Bamboo Product Processing

Level III

Based on May 2021, Version 2 Occupational standards

Module Title: - **Preparing Bill of Quantity**

LG Code: **IND MAC3 M03LO (1-4) LG (10-14)**

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Adama, Ethiopia

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LG#10	LO#1- Perform Estimation

Instruction Sheet

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

- Identifying Job requirements
- Estimating Quantities of materials and resources
- Estimating accurate time to complete work
- Reporting estimated materials and resources

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 job requirements from written or oral communication.
- Estimate quantities of materials and resource s required to complete works.
- Time needed to complete a work activity is estimated.
- Make accurate estimation for work completion.
- Report estimation of materials and resources to appropriate person.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets

Information -1 Identifying Job Requirements

1.1 Introduction

Job requirements

Job requirements are qualifications and skills necessary for a certain position usually written in form of a list that contains the most important qualifications that a candidate must possess in order to be able to perform certain job duties. Every position has different requirements, depending on the industry, how technical the work is and how competitive the job market is.

These qualifications include:

- Work experience - types and amounts (years) of work experience.
- Skills (soft skills and/or technical skills).
- Specific knowledge.
- Education level and type.
- Professional licenses, accreditations and certifications
- Personal qualities and attributes
- Languages.
- Physical abilities.

Figure 1 Types of job requirements

1.2 Importance of job requirements

Job requirements are **used to communicate employer's expectations from job seekers**. By laying out clearly defined job requirements, employers can attract the right type of candidates. Over or under qualified candidates will be turned away from applying, thus saving employers a lot of time and money in the long run.

1.3 How Material Requirements planning?

Material requirement planning is designed to answer three questions:

1. What is needed?
2. How much is needed?
3. When is it needed?

Material requirement planning works backward from a production plan for finished goods, which is converted into a list of requirements for the subassemblies, component parts, and raw materials needed to produce the final product within the established schedule.

In other words, it's basically a system for trying to figure out the materials and items needed to manufacture a given product. MRP helps manufacturers get a grasp of inventory requirements while balancing both supply and demand.

By parsing raw data: Like bills of lading and shelf life of stored materials. This technology provides meaningful information to managers about their need for labor and supplies, which can help companies, improve their production efficiency.

1.4 Steps of Material Requirements planning

The material requirements planning process can be broken down into four basic steps:

1. **Estimating demand and the materials required to meet it.** The initial step of the MRP process is determining customer demand and the requirements to meet it. Utilizing the bill of materials which is simply a list of raw materials, assemblies, and components needed to manufacture an end product MRP breaks down demand into specific raw materials and components.

2. **Check demand against inventory and allocate resources:** This step involves checking demand against what you already have in inventory. The MRP then distributes resources accordingly. In other words, the MRP allocates inventory into the exact areas it is needed.

3. **Production scheduling.** The next step in the process is simply to calculate the amount of time and labor required to complete manufacturing. A deadline is also provided.

4. **Monitor the process.** The final step of the process is simply to monitor it for any issues. The MRP can automatically alert managers for any delays and even suggest contingency plans in order to meet build deadlines.

Self-check -1	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the space.

Instruction: Short answer

1) Describe the importance of job requirements?

_____

_____

_____

2) Write the steps of material requirements planning?

_____

_____

_____

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet - 2: Estimating Quantities of Materials and Resources

2.1 Introduction

Estimating Resource

Estimating resource perform tasks estimates from the bottom up, meaning each task is given an estimate which is rolled up into the overall project estimate. Naturally, this is called ***Bottom up Estimating***. The goal of activity resource estimating is to assign resources to each activity in the activity list. There are five tools and techniques for estimating activity resources.

Expert judgment: means bringing in experts who have done the sort of work before and getting their opinions on what resources are needed.

Alternative analysis: means considering several different options for how you assign resources. This includes varying the number of resources as well as the kind of resources you use. Many times, there's more than one way to accomplish an activity and alternative analysis helps decide among the possibilities.

Published estimating data: Is something that project managers in a lot of industries use to help them figure out how many resources they need. They rely on articles, books, journals, and periodicals that collect, analyze, and publish data from other people's projects.

Project management: Project will often have features designed to help project managers estimate resource needs and constraints and find the best combination of assignments for the project.

Bottom-up estimating: Mean breaking down complex activities into pieces and working out the resource assignments for each piece. It is a process of estimating individual activity resource need or cost and then adding these up together to come

up with a total estimate. Bottom-up estimating is a very accurate means of estimating, provided the estimates at the schedule activity level are accurate. However, it takes a considerable amount of time to perform bottom-up estimating because every activity must be assessed and estimated accurately to be included in the bottom-up calculation. The smaller and more detailed the activity, the greater the accuracy and cost of this technique.

2.1 Estimating Quantities of materials

To estimate how much of each type of material should be need for a job, follow these steps.

Step 1 — Work out areas of boards

Start by working out the area of each of the boards that is needed. If more than one kind of board is needed, work out each type separately. To work out the area of the boards, write the measurements in meters, and then multiply them together as shown in the table below.

Components	Quantity and size	Calculation to work out area	Area (m^2)
Ends	2 x 1800 x 450	2 x 1.8 x 0.45	1.62
Top, bottom and shelves	5 x 900 x 450	5 x 0.9 x 0.45	2.025
Kicker	900 x 70	0.9 x 0.07	0.063
Back	900 x 1800	0.9 x 1.8	1.62
Doors	2 x 400 x 450	2 x 0.4 x 0.45	0.36

Step 2 - Work out total area of boards

Find the total area of board needed. Note that in this example; only one kind of board is needed. If more than one kind is needed, do a separate calculation for each type.

Component	Quantity and size	Calculation to work out area	Area (m^2)
Ends	2 x 1800 x 450	2 x 1.8 x 0.45	1.62
Top, bottom and shelves	5 x 900 x 450	5 x 0.9 x 0.45	2.025
Kicker	900 x 70	0.9 x 0.07	0.063
Back	900 x 1800	0.9 x 1.8	1.62
Doors	2 x 400 x 450	2 x 0.4 x 0.45	0.36
		Total:	**5.618**

Step 3 - Consider the standard sheet size

Veneer board comes in a standard sheet size of 1200 x 2400 or 2.88 m^2.

Divide the total area of board by 2.88 to work out the number of sheets needed.

5.618 ÷ 2.88 = 1.975

This is very close to 2 sheets. Round this up to 3 sheets to allow for waste.

Step 4 - Work out other quantities needed

Now work out the quantities of other materials you will need.

This is 16.9 Lm. Add 10% to allow for waste.

16.9 + 10% = 16.9 + 1.69 = 18.59

Step 5 - Write out your list of materials

List of materials needed looks like this:

Item	Quantity needed
Veneer board	3 sheets
Solid edging	19 Lm
Door handles	2
Hinges	4

Step 6 - Work out costs of each material

Find out the unit cost of each item and multiply this by the quantity needed.

Item	Quantity needed	Unit cost(birr)	Cost (Quantity x Unit cost)
Veneer board	3 sheets	1200	3600
Solid edging	19 Lm	0.70	13.30
Door handles	2	5	10
Hinges	4	3	12

Step 7 - Work out total cost

Add up the costs to find the total cost.

Item	Quantity needed	Unit cost (birr)	Cost (Quantity x Unit cost)
Veneer board			
Solid edging			
Door handles			
Hinges			
		Total:	**$395.30**

Self-check -2	Written test

Directions: Answer all the questions listed below.

Instruction: I fill the blank space

1. _____bringing in experts who have done the sort of work on what resources are needed.
2. _____means considering several different options for how you assign resources.
3. _____Project will often have features designed to help managers to estimate resource.

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself

Information Sheet – 3 Estimating Accurate Time to complete work

3.1 Introduction

People often underestimate the amount of time needed to implement projects, particularly when they're not familiar with the work that needs to be done. For instance, they may not take into account unexpected events or urgent, high-priority work; and they may fail to allow for the full complexity of the job. Clearly, this will likely have serious negative consequences further down the line.

Correct time estimates for project completion can improve professional status and reduce workplace stress. When the estimating time complete is accurate likely to be able to secure enough funding, personnel and materials to complete the project to the client's or employer's satisfaction, possibly leading to more project management opportunities in the future. A correct estimating time complete also helps project managers design fair scheduling. The members of the project are unlikely to need to work overtime to produce high-quality results and meet project deadlines, presenting a more satisfying working environment for them.

3.2 Why Estimate Time Accurately?

Accurate time estimation is a crucial skill in project management. Without accurate time estimation do not know how long the project will take, and you won't be able to get commitment from the people who need to sign it off.

How to Estimate Time Accurately?

Use these steps to make accurate time estimates:

Step 1: Understand What's Required:

Start by identifying all of the work that needs to be done within the project. Use tools such as **business requirements**, **analysis**, **work breakdown structures**, **gap analysis**, and **drill-down** to do this in sufficient detail.

As part of this, make sure that allow time for meetings, reporting c communications, testing, and other activities that are critical to the project's success.

Step 2: Order Activities:

- List all of the activities that identify in the order in which they need to happen.
- At this stage, don't need to add in how long should think activities are going to take. However, you might want to note any important deadlines. For example, you might need to get work by the finance department finished before it starts work on year-end.

Step 3: Decide Who You Need to Involve:

- You can do the estimates yourself, brainstorm them as a group, or ask others to contribute. Where you can, get the help of the people who will actually do the work, as they're likely to have relevant experience to draw upon. By involving them, they'll also take on greater ownership of the time estimates they come up with, and they'll work harder to meet them.

Step 4: Make Your Estimates:

You are now ready to make your estimates. We've outlined a variety of methods below to help you do this. Whichever methods you choose, bear these basic rules in mind:

3.3 Methods for Estimating Time:

- ***Bottom-Up Estimating:*** Bottom-up estimating allows creating an estimate for the project as a whole. To analyze from the "bottom up," break down larger tasks into detailed tasks, then estimate the time needed to complete each one. Because considering each task individually, the estimations of the time required for each one is likely to be more accurate. Add up the total amount of time needed to complete the plan.

- ***Top-Down Estimating:*** In top-down analysis, you develop an overview of the expected timeline first, using past projects or previous experience as a guide.

  It's often helpful to compare top-down estimates against your bottom-up estimates, to ensure accuracy.

To estimate time effectively, follow this four-step process:

1. Understand what's required.
2. Prioritize activities and tasks.
3. Decide who you need to involve.
4. Do your estimates.

Self-Check – 3	**Written test**

Directions: Answer all the questions listed below.

Instruction: I short answer;

1. Write and explain the methods to estimate time?
2. Write the steps of estimating the time effectively?
3. Explain the reasons why time is estimated accurately?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet -4 Reporting Estimated Materials and Resources

4.1. Material resource reporting

Resource reporting provides feedback of what is actually happening on the plant floor. It allows production activity control to maintain valid records of on-hand and on-order balances, job status, shortages, scrap, material shortages, and so on. Production activity control needs this information to establish proper priorities and to answer questions regarding deliveries, shortages, and the status of orders. Manufacturing management needs this information to make decisions about plant operation. Payroll needs this information to calculate employees' pay. Data must be collected, sorted, and reported. The particular data collected depend upon the needs of the various departments. The methods of data collection vary. Sometimes the operator reports the start and completion of an operation, order, movement, and so on, using an online system directly reporting events as they occur via data terminals. In other cases, the operator, supervisor, or timekeeper reports this information on an operation reporting form included in the shop packet. Information about inventory withdrawals and receipts must be reported as well. Once the data are collected, they must be sorted and appropriate reports produced.

Types of information needed for the various reports include:

- ✓ Order status.
- ✓ Weekly input/output by department or work center.
- ✓ Exception reports on such things as scrap, rework, and late shop orders.
- ✓ Inventory status.
- ✓ Performance summaries on order status, work center and department efficiencies, and so on.

Self- Check 4	**Written test**

Directions: Answer all the questions listed below.

1. Write the methods reporting estimated resources materials (points)

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet -4 Reporting Estimated Materials and Resources

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- ✓ Performance summaries on order status, work center and department efficiencies, and so on.

Self-check -4	**Written test**

Directions: Answer all the questions listed below.

2. Write the methods reporting estimated resources materials (points)

_____
_____
_____
_____

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Instruction Sheet

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

- Identifying type of project
- Listing required materials
- Determining Quantities of raw materials
- Determining finishing materials
- Determining Types and quantity 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 types of project based on design
- List required materials according to types of project
- Determine quantities of raw materials in size, height, width thickness, by using specific unit of measurement.
- Determine finishing materials of job requirement
- Determine types and quantity of assembling and fixing materials according to project design.

Learning Instructions

3. Read the specific objectives of this Learning Guide.
4. Follow the instructions described below.
5. Read the information written in the information Sheets
6. Accomplish the Self-checks

Information Sheet -1 Identifying type of project

3.1 Project Identification

Project identification is a process in the initiating phase of project life cycle for identifying a need, problem or opportunity. Once identified, a project is initially documented objectively defining what was identified. This identification can be the result of an organization's strategic planning, of a company's normal operations, as the response to an unexpected event, or to a need.

The key feature of this activity is recognizing that identifying candidate projects is something that an organization should do on a regular basis, not just once each year. Further, when examining projects for approval, it is vital to also examine the resource capacities and capabilities available for assignment. It is futile to assign a major new project requiring extensive discovery of business requirements if no business analysts are available. Project Identification precedes Project Initiation.

Before analyzing project identification, keep in mind that identifying projects more regularly may be easier if an organization implements project management tools

3.2 Project Identification Stage

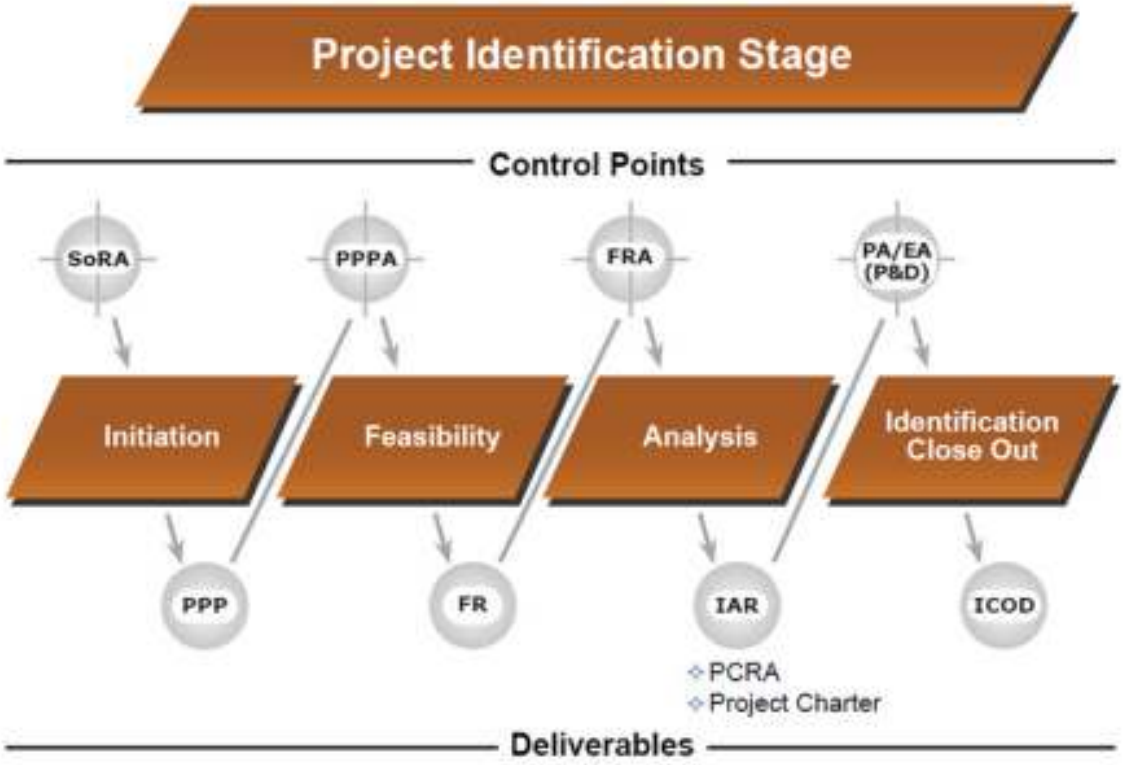

Figure 2Identification stage diagram

This image describes the project identification stage, its **phases**, **control points** and **deliverables**:

- **Phases**

✓ Initiation
✓ Feasibility
✓ Analysis
✓ Identification close out

- **Control points**

✓ Statement of requirements approval (SoRA)
✓ Preliminary project plan approval (PPPA)

- ✓ Feasibility report approval (FRA)
- ✓ Project approval/expenditure authority (planning and design) PA/EA (P&D)

- **Deliverables**

- ✓ Preliminary project plan (PPP).
- ✓ Feasibility report (FR).
- ✓ Investment analysis report (IAR).
- ✓ Project complexity and risk assessment (PCRA).
- ✓ Project charter.
- ✓ Identification closes out document (ICOD).

3.3 Steps in Identification of projects

Step 1: Identify & Meet with stakeholders:

A stakeholder is anyone who is affected by the results of project plan may include customers and end users. Identify all stakeholders and keep their interests while creating project plan. Meet with the project sponsors and key stakeholders to discuss their needs and expectations, and establish baselines for project scope, budget, and timeline. Then create a Scope Statement document to finalize and record project scope details, get everyone on the same page, and reduce the chances of miscommunication.

Step 2: Set & Prioritize Goals:

With a list of stakeholder needs, prioritize them and set specific project goals. These should outline project objectives, or the metrics and benefits to achieve. Write the goals and the stakeholder needs to address in the project plan so it's clearly communicated and easily shareable.

Step 3: Define Deliverables:

Identify the deliverables and project planning steps required to meet the project's goals.

Step 4: Create the Project Schedule:

Go through the each deliverable and define the series of tasks that must be completed to accomplish each one. For each task, determine the amount of time it will take, the resources necessary, and who will be responsible for execution.

Step 5: Identify Issues and Complete a Risk Assessment:

No project is risk-free. If there any issues, that will affect the project planning process. So, should know how to manage risk in a project and consider the steps you should take to either prevent certain risks from happening, or limit their negative impact. Conduct a risk assessment and develop a risk management strategy.

Step 6: Present the Project Plan to Stakeholders:

Explain how project plan addresses stakeholders' expectations, and present the solutions to any conflicts. Make sure that presentation isn't one-sided. Have an open discussion with stakeholders instead. Make project plan clear and accessible to all stakeholders. Housing all project plan data in a single location, like a collaboration tool, makes it easy to track progress.

Self-check -1	Written test

Directions: Answer all the questions listed below.

Instruction I Short answer

1. List a project identification stages?

   _____
   _____
   ____

2. Describe the steps of project identification?

   _____
   _____
   ____

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet -2 Listing required materials

2.1 Introduction

A material list is a predefined list of parts that may be referenced on an activity of a work order, production materials schedule, or standard work order to minimize data entry and ensure consistent material planning for jobs.

2.2 Bill of Materials

A bill of materials is an extensive list of raw materials, components, and instructions required to construct, manufacture, or repair a product or service. A bill of materials usually appears in a hierarchical format, with the highest level displaying the finished product and the bottom level showing individual components and materials.

Creating an accurate bill of materials is vital because it ensures that parts are available when needed as well as ensuring that the assembly process is as efficient as possible. If the bill of materials is not accurate, it can cause production to halt, which increases operating costs, as time is needed to locate missing parts, start another production order, or until the correct process of assembly is determined.

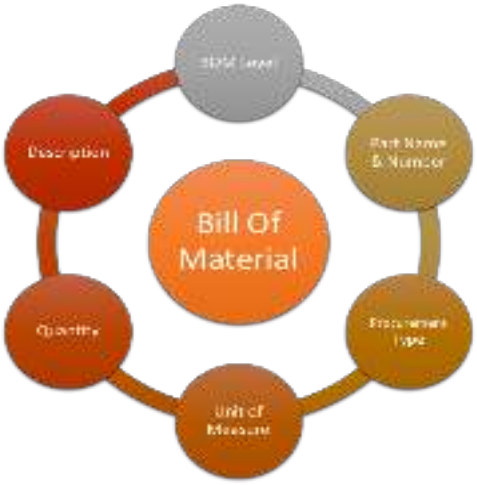

Figure 3 bill of material elements enter relation

A good bill of materials always includes certain essential elements:

- **Bill of material level:** Each part or assembly in the BOM must receive a number or ranking that explains where it fits into the BOM hierarchy. This makes it easier for anyone to understand the BOM.
- **Part number:** The BOM should assign a part number to each item, which allows anyone involved in the manufacturing cycle to reference and identify parts instantly. To avoid confusion, each part must receive only one part number.
- **Part name:** Each part, material, or assembly should also include a detailed, unique name that allows anyone to identify the part easily without having to reference other sources.
- **Phase:** Make sure to record the lifecycle stage of each part in the BOM. For example, for parts that are the process of being completed, a term like "In Production" can be used. Other terms, such as "Unreleased" or "In Design" can be used for parts that have not yet been approved. Such terms are especially helpful during new product introductions since they allow progress to be tracked easily.
- **Description:** A comprehensive, informative description of each material or part must be included. This description helps you and others identify parts and distinguish between similar parts and materials.
- **Quantity:** The number of each part used in each assembly must be specified in order for the BOM to serve as an accurate purchasing tool.
- **Unit of measure:** The BOM must specify what unit of measure is being used to quantify the part or material. Terms like "each," "inches," "feet," "ounces,"

and similar identifiers of quantity can be used. This information helps ensure that correct quantities are purchased and delivered to assembly lines.

- **Procurement type:** Each part should be identified as something that is purchased off the shelf or manufactured according to project specifications.
- **BOM notes:** Make sure to include any additional information that is necessary for those who will use the BOM.

Table 1 A sample form of a bill of materials:

No.	1	2	3	4	5	Part No.	Part name	Description	Qty	Measuring unit	Type
1						10-01	Leg, top, rail				
2											

Self-check -2	Written test

Directions: Answer all the questions listed below.

Instruction: I Short answer

1. List the essential elements in the bill of materials? (10 points)

_____

_____

_____

2. Write the functions of bill of material.

_____

_____

_____

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet -3 Determining quantities of materials

3.1 How to determine quantities of materials?

Raw materials are materials or substances used in the primary production or manufacturing of goods. Raw materials are commodities that are bought and sold on commodities exchanges worldwide. Traders buy and sell raw materials in the factor market because raw materials are factors of production, as are labor and capital.

3.2 Types of materials

- **Direct raw materials:** Direct raw materials are materials that companies directly use in the manufacturing of a finished product, such as bamboo, wood, metal. Direct raw materials are placed in current assets and are expensed on the income statement within cost of goods sold. Manufacturing companies must also take added steps over non-manufacturing companies to create more detailed expense reporting on costs of goods sold. Direct raw materials are typically considered variable costs since the amount used depends on the quantities being product.

- **Indirect raw materials**: Indirect raw materials are not part of the final product but are instead used comprehensively in the production process. Indirect raw materials will be recorded as long-term assets. They can fall under several categories within long-term assets, including selling, general, and administrative (SG&A) or property, plant, and equipment (PP&E). Long-term assets usually follow a depreciation schedule that allows them to be expensed over time and matched with revenue they help produce. For

indirect raw materials, depreciation timing will usually be shorter than other long-term assets like a building expensed over several years.

Examples of raw materials:

A company manufactures tables and chairs, and below are the materials used in production.

- **Direct raw materials**

✓ Bamboo, bamboo board, wood. etc
✓ Cushions and padding for the chairs
✓ Cloth fabric to cover the cushions

- **Indirect raw materials**

✓ Fittings and nails
✓ glue
✓ Equipment for the workers, such as gloves,

Since the wood, padding, and fabric can be directly tied to the production of the tables and chairs, they are considered direct raw materials. When calculating the cost on a per-unit basis, the direct raw materials could be traced to each unit.

The glue nails, and worker equipment would likely be considered indirect materials since the quantities used would not be significant, nor would they be directly tied to each unit produced.

Self-check -3	Written test

Directions: Answer all the questions listed below.

Instruction: I short answer

1. Write explain types of raw materials.(3 points)

Instruction: II chose the correct answer.(each questions has scored 3 points)

1. Which one of the following is a kind of direct raw materials?
   A. Bamboo pole C. Nail
   B. Glue D. All

2. Which one of the following is a kind of indirect materials?

   A. Machineries C. bamboo pole
   B. Fittings D. bamboo boards

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet – 4 Determining Finishing Materials

4.1. Determining finishing materials.

Finishing: The application of a protective or refining coating to bamboo is the final step in the making of fine bamboo products. To finish bamboo product processing can help bring out the grain and elicit a beautiful luster, while also providing protection to moisture, oils and other elements and making it easier to clean.

It is most commonly used to protect color or provide texture to objects. Paint finishing materials are intended mainly for painting operations. It makes possible a substantial reduction in the labor-intensiveness of finishing operations and an improvement in the protective and decorative properties of structures.

It usually consists of several coats of ***wax, shellac, drying oil, lacquer, varnish, or paint,*** and each coat is typically followed by sanding. Finally, the surface may be polished or buffed using steel wool, pumice, rotten stone or other materials, depending on the shine desired.

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Bamboo Finishes: Several Natural Solutions. Tung oil comes from the seed or nut of the tong tree.

- Beeswax. Beeswax has been used as a wood protector for years as well.

- Soy wax. Soy wax can be used in the same manner as beeswax.
- Linseed oil.
- Shellac.

The processes used in the manufacture of furniture include the cutting, bending, molding, laminating, and assembly of such materials as wood, metal, glass, plastics, and rattan. However, the production process for furniture is not solely bending metal, cutting and shaping wood, or extruding and molding plastics.

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Self-check -4	Written test

Directions: Answer all the questions listed below.

Instruction: I short answer

1. What are the finishing materials for beautifying bamboo product surfaces? (10 points)

_____
_____
_____
_____

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet – 5 Determining Types of Assembling and Fixing Materials

5.1 Introduction

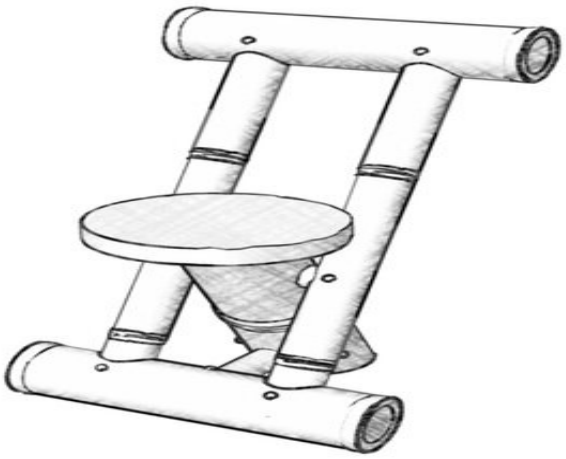
Bamboo products: most of products made from bamboo that is mostly used for main body. Bamboo used for best product and they are often used in combination with the less expensive raw materials.

Quantity: amount should be used when you are talking about a singular noun that can't be measured. Number should be used when you're referring to a singular or plural noun that can be counted. The value of a quantity is expressed as the product of a number and a unit, and the number multiplying the unit is the numerical value of the quantity expressed in that unit. The numerical value of a quantity depends on the choice of unit.

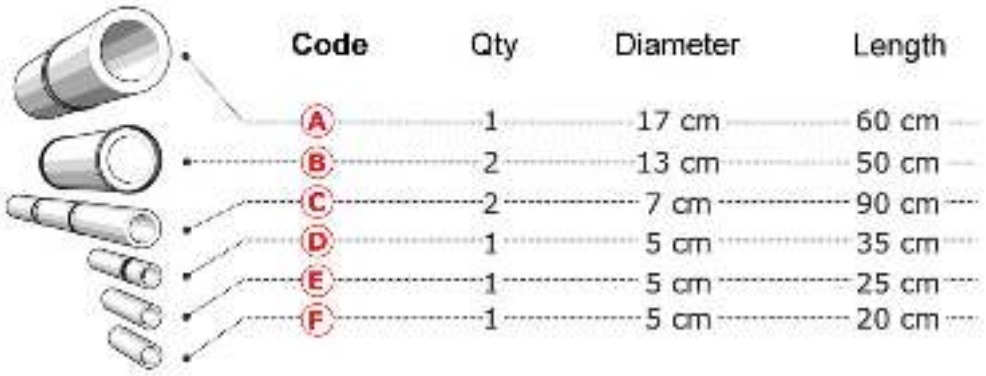
Required Quantity: In a unit price Contract shall mean the actual quantity of any item of work or materials which is required to be performed or furnished in order to comply with the Contract.

5.2 Assembling and fixing Materials

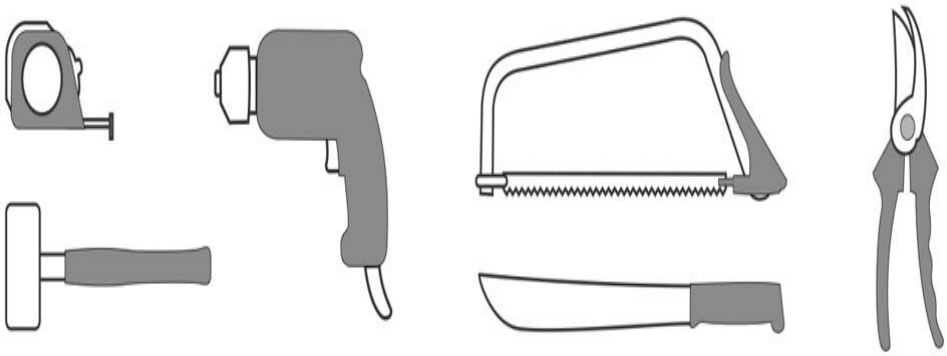
This shows you how to assemble a bamboo chair with very basic hand tools and using fixing materials.



- **Inventory of Materials**

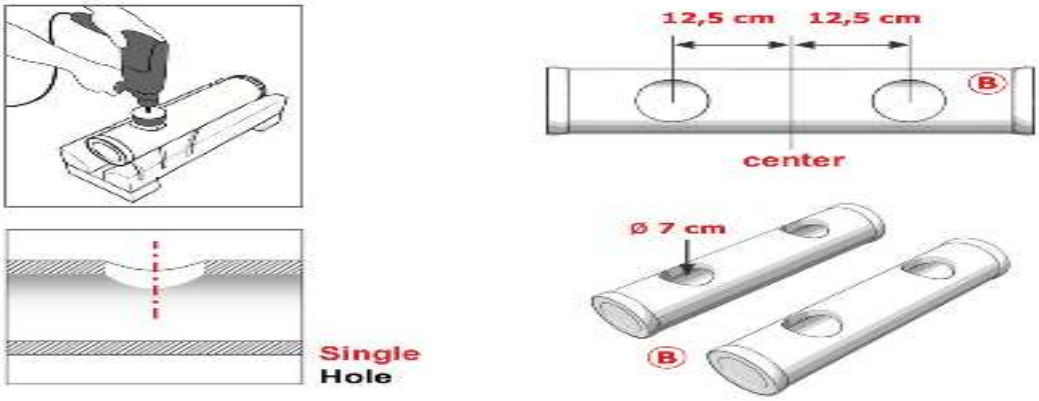


- **Tools Needed**



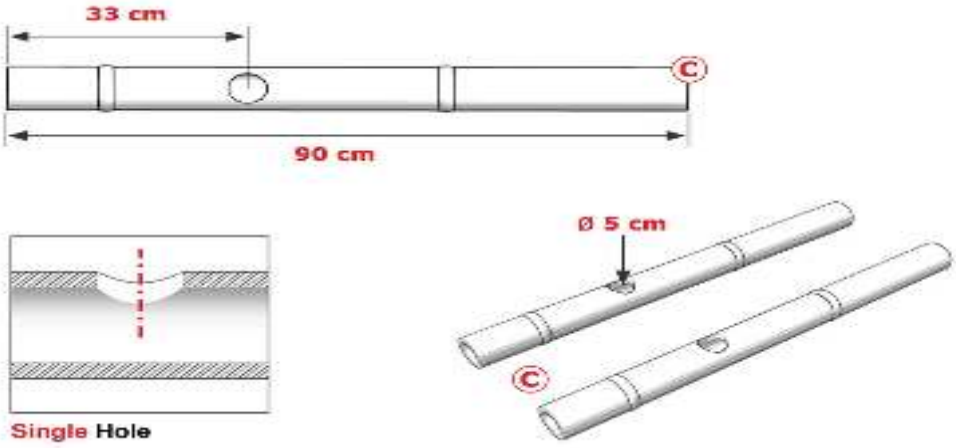
Step 1: Drilling Single Holes in the Bamboo Chair Crossbars

Mark the center of each crossbar **(B)** and drill two holes at 12.5 cm left and right from the center. Each hole should have a diameter of 7 cm with a total of 25 cm between them.



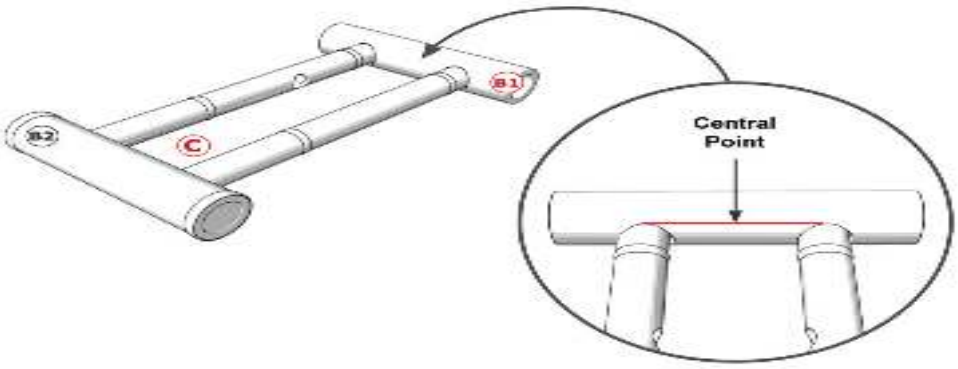
Step 2: Drilling a Single Hole in Each Chair Frame Rail

Drill a single hole in each frame rail **(C)** at 33 cm from the end of the bamboo pole. The hole should have a diameter of 5 cm.



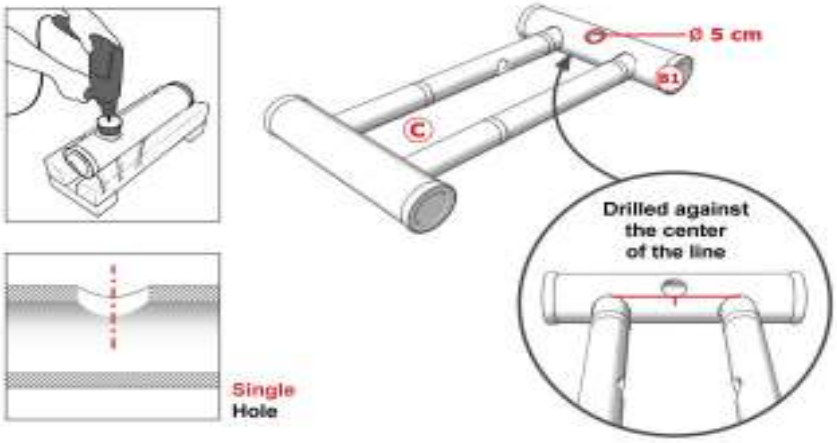
Step 3: Marking of the B1 Crossbar

Place frame rails **(C)** of the bamboo chair into the crossbars **(B)** so they form a closed frame. Draw a line on one of the crossbars **(B1)** that connects the outside of the frame rails and then mark the center.



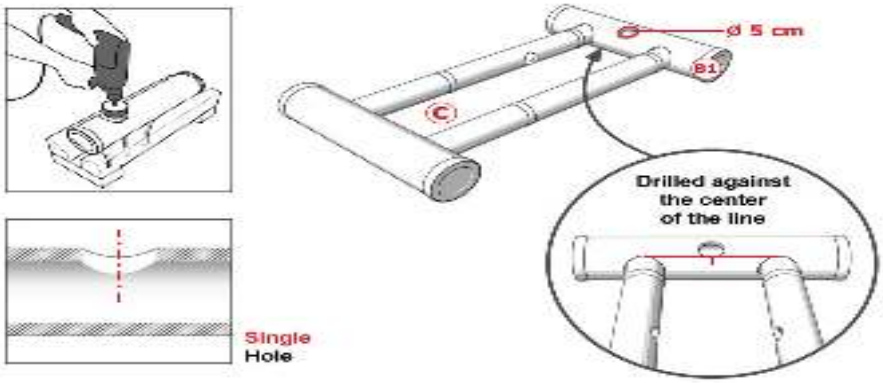
Step 4: Drilling a Single Hole in the B1 Crossbar

Drill a single hole in the crossbar **(B1)** of 5 cm diameter. The hole must be drilled so it touches the previously marked line and not through the line



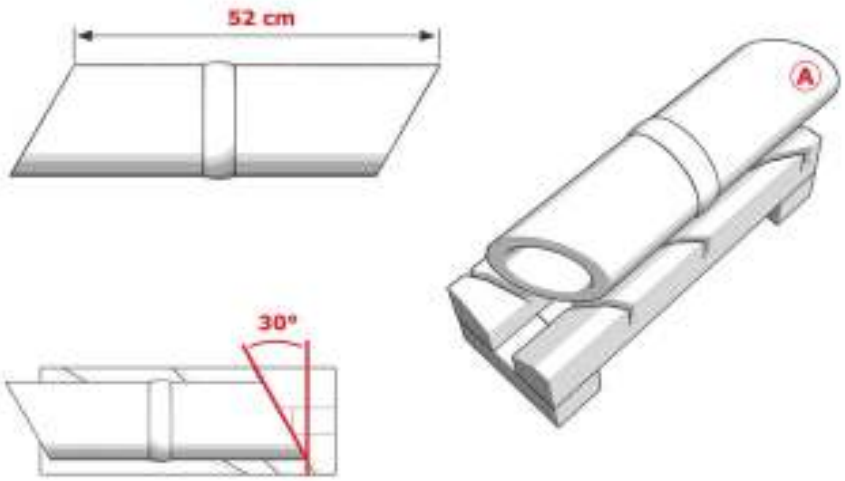
Step 5: Making a First Cut in the Center Chair Support

Place the center support **(A)** in a miter box or workbench and cut the end of the bamboo pole at a 30 degree angle.



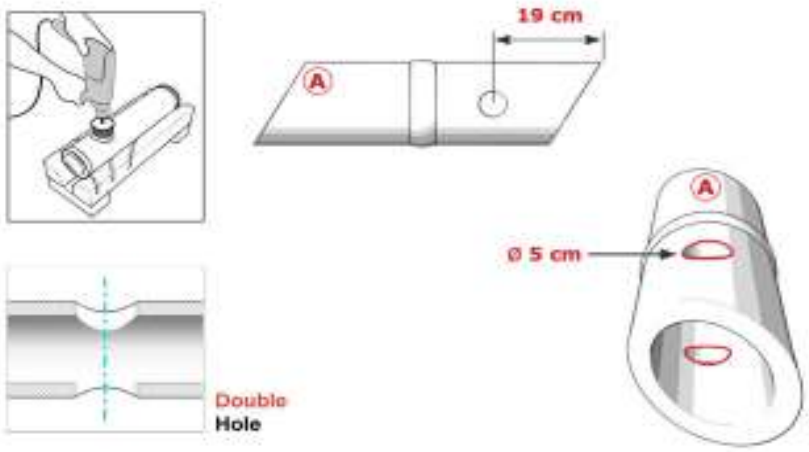
Step 6: Making a Second Cut in the Center Chair Support

Place the other end of the center support **(A)** in the miter box or workbench and make another 30 degree cut at 52 cm from the previous one.



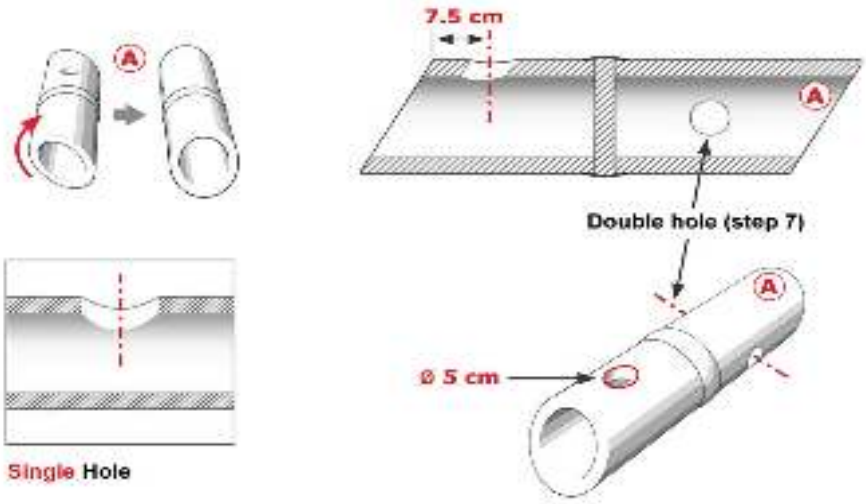
Step 7: Drilling a Double Hole in the Center Chair Support

Drill a hole of 5 cm diameter through both sides of the center support **(A)**. The center of the hole should be 19 cm from the far end of the bamboo pole.



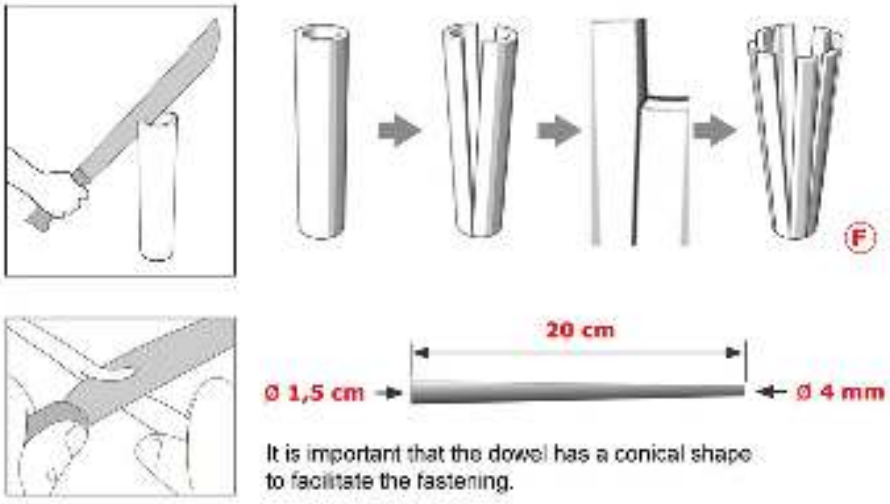
Step 8: Drilling the Bottom Hole in the Center Chair Support

Rotate the center support **(A)** 90 degrees and drill another hole of 5 cm diameter at a distance of 7.5 cm from the nearest end.



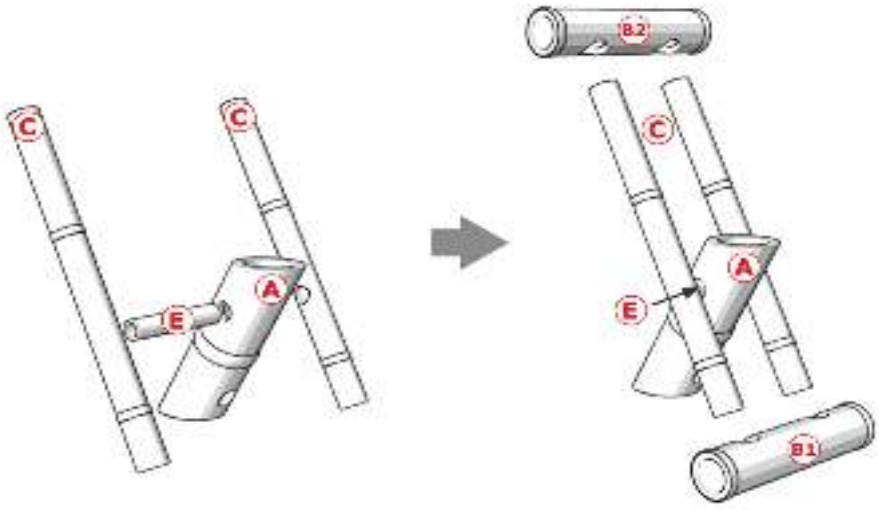
Step 9: Making Bamboo Dowels

Cut bamboo pole **(F)** lengthwise into at least 8 parts. Each of these portions must be thinned to form dowels of 20 cm long and 1.5 cm in diameter at one end and 4 mm at the other end.



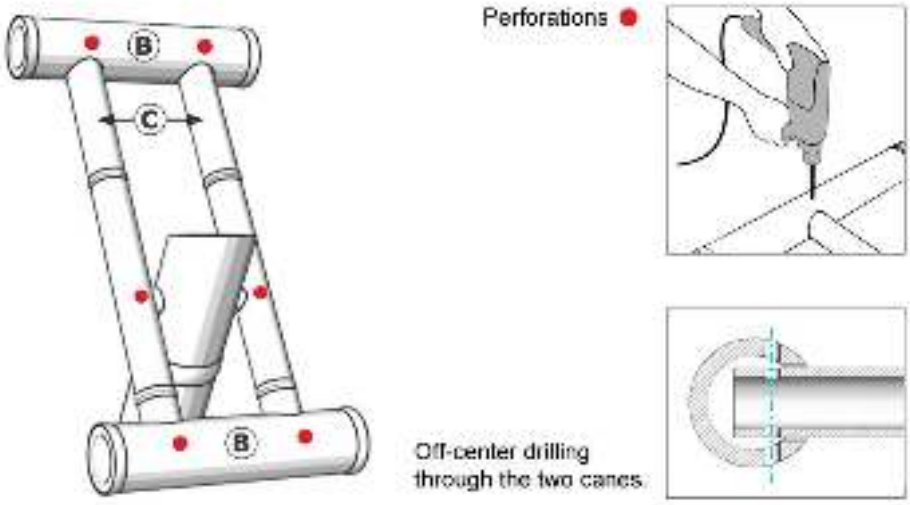
Step 10: Assembling the Bamboo Chair

Insert bamboo cane **(E)** through the side holes of the center support **(A)**. Next, place the side frame rails **(C)** and finish by mounting the crossbars **(B)** over the frame rails **(C)**.



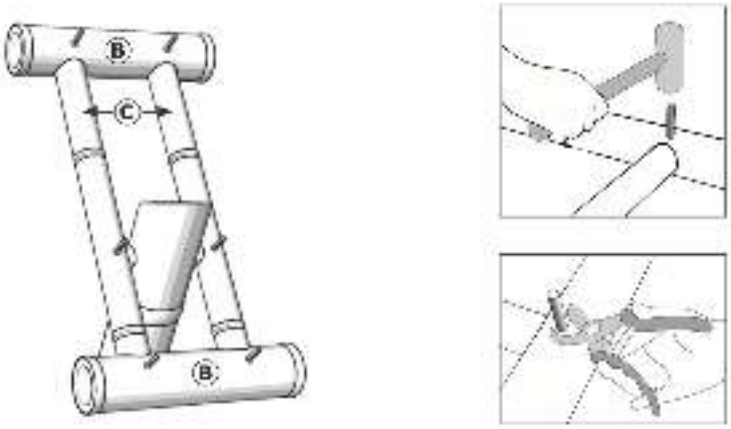
Step 11: Drilling Holes for the Bamboo Dowels

Make 6 perforations of approximately 8 mm diameter that cross the junctions between parts **(B-C)** and **(C-E)**. Drill the perforations towards the junctions and not in the center of the bamboo canes. This will make the joints much stronger.



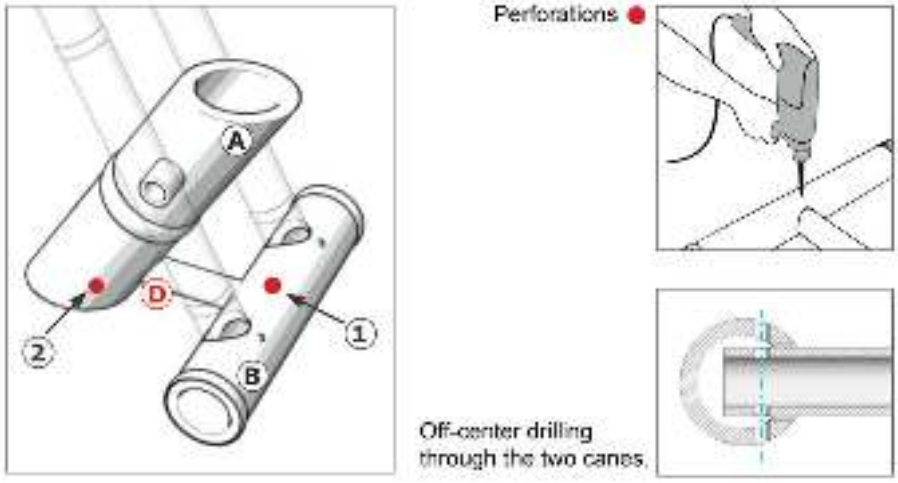
Step 12: Inserting the Bamboo Dowels

The dowels are struck with a mallet until they come out at the other end of the perforations. Once the dowels are inserted properly the excess is cut off. A drop of wood glue may be used, although not necessary.



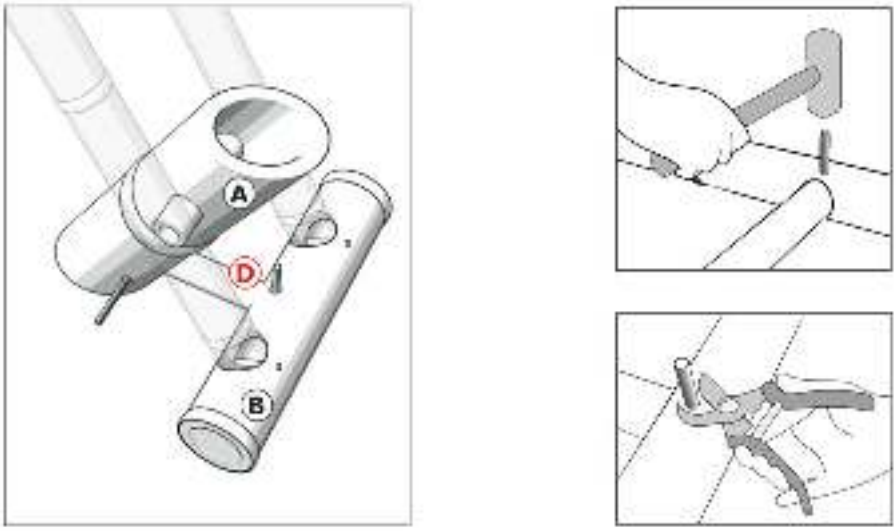
Step 13: Drilling Holes in Bamboo Cane (D)

Place bamboo Culm **(D)** and drill perforations for the dowels. The first perforation **(1)** is made vertically between bamboo Culm **(D)** and crossbar **(B)**. The second perforation is made horizontally between bamboos cane **(D)** and center support **(A)**.



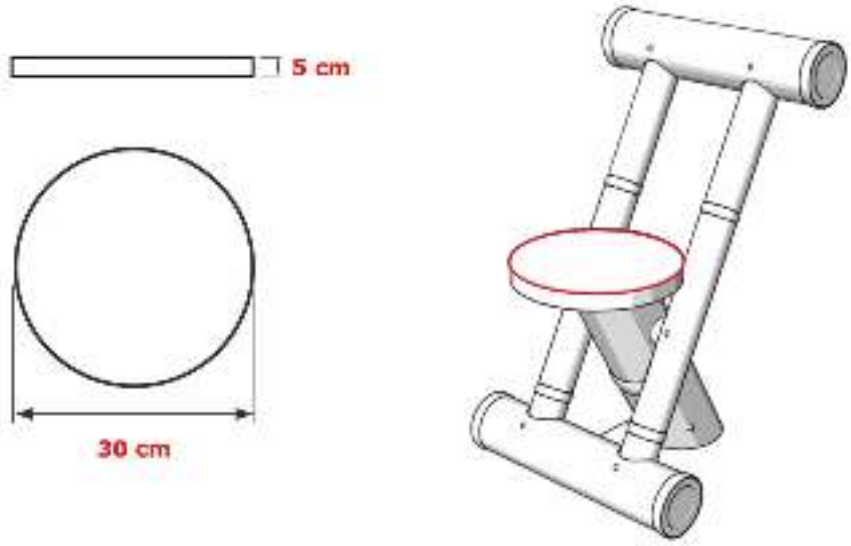
Step 14: Inserting Dowels in Bamboo Cane (D)

Strike the dowels with a mallet until they come out at the other end of the perforation and cut off the excess.

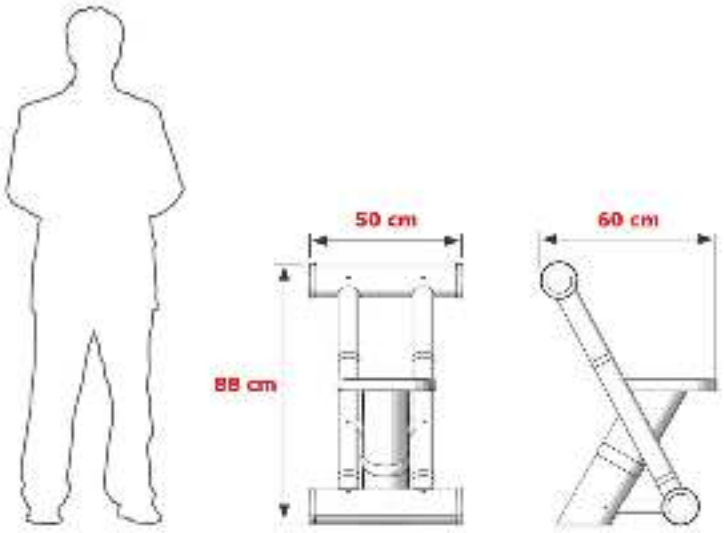


Step 15: Placing the Seat

The seat can be made from wood with a thickness of 5 cm and a diameter of 30 cm.



Dimensions of the Bamboo Chair



Self-check -5	Written test

Directions: Answer all the questions listed below (each question has 3 point)

1. Describe the basic material for assembling bamboo product.

   _____

   _____

   ____

2. What are the materials for fixing bamboo product?

   _____

   _____

   ____

3. Write the steps for assembling and fixing the chair.

   _____

   _____

   ____

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

LG#12	LO#3- Calculate resource Requirements

Instruction sheet

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

- Ascertaining System and units of measurement
- Calculating and finalizing type and quantity of supplies, materials and labor required
- Obtaining cost supplies and materials from suppliers
- Calculating material quantities

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:

- Ascertain followed systems and units of measurement.
- Calculate and finalize types and quantity of supplies materials and labor required work in line with job requirements
- Obtain cost of supplies materials from supplier.
- Calculate material quantities for the job using appropriate factors or formula
- Record and confirm the results.

Learning Instructions:

1.5 Read the specific objectives of this Learning Guide.
1.6 Follow the instructions described below.
1.7 Read the information written in the information Sheets
1.8 Accomplish the Self-checks

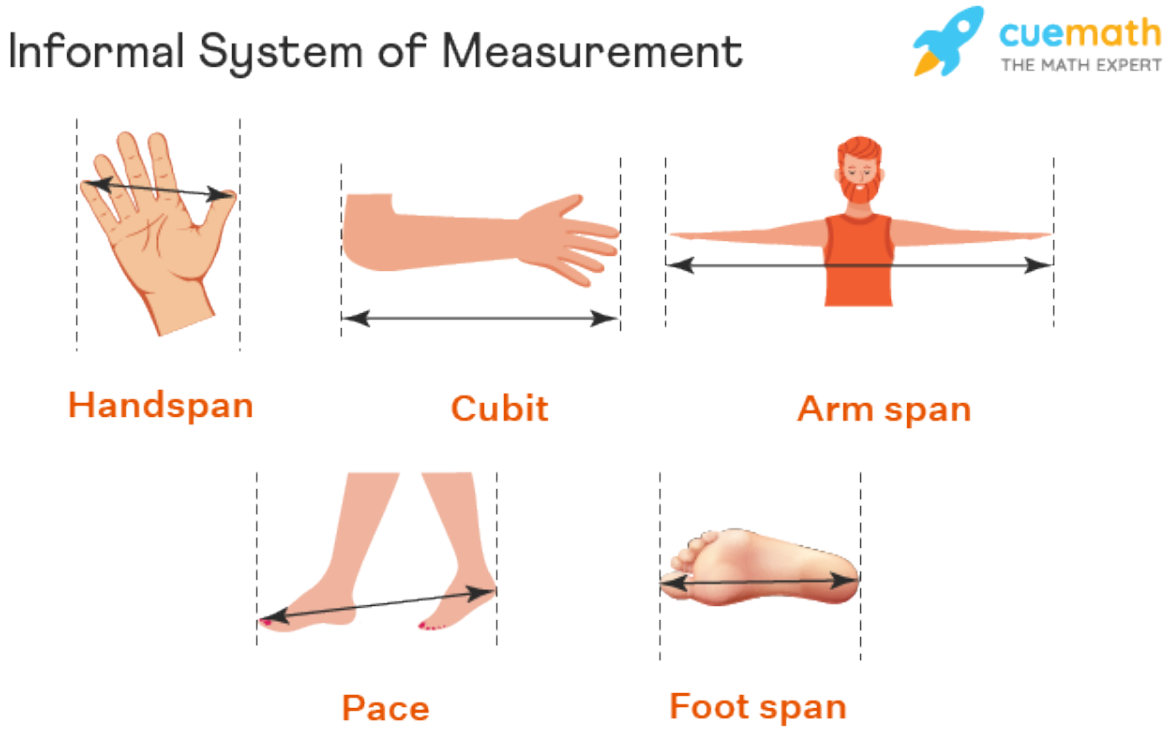
Information Sheet – 1 Ascertaining System and units of measurement

3.1 **Introduction**

System of measurement refers to the process of associating numbers with physical quantities and phenomena. It is more like a collection of units of measurement and rules relating them to each other. The whole world revolves around measuring things! Everything is measured: the milk you buy, the gas you fill for the vehicle, the steps you walk. Even our productivity is measured in terms of productivity indexes on how productively we work. Systems of measurement are very important and define and express the different quantities of length, area, volume, weight, in our day-to-day communications. The system of measurement is based on two important foundation pillars of defining the basic unit of measurement, and the measure of conversion from the basic unit to other related units.

3.2 What is system of Measurements?

Measurement systems are a collection of units of measurement and rules relating them to each other. The word “measurement” is derived from the Greek word "**metron**," which means a limited proportion. This word also finds its roots in the words "moon" and "month", possibly because astronomical objects were among the first methods to measure time. In the old days, we used body parts for informal measurement systems like foot length, cubit, hand span, etc. which were not so accurate and vary from person to person. A system of measurement like the International System of Units called the SI units (the modern form of the metric system), Imperial system, and US customary units were standardized across the world.



Metric Measurement

A metric system is a system of measurement based on the standard units as a meter for length, kilogram for mass, and liter for volume. It was introduced in France in the 1790s and is now being used officially by many countries around the world. The metric system is based on the international decimal system. The base units used in the metric system are used to derive higher and lower units of measurement. Often the required unit is either larger or much small than the defined units. Let us now look at the below described, different systems of measurement.

Metric System:

The units of the metric system, originally taken from observable features of nature (basically what we normally measure like the time, length, mass, etc. are defined by seven physical constants with numerical values in terms of the units. Metrics systems evolved and over time are universally accepted as the International System of Units called the SI System. Many countries follow this

system.

Systems of Measurement

The metric system has three main units namely **meter** (m) to measure the length, **kilogram** (Kg) to measure the mass, and **seconds** to measure time.

- **Meter:** Length is measured in meters. The unit is denoted by the alphabet (m). Look at the chart below. The base unit is "m" and we add "Deca," "Hecto," and "Kilo" to measure large units by successively multiplying by 10 and "deci," "centi," and "millie" successively dividing by 10, to measure smaller length. We can use a simple ruler to measure length. For example, a pencil measured on a ruler would be 10 cm long.

- **Kilogram:** Mass is measured in kilograms and the unit is denoted by (kg). It tells us how heavy or how light an object is. We can multiply and divide the base units to measure smaller and bigger units. In general, for our convenience, we use gram, kilogram, and milligram. Other units are hardly used. We use a weighing scale to measure how heavy things are. A weighing scale is used in supermarkets to weigh groceries. A doctor also used a weighing scale to find the weight of a person.

Other Metric System of Measurements

Though we are aware of the basic defined metric systems for length, mass, volume, but there are numerous other quantities in the physical world, for which we need to define the base unit. Quantities like, force, power, area, magnetic intensity, have their own individual units, which have been derived from the basic 7 quantities of the metric system of measurement. Such quantities of the basic system are sometimes not sufficient to overcome the challenges of studying and measuring other higher quantities existing in physics. Here we shall look at some of the other important physical quantities and their units.

- **Area:** The area is the space occupied by a two-dimensional shape or figure. The area is measured in square units like sq. cm or cm^2, sq. m or m^2, sq km or km^2, etc.

Let us look at the below example.

If the area of each square is 1 cm^2.

- ✓ The area of shape A = 1cm^2.
- ✓ Area of shape B = (1+1) = 2 cm^2.
- ✓ Area of shape C = (1+1+1) = 3 cm^2.
- ✓ Area of shape D = (0.5 +1 +0.5) = 2 cm^2.

Now that you know what an Area is, let us learn how to find the Area of Triangle, Area of a quadrilateral, Area of Circle.

- **Volume**: It is the space enclosed or occupied by any three-dimensional object or solid shape. It has length, width, and height. It is measured in cubic units like cm^3, m^3, etc. and liquid volume is measured in liters.

Let us look at a simple example.

The initial volume of water in the container is 20 units. The volume of water when the object is placed inside the container 30 is units.

Therefore, the Volume of the object is the difference between the two volumes, that is, 30-20 = 10 units.

- **Length:** The four most commonly used measures of lengths are inch, feet, yards, miles. Let us look at the conversions from one unit to another. 1 inch = 2.54 cms. 1 foot = 12 inches. 1 yard = 3ft or 36 inches. 1 mile = 1760 yards(5280 ft), (1 metrics 1.609344 km.)

Conversions from One System of Measurement to Another

The conversion of length, mass, area, volume from one system of measurement to another system of measurement is very helpful to identify the units. In the below set of tables, we have listed the different units of length, area, volume, mass from US standard measurement to the metric measurement system. Please find below the different units of conversion of length from US

standard measurement to the metric measurement system.

Length Conversions	
US standard meaurement	Metric Measurement
1 inch	2.54 cm
1 ft	0.3048 m
1 yard	0.914 m
1 mile	1.609 km

Volume(capacity) Conversions	
US standard measurement	Metric measurement
1 fluid ounce	29.573 ml
1 fluid pint	0.473 l
1 fluid quart	0.946 l
1 gallon	3.785 l

Area Conversions	
US standard measurement	Metrics measurement
1 sq.in	6.45 sq cm
1 sq ft	0.929 sq.m
1 sq yd	0.836 sq m
1 acre	4046.86 sq m

Conversion of Units Measurements

Different units are used to measure different quantities. Let us explore the units used to measure the following:

- ✓ Length
- ✓ Temperature
- ✓ Area
- ✓ Volume
- ✓ Weight

Quantity	Units
Length	inch (in), feet (ft), yards (yd), miles
Temperature	Kelvin (K), Fahrenheit (F), Celsius (C)
Area	Square Inch, Square Feet, Acre, Square Yard, Square Mile
Volume (Capacity)	Fluid Ounces (fl oz), pint (pt), quarts (qt), gallons (gal)
Weight (Mass)	Ounces, Pounds (lb), Tons

Measurement of weight

The concept of measurement begins by making children understand the different parameters on which objects are measured. In Grade K children learn how an object can be described using its length, weight and capacity using simple terms like heavy & light, tall & short, big & small. An understanding of these concepts would set the stage for understanding the measurement of objects using standardized units.

Formula

The relationship between units of measurement.

Following facts:

1000 milligrams = 1 grams (gm)

1000 grams = 1 kilogram (kg)

Using this fact, they would be able to convert the weights. Add and subtract weights. A thorough understanding of the conversion of units can be built by exposing children to real life situations where measuring converting and figuring out the solution happens.

System of Measurement Examples

Example 1: Using the system of measurement, determine how many feet are there in 6 miles?

Solution:

From the conversion chart above, we can see that 1 mile = 5280 ft. Thus, in 6 miles there is 6 × 5280 = 31,680 ft. Therefore,6 miles = 31,680 feet.

Example 2: Adem measured 3 inches in his inch scale. How many centimeters will it be approximately equal to?

Solution:

Using system of measurement, we have 1 in = 2.54 cm. Thus, 3 in = 3 × 2.54 = 7.62 cm. Therefore, 3 inches =7.62 cm.

Example 3: Which of the following weighs the heaviest? (a) a sack of wheat weighing 12 kg (b) a bag of rice weighing 0.15 tons (c) a box of corn weighing 100 pounds. Use system of measurement to find the answer.

Solution:

We know that 1 pound is roughly 1/2 kg. Hence 100 pounds is approximately 50 kg. 1 ton is roughly 1000 kg. 0.15 tons is approximately 150 kg. So, a bag of rice weighing 0.15 tons weighs the heaviest. Therefore, a bag of rice of 0.15 tons weighs the heaviest.

Example 4: A football ground exactly measures 1.32 acres in size. Using the system of measurement, determine how many square feet does it measure?

Solution:

We know that,1 acre = 43560 sq ft.Thus, 1.32 acre = 1.32 × 43560 = 57499.2 sq. ft. Therefore, 1.32 acres = 57499.2 sq.ft

Example 5: Water boils at 100 degrees Celsius. What is the temperature in degrees Fahrenheit?

Solution:

As per the measurement system, Fahrenheit = 9/5 × C +32. Substituting C = 100, we get, F = 9/5 ×100 +32. Simplifying it further, we get, F = 9 × 20 +32 = 180 + 32 = 212.F. Therefore, 100 Celsius is equal to 212 Fahrenheit.

Self-check -1	**Written test**

Directions: Answer all the questions listed below.

Test I: Short Answer Questions (5 points)

1. _____is the space enclosed or occupied by any three-dimensional object or solid shape.
   B. Volume B. Length C. Area D. weight

2. Length is measured in_____.

C. Kilogram C. kilo meter

D. Gram D. All

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Score = _____
Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet – 2 Calculating and Finalizing type and Quantity of Supplies, Materials and Labour required

2.1 Calculations for Direct Materials and Labour

Introduction

Labor and materials," also known as **time** and **materials**, is a phrase in a companies in which an employer agrees to pay the contractor based on the amount of time spent by the contractor's employees to perform the work and for the materials used in the project.

Estimate the labour Required to manufactured a product

Within the labor category, there is direct labor and indirect labor. Direct labor goes directly into the product, while indirect labor contributes to the company's overall labor requirement.

Estimating the direct labor to build a product requires the small-business owner to break down the labor categories into two major components: **Engineering** and **manufacturing**.

Engineering laborers are the people who design and test manufacturing laborers are the people who build the product. Correctly identifying labor cost components boosts the small-business owner's bottom line by making project estimates more accurate, enabling better planning and accounting.

Direct Labor Cost?

Direct labor refers to anyone directly involved in the manufacturing product.

This includes the cost of wages and benefits for employees including the:

- ✓ Foreman
- ✓ Laborer

Direct labor cost will be figured by determining how much it costs per day to have each employee on the job. This number will then be multiplied by how many days the job will potentially take.

A materials quantity variance compares the actual and expected direct material used in manufacturing a product. You have an unfavorable materials quantity variance

when you use more material than expected. It's favorable when you use less material than planned.

Labor cost may be affected by:

- The efficiency of manufacturing methods.
- The need or lack of need, for overtime hours.
- The level of quality control you choose to implement on a specific project.

2.2 What Is Included in Material Cost?

Material cost includes all the tangible items that go into the finished product.

When calculating material costs, both indirect and direct materials will be taken into consideration.

Direct material includes things such as:

- ✓ Bamboo, wood, plywood glue and like that
- ✓ Transportation expenses

Indirect material includes items like:

- ✓ Nails
- ✓ Screws
- ✓ Fasteners

The cost for any equipment that you will need to lease should also be factored into the materials cost. In addition, some contractors will choose to include the cost of materials delivery and potential wastage in their material costs totals.

Calculate materials quantity:

Before you start production, estimate the amount of direct material used in one product or manufacturing run. Businesses that use the standard costing system to value inventory need to estimate standard prices and quantities for all direct

materials. You'll use those figures to track the manufacturing process in your accounting software. Direct materials move from raw materials to work in process to finished goods as they're transformed into saleable products.

Self-check -2	Written test

Directions: Answer all the questions listed below.

Test I: Short Answer Questions (7 points)

1. _____ are the people who design and test manufacturing.

2. _____ refers to anyone directly involved in the manufacturing product.

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet – 3 Obtaining Cost Supplies and Materials from Supplier

3.1 Introduction

Suppliers are essential to almost every business. Without raw materials to make what you sell or manufacturers to provide what you resell, you will have a tough time

growing. There are also many supplies and services for business consumes as part of general overhead.

Suppliers and vendors-the terms are used interchangeably here-can do much more than merely supply you with the materials and services need to do business. They can also be important sources of information, helping you evaluate the potential of new products, track competitors' actions and identify promising opportunities. Vendors can turn into partners, helping you cut costs, improve product designs and even fund new marketing efforts. If you don't make selecting good suppliers and vendors a part of the growth plan and likely to regret it.

3.2 Obtaining Supplier

When the purchasing department receives a duly authorized purchase requisition, a source of supply has to be selected. The purchase department generally maintains a list of suppliers for each type of material and selects a particular supplier after inviting tenders.

The important rule is to buy the best quality materials at the lowest possible price after giving due consideration to delivery dates and other terms of purchases. Purchase should be made from dependable sources of supply and ethical standards in dealing with suppliers should be maintained.

Material cost: is the cost of materials used to manufacture a product or provide a service. Excluded from the material cost are all indirect materials, such as cleaning supplies used in the production process. Add the standard amount of scrap associated with manufacturing one unit.

Job costing: method of costing can be used in furniture manufacture industry. A job card is made for each work or job. This method of costing is used in the factories which produce the machine tool and other engineering products, furniture projects, hardware and interior decoration.

Following this summary of the different types of costs are some examples of how costs are used in different business applications.

- ✓ Fixed and Variable Costs.
- ✓ Direct and Indirect Costs.
- ✓ Product and Period Costs.
- ✓ Other Types of Cost.
- ✓ Controllable and Uncontrollable Costs
- ✓ Out-of-pocket and Sunk Costs.

Start with the Beginning Raw Materials Inventory value and add all raw materials purchased during the selected accounting period. Then, subtract the ending inventory value. This is the valuation of the direct materials used in production. Next, add the value of the direct labor and factory overhead.

The types are:

- ✓ Fixed Costs
- ✓ Variable Costs
- ✓ Semi-Variable Costs.

A unit of production for which the management of an organization wishes to collect the costs incurred. In some cases the cost unit may be the final item produced, for example a chair or a light bulb, but in other more complex products the cost unit may be a sub-assembly, for example an aircraft wing or a gear box.

Cost Classification: refers to a complete and transparent idea of separation of expenses in the different sector as like manufacturing cost, product cost, sunk cost, variable cost, direct cost, and indirect cost.

Price: the amount of money that has to be paid to acquire a given product. Insofar as the amount people are prepared to pay for a product represents its value, price is also a measure of value.

Purchase order and follow-up

When the supplier has been selected, the most common procedure is the preparation of a purchase order. The purchase order is the form used by purchasing department authorizing the suppliers to supply the specified materials at a price and terms stated in.

A purchase order should be carefully prepared as it forms a basis of legal contract between the parties concerned. For this reason, authority to sign purchase orders should also be restricted to selected responsible officials

FORMAT OF PURCHASE ORDER

ABC Co. Ltd.

Supplier..... No.....

..... Date.....

Please supply the following materials subject to the term and conditions given on the reverse side of this purchase order.

Quantity	*Description*	*Rate*	*Amount*

Please quote purchase order no. on all advice notes and invoices

Place of Delivery.....

Date of Delivery.....

Terms of Payment.....

.....

Purchase Manager

Fig Purchase order format for supplier

Self-check -3	**Written test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Instruction: 1 Fill the blank space

1. _____ is the cost used to manufacture a product or provide a service**(5points)**
2. _____the amount of money that has to be paid to acquire a given product**.(each 5%point)**
3. _____method of costing can be used in furniture manufacture industry**.(each 5%point)**

Score = _____
Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet – 4 Calculating Material Quantities

4.1. Calculating material quantities correctly using appropriate.

Job costing: method of costing can be used in furniture manufacture industry. A job card is made for each work or job. This method of costing is used in the factories which produce the

machine tool and other engineering products, furniture projects, hardware and interior decoration.

Steps to estimate the direct material costs:

1. Find the total amount to be produced.
2. Calculate the total amount of raw materials required to produce the order size.
3. Multiply that amount by the cost associated with the raw materials.
4. If there is a waste or scrap, its cost should be added to the costs

Determine how many items were produced within the same time period. Divide the total manufacturing costs by the number of items produced to arrive at the production cost per unit.

For purposes of inventory calculation, the direct materials account includes the cost of materials used rather than materials purchased. To calculate direct materials, add beginning direct materials to direct materials purchases and subtract ending direct materials.

The formula for conversion costs is as follows:

Conversion costs= Direct Labor + Manufacturing Overheads.

inches----------	Centimeters
1 in----------	2.54 cm
2 in----------	5.08 cm

3 in----------	7.62 cm
4 in----------	10.16 cm

Direct manufacturing labor costs: are associated with the laborers in your factory who work on the goods you're manufacturing directly. It's important to measure this cost for a small business, because this is pretty much a direct measure of how much of your manufacturing **costs** are for paying your laborers.

Total Indirect Cost = Total Indirect Manufacturing Overhead + Total Indirect

Administrative Overhead:

1. Total Indirect Cost

   =Total Indirect Manufacturing Overhead + Total Indirect Administrative Overhead.

Quantity: is a property that can exist as a multitude or magnitude, which illustrate discontinuity and continuity. Quantities can be compared in terms of "more", "less", or "equal", or by assigning a numerical value in terms of a unit of measurement.

Quantity is defined as an amount, measure or number. An example of quantity is how many apples are in a barrel. An amount; portion. A number or symbol expressing a mathematical quantity.

Self-check -4	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Instruction: I Fill the blank space (each 5point)

1. _____ is a property that can exist as a multitude or magnitude, which illustrate discontinuity and continuity.
2. _____is a property that can exist as a multitude or magnitude, which discontinuity and continuity. **(5%point)**
3. **Define** over head cost and manufacturing cost.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Note Satisfactory rating above 100%

Information Sheet – 5 Calculating Material Quantities

5.1 Confirming and recording results

Definition Confirming: to give approval to ratify confirm a treaty to make firm or firmer strengthen confirm one's resolve to administer the rite of confirmation to give new assurance of the validity of remove doubt about by authoritative act or indisputable fact confirm a rumor confirm an order.

It is intended to show a person taking responsibility for what they believe in and professing it to the friends and family. The main reason for the importance of Confirmation in the modern has to do with the practice of infant baptism.

Here's what happens at the actual ritual of Confirmation: You stand or kneel before the bishop. The bishop anoints you by using oil of Chrism consecrated oil) to make the Sign of the Cross on your forehead while saying your Confirmation name and “Be sealed with the gift.

Bad quality furniture will wobble, twist, or creak. Wood on a good quality furniture piece should be reasonably scratch resistant; if it dents easily the furniture will not stand up to much use. To test this you can try drawing a line on an unexposed area with your fingernail to see if it leaves a visible dent

Recording: is writing the actual data of project tasks and documented securely, by using electronic device. So that they can be heard or seen again the act or process of storing sounds or images on tape or a disk. The purpose of recording a document is to provide a traceable chain of title to the property (chain of title is evidence that a piece of property has validly passed down through the years from one owner.

Types of records

- Correspondence records. Correspondence records may be created inside the office or may be received from outside the office.
- Accounting records. The records relating to financial transactions are known as financial records.

✓ Legal records.

- ✓ Personnel records.
- ✓ Progress records.
- ✓ Miscellaneous records.

Essential characteristics authenticity record must be what it purports to be reliability record must be a full and accurate representation of the transactions, activities, or facts to which it attests. Integrity a record must be complete and unaltered.

Ratios crop up often in official statistics. The government wants the teacher–pupil ratio in schools to be increased to one teacher to thirty pupils or less. The birth rate has fallen: the ratio of children to women of child bearing age has gone down. It used to be 2.4 to 1, and now it is 1.9 to 1. Predictions for the ratio of working adults to retired adults are disturbing. Predictions are that by 2030 the ratio will be two working adults to every retired person, instead of three to one now, and four to one ten years ago.

The conversion rates between currencies or different units are often easier to remember as ratios. Many people remember that the ratio of distance in miles to the same distance in kilometers is five to eight.

Self-check -5	**Written test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Instruction: I Fill the blank space (each 5point)

4. _____ is a property that can exist as a multitude or magnitude, which illustrate discontinuity and continuity.
5. _____is a property that can exist as a multitude or magnitude, which discontinuity and continuity. **(5%point)**
6. **Define** over head cost and manufacturing cost.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Note Satisfactory rating above 100%

LG#13	LO#3- Estimate Approximate Quantities and Cost

Instruction Sheet

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upoLO4. Weave item

- Calculating resource requirement.
- Estimating quantities.
- Calculating, confirming and recording resource quantities.
- Estimating total cost of resource requirements.
- Finalizing, documenting and presenting bill of quantity.

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:

- Calculations for determining ***resource requirements*** are taken
- Quantities are estimated from calculations taken
- Resource quantities for the job are calculated, confirmed and recorded within organization tolerances
- Bill of quantity is finalized, documented and presented to appropriate personnel

Learning Instructions:

3. Read the specific objectives of this Learning Guide.
4. Follow the instructions described below.
5. Read the information written in the information Sheets
6. Accomplish the Self-checks

Information Sheet - 1Calculating Resource Requirement

1.1 Resource Requirements

Resource requirements involve determining what resources (people, equipment, services, and material) and the quantities of those resources are required to

complete the project. The projects' WBS, scope statement, historical information, resource information, and policies are inputs used to determine the resources for the project. The main output is a list of resource requirements that provide the basis for budget estimating and budget controls, and provide valuable information to the project resource management process.

There are four typical types of resources under which all requirements can be grouped:

- **Human or Labor resources**; including consulting services, consist of the right people with the expertise and skills needed to complete the activities on the project schedule. People may come from the organization, or hired for the duration of the project. People skills also include consultants who bring a high level technical expertise that is not found in the organization or in the local labor market. The project will develop a list of the human resource requirements detailing the expertise level, areas of experience, education and language requirements. This information will be used in the Resource management process to acquire or contract the right people. For example the following list the human resources needed by a project:
- **Equipment and Material resources;** equipment include all the specialized tools needed by the project, from water pumps to electrical generators that will be used by the project or delivered to the beneficiaries, it also includes the need for vehicles and office equipment such as computers and printers. The materials include a wider category of requirements such as utility services such as electricity, telephone lines, access to the internet, office material, office space and used by the project. The material may also include building materials that will be used to build facilities, or food and medicines that will be delivered to the beneficiaries

  As a final output of this exercise the project will have a complete list of all the requirements needed for the project, this can be in the form of a spreadsheet organized by either the order that came from the WBS or by the organization's or donor's chart of accounts.

Budget Estimation:

Once all project requirements have been documented, the next step is to determine the costs of each requirement which will result in the creation of the project budget. A cost estimate, which is the process to approximate the costs that the project will spend to get or use the project resources Budget estimates are obtained from the people responsible for managing the work efforts. They provide the required expertise to make the estimate and provide buy-in and accountability during the actual performance of the activities.

Rough estimate:

Project managers develop the first budget estimate used before or during the project initiation phase; to get a quick estimate of what would the costs of the project be to see if there is an interest in the organization or donor. It provides a rough idea of the project budget, estimates are based on high-level objectives, provides a quick view of the project deliverables, Most rough estimates, depending on the project, have a range of variance from –25% to +75%. The project manager shouldn't invest too much time in creating these initial estimates. Rough estimates, are simply used to have a good look at the project's initial perceived costs, and should not be used as a definitive estimate or an estimate for RFP purposes

Contract estimate:

is more accurate, it is formulated late in the project's initiation stage, it's done either from the donor’s RFP requirements, which sometimes includes conditions and formats on how to present a budget – such as an account code. It is based on analogous estimating—taking budget lessons learned from a similar project and applying them to the current project. The contract estimate, starts from objectives and works its way down into the project details. Like the rough estimate, this estimate should include Project Budget Management www.pm4dev.com conditions, a range of variance, and any assumptions that went into the calculations. A contract estimate is quick, but not very accurate. The range of variance in the budget estimate is from –10 percent to +25 percent. This is the estimate that most of the

time goes into a proposal and it's the basis for project negotiations between the donor and the organization.

Definitive Estimate:

Is the most accurate of the estimate types, but• takes the most time to create. The definitive estimate makes use of the ***work breakdown structure*** which is a deliverables oriented decomposition of the project scope. This type of estimate is usually made during the planning phase of the project to get detailed information on all the project costs and it uses the organization chart of accounts to track costs in the accounting system. The definitive estimate is used to for estimating final project costs and used for making purchase decisions where the actual costs are required before making payments. The definitive estimate is used throughout the project life cycle and updates as soon as new information is made available. The accuracy of this estimate is normally -5 percent to +10 percent, meaning the actual costs could be 5 percent less or 10 percent more than the definitive estimate.

Type of Estimate	When	Why	Accuracy
Rough Estimate	Pre-proposal	Get a quick idea of the project costs	Low -25%, +75%
Contract Estimate	Initiation Phase	RFP responses and donor negotiations	Medium -10%, +25%
Definitive Estimate	Planning Phase	Monitor actual costs and purchases	High -5%, +10%

There are four basic methods to estimate a budget: analogous, top down, bottom-up and parametric estimating.

- **Analogous**: this estimate technique uses the actual costs of a previous, similar project for the basis for estimating the costs of the current project. This method is generally less costly than others, takes less time but is less accurate. Analogous estimates are most reliable when a previous project is similar in the objectives and

activities to the current one. Additionally the people preparing the estimates must have the required expertise to determine if certain activities will be more or less expensive on the new project.

- **Top-down estimate:** It is a budget estimate when the total project budget is known and the project needs to know the costs of each individual activity, in this scenario the project determines the number of activities or outputs the project can produce with a given budget. A fixed budget is the broken down using the WBS to determine the number or quantity of activities that can be achieved with the budget. The project may decide to reduce or increase certain activities or reduce the number of WBS levels to fit the budget limitations. Top down uses actual budgets from activities in similar past projects.
- **Bottom Up:** estimate requires estimating the individual activities and the cost of each input and is adding them up to get the project total. A detailed WBS is needed to determine all the activities in the project and determine all required resources such as personnel, equipment and materials. Staff responsible for an activity or with expertise in a specific area develops the estimates of the lowest level of the WBS and all estimates are added to create estimates for each higher level of the WBS and finally for the entire project. In this technique the estimate starts with a fixed number of activities and the estimate calculates the total budget.
- **Parametric:** estimates use standardized parameters that define the costs of an activity or task for a specific rate or output. For example the costs of training one person are a rate that can include people, material and equipment costs that once it is multiplied for the required number of people that need to be trained, gives the total budget for the activity. For this example the parameter may include the type of location, length of the training. Parametric model is quite popular in construction projects, costs can be estimated based on square meters of construction to arrive at the total cost for a building. The accuracy of this method depends on the data available and whether or not the model can be scalable to different conditions.

Self-check -1	Written test

Directions: Answer all the questions listed below.

Instruction: I Short Answer

1. List and explain types of resource requirements (2.5 points).
2. Write the basic methods to estimate budget (2.5points).

Instruction II chose

1. Estimating the individual activities and the cost of each input and is adding the project total is

   A. Top down estimate
   B. Bottom up
   C. Parametric
   D. Analogues

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating –5 points** **Unsatisfactory - below 5points**

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.

Information Sheet – 2	Estimating quantities

2.1 How does cost estimating work?

Although there are many things you need to pay attention to when creating a project cost estimate, the following 6 steps provide a guideline when creating such an estimate:

Step1. Agree on estimating basis

Before starting with the actual estimate, the parties involved must agree on the way the estimate is set up. This includes determining the cost estimating software, methodology, labor productivity, labor rates, equipment/material pricing, MTOs, allowances, indirect costs, engineering and the scope allocation. All inputs to the estimate and required outputs should be identified at this point. If requirements are not clear, meetings should be held to obtain alignment.

Step2. Collect scope documentation

Scope documents delivered to the estimate team have to be frozen; otherwise decisions are not based on costs that honestly reflect the design. Revision control is critical for this to work. Collecting and interpreting all scope documents such that your estimate covers the entire project can be challenging.

Step3. Estimate direct cost

Based on the scope you estimate the quantities and cost of the required resources. Depending on project type, size and the current phase of a project's lifecycle, different tools and **techniques** may be used.

Step4. Estimate other costs and apply factors, indexation and escalation

Other cost types like allowances, indirect costs and overhead costs are often calculated with the direct costs as basis. The estimate is further adjusted to project-specific conditions by applying location and productivity factors. At this point information from risk management and finance are used to determine the proper amount of contingency and escalation funds to be added.

Step 5: Peer review

An estimate should always be peer-reviewed by another estimator. Check the scope completeness, assumptions and perform spot checks to verify quantities and costs. Lessons learned from the prior phase can be a source of opportunities to reduce costs or highlight significant gaps in past practices which need to be addressed before completing the estimate. Any assumptions that can be removed or clarified should be.

Step6. Finalize basis of estimate report and send estimate for approval

Preparation of the basis of estimate document while the estimate is being prepared is preferred to completing it after the estimate when time is short and key information may have been forgotten or gone missing along with personnel that is no longer available. Stating the planned sources of estimating basis such as **project historical date** is important for obtaining owner and contractor alignment and confirming validity. This also applies to the estimating tools, processes, and estimator qualifications.

- Estimation is the scientific way of working out the approximate cost of an engineering project before implementation of the work.
- The process of forecasting or approximating the time and cost of completing project deliverables.
- It is totally different from calculation of the exact cost after completion of the project.
- Developing an approximation or estimate of the costs of the resources needed to complete a project
- Cost estimating is one of the most important steps in project management.

Estimating & calculating quantities

Estimation requires a thorough Knowledge of the product procedures and cost of materials & labor in addition to the skill, experience and good judgment.

Unit cost:

A unit cost is a total expenditure incurred by a company to produce, store, and sell one unit of a particular product or service. Unit costs are synonymous with the cost of goods sold and cost of sales.

This accounting measure includes all of the fixed and variable costs associated with the production of a good or service. Unit cost is a crucial cost measure in the operational analysis of a company. Identifying and analyzing a company's unit costs is a quick way to check if a company is producing a product efficiently.

Variable and Fixed Unit Costs:

Successful companies seek ways to improve the overall unit cost of their products by managing the fixed and variable costs. Fixed costs are production expenses which are not dependent on the volume of units produced. Examples are rent, insurance, and equipment. Fixed costs, such as warehousing and the use of production equipment may be managed through long-term rental agreements.

Variable costs vary depending on the level of output produced. These expenses have further division into specific categories such as direct labor costs and direct material costs. Direct labor costs are the salaries paid to those who are directly involved in production while direct material costs are the cost of materials purchased and used in production. Sourcing materials can improve variable costs from the cheapest supplier or by outsourcing the production process to a more efficient manufacturer.

Labor cost: The human effort required to convert the materials into finished product is called labor.

Direct labor: Is one which can be conveniently identified or attributed wholly to a particular job, product or process.

E.g.: salary paid to carpenter, salary paid to welder, fees paid to tailor, etc. **Indirect labor:** is one which cannot be conveniently identified or attributed totally to a particular job, product or process.

Calculating Labor Costs: labor is one of the most difficult costs to predict in an estimate. Basically, it's determined by calculating the hours required to complete a task and then charging what it costs the business to compensate its field employees. But trying to predict the time required to complete a task or a project, especially if someone other than you will do the work, requires judgment and experience.

Self-check -2	**Written test**

Directions: Answer all the questions listed below.

Test I: Short Answer Questions (4points)

1. Write the steps of guideline for creating cost estimate

   _____

   _____

   ____

2. Write the differences between fixed cost and variable cost

   _____

   _____

   ____

Instruction: II Fill the blank space,

1. The human effort required to convert the materials into finished product is_____.

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating –4points** **Unsatisfactory - below 4points**

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself;

Information Sheet – 3 Calculating, Confirming and Recording Resource Quantities

3.1 How to calculate resources in manufacturing?

- Check inventory records to find out the finished goods inventory for the previous period.
- Subtract the cost of goods sold from the cost of goods manufactured.
- Calculate the new finished goods inventory by adding the previous finished goods inventory value to the previous solution.

3.1 Confirm and Record Resources

Using the appropriate workplace checklists, forms or record sheets often makes the task easier. Workers should make themselves familiar with the relevant workplace procedures and systems where these relate to calculations and formulas. Using the right formula makes the job easier and more effective. It may also save the organization time and money with reduced waste and the supply of the required material quantities. Selecting the correct formula is often gained with practice. The more you use the formulas, the easier it becomes to apply the formulas to other tasks. If you are not sure about the correct formula to use, speak to your supervisor for assistance. If this is an area that you have difficulty in, consider completing a training course to improve your skills

Self-check -3	Written test

Directions: Answer all the questions listed below.

Test I: Short Answer Questions (5points)

1. Write the methods of recording and confirming resource quantities. (5point)

   _____
   _____
   _____
   _____
   _____

Note: **Satisfactory rating –5 points** **Unsatisfactory - below 5points**

Score = _____
Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself

Information Sheet – 4 Estimating total cost of resource requirements

4.1 **Introduction**

Resource cost

The cost per use is the cost for the use of a resource that can be considered as a one-time cost incurred every time the resource is used by the activity. The peruse cost for a consumable resource is applied only once from the moment the resource is used. The peruse cost for a renewable resource, however, depends on the resource demand of the activity (i.e. its resource requirement and not its total work content).

Estimate activity resources process briefly helps to assign which resources in the project will do which project activities. Estimate activity resources process is the process of estimating the type and quantities of:

- Material,
- Human resources,
- Equipment,
- Supplies required performing each activity.

4.2 What is Cost Estimating?

Cost estimating is the process of collecting and analyzing historical data and applying quantitative models, techniques, tools, and databases in order to predict an estimate of the future cost of an item, product, program or task. Cost estimating is the application of the art and the technology of approximating the probable worth (or cost), extent, or character of something based on information available at the time.

The calculation of the total activity per unit cost differs according to the resource type, renewable or consumable, as explained along the following lines:

- **Renewable resources:** the costs per unit are cost rates calculated per time unit (hours, days, weeks, etc.) and per resource unit and hence are based on the total work content (= activity duration x resource demand) of the activity.

- **Consumable resources:** Normally, the use of consumable resources by project activities is expressed in units that are typically different from time units. Consequently, the costs per unit are monetary rates typically not calculated per hour but expressed in other units (per weight, per length, per pallet, etc.). However, there are examples where consumable resource use is expressed as a time dimension. To that purpose, the assignment of a consumable resource to an activity can be done in two alternative ways:

  - ✓ **Fixed use:** The unit for the cost/unit calculation of a consumable resource is anything but a time dimension. It is an indication that the quantity of the resource used by an activity is independent from its duration.

  - ✓ **Variable use**: The unit for the calculation of the cost/unit for a consumable resource can be expressed in a time dimension (hours, days etc). It is an indication that the quantity of resources used by an activity changes proportionally as its duration changes.

4.3 Total Cost of Resource

The total activity cost is equal to the sum of these cost factors as shown in the formula.

Total activity cost
=
Fixed activity cost
+
Variable activity cost * duration
+
Cost/use x resource demand (renewable resources)
+
Cost/unit x work content (renewable resources)
+
Cost/use (consumable resources)
+
Cost/unit x resource demand * duration
(Variable consumable resource with units expressed in time units (hours))
+
Cost/unit x #units
(Fixed consumable resource with units not expressed in time units)

Self-check -4	Written test

Directions: Answer all the questions listed below.

Test I: Short Answer Questions (5points)

7. _____is the process of collecting and analyzing data and applying quantitative models.

8. List and explain types of resource requirements.

Instruction: II chose the correct answer (5point)

1. The unit for the cost calculation of a consumable resource is
   A. Fixed use C. Material
   B. Variable use D. equipment

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating –5 points** **Unsatisfactory - below 5points**

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself

Information Sheet – 5 Finalizing, Documenting and Presenting Bill of Quantity

5.1. Finalizing and presenting bill of quantity to appropriate personnel.

If the contract is with quantities, the BOQ as prepared by the Employer takes precedence over the drawings and specification. Any missing items from the BOQ are dealt with as a change and therefore a client risk.

The main sections included in the bill of quantities are form of tender, Information, requirements, pricing schedule, Provisional sums and day works. For the preparation of BOQ, 5 main components are to be considered which are as follows:

- Item Description.
- Unit.
- Quantity.
- Rate per unit.
- Total Amount.

The prime purpose of the Bill of Quantities is to enable all contractors tendering for a contract to price on exactly the same information. Subsequent to this, it is widely used for post-tender work such as: material scheduling; construction planning; cost analysis; and cost planning. A bill of quantities is a document used in tendering in the construction industry in which materials, parts, and labor (and their costs) are itemized.

Presenting cost estimation: Detailed cost estimating is the process of predicting the cost of a facility through quantitative analysis of the work required by the design documents. Although not always required by clients, detailed cost estimates can be an important part of overall cost management and budget adherence.

They're the basics you need to master to develop a robust cost estimate for your project:

- Define the idea.
- Identify the parts.
- Do your research.
- Ask difficult questions.
- Prepare for the unexpected.
- Know your estimate limits.
- Account for hidden costs.
- Check it.

The detailed estimates serve as a guide during the execution of the work. It helps in computing the quantities of materials required and labor to be employed for the completion of various items of construction. Cost estimation in project management is the process of forecasting the cost and other resources needed to complete a project within a defined scope. Cost estimation accounts for each element required for the project and calculate a total amount that determines a project's budget.

Self-check -5	Written test

Directions: Answer all the questions listed below.

Test I: Short Answer Questions (5points)

1. Write main components for preparing finalize documents.

   _____
   _____
   _____
   _____

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating –5 points** **Unsatisfactory - below 5points**

Score = _____

Rating: _____

Name: _____ Date: _____

You can ask your teacher for the copy of the correct answers after you try by yourself.