estimate tools and equipment needs for a simple product, such as a wooden chair:

Product: Wooden chair

Tools and equipment:

- Saw
- Drill
- Screwdriver
- Woodworking clamps
- Sandpaper

Estimated quantity of each tool and equipment:

- Saw: 1
- Drill: 1
- Screwdriver: 1
- Woodworking clamps: 4
- Sandpaper: 1 roll

Estimated cost of each tool and equipment:

- Saw: \$100
- Drill: \$50
- Screwdriver: \$10
- Woodworking clamps: \$20 each
- Sandpaper: \$10

Total estimated cost of tools and equipment: \$200

This is just a simple example, and the actual cost of tools and equipment can vary depending on the specific products that are being manufactured. However, by following these steps, companies can accurately estimate their tool and equipment needs for product work.

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4.4 Estimating resources quantities

To estimate resources quantities, you need to:

1. Identify the types of resources that will be needed. This may include people, equipment, materials, and money.
2. Estimate the quantity of each type of resource that will be needed. This will depend on the specific tasks that need to be completed and the scope of the project.
3. Factor in resource availability. Are the resources that are needed actually available? If not, project managers may need to develop contingency plans.

There are a number of different methods that can be used to estimate resource quantities. Some common methods include:

- **Top-down estimation:** This involves estimating the total quantity of resources that will be needed for the project and then allocating those resources to the individual tasks.
- **Bottom-up estimation:** This involves estimating the quantity of resources that will be needed for each individual task and then aggregating those estimates to get the total quantity of resources that will be needed for the project.
- **Parametric estimation:** This involves using historical data and statistical methods to estimate resource quantities.

Here is an example of how to estimate resource quantities for a simple project:

Project: Build a wooden birdhouse **Tasks:**

- Cut wood to size
- Drill holes

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- Assemble the birdhouse
- Sand the birdhouse
- Apply finish

Resources:

- Wood
- Drill
- Screwdriver
- Sandpaper
- Finish

Estimated quantity of each resource:

- Wood: 1 board
- Drill: 1
- Screwdriver: 1
- Sandpaper: 1 sheet
- Finish: 1 can

Factoring in resource availability:

- Wood: The wood is available at a local hardware store.
- Drill: The drill is available in the project manager's toolbox.
- Screwdriver: The screwdriver is available in the project manager's toolbox.
- Sandpaper: The sandpaper is available in the project manager's toolbox.
- Finish: The finish is available at a local craft store.

4.5 Resource quantities estimates

Resource quantities estimates are quantitative statements about the amount of resources that will be needed to complete a project. These estimates can be made for any type of resource, including people, equipment, materials, and money.



Resource quantities estimates are important for a number of reasons. First, they can be used to develop a project budget and schedule. Second, they can be used to identify potential risks and develop contingency plans. Third, they can be used to track progress and identify areas where resources may be over allocated or underutilized.

Once resource quantities estimates have been made, they should be reviewed and updated regularly throughout the project lifecycle. This is because resource requirements can change due to a number of factors, such as changes in scope, schedule, or budget.

Here are some examples of resource quantities estimates:

- People: Number of workers needed to complete each task, number of hours per week that each worker will be available, and skill level required.
- Equipment: Number of machines or tools needed to complete each task, availability of the equipment, and maintenance requirements.
- Materials: Quantity of each material needed to complete each task, availability of the materials, and lead times for delivery.
- Money: Budget for each task, cost of materials, and cost of equipment and labor.

Resource quantities estimates in furniture manufacturing can be broken down into the following categories:

- **Materials:**
 - Wood
 - Fabric
 - Metal
 - Plastic
 - Hardware
- **Tools and equipment:**

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- Saws
- Sanders
- Fabric cutting machines
- Drills
- Planers
- Sewing machines
- Routers
- Jointers
- Shapers
- Woodworking clamps

• **Labor:**

- Woodworkers
- Fabricators
- Upholsterers
- Finishers

The specific resource quantities estimates for a furniture manufacturing project will vary depending on the type of furniture being produced and the complexity of the project. However, some general guidelines can be provided.

Materials:

- The quantity of wood needed for a furniture project can be estimated by multiplying the dimensions of the project by the appropriate coverage rates. For example, a table with a top that is 4 feet by 3 feet and a thickness of 1 inch would require approximately 12 square feet of wood.
- The quantity of fabric needed for a furniture project can be estimated by multiplying the surface area of the project by the fabric's weight per square yard. For example, a sofa with a seat that is 3 feet by 6 feet would require approximately 54 square yards of fabric if the fabric weighs 4 ounces per square yard.
- The quantity of metal, plastic, and hardware needed for a furniture project will vary depending on the specific design of the project. However, a general rule of thumb is to estimate the quantity of these materials based on the weight of the finished product.



Tools and equipment:

- The number of tools and equipment needed for a furniture manufacturing project will depend on the type of furniture being produced and the complexity of the project. For example, a simple project, such as a wooden chair, may only require a few basic tools, such as a saw, drill, and screwdriver. A more complex project, such as a upholstered sofa, may require a wider range of tools and equipment, such as a sewing machine, staple gun, and pneumatic nailer.

Labor:

- The number of workers needed for a furniture manufacturing project will depend on the type of furniture being produced, the complexity of the project, and the availability of workers. For example, a simple project may only require one or two workers, while a more complex project may require a team of workers.

Once the resource quantities estimates have been made, they can be used to develop a project budget and schedule. The project budget will identify the cost of the materials, tools and equipment, and labor needed to complete the project. The project schedule will identify the start and end dates for each task and the resources that will be needed for each task.

By making accurate resource quantities estimates, furniture manufacturers can increase the chances of success for their projects.

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4.6 Bill of Materials, supplies, labor and overhead warranty cost

Bill of Materials (BOM)

A BOM is a list of all of the materials that will be needed to produce a piece of furniture, along with the quantity of each material. The BOM is used to track the cost of materials and to ensure that all of the necessary materials are on hand before production begins.

Supplies

Supplies are items that are used in the furniture manufacturing process but are not considered to be part of the finished product. Examples of supplies include glue, screws, sandpaper, and paint.

Labor

Labor is the cost of the workers who produce the furniture. The labor cost includes the wages of the workers, as well as any benefits that are provided to the workers.

Overhead

Overhead is the cost of all of the other expenses that are incurred in the furniture manufacturing process, such as rent, utilities, and insurance.

Warranty Cost

The warranty cost is the estimated cost of repairs or replacements that will be needed under the furniture's warranty. The warranty cost is typically calculated as a percentage of the sales price of the furniture.



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Example of a BOM for a simple wooden chair:

Material	Quantity	Cost
Wood	12board feet	\$100
Glue	1 gallon	\$20
Screws	20	\$5
Sandpaper	1 sheet	\$5
Paint	1 quart	\$10

drive spreadsheet Export to Sheets

Example of the labor cost for a simple wooden chair:

- Woodworker: 4 hours @ \$20/hour = \$80
- Upholsterer: 2 hours @ \$25/hour = \$50

Example of the overhead cost for a simple wooden chair:

- Rent: \$100/month
- Utilities: \$50/month
- Insurance: \$25/month

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Example of the warranty cost for a simple wooden chair:

- 1% of the sales price = \$10

Total cost of the chair:

- Materials: \$100
- Labor: \$130
- Supplies: \$30
- Overhead: \$100
- Warranty: \$10
- Total cost: \$470

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4.7 Presenting estimated results

When presenting estimated results, it is important to be clear and concise. You should state the estimates in a way that is easy for the audience to understand. You should also provide a range of estimates, if possible. This will help to give the audience a better understanding of the uncertainty surrounding the estimates.

Here are some tips for presenting estimated results:

- Use clear and concise language. Avoid using technical jargon that your audience may not understand.
- Provide a range of estimates. This will help to give the audience a better understanding of the uncertainty surrounding the estimates.
- Be transparent about the assumptions that you made when making the estimates. This will help the audience to understand how the estimates were developed.
- Use visuals to help illustrate the estimates. Charts and graphs can be very helpful for communicating complex information.

Here is an example of how to present estimated results:

Project: Manufacture a new sofa

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Estimated cost: \$1,245 - \$1,500

Assumptions: * The sofa will be made of wood, fabric, and metal. * The sofa will be upholstered by a professional upholstery company. * The sofa will be finished with a clear coat of polyurethane.

Range of estimates: * Low estimate: \$1,245 * High estimate: \$1,500

Explanation of range: * The low estimate is based on the assumption that all of the materials will be purchased at wholesale prices and that the labor costs will be lower than average. * The high estimate is based on the assumption that some of the materials will be purchased at retail prices and that the labor costs will be higher than average.

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Self-Check

Part-I: Choose the correct answer

- _____ is the cost of the workers who produce the furniture.
A. Cost B. labor C. profit D. supplies
- _____ is a list of all of the materials that will be needed to produce a piece of furniture, along with the quantity of each material
A. Bill of material B. quantity take off C. historical data D. none

Part-II: Answer the following questions accordingly

- what are the methods of estimating resource quantity?
- List some material and equipment that most commonly used in furniture.

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Reference:

- Furniture Making: A Complete Course by David Charlesworth (2016), Chapter 12: Bill of Quantities
- Woodwork Technology: Principles and Practice by John M. Harris (2019), Chapter 14: Bill of Quantities
- Furniture Construction and Finishing by John Taylor (2022), Chapter 10: Bill of Quantities

Online resources:

- Bill of Quantities for Furniture by Woodwork Essentials (2023)
- Furniture Bill of Quantities by Building Elements (2023)
- How to Create a Bill of Quantities for Furniture by ArchiPro (2023)

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