



RQF.LEVEL 4



MATLO401
MANUFACTURING
TECHNOLOGY

Lathe
Machine
operation

TRAINER'S MANUAL

October, 2024



LATHE MACHINE OPERATION



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TABLE OF CONTENT

AUTHOR'S NOTE PAGE (COPYRIGHT)-----	iii
ACKNOWLEDGEMENTS-----	iv
TABLE OF CONTENT -----	vii
ACRONYMS-----	viii
INTRODUCTION -----	1
MODULE CODE AND TITLE: MATLO401 LATHE MACHINE OPERATION-----	2
Learning Outcome 1: Prepare the Workplace-----	3
Key Competencies for Learning Outcome 1: Prepare the Workplace -----	4
Indicative content 1.1: Introduction to Lathe Machine Operations-----	7
Indicative content 1.2: Organizing Workplace -----	9
Indicative content 1.3: Selecting Equipment, Tools, and Materials -----	13
Indicative content 1.4: Applying safety at the Workplace-----	17
Learning outcome 1 end assessment -----	20
Further information to the trainer-----	24
Learning Outcome 2: Carry Out Turning Operations -----	25
Key Competencies for Learning Outcome 2: Carry out turning operations -----	26
Indicative content 2.1: Conducting Pre-Operation Inspection -----	29
Indicative content 2.2: Setting Machine, Tools and Equipment-----	34
Indicative content 2.3: Mounting Workpiece -----	42
Indicative content 2.4: Carrying out Turing Operations-----	48
Learning outcome 2 end assessment -----	59
Further information to the trainer-----	66
Learning Outcome 3: Carry Out Finishing Activities -----	67
Key Competencies for Learning Outcome 3: Carry Out Finishing Activities: -----	68
Indicative content 3.1: Apply Finishing Techniques on the Product -----	71
Indicative content 3.2: Cleaning the Machine, Tools and Workplace-----	75
Indicative content 3.3: Storing Techniques for the Products -----	79
Indicative content 3.4: Reporting the Work Done -----	83
Learning outcome 3 end assessment -----	86
Further information to the trainer-----	92

ACRONYMS

CBC: Cubic Boron Nitride

CBC: Competency Based Curriculum

CBT: Competency Based Training

KOICA: Korea International Cooperation Agency

MM: Millimetres

PPE: Personal Protective Equipment

RPM: Revolution per minute

RTB: Rwanda TVET Board

TQUM Project: TVET Quality Management Project

TVET: Technical and Vocational Education and Training

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled "**Lathe machine operation**". Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labor market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer trainees opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that trainees review the key reading and the points to remember section.

MODULE CODE AND TITLE: MATLO401 LATHE MACHINE OPERATION

Learning Outcome 1: Prepare the workplace

Learning Outcome 2: Carry out turning operations

Learning Outcome 3: Carry out Finishing activities

Learning Outcome 1: Prepare the Workplace



Indicative contents

1.1 Introduction to lathe machine operation

1.2 Organizing Workplace

1.3 Selecting equipment, tools, and materials

1.4 Applying safety at the workplace

Key Competencies for Learning Outcome 1: Prepare the Workplace

Knowledge	Skills	Attitudes
• Explanation of key terms used in lathe machine operation • Explanation of working principle of Lathe machine • Explanation of the selection criteria of tools, materials and equipment for lathe machine operation • Identification of types of hazards at workplace for lathe machine operation • Identification of hazards control measures at the workplace. For lathe machine operation • Identification of PPEs used lathe machine operation	• Applying safety at the workplace for lathe machine operation • Apply 5S at the workplace for lathe machine operation • Selecting tools, materials and equipment for lathe machine operation	• Having attention while applying safety at the work place • Being active when preparing workplace • Having Self-confidence When selecting materials tools and equipment for lathe machine.



Duration: 10 hrs

Learning outcome 1 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Explain properly the key terms which are used in lathe machine operation
2. Explain clearly the working principle of lathe machine
3. Identify properly the type of hazards at workplace for lathe machine operation
4. Identify clearly hazards control measures at the workplace for lathe machine operation
5. Identify properly the types of PPEs for lathe machine operation
6. Organize appropriately the workplace for lathe machine operation
7. Apply correctly the safety measures at workplace for lathe machine operation
8. Select perfectly the tools, materials and equipment for lathe machine operation



Resources

Equipment	Tools	Materials
• Lathe Machine and accessories • Air Compressor • Air Blower • Fire Extinguisher • Gloves • Safety Boots • Goggles • Overall • Clothes' Rug • Trash Can • Dustpan	• Wiper • Mops • Wire Brush • Sign Plates • Brooms • Spacers • turning tools • threading tools • facing tools • parting tools • knurling tools • forming tools • boring tools	• Workpiece • Liquid Soap • Powder Soap • Cutting Fluid/Coolant

	• grooving tools • drilling tools Inserts • Steel Ruler • Vernier Caliper • Micro-Meter • Dial Indicator	
 Advance Preparation: Before delivering this learning outcome, you are recommended to: • Have some Videos and/ or photos representing the working principle of lathe machine operation. • Avail required PPEs and safety equipment, which are ready to be used for safe lathe machine operation. • Safety signs and symbols related to lathe machine operations must be availed at the workplace. • Avail lathe machine and its accessories at the workplace. • Have the workplace to be organized.		



Indicative content 1.1: Introduction to Lathe Machine Operations



Duration: 2 hrs



Theoretical Activity 1.1.1: Introduction to lathe machine operation



Notes to the trainer:

- Trainer may deliver this content, by using open questions in small groups of trainees for better understanding of lathe machine operation and its related key terms, advantages and disadvantages of lathe machine operation.
- Images, videos related to lathe machine can be use didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking learners to answer the following questions:

- What do you understand by the following terms used for lathe machine operation?
 - Lathe machine
 - Turning operations
 - Machining
 - Cutting tool
 - Depth of cut
 - Feed rate
 - Cutting speed
- Explain the working principle of lathe machine.
- Identify the advantages and disadvantages of lathe machine operation.

Step 2: Ask trainees to write the answers on flipchart/paper.

Step 3: Engage trainees in presentation of their findings.

Step 4: Provide expert view and clarify ideas by using didactic materials.

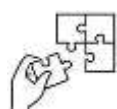
Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 1.1.1. In trainee manual



Points to Remember

- While machining complex shaped part, the lathe tooling option is limited, remember to use additional equipment like lathe attachment.
- Remember that materials with high heat resistance always pose challenges and require specialized tooling during lathe machine operation



Application of learning 1.1.

Ask trainees to visit any manufacturing workshop that produces turned products using lathe machine and elaborate a written report about the following activities:

- i. Definition of key terms used in lathe machine operation.
- ii. Explanation of the working principle of lathe machine.
- iii. Identification of lathe machine advantages.
- iv. Identification of lathe machine disadvantages.

Checklist /Solution for application

SN	Criteria	Indicators	Yes	No
1	Visit report is well elaborated	1.1. Key terms used in lathe machine operation are defined.		
		1.2. Working principle of lathe machine is explained		
		1.3. Advantages of lathe machine are identified		
		1.4. Disadvantages of lathe machine are identified		



Indicative content 1.2: Organizing Workplace



Duration: 2hrs



Theoretical Activity 1.2.1: Explanation of workplace organization for lathe machine operation.



Notes to the trainer:

- Trainer may deliver this content, by using small groups to explain the importance of workplace organization, hazard analysis procedures and 5S principles for lathe machine operation.
- Images, videos, and illustrations related to workplace organization, hazards analysis for lathe machine operation can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Ask trainees in groups to respond to the following questions:

- i. Explain the importance of workplace organization
- ii. Explain the job hazards analysis procedures
- iii. Interpret the 5S Concept as applied for lathe machine operation.

Step 2: Ask trainees to write the answers on flip chart/paper

Step 3: Engage trainees in presentation of their findings

Step 4: Provide expert view and clarifies ideas by using didactic materials.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 1.2.1. in trainee manual



Points to Remember

- Lathe operations involve high-speed rotation, remember to organize tool, materials around the lathe machine for reducing risk and accident.
- When organizing workplace conduct job hazards analysis to ensure the safety of workers.



Practical Activity 1.2.2: Applying 5S principles at the workplace for lathe machine operation

Notes to the trainer

- you are supposed to go in the school workshop and demonstrate to the trainees on how to apply 5S required for lathe machine operation for turning hexagon bolt of 80mm of length and 60mm of threaded length within 2mm pitch.
- For the effective delivery, it is recommended to:
 - i. Avail lathe equipment and its safety and security kits.
 - ii. Have the workplace to be organized.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees perform the task described below:
you are requested to go in the manufacturing workshop to organize workplace for lathe machine operations by applying 5S principle.
- Step 2:** Explain the task and provide clear work instruction (Task, PPEs, Time allocated).
- Step 3:** Demonstrate to the trainees how to apply 5S principles for lathe machine operation.
- Step 4:** Ask trainees to apply 5S principles for lathe machine operation as you have demonstrated
- Step 5:** Assess whether 5S principles are appropriately applied.
- Step 6:** Ask trainees to read key reading 1.2.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 1.2



Points to Remember

- While organizing the workplace do not forget to apply the following 5S principles, sort, set in order, shine, standardize and sustain, unless the safe working environment will never be maintained.



Application of learning 1.2.

Ask trainees to Visit any manufacturing workshop that turns products using lathe machine, by joining the manufacturing team during turning operation, perform the following task:

- Apply 5S principles

Checklist /Solution for application:

SN	Criteria	Indicators	Yes	No
1	Items are well sorted	1.1. Items are categorized as necessary or unnecessary.		
		1.2. unnecessary items are removed		
2	Items are properly set in order	2.1. Tools are organized by frequency of use.		
		2.2. Materials are organized by frequency of use.		
		2.3. Equipment is organized by frequency of use.		
		2.4. Each item has a specific location		
		2.5. Item storage area is labelled		
3	Items and workplace are shine	3.1. Lathe machine is cleaned		
		3.2. Lathe machine is lubricated		
		3.3. Workplace is cleaned		
4		4.1. Organization and cleanliness of items and workspace is standardized		

	Standard operating procedures are perfectly developed	4.2. Checklists for daily, weekly, and monthly tasks are created.		
5	The 5S practices is continually improve and maintained	5.1. Ongoing training and refresher courses on 5S principles are provided		
		5.2. 5S principles regular audits is Conducted		



Indicative content 1.3: Selecting Equipment, Tools, and Materials



Duration: 2 hrs



Theoretical Activity 1.3.1: Identification of equipment, tools and materials for lathe machine operation.



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to identify the types of tools, materials and equipment, which are used in lathe machine operations.
- Use pictures or photo representing lathe tools, materials for lathe operation and lathe equipment as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to respond to the following questions

- i. Identify types of equipment used for lathe machine operation
- ii. Identify of tools used for lathe machine operation
- iii. Identify of materials used for lathe machine operation

Step 2: Asks any trainee to write answers on flipchart/blackboard.

Step 3: Ask trainees to present the answer.

Step 4: Provides expert view and clarifies ideas by using didactic materials if necessary.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 1.3.1. in the trainee manual.



Points to Remember

- While selecting lathe machine cutting tools remember the single point cutting tools are used for general turning operation while multipoint cutting tools are used for milling, knurling and drilling operations
- When selecting lathe machine accessories remember they are divided into two categories mainly Work-holding, supporting, and driving devices and Cutting-tool-holding devices.



Practical Activity 1.3.2: Selecting equipment, tools and materials for lathe machine operation



Notes to the trainer

- The trainer allows trainees to go in the manufacturing workshop and demonstrate to the trainees how to select tools, material and equipment for lathe machine operation
- Avail the Store of tools, materials, and equipment for lathe machine operation.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to perform the task described below:

Go in the manufacturing workshop of the school and select the right tools, materials, and equipment required for turning a tapered stainless steel cue stick of 20mm of larger diameter ,15mm smaller of diameter and 1000mm of length.

Step 2: Demonstrate how to select tools, materials and equipment used for lathe machine operation and explain selection criteria.

Step 3: Ask trainees to select tools, materials and equipment used in lathe machine operation and monitor the procedures.

Step 4: Verify whether tools, materials and equipment used for lathe machine operations are correctly selected and provide support where necessary.

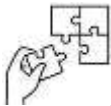
Step 5: Ask trainees to read key reading 1.3.2.

Step 6: Ask trainees to perform the task provided in application of learning 1.3



Points to Remember

- While selecting turning equipment consider its selection criteria mainly, Type of Material to be Machined, Precision and Tolerance Requirements, Production Volume, Type of Turning Operation and Machine Capability and Features.
- When selecting safety equipment for lathe machine operation consider the selection criteria mainly, Type of Hazards Present and Machine Safety Features.
- When selecting cleaning equipment for lathe machine operation consider the selection criteria mainly Type of Contaminants present and Compatibility with Lathe Materials.
- Material of the Cutting Tool, Workpiece Material, Cutting Tool Geometry, cutting condition and type of operation must be taken into consideration when selecting cutting tools for lathe machine operation.



Application of learning 1.3.

Go in the manufacturing workshop at your school and perform the bellow described task related to turning operation of an aluminium baseball bat from an aluminium round bar of 40mm of diameter ,the turned baseball bat has 1300mm of length including 500mm of barrel length ,500mm of taper length ,300mm of handle length, the barrel diameter is 30mm, the larger diameter and smaller diameter of tapered portion is 30mm and 20mm respectively, the handle diameter is 20mm and the knob diameter is 25mm. the barrel end is chamfered at 4X15o

- i. Select turning operation equipment for turning this baseball bate
- ii. Select Safety equipment for turning this baseball bate
- iii. Select Cleaning equipment for turning this baseball bate
- iv. Select lathe machine cutting tools required for turning this baseball bate
- v. Select Lathe machine accessories and attachments required for turning this baseball
- vi. Select Measuring instruments for turning this baseball bate
- vii. Select Safety tools required for turning this baseball bate
- viii. Select Cleaning tools required for turning this baseball bat
- ix. Select Workpiece required for turning this baseball bate
- x. Select Cutting fluid/coolant for this lathe turning operation
- xi. Select Cleaning solvents for this lathe turning operation

Checklist /Solution for application

SN	Criteria	Indicators	Yes	No
1	Equipment are properly selected	1.1. Turning equipment is selected		
		1.2. Safety equipment are selected		
		1.3. Cleaning equipment are selected		
2	Tools are correctly selected	2.1. Lathe machine cutting tools are selected		
		2.2. Lathe machine accessories are selected		
		2.3. Lathe machine attachment are selected		
		2.4. Measuring instrument are selected		
		2.5. Safety tools are selected		
		2.6. Cleaning tools are selected		
3	Materials are correctly selected	3.1. Workpiece is selected		
		3.2. Cutting fluids or coolants are selected		
		3.3. Cleaning solvents are selected		



Indicative content 1.4: Applying safety at the Workplace



Duration: 4hrs



Theoretical Activity 1.4.1: Identification of hazards at workplace and hazards control measures for lathe machine operation.



Tasks:

- While delivering this content, small group can be used to identify types of hazards and hazard control measures for lathe machine operation.
- Images, videos, and illustrations representing types of hazards and hazards control measures for lathe machine operation can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps

Step 1: Introduce the activity and ask trainees to do the task described below:

- i. Identify the types of hazards at workplace.
- ii. Identify the Hazards control measures at the workplace

Step 2: Ask trainees to write answers on flipchart/paper.

Step 3: Provide expert view on the presentations.

Step 4: Address any questions or concerns from the learners.

Step 5: Ask learners to read the key reading 1.4.1. in trainee manual



Points to Remember

- When maintaining safety for lathe machine operation consider the workplace safety rules mainly, machine operation procedures, personal protective equipment (PPE) requirements, emergency response protocols, and safe work practices.



Practical Activity 1.4.2: Applying safety at the workplace work place.



Notes to the trainer

- By referring to the previous activity 1.4.1, the trainer demonstrates how to apply hazards control measures, use appropriate PPEs and apply safety sign and symbols required for lathe machine operations.
- The use of images, videos, and illustrations related to hazards control measures and safety sign and symbols for lathe machine operation can be used as didactic materials for more clarification.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to do the task described below:

As a manufacturing technician, you are asked to go in the manufacturing workshop/store apply hazards control measures by installing safety sign and symbols for lathe machine operation, select and wear appropriate PPE for lathe machine operation and use fire extinguisher

Demonstrate how to install safety sign and symbols, how to use fire extinguisher, and how to wear PPE for lathe machine operation.

Step 2: Asks trainees to install/position safety sign and symbols for lathe machine operation

Step 3: Checks whether safety sign and symbols are well positioned and provide clarifications if any.

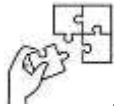
Step 4: Ask trainees to perform the task provided in application of learning 1.4



Points to Remember

- Before positioning safety sign and symbols conduct a thorough risk assessment to identify all hazardous areas especially near the chuck, cutting tool, and the tailstock where there is a risk of entanglement, ejection, or cuts.
- When Placing safety signs and symbols place them in locations where they are easily visible to workers.
- After wearing PPEs for lathe machine operation ensure their Proper Fit and Function

- by Check that each piece fits correctly and does not interfere with the operation of the lathe machine.



Application of learning 1.4.

Ask trainees to use the school workshop and perform the bellow described task an hour before a turning operation of nuts with Internal Thread: M20 x 1.5 and 24mm hex size:

- Apply safety sign and symbols for this lathe turning operation
- Wear PPEs for this lathe turning operation.

Checklist /Solution for application:

SN	Criteria	Indicators	Yes	No
1	Hazardous Areas area is well identified	1.1. Mechanical hazard risk assessment is conducted		
		1.2. Electrical hazard risk assessment is conducted		
		1.3. Thermal hazards risk assessment is conducted		
2	Safety sign and symbols are Selected appropriately.	2.1. Warning signs are selected		
		2.2. Mandatory action signs are selected		
		2.3. Prohibition signs are selected		
		2.4. Safety symbols are selected		
3	Safety sign and symbols maintenance and inspection are well conducted, placed and selected	3.1. Damaged or faded signs are replaced 3.2. Safety sign and symbols are placed at easily visible location. 3.3. Safety glasses, Gloves, are selected		
4	PPES are well used	4.1. Eyes are protected 4.2. Hands are protected 4.3. Ears are protected 4.4. Body is protected 4.5. Feet are protected 4.6. Faces is protected		



Learning outcome 1 end assessment

Written assessment

Q1. Read the following sentences and fill in the dashed spaces by the appropriate word selected from the following words: **Cutting tool, cylindrical shape, job hazard analysis, 5S methodology**

- I. Turning is a machining process in which a cutting tool is used to remove material from the workpiece to create a(**Answer: Cylindrical shape**)
- II.is a system for organizing and maintaining a clean and efficient workplace (**Answer: job hazard analysis**)
- III. A tool used in machining operations to remove material from the workpiece is called(**Answer: Cutting tool**)

Q2. Match column **A** representing advantages and disadvantages of lathe machine operation with their explanations in column **B**. Use each letter only once and write it in the provide blank space provide blank space.

Answers	Column A	Column B
1 ...	1. Versatility	A. The size of the workpiece that can be accommodated in a lathe machine is limited by the bed length and swing capacity
2 ...	2. Flexibility	B. Lathe machines can perform a wide range of operations such as turning, facing, drilling, boring, and threading.
3 ...	3. Cost-effective	C. Lathe machines can accommodate different sizes and types of workpieces.
4 ...	4. Limited workpiece size	D. Lathe machines are capable of achieving high levels of precision and accuracy in machining operations
5 ...	5. Precision	E. Lathe machines are relatively cost-effective compared to other types of machining equipment.

Answers	Column A	Column B
1 → B	6. Versatility	F. The size of the workpiece that can be accommodated in a lathe machine is limited by the bed length and swing capacity
2 → C	7. Flexibility	G. Lathe machines can perform a wide range of operations such as turning, facing, drilling, boring, and threading.

3 → E	8. Cost-effective	H. Lathe machines can accommodate different sizes and types of workpieces.
4 → A	9. Limited workpiece size	I. Lathe machines are capable of achieving high levels of precision and accuracy in machining operations
5 → B	10. Precision	J. Lathe machines are relatively cost-effective compared to other types of machining equipment.

Q3. Fill in the following table by the appropriated word or sentences selected from the followings: **Gloves, safety glass, Foot protection, Fight against excessive noise, prevent hairs from getting caught in the machine, Hair, Safety boot, Ear protection, Protect eyes against flying particles, overall**

Body parts	Name of PPE	Functions
Eye Protection		
	Earplugs	
	Hair Ties	
		Enhancing slip resistance

Answer:

Body parts	Name of PPE	Functions
Eye Protection	Safety glass	Protect eyes against flying particles.
Ear protection	Earplugs	Fight against excessive noise
Hair protection	Hair Ties	Prevent hairs from getting caught in the machine.
Foot protection	Safety boot	Enhancing slip resistance

Q4. Read the following statement related to lathe cutting tools and write the letter corresponding to the correct answer

- I. Among the following types of lathe machine cutting tools which one is Suitable for cutting more than one edges.
 - a. Forging tool
 - b. Single point cutting tool
 - c. Multipoint cutting tool
 - d. Parting tool

Answer: C

1. Read the following statement and write the letter corresponding to the correct answer
 - i. The following are type of Cutting Fluid/Coolant, except:
 - a. Water-based Coolants
 - b. Synthetic Coolants
 - c. Cutting Oils
 - d. Water

Answer: D

2. Read the following statement and write the letter corresponding to the correct answer:

I. Which one is not a factor affecting the selection cutting tool

- a. PPEs
- b. Cutting tool geometry
- c. Workpiece materials
- d. High speed steel

Answer: A

3. Read the following statement and answer **true** or **false**, if the statement is correct and not correct respectively:

- a. Water-based Coolants are mixtures of water and additives, such as oils, emulsifiers, and corrosion inhibitors.
- b. Lathe machines can generate significant noise; Face Shields can contribute to hearing loss over time
- c. Place safety signs and symbols in locations where they are not necessary to be easily visible for the workers.

Answer; A, TRUE: B, FALSE: C, FALSE

4. The followings are the steps for guiding how to effectively apply the safety signs and symbols for lathe machine operation. rearrange them appropriately by writing the first up to the last step.

- Step 1:** Identify Hazardous Areas
- Step 2:** Determine Strategic Placement
- Step 3:** Regular Maintenance and Inspection
- Step 4:** Select Appropriate Safety Signs and Symbols
- Step 5:** Use Durable Materials

Answer:

- Step1:** Identify Hazardous Areas
- Step2:** Select Appropriate Safety Signs and Symbols
- Step3:** Determine Strategic Placement
- Step4:** Use Durable Materials
- Step5:** Regular Maintenance and Inspection

Practical assessment

SB company Ltd want to produce lathe live centers for selling but it does have a qualified work for selecting the required tools, equipment and materials for the production of these lathe live centers, assume the SB company Ltd gives you a casual job. as a manufacturing technician you are requested to go in workshop and select required tools, equipment and materials for the production of these lathe live centers.

Solution

SN	Criteria	Indicators	Yes	No
1.	5S principles are appropriately applied	1.1. Sort is applied		
		1.2. Set in order is applied		
		1.3. Workplace is cleaned and shine		
		1.4. 5S practices are continually practiced		
		1.5. Lathe machine equipment safety is respected		
2.	Tools, Equipment, and materials are properly selected according to the operations	2.1. metals for lathe machine operation are selected		
		2.2. Cleaning tools for lathe machine operation are selected		
		2.3. Measuring tools are selected		
		2.4. Cutting tool are selected		
		2.5. Coolants are selected		
		2.6. Lathe machine equipment is selected		
3	Safety measures are correctly applied	3.1. PPE is won		
		3.2. Cleaning is done		
		3.3. Safety Signs and Symbols are established		
		3.4. PPEs are cleaned place dry place		
		3.5 Regular Maintenance and Inspection are established		
		3.5. PPEs are identified		
Marks:			 /100	
Passing line:			 70%	

END



Further information to the trainer

Black, B. J. (2010). Workshop Processes. *Practices and Materials Fourth edition*.

J.-D. Caprace, B. M. (2015). Materials and Fabrication Technology.

Richard.M.M, M. R. (2004). Machine Shop Tools and operations (5th Edition).

Learning Outcome 2: Carry Out Turning Operations



Indicative contents

1.1 Conducting Pre-Operation Inspection

1.2 Setting Machine, tools and equipment

1.3 Mounting the workpiece

1.4 Carrying out turning operations

Key Competencies for Learning Outcome 2: Carry out turning operations

Knowledge	Skills	Attitudes
• Description of types of lathe machines. • Identification of lathe machine parts. • Identification of lathe machine specification. • Description lathe machine mechanical, electrical and coolant systems. • Description of cutting tool geometry. • Identification of types of tool posts • Identification workpiece holding accessories of lathe machine • Description of lathe machine attachments • Description of types of turning operation to be	• Inspecting mechanical, electrical and coolant system of lathe machine. • Setting lathe machine • Setting cutting tool on tool post • Mounting workpiece on lathe machine • Performing types of turning operations	• Having attention while inspecting electrical system of lathe machine • Having Self-confidence while setting lathe machine parameter.

carried out on lathe machine		
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Duration: 60 hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Identify properly type and parts of lathe machine
2. Describing properly specification of lathe machine
3. Fill correctly parts list format with appropriate elements
4. Perform efficiently lathe machine setting required during operations.
5. Fix correctly cutting tool on lathe machine tool post
6. Perform correctly lathe machine operation according to the cutting tool geometry



Resources

Equipment	Tools	Materials
• Lathe Machine and accessories • Air Compressor • Air Blower • Fire Extinguisher • Gloves • Safety Boots • Goggles • Overall	• Wiper • Mops • Wire Brush • Sign Plates • Brooms • Spacers • turning tools • threading tools • facing tools	• Workpiece • Liquid Soap • Powder Soap • Cutting Fluid/Coolant

• Clothes' Rug • Trash Can • Dustpan	• parting tools • knurling tools • forming tools • boring tools • grooving tools • drilling tools Inserts • Steel Ruler • Vernier Calliper • Micro-Meter • Dial Indicator • Thread Gauge • Multimeter • Oil Level Tester • Allen Keys • Spanner	
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Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have some Videos and/ or photos illustrating the types of lathe machines and their parts.
- Avail unset lathe machine
- Avail non sharpened lathe cutting tools
- Have the workpiece holding accessories
- Have a well-arranged work place.
- Avail lathe machine attachment
- Avail turning tools
- Have cooling equipment



Indicative content 2.1: Conducting Pre-Operation Inspection



Duration: 8hrs



Theoretical Activity 2.1.1: Description of lathe machine.



Notes to the trainer:

- Trainer may deliver this content, by using open questions in small groups of trainees to explain the types of lathe machine, the parts of lathe machine, the system of lathe machine and the lathe machine specification.
- Images, videos, and illustrations related to lathe machine can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity by asking trainees to answer the following questions:
- Describe the types of lathe machines.
 - Identify the parts of lathe machine.
 - Explain the systems of lathe machine.
 - Identify lathe machine specifications.
- Step 2:** Ask trainees to write the answers on flipchart/paper.
- Step 3:** Ask trainees to present their answers.
- Step 4:** Provide expert view and clarify ideas by using didactic materials.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 2.1.1. In trainee manual.



Points to Remember

- While describing the types of lathe machines consider their parts mainly Bed, Head stock, Tailstock, Carriage, Feed mechanism and Thread cutting mechanism
- When describing systems of lathe machine do not forget the main systems like mechanical system electrical system and coolant system.



Practical Activity 2.1.2: Inspecting systems of lathe machine



Notes to the trainer

- You are supposed to go in the workshop and demonstrate to the trainees how to conduct Pre-operation inspection of mechanical system, electrical system and coolant system of the lathe machine
- For the effective delivery; it is recommended to have lathe machine and its safety and security kits.



Key steps:

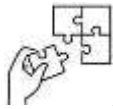
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below: you are requested to go in the manufacturing workshop and conduct Pre-operation inspection of mechanical system, electrical system and coolant system of lathe machine a day before performing turning operation of mild steel table legs.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to inspect mechanical system, electrical system and coolant system of lathe machine
- Step 4:** Ask trainees to inspect mechanical system, electrical system and coolant system of lathe machine
- Step 5:** Verify whether mechanical system, electrical system and coolant system of lathe machine of lathe machine are well inspected.
- Step 6:** Ask trainees to read key reading 2.1.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in the application of learning 2.1



Points to Remember

- Before performing any lathe machine operation inspect lathe machine systems mainly mechanical system, electrical system and coolant system.
- While carrying out visual inspection for lathe machine remember the machine must be turned off and disconnected from the power supply to avoid any accidental starts.



Application of learning 2.1.

Ask trainees to Visit any manufacturing workshop that uses lathe machine join the manufacturing team and participate in the following lathe machine inspections

- i. Inspect mechanical system of lathe machine
- ii. Inspect electrical system of lathe machine
- iii. Inspect coolant system of lathe machine

Checklist /Solution for application

SN	Criteria	Indicators	Yes	No
1	Mechanical system is appropriately inspected	1.1. PPEs are worn		
		1.2. Tools for inspection are gathered		
		1.3. Equipment for inspection are gathered		
		1.4. Alignment of the lathe bed is checked		
		1.5. Alignment of headstock to tail stock checked		
		1.6. Alignment of carriage is checked		
		1.7. Cleanliness is checked		
		1.8. The flatness of the lathe bed is checked		
		1.9. Surface Condition of the lathe bed is inspected		
		1.10. Spindle smooth operation is checked		
		1.11. Movement in the spindle bearings is checked		
		1.12. The headstock gears and belts is checked		
		1.13. Quill movement is checked		
		1.14. Motion of the carriage and cross slide is checked		
		1.15. Gib adjustments on the carriage and cross slide is checked		
		1.16. Chuck Condition is inspected		

		1.17. Tool post alignment is checked		
		1.18. Oil level in headstock and gearbox is checked		
		1.19. Lubrication points are inspected		
2	Electrical system is well inspected	2.1. Electrical inspection tools are gathered		
		2.2. Visible wiring are inspected		
		2.3. Electrical connections are inspected		
		2.4. Power cables are checked		
		2.5. Lathe electrical Enclosures are inspected		
		2.6. Power supply voltage is checked		
		2.7. The emergency stop button is tested		
		2.8. The control panel is inspected		
		2.9. Motor connections are inspected		
		2.10. The condition of drive belts and pulleys are checked		
		2.11. Sensors and Switches are inspected		
		2.12. Ground Continuity is tested Test		
3	Coolant system is properly inspected	3.1. The coolant reservoir is checked		
		3.2. Coolant lines and hoses are inspected		
		3.3. Coolant nozzles are checked		
		3.4. the concentration of the coolant mixture is checked		
		3.5. The color and clarity of the coolant are checked		
		3.6. The coolant PH level is checked		
		3.7. The coolant temperature is checked		
		3.8. the coolant filtration system is checked		
		3.9. The flow rate of the coolant from the nozzles is measured		
		3.10. The coolant leak is checked		

		3.11. Dirty or contaminated coolant is drained from the reservoir.		
		3.12. Fresh coolant is refilled		



Indicative content 2.2: Setting Machine, Tools and Equipment



Duration: 8hrs



Theoretical Activity 2.2.1: Description of parameters to be set on lathe machine



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to explain Spindle speed, Taper turning angle, Feed, Flow rate and depth of cut as lathe machine parameters and their calculations.
- Use video, photo related to lathe machine parameters as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and request trainees to respond to the following questions reflecting on types of tools materials and equipment used in lathe machine operation:
- What do you understand by the following terms used in lathe machine operation?
 - Spindle speed
 - Taper turning angle
 - Feed
 - Flow rate
 - What are the formulas for calculating the values of following parameters in lathe machine operation?
 - Spindle speed
 - Taper turning angle
 - Coolant flow rate
 - Feed
 - Feed rate
 - Depth of cut
- Step 2:** Asks trainee to write answers provided on flipchart/paper.
- Step 3:** Ask trainees to present their answers
- Step 4:** Provide the expert view on their presentation
- Step 5:** Address any questions or concerns from the trainees.
- Step 6:** Ask trainees to read the key reading 2.2.1. in the trainee manual.



Points to Remember

- When determining the Spindle speed consider the desired the cutting speed and the diameter of the workpiece.
- When adjusting coolant flow rate use the coolant control valve or regulator to ensure proper cooling and lubrication during the turning operation



Practical Activity 2.2.2: Setting the lathe machine parameters



Notes to the trainer

- you are supposed to go in the workshop and demonstrate to the trainees how to set lathe machine parameters, spindle speed, taper turning angle, coolant flow rate, feed and depth of cut.
- For the effective delivery, it is recommended to have lathe machine and its accessories



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below: you are asked to go in workshop and demonstrate the trainees how to set the following lathe machine parameters, spindle speed, taper turning angle, coolant flow rate, feed and depth of cut, for tuning a blank of brake drum of 100mm of larger end diameter, 40mm of smaller end diameter with a tape length of 300mm of length.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to set lathe machine parameters, spindle speed, taper turning angle, coolant flow rate, feed and depth of cut.
- Step 4:** Ask trainees to set lathe machine parameters, spindle speed, taper turning angle, coolant flow rate, feed and depth of cut.
- Step 5:** Verify whether the spindle speed, taper turning angle, coolant flow rate, feed and depth of cut are correctly set.
- Step 6:** For more information, ask trainees to read key reading 2.2.2 in trainee manual

Step 7: Ask trainees to perform the task provided in the application of learning 2.2



Points to Remember

- During the setting of spindle speed on lathe machine remember to consider the types of material, because the harder material require a higher cutting speed compared to softer material.
- When calculating taper turning angle do not use centreline angle use only an included angle
- For heavy-duty operations, increase the flow rate to handle the additional heat generated because if the tool is overheating the chips are not being removed properly.
- Take multiple passes, if the total material to be removed exceeds the tool's safe depth of cut



Theoretical Activity 2.2.3: Description of types of tool poste



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to explain the following types of tool post: the single way tool post, open side tools post, four way tools post and quick change tool post.
- Use video, photo related to tool post as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and request trainees to respond to the following questions reflecting on tool post operation:

- i. What do you understand by the following terms?
 - a) Single way tool post
 - b) Open way tool post
 - c) Four-way tool post
 - d) Quick change tool post

Step 2: Asks trainee to write answers provided on flipchart/paper.

Step 3: Ask trainees to present their answers.

- Step 4:** Provide the expert view on the presentation
- Step 5:** Address any questions or concerns from the trainees.
- Step 6:** For more information, ask trainees to read the key reading 2.2.3. in the trainee manual



Points to Remember

- Do not use single way tool post for lathe operation that require multiple tools to be quickly changed because it increases the downtime due to multiple tool changing.



Theoretical Activity 2.2.4.: Description of cutting tool geometry for lathe machine operation.

Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to explain the cutting tool geometry and tool signature.
- Use video, photo related to cutting tool geometry as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and request trainees to respond to the following questions reflecting on tool post operation:
- What do you understand by the following terms?
 - Cutting tool geometry
 - Tool signature
 - What are the key elements of the cutting tool geometry?
- Step 2:** Asks trainee to write answers provided on flipchart/paper.
- Step 3:** Asks trainees to discuss the answers and choose correct answers
- Step 4:** Address any questions or concerns from the trainees.
- Step 5:** For more information, ask trainees to read the key reading 2.2.4.1. in the trainee manual



Points to Remember

- Do not allow the cutting tool to rub on the workpiece unless the tool will wear out as fast as possible.

- To avoid the excessive wear of cutting tool, match the cutting tool geometry with the appropriate cutting speed and feed rate.



Practical Activity 2.2.4.2: Cutting tool setting



Notes to the trainer

- You are supposed to go in the workshop and demonstrate to the trainees how to sharpen the cutting tool, fix the cutting tool in the toolpost and how to fix the drill chuck in the tailstock spindle.
- For the effective delivery, it is recommended to have lathe machine and its accessories



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below: while you are preparing for straight turning the round bar of 40mm diameter to 25mm diameter at a length of 1000mm and a drilling of the end holes of 10mm diameter for supporting lathe centers. you are asked to go in workshop and demonstrate to trainees the way of:
- 1) Sharpening the cutting tool
 - 2) Fixing the cutting tool in the tool post
 - 3) Fixing the drill chuck in tailstock spindle
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to sharpen the cutting tool, fix cutting tool in the tool post and how to fix the drill chuck in tail stock spindle.
- Step 4:** Ask trainees to sharpen cutting tool, fix cutting tool in tool post and to fix the drill chuck in tail stock spindle.
- Step 5:** Verify whether the cutting tool is well sharpened, well fixed in the tool post and check if the drill chuck is well fixed in the tailstock spindle.
- Step 6:** For more information, ask trainees to read key reading 2.2.4.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in the application of learning 2.2



Points to Remember

- While setting the lathe cutting tool take into consideration the geometry of the tools if not the cutting tool performance and tool life are reduced.
- While setting the lathe cutting tool take into consideration the geometry of the tools if not the cutting tool performance and tool life are reduced.
- When setting the rake angle remember the rake angle may be positive, or negative or even zero
- When setting cutting tool angles do not set a larger relief angle because it weakens the cutting edge.
- While positioning the tool set it at the correct height and securely fixing it in the tool post is to ensure optimal cutting performance, tool life, and operator safety during lathe machine operations.
- When Inserting the Cutting Tool into the tool post do not leave gaps between the tool and the holder as they cause slippage during the operation.



Application of learning 2.2.

Ask trainees to go in the workshop and perform the below tasks required for turning a mild steel tapered sleeve of 40mm of big diameter ,20mm of smaller diameter and 80 mm of tapered length.

- i. Set the spindle speed
- ii. Set the taper turning angle
- iii. Set the coolant flow rate
- iv. Set the feed mechanism
- v. Set the depth of cut
- vi. Sharpen the cutting tool
- vii. Fix the cutting tool into the tool post
- viii. Fix the drill chuck in the tailstock spindle.

Checklist /Solution for application:

SN	Criteria	Indicators	Yes	No
1	The spindle speed is well set	1.1. Recommended cutting speed for mild steel is identified		
		1.2. The work piece diameter is measured		
		1.3. The spindle speed is calculated		
		1.4. The spindle speed is adjusted		
		1.5. Test cut is performed		
2	The taper turning angle is correctly set	2.1. The taper angle is calculated		
		2.2. The Compound rest is set to the taper angle		
3	The coolant flow rate is appropriately set	3.1. The coolant is selected		
		3.2. Coolant system is inspected		
		3.3. The nozzle is positioned		
		3.4. Coolant follow rate is calculated		
		3.5. Coolant flow is started		
		3.6. Coolant flow is adjusted		
4	Feed mechanism is well set	4.1. The feed rate is set based on material and operation		
		4.2. The Gearbox or Quick Change Gearbox is set		
		4.3. The Feed is disengaged After Completing the Operation		
5	Depth of cut is well set	5.1. The Desired Depth of Cut		
		5.2. The Cross Slide is adjusted for Depth		
6	Cutting tool geometry is appropriately set	6.1. Back rack angle is set		
		6.2. Side rack angle is set		
		6.3. Clearance angle is set		
		6.4. Side Cutting Edge Angle		
		6.5. The nose radius is determined		
7	The lathe cutting tools are properly sharpened	7.1. Bench grinder is selected		
		7.2. Grinding wheel is prepared		
		7.3. Tool is secured		
		7.4. Front clearance angle is ground		
		7.5. Side clearance angle is ground		
		7.6. Rack angles are ground		
		7.7. The tool tip is shaped		
		7.8. Tool is inspected		
		7.9. Tool is tested		
8	Cutting tool is correctly fixed in the tool post	8.1. Tool post is prepared		
		8.2. Tool holder is prepared		
		8.3. Cutting tool is inserted		
		8.4. Tool height is adjusted		

9	Drill chuck is correctly fixed in tailstock spindle	8.5. Tool is secured in place		
		8.6. Tool alignment is tested		
		9.1. The Tailstock is cleaned		
		9.2. The Drill Chuck Taper is cleaned		
		9.3. The Drill Chuck is inserted into the tailstock spindle		
		9.4. The Drill Chuck is secured in Place		
		9.5. The Tailstock Lock is tightened		



Indicative content 2.3: Mounting Workpiece



Duration: 8hrs



Theoretical Activity 2.3.1: Description of mounting the work piece on lathe machine



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to describe the method of mounting work piece on lathe machine, identify the lathe work holding accessories and describe the lathe machine attachment.
- Video, photo related to the mounting of workpiece on lathe machine can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and request trainees to respond to the following questions reflecting on cutting tool geometry

- Describe the methods of mounting the work piece on lathe machine
- Identify the Work piece holding accessories for lathe machine
- Describe the following lathe machine attachment.
 - Milling attachment
 - Grinding attachment
 - Gear-cutting attachment
 - Turret attachment
 - Crank pin turning attachment
 - Taper turning attachment

Step 2: Asks trainee to write answers on flipchart/paper.

Step 3: Ask trainees to present their answers

Step 4: Provide the expert view on the presentation

Step 5: Address any questions or concerns from the trainees.

Step 6: For more information, ask trainees to read the key reading 2.3.1. in the trainee manual



Points to Remember

- When securing the milling attachment on the lathe machine ensure that all bolts are tightened because any looseness can result in inaccurate cuts or damage.
- When mounting grinding wheel attachment on the lathe machine remember to adjust the height of the grinding attachment to avoid the misalignment between grinding wheel and work piece.
- When mounting the crankpin turning attachment adjust the lathe center to accommodate the eccentricity of the crank pin.



Practical Activity 2.3.2: Mounting the work piece on lathe machine



Notes to the trainer

- You are supposed to go in the workshop and demonstrate to the trainees how to mount the workpiece between in chucks of lathe machine, how to mount the workpiece between two centers and how to mount the workpiece to faceplates.
- For the effective delivery, it is recommended to have lathe machine and its accessories



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below: you are asked to go in the workshop and demonstrate to the trainees how to mount the work piece in the chucks, between two chucks and how to mount the workpiece to the faceplate for turning a boring bar of 20mm of diameter and 100mm of length from a high speed steel (HSS) round bar of 40mm diameter and 600mm of length.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how the chucks, between two chucks and to the faceplate

- Step 4:** Ask trainees to mount the work piece between the chucks, between two chucks and to the faceplate.
- Step 5:** Verify whether the work piece is mounted in Demonstrate how the chucks, between two chucks and to the faceplate.
- Step 6:** For more information, ask trainees to read key reading 2.3.2. in trainee manual
- Step 7:** Ask trainees to perform the task provided in the application of learning 2.3



Points to Remember

- When using a four –jaw chuck re member to adjust each jaw individually unless the work piece will not be aligned.
- When mounting the workpiece between centers remember to engage the live center with the work piece so that the workpiece rotate freely without wobbling.



Practical Activity 2.3.3 Mounting lathe machine attachments

Task:

- You are supposed to go in the workshop and demonstrate to the trainees how to mount work piece with lathe machine attachments
- For the effective delivery, it is recommended to have lathe machine attachments



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below:
As a manufacturing technician you are asked to go in workshop and demonstrate to the trainees how to mount the work piece with lathe machine attachments for turning a shaft and crankshaft having the following specification:
- i.The shaft is 800mm length and 40mm of diameter.
 - ii.The left end is hexagonal shaped at 100mm of length
 - iii.At 200mm from the lend of the shaft there is a spur gear portion of 30 teeth and 1.5mm of pitch at 200mm of length.
 - iv.At 100mm from the spur gear portion a threaded portion of 200mm of length
 - v.From the threaded portion there is a grooved portion
 - vi.The right end of the shaft is tapered at length of 300mm and 200mm of big diameter and 100mm of smaller diameter

vii. The school also wants to fabricate a crank shaft having the crankpin at the offset from the central axis of the crank shaft.

Step 2: Explain the task and provide clear work instruction (Task, PPE, Time allocated)

Step 3: Demonstrate how to lathe machine attachments

Step 4: Ask trainees to mount lathe machine attachments.

Step 5: Verify whether the lathe machine attachments are mounted

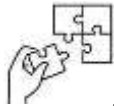
Step 6: For more information, ask trainees to read key reading 2.3.3. in trainee manual.

Step 7: Ask trainees to perform the task provided in the application of learning 2.3



Points to Remember

- While securing the milling attachment on the lathe machine ensure that all bolts are tightened because any looseness can result in inaccurate cuts or damage.
- When mounting grinding wheel attachment on the lathe machine remember to adjust the height of the grinding attachment to avoid the misalignment between grinding wheel and workpiece.



Application of learning 2.3.

Ask trainees to visit any manufacturing workshop that uses a lathe machine, make an observation and elaborate a written report on the following observed tasks: Mounting the milling attachment

- i. Mounting grinding attachment
- ii. Mounting gear-cutting attachment
- iii. Mounting turret attachment
- iv. Mounting crank pin turning attachment
- v. Mounting taper turning attachment

Checklist /Solution for application:

SN	Criteria	Indicators	Yes	No
1	Lathe milling attachment is well mounted	1.1. Lathe machine is disconnect from the power supply		
		1.2. Lathe bed and carriage are cleaned		
		1.3. Lathe tool post is removed		
		1.4. The Milling Attachment is aligned		
		1.5. The Milling Attachment is secured		
		1.6. The Vertical Slide is adjusted		
		1.7. The Mill cutter is mounted		
2	The grinding attachment is correctly mounted	2.1. Lathe is cleaned		
		2.2. Tool post is detached		
		2.3. The grinding attachment is positioned		
		2.4. The grinding Attachment is secured		
		2.5. The grinding wheel is aligned		
		2.6. The grinding attachment height is adjusted		
		2.7. The correct gear-cutting attachment is selected		
		2.8. The existing tool post is removed		
		2.9. The gear-cutting attachment is positioned on the carriage		
		2.10. Secure the Gear-Cutting Attachment		
3	The gear cutting attachment is appropriately mounted	3.1. The lathe is cleaned		
		3.2. The correct gear-cutting attachment is selected		
		3.3. The existing tool post is removed		
		3.4. The gear-cutting attachment is positioned on the carriage		
		3.5. The gear-cutting attachment is secured		
		3.6. The Indexing Head is attached		
		3.7. The gear cutter is fixed into gear cutting attachment		
4	The turret attachment is well mounted	3.8. The cutter is aligned		
		4.1. Lathe is cleaned		
		4.2. The Existing Tool Post is removed		
		4.3. The turret attachment is aligned on the Cross-Slide		
		4.4. The Turret Attachment is secured		
		4.5. Tools are installed		

		4.6. Tool height is adjusted		
		4.7. The Turret Indexing Mechanism is tested		
		4.8. The Turret Head is secured		
5	Crank pin turning attachment is well mounted	5.1. The lathe is cleaned		
		5.2. Tool post is removed		
		5.3. The Crank Pin Turning Attachment is aligned		
		5.4. The Crank Pin Turning Attachment is secured		
		5.5. The Crank Pin Offset is set		
		5.6. The Crank Pin Offset is adjusted		
6	The taper turning attachment is well mounted	6.1. Lathe is cleaned		
		6.2. The Carriage is positioned		
		6.3. The Tailstock is removed		
		6.4. The Taper Turning Attachment is positioned		
		6.5. The Attachment is connected to the Cross-Slide		



Indicative content 2.4: Carrying out Turning Operations



Duration: 36 hrs



Theoretical Activity 2.3.1: Description types of turning operation to be carried out in lathe machine operation



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to explain types of turning operations to be carried out in lathe machine operation
- Use video, photo related types of turning operations to be carried out in lathe machine operation as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and request trainees to respond to the following questions reflecting to the lathe turning operations

i. What do you understand by the turning operations?

- Facing
 - Parallel tuning
 - Step turning
 - Chamfering
 - Parting
 - Taper turning
 - Drilling
 - Boring
 - Grooving
 - Reaming
 - Tapping
 - Knurling
 - Threading
 - Eccentric turning
- ii. Describe the following cooling techniques
- Air cooling technique
 - Fluid cooling technique

Step 2: Asks trainee to write the answers on flipchart/paper.

Step 3: Asks trainees to present their answers

Step 4: Address any questions or concerns from the trainees.

Step 5: For more information, ask trainees to read the key reading 2.4.1. in the trainee manual



Points to Remember

- When performing a taper turning using a form tool remember the taper length must be equal to the width of the form tool.
- When preparing for taper turning operation do not care about centerline angle, use only the included angle.



Practical Activity 2.4.2: performing facing, parallel turning, step turning, chamfering, parting and taper turning operations on lathe machine



Notes to the trainer

- You are required to go in the workshop and demonstrate to the trainees how to perform turning operations on lathe machine
- For the effective delivery, it is recommended to have lathe machine lathe accessories and lathe attachment and work piece



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to perform the task described below:

As a manufacturing technician you are asked to go in workshop and demonstrate trainees how perform turning operation on lathe machine by turning twelve metallic legs of chairs having the following specifications:

- i. The chair legs are fabricated from the round bars of 50mm of diameter
- ii. The four (4) legs are straight and have 500mm of length and 20mm of diameter
- iii. The four (4) legs have 30mm and 20mm of diameter at a length of 300mm and 200mm of length respectively
- iv. The four (4) legs are tapered at a length of 500mm with 30mm and 20mm of big and smaller diameter respectively.
- v. The end of each legs has a chamfer of 5mm at 15 °

Step 2: Explain the task and provide clear work instruction (Task, PPE, Time allocated).

- Step 3:** Demonstrate how to perform facing, parallel turning, step turning, chamfering, parting and taper turning operations on lathe machine
- Step 4:** Ask trainees to performing facing, parallel turning, step turning, chamfering, parting and taper turning operations on lathe machine
- Step 5:** Verify whether facing, parallel turning, step turning, chamfering, parting and taper turning operations are well performed on lathe machine
- Step 6:** For more information, ask trainees to read key reading 2.4.2. in trainee manual
- Step 7:** Ask trainees to perform the task provided in the application of learning 2.4



Points to Remember

- Ensure the work piece is securely mounted and properly aligned in the chuck or between centres to prevent vibrations and inaccuracies.
- Adjust the spindle speed according to the material and the size of the boring tool.
- Verify that all tools and equipment are in good condition



Practical Activity 2.4.3: Performing drilling, Boring, grooving, reaming and tapping operations on lathe machine



Notes to the trainer

- You are supposed to go in the workshop and demonstrate to the trainees how to perform drilling, Boring, grooving, reaming and tapping operations on lathe machine
- For the effective delivery, avail the drilling tool, boring tool, grooving tool, reaming tool, tapping tool and machine with its accessories



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below:
As a manufacturing technician you are asked to go in the workshop and demonstrate to the trainees how to perform drilling, Boring, grooving, reaming and tapping operations on lathe machine while turning a nut having the following specifications:

- i. The nuts are fabricated from the round bar of 40mm of diameter.
- ii. The nuts have 50mm of length ,30mm and 25mm of outer and inner diameter respectively.
- iii. The nuts are firstly produced by drilling a hole of 20mm of diameter and then enlarged to 25 mm diameter.
- iv. For decorative purpose the outer surfaces of the nuts have a groove of 3mm of depth at 10mm length from the length center of the nut.
- v. The nut has internal treads of 2mm pitch.

Step 2: Explain the task and provide clear work instruction (Task, PPE, Time allocated).

Step 3: Demonstrate how to perform drilling, Boring, grooving, reaming and tapping operations on lathe machine.

Step 4: Ask trainees to perform drilling, Boring, grooving, reaming and tapping operations on lathe machine.

Step 5: Verify whether drilling, Boring, grooving, reaming and tapping operations are well performed on lathe machine.

Step 6: For more information, ask trainees to read key reading 2.4.3. in trainee manual.

Step 7: Ask trainees to perform the task provided in the application of learning 2.4



Points to Remember

- Before performing drilling operation, create a small pilot hole at the center of the workpiece for guiding the main drill bit.
- When preparing for grooving operation, select the grooving tool which is narrower than the groove to allow gradual cutting.
- When using a tapered shank reamer, remember to replace the tailstock chuck by a morse taper.
- While advancing the drill bit into the workpiece by moving the tailstock, apply steady, even pressure without forcing the drill bit.
- When feeding the boring tool into the workpiece feed it gradually and move it slowly avoid chatter.



Practical Activity 2.4.4: Performing Knurling and Threading operation on lathe machine.

Notes to the trainer

- You are supposed to go in the workshop and demonstrate to the trainees how to perform Knurling and Threading operations on lathe machine

- For the effective delivery, it is recommended to have Knurling and Threading cutting tools and lathe machine with its accessories



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below:
As a manufacturing technician you are asked to go in workshop and demonstrate to the trainees how to perform Knurling and threading operation on lathe machine by turning a knurled head bolt within the following specifications:
- The bolt is produced from mild steel round bar of 40 mm of diameter
 - The length of the bolt is 100mm
 - The threaded length is 90mm
 - The major diameter is 30mm
 - The minor diameter is 20mm
 - The threads pitch is 2mm
 - The knurls are diamond type.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to perform Knurling and Threading operation on lathe machine
- Step 4:** Ask trainees to perform Knurling and Threading operation on lathe machine
- Step 5:** Verify whether Knurling and Threading operations are correctly performed
- Step 6:** For more information, ask trainees to read key reading 2.4.4. in trainee manual
- Step 7:** Ask trainees to perform the task provided in the application of learning 2.4



Points to Remember

- While performing knurling and threading operation, after each pass remember to check the knurls pattern and threads for uniformity and depth.
- While performing threading on lathe machine remember to determine the thread pitch.



Practical Activity 2.4.5: Performing eccentric turning on lathe machine



Notes to the trainer

- You are required to go in the workshop and demonstrate to the trainees how to perform eccentric turning operations on lathe machine
- For the effective delivery, it is recommended to eccentric turning cutting tools and lathe machine and its accessories



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below:
As a manufacturing technician you are asked to go in workshop and demonstrate to the trainees how to perform eccentric turning operation on lathe machine by turning a crank shaft in mild steel rod of 40mm of diameter with eccentric crankpin where eccentric axis is located at 10mm from the main axis.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to perform eccentric turning operation on lathe machine
- Step 4:** Ask trainees to perform an eccentric turning operation on lathe machine
- Step 5:** Verify whether eccentric turning operation is well performed
- Step 6:** For more information, ask trainees to read key reading 2.4.5. in trainee manual
- Step 7:** Ask trainees to perform the task provided in the application of learning 2.4



Points to Remember

- When preparing for eccentric turning remember to scribe the offset axis on the workpiece.
- During an eccentric turning remember to adjust the position of the tool or the workpiece periodically to achieve the desired shape.



Practical Activity 2.4.6: Applying cooling techniques



Notes to the trainer

- You are supposed to go in the workshop and demonstrate to the trainees how to applying air cooling technique and fluid cooling technique on lathe machine.
- For the effective delivery, it is recommended a lathe machine which has air and fluid cooling system.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below:
As a manufacturing technician you are asked to go in workshop and demonstrate to the trainees how to apply air cooling and fluid cooling techniques during lathe machine operation while reducing a diameter a mild steel rod from 50mm to 40mm.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to Apply air and fluid cooling techniques during lathe machine operation
- Step 4:** Ask trainees to Apply air and fluid cooling techniques during lathe machine operation
- Step 5:** Verify whether air and fluid cooling techniques are well applied during lathe machine operation
- Step 6:** For more information, ask trainees to read key reading 2.4.6. in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 2.4



Points to Remember

- While applying the air and fluid cooling technique during turning operation remember to adjust the angle the nozzle to direct the airflow or the fluid flow to the cutting zone
- When using fluid cooling technique remember to change the fluid as Over time, cutting fluids can become contaminated and less effective.



Application of learning 2.4.

Ask trainees to go in the manufacturing workshop of the school and produce the piece having the following specifications:

- i. Make a mild steel piece of 500mm of length
- ii. The piece is made from the round bar of 40mm of diameter
- iii. The piece has 35 mm and 30mm of diameters at a 100mm and 80mm of length from the left end of the piece respectively.
- iv. This portion of 35 mm of diameter is threaded with 2mm pitch.

- v. From the end of 30mm of diameter portion the piece is tapered to 20mm diameter at a 100mm of length.
- vi. At 50mm from the smaller diameter of tapered portion the piece has a groove of 8mm of depth at 6mm of length.
- vii. At 100mm from the grooved portion toward the left side of the piece there is a stepped hole of 12mm of smaller diameter with 10mm of depth which is then enlarged to 16mm diameter at 8mm of height toward the top face of the piece.
- viii. The face of the drilled smaller hole is fully threaded with 1.5mm pitch
- ix. The left end of the piece has a diamond knurled crankpin of 150mm of length 15mm of diameter located at 5mm from the main axis to eccentric axis
- x. The right end of the piece has a chamfer of 5mm at 15°

Checklist/Solution for application:

SN	Criteria	Indicators	Yes	No
1	Parting is performed properly	1.1. Parting tool is selected		
		1.2. Parting tool is installed in the tool holder or tool post		
		1.3. Parting tool position is adjusted		
		1.4. The workpiece is secured in the lathe chuck or collet.		
		1.5. The spindle speed is adjusted		
		1.6. The parting tool is advanced into the workpiece		
		1.7. The cut is completed		
		1.8. The workpiece of 500mm of length is obtained		
2	Parallel Turning is well performed	2.1. The workpiece is selected		
		2.2. The workpiece is mounted between the lathe's centres or in a chuck.		
		2.3. The cutting tool is selected		
		2.4. The cutting tool is mounted in the tool post		
		2.5. the lathe speed and feed rate are adjusted		
		2.6. The tool is positioned to touch the workpiece surface		
		2.7. The initial pass is performed		
		2.8. Final pass is performed		
		2.9. The workpiece diameter is reduced from 40mm to 35mm.		
3	Step turning is well performed	3.1. The cutting tool is select and installed into the tool post		
		3.2. The tool height is set.		

		3.3. The Steps on the Workpiece are marked		
		3.4. The Spindle Speed is set		
		3.5. The rough Turning of the largest diameter is started		
		3.6. The Rough Turning for Remaining Steps is performed		
		3.7. The Steps are finished		
		3.8. The Diameters are checked		
		3.9. The step of 35 at a length of 100mm is obtained		
		3.10. The step of 30mm at a length of 80mm is obtained.		
		3.11. The edges of each step are deburred		
		3.12. The Final Workpiece is inspected for surface finish and dimension		
4	Taper turning is correctly performed	4.1. The workpiece is mounted and centered		
		4.2. The taper angle is calculated.		
		4.3. The Compound Rest is adjusted to the desired taper angle		
		4.4. The tool is positioned in the tool holder at correct height and angle		
		4.5. The spindle speed is set		
		4.6. The feed rate is set		
		4.7. Cutting passes are performed		
		4.8. Measurement is checked		
		4.9. Finishing cut is performed		
		4.10. Sharp edges are removed from the surface		
		4.11. The tapered portion has 30mm and 20mm of big and smaller diameter at 100 mm of length.		
5	Grooving is well performed	5.1. Grooving tool is selected and mounted in the tool post		
		5.2. The depth and width of the groove are set		
		5.3. Speed and feed are adjusted		
		5.4. The tool is adjusted to the correct height and angle		
		5.5. The Tool is fed into the workpiece		
		5.6. The groove is finished		

		5.7. The groove of 6mm of depth and 8mm of width is obtained		
6	Drilling operation is well performed	6.1. The drill bit is selected		
		6.2. The Drill Bit is installed and aligned		
		6.3. The lathe speed and Feed are set		
		6.4. The drill bit is advanced into the workpiece		
		6.5. The Drilling is completed		
		6.6. The hole of 12mm of diameter is obtained		
7	Boring is well performed.	7.1. Boring Tool is selected and installed		
		7.2. The lathe speed and feed rate are adjusted		
		7.3. The boring tool is feed into the workpiece		
		7.4. The enlarged hole of 16mm of diameter is machined.		
8	Reaming is well performed	8.1. The reamer is installed into the tailstock		
		8.2. The lathe speed is set		
		8.3. The tool is advanced into the hole		
		8.4. The drilled holes are smooth		
9	Tapping is well performed	9.1. The tap is inserted into the tailstock or tapping attachment		
		9.2. The Depth of Cut is set		
		9.3. The tap is advanced into the workpiece		
		9.4. The internal threads with 1.5mm pitch are cut		
10	Eccentric turning is correctly performed	10.1. The Offset Axis is marked on the Workpiece		
		10.2. The Workpiece is mounted		
		10.3. The required amount of offset is adjusted		
		10.4. Initial turning is performed		
		10.5. Eccentric turning is performed		
		10.6. The turned eccentric pin is finished		
11	Knurling is well performed	11.1. The knurling tool with diamond knurls is selected.		
		11.2. The knurling tools are installed into the tool post		
		11.3. The knurling tool height is adjusted		

		11.4. The knurling tool is feed into the workpiece surface		
		11.5. The eccentric pin is equipped with diamond knurls		
12	Threading is properly performed	12.1. The threading tool is selected and installed into the tool post		
		12.2. The Thread Pitch of 2mm is selected		
		12.3. The Spindle Speed is set		
		12.4. The lathe Threading Mechanism is engaged		
		12.5. The feed threading tool is fed into the workpiece		
		12.6. The threads of 2mm of pitch are obtained		
13	Facing is well performed	13.1. The facing tool is installed and positioned		
		13.2. The tool height is adjusted		
		13.3. The Spindle Speed is set		
		13.4. The feed mechanism is engaged		
		13.5. The Depth of cut is set		
		13.6. The tool is moved across the face of the workpiece		
14	Chamfering is well performed.	13.7. The face flatness is checked		
		14.1. The chamfering tool is selected		
		14.2. The chamfering tool is Positioning at the appropriate angle		
		14.3. The tool Height is adjusted and aligned with the centerline of the workpiece.		
		14.4. The lathe Speed and Feed are set		
		14.5. the chamfering tool is moved across the edge of the workpiece.		
		14.6. The chamfer of 5mm at 15° is obtained.		



Learning outcome 2 end assessment

Written assessment

Q1. Read and complete the following sentence by the appropriate word selected from the following list: **Feed Mechanism, Special lathe machine, motor, carriage**

- a) are used to perform special operations that are not possible with the rest of the lathe (**Answer: Special lathe machine**)
- b) is used for support, guide and feed the tool against the job when the machining is done. (**Answer: carriage**)
- c) is the combination of different units through which motion of headstock spindle is transmitted to the carriage of lathe machine **Answer: (Feed Mechanism)**
- d) is an essential part of the electrical system and provides the power necessary to drive the spindle, feed mechanisms, and other moving parts of the lathe machine. (**Answer: Motor**)

Q2. Which one is not type of lathe machine:

- a) Engine lathe
- b) Speed lathe
- c) Turret lathe
- d) All are correct

Answer: d

Q3. Match column **A** representing types of turning operations and their explanations in column **B**. Use each letter only once and write it in the provide blank space provide blank space

Answers	Column A	Column B
1 → I	11. Facing	K. involves cutting a workpiece to separate it from the main stock
2 → H	12. Chamfering	L. involves cutting a narrow, elongated recess or groove on the surface of a work piece.
3 → G	13. Parting	M. the process of cutting a bevelled edge or chamfer on the outer or inner corners of a workpiece
4 → J	14. Boring	N. is the process of cutting a flat surface perpendicular to the workpiece's axis.
5 → F	15. Grooving	O. is the process of enlarging an existing hole or creating a precise cylindrical hole in a work piece

Q4. Read the following statement and answer true or false, if the statement is correct and not correct respectively:

- a) The combined feed is made with the movement of a tool in longitudinal and lateral direction simultaneously while moving the workpiece. **(True)**
- b) The taper angle is the angle at which the compound rest to be rotated is calculated by using the formula $\tan \alpha = D-d / 2$ **(False)**
- c) Drilling is the process of creating different diameter in a workpiece using a drill bit. **(False)**
- d) Fluid cooling, also known as coolant or cutting fluid cooling, involves the use of liquids or coolant fluids to cool the workpiece and cutting tool during machining operations. **(True)**

Q5. Which one is a cutting speed in machining a workpiece of 200 mm diameter rotating at a speed of 100 rpm. Write a letter corresponding to the correct answer:

- a) 72.83 m/min
- b) 62.83 m/min
- c) 52.83 m/min
- d) 61.83 m/min

Answer: b

Q6. Which one is the spindle speed for turning a 50 mm diameter bar at a cutting speed of 40 m/min. Write a letter corresponding to the correct answer:

- a) 256 rev/min
- b) 356 rev/min
- c) 355 rev /min
- d) 255 rev/min

Answer: d

Practical assessment

The YES company Ltd is a manufacturing company which is located in Mayada district and RWERU Sector. it is specialized in the manufacturing of the ball valves used in plumbing, as a hired weekend worker by the YES company ltd you are required to go in the manufacturing workshop of the YES company ltd and produce the ball valve having the following specifications:

- i. The ball valve has a T-shape
- ii. The ball valve is produced from a round steel bar of 45mm of diameter and 150mm of length.
- iii. The ball valve has a through hole divided into three (3) steps.
- iv. The main hole has 30mm of internal diameter and 35mm of

- v. From the right and left end of the ball valve the main diameter is enlarged to 33 mm at 20mm of depth and they are internally threaded with 2mm pitch.
- vi. The ball valve has octagonal shape at a length of 30mm from the right end.
- vii. From the end of octagonal shaped portion there is a groove of 10mm of depth and 8mm of width.
- viii. From the end of the grooved portion there is a straight portion of 40mm of diameter and 40mm of length.
- ix. At the center of this straight portion there is a projection of 50mm of length and 15mm of internal diameter and 18mm of outer diameter, this hole is internally threaded with 2mm pitch.
- x. From the end of the straight portion there is a second groove of the same specifications as the first groove
- xi. This ball valves have cross knurls at a length of 20mm from the left side.
- xii. The eccentric pin round head bolt must be produced with the following specifications:
 - a) The major diameter of the bolt is 14mm
 - b) The threaded length of the bolt is 49mm
 - c) The head of the bolt has 15mm of height and 16mm of diameter
 - d) The bolt has an eccentric pin of 160mm of length at 3mm from the main axis to eccentric axis.
 - e) The bolt is made from around steel bar of 16 mm of diameter.
 - f) The end of the bolt is chamfered on a length of 3mm at 15°

Checklist/Solution for application:

SN	Criteria	Indicators	Yes	No
1	Safety is well maintained	1.1. PPEs are worn		
		1.2. Fire extinguishers are checked for their working condition		
		1.3. First aid kit is availed		
2	Lathe and workpiece are well prepared	2.1. Electrical system is checked		
		2.2. Mechanical system is checked		
		2.3. Coolant system is checked		
		2.4. The workpiece is cleaned		
3	Tools are well selected and	3.1. Parting tool is selected		
		3.2. Parallel turning tool is selected		

		3.3. Step turning tool is selected		
		3.4. Taper turning tool is selected		
		3.5. Grooving tool is performed		
		3.6. Drilling tool is selected		
		3.7. Boring tool is selected		
		3.8. Reaming tool is selected		
		3.9. eccentric turning tool is selected		
		3.10. Knurling tool is selected		
		3.11. Threading tool is selected		
		3.12. Facing tool is selected		
		3.13. Chamfering tool is selected		
4	Parting is performed properly	4.1. Parting tool is installed in the tool holder or tool post		
		4.2. Parting tool position is adjusted		
		4.3. The workpiece is secured in the lathe chuck or collet.		
		4.4. The spindle speed is adjusted		
		4.5. The parting tool is advanced into the workpiece		
		4.6. The cut is completed		
		4.7. The workpiece of 152mm of length is obtained		
5	Parallel Turning is well performed	5.1. The workpiece is mounted between the lathe's centres or in a chuck.		
		5.2. The cutting tool is selected		
		5.3. The cutting tool is mounted in the tool post		
		5.4. the lathe speed and feed rate are adjusted		
		5.5. The tool is positioned to touch the workpiece surface		
		5.6. The initial pass is performed		
		5.7. Final pass is performed		
		5.8. The workpiece diameter is reduced from 45mm to 40mm.		
6	Step turning is well performed	6.1. The cutting tool is installed into the tool post		
		6.2. The tool height is set.		
		6.3. The Steps on the Workpiece are marked		
		6.4. The Spindle Speed is set		
		6.5. The rough Turning of the largest diameter is started		
		6.6. The Rough Turning for Remaining Steps is performed		

		6.7. The Steps are finished		
		6.8. The Diameters are checked		
		6.9. The step of 35 at a length of 100mm is obtained		
		6.10. The step of 38mm of length from the left end is obtained.		
		6.11. The step of 72 mm of length from the right end is obtained.		
		6.12. The edges of each step are deburred		
		6.13. The Final Workpiece is inspected for surface finish and dimension		
7	Grooving is well performed	7.1. Grooving tool is mounted in the tool post		
		7.2. The depth and width of the groove are set		
		7.3. Speed and feed are adjusted		
		7.4. The tool is adjusted to the correct height and angle		
		7.5. The Tool is fed into the workpiece		
		7.6. The groove is finished		
		7.7. The groove of 10mm of depth and 8mm of width is obtained		
8	Facing is well performed	8.1. The facing tool is installed and positioned		
		8.2. The tool height is adjusted		
		8.3. The Spindle Speed is set		
		8.4. The Depth of cut is set		
		8.5. The feed mechanism is engaged		
		8.6. The tool is moved across the face of the workpiece		
		8.7. 1mm is cut on both ends		
		8.8. The face flatness is checked		
		8.9. The workpiece of 150mm is obtained.		
9	Drilling operation is well performed	9.1. The Drill Bit is installed and aligned		
		9.2. The lathe speed and Feed are set		
		9.3. The drill bit is advanced into the workpiece		
		9.4. The Drilling is completed		
		9.5. The through hole of 30mm of diameter is obtained		
10		10.1. Boring Tool is Installed		

	Boring is well performed.	10.2. The lathe speed and feed rate are adjusted		
		10.3. The boring tool is feed into the workpiece		
		10.4. The enlarged hole of 33mm of diameter is machined.		
11	Reaming is well performed Tapping is well performed	11.1. The reamer is installed into the tailstock		
		11.2. The lathe speed is set		
		11.3. The tool is advanced into the hole		
		11.4. The drilled holes are smooth		
		11.5. The tap is inserted into the tailstock or tapping attachment		
		11.6. The Depth of Cut is set		
		11.7. The tap is advanced into the workpiece		
		11.8. The internal threads with 2mm pitch are cut		
12	Knurling is well performed	12.1. The knurling tool with diamond knurls is selected.		
		12.2. The knurling tools are installed into the tool post		
		12.3. The knurling tool height is adjusted		
		12.4. The knurling tool is feed into the workpiece surface		
		12.5. The eccentric pin is equipped with cross knurls		
13	Milling attachment is well mounted	13.1. An existing Lathe Tool Post is removed		
		13.2. The milling attachment is positioned.		
		13.3. The Milling Attachment is secured		
		13.4. The Vertical Slide is adjusted		
		13.5. The mill Cutter is mounted		
		13.6. Octagonal shape is machined		
14	Threading is properly performed	14.1. The threading tool is selected and installed into the tool post		
		14.2. The Thread Pitch of 2mm is selected		
		14.3. The Spindle Speed is set		

		14.4. The lathe Threading Mechanism is engaged		
		14.5. The feed threading tool is fed into the workpiece		
		14.6. The pitch of 2mm is respected.		
		14.7. The threaded length of 49mm is machined		
		14.8. The major diameter of 14mm is respected		
15	Chamfering is well performed.	15.1. The chamfering tool is selected		
		15.2. The chamfering tool is Positioning at the appropriate angle		
		15.3. The tool Height is adjusted and aligned with the centerline of the workpiece.		
		15.4. The lathe Speed and Feed are set		
		15.5. the chamfering tool is moved across the edge of the workpiece.		
		15.6. The chamfer of 3mm at 15° is machined		
16	Eccentric turning is well performed	16.1. The Offset Axis is marked on the Workpiece		
		16.2. The Workpiece is mounted		
		16.3. The required amount of offset is adjusted		
		16.4. Initial turning is performed		
		16.5. Eccentric turning is performed		
		16.6. The turned eccentric pin is finished		
		16.7. The eccentric pin of 160mm of length is machined		
		16.8. The main axis is at 3mm to eccentric axis.		
Marks:				
/122				
Passing line:				
/70%				

END



Further information to the trainer

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Learning Outcome 3: Carry Out Finishing Activities



Indicative contents

3.1 Applying finishing techniques on the product

3.2 Cleaning the machine, tools and workplace

3.3 Storing techniques for the product

3.4 Reporting the work done

Key Competencies for Learning Outcome 3: Carry Out Finishing Activities:

Knowledge	Skills	Attitudes
• Explanation of finishing techniques on the product turned on lathe machine • Explanation of cleaning methods of lathe machine, tools and workplace • Description of techniques of storing the product turned on lathe machine • Description of forms of report for reporting the work done on lathe machine	• Applying finishing techniques on for the product performed on lathe machine • Cleaning lathe machine equipment, tools and workplace • Applying Storing techniques for the product turned on lathe machine • Filling the Report template for the work done on lathe machine	• Having attention while finishing the product on lathe machine. • Being organizer while storing performed products on lathe machine • Being critical thinker while reporting the work done on the lathe machine



Duration: 10 hrs

Learning outcome 3 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Explain clearly the finishing techniques on the product performed on lathe machine.
2. Explain clearly the cleaning methods of lathe machine, tools and workplace
3. Describe properly the methods of storing the product produced on lathe machine
4. Describe clearly the methods of reporting the work done on lathe machine.
5. Apply appropriately the finishing techniques on the product performed on lathe machine.
6. Clean properly the lathe machine equipment, tools and workplace
7. Apply correctly the storing techniques for the product performed on lathe machine.
8. Report appropriately the work done on lathe machine.



Resources

Equipment	Tools	Materials
• Lathe machine and accessories • Gloves • Safety Boots • Goggles • Overall • Shelves or Drawers	• Parallel turning tool • Allen key	• Product to be Finished • Polishing Paper



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have some Videos and/ or photos illustrating the types of finishing technique and cleaning tools.

- Avail unfinished products
- Avail non cleaned machine, tools and workplace
- Avail non stored products
- Avail non filled report template for the work done.



Indicative content 3.1: Apply Finishing Techniques on the Product



Duration: 4 hrs



Theoretical Activity 3.1.1: Explanation of finishing technique on the product performed on lathe machine



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to explain the finishing techniques for the product performed on lathe machine.
- Videos, photos related to the application of finishing techniques of the turned products can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and request trainees to respond to the following question:
- What do you understand by the following terms used in finishing products?
 - Polishing
 - Grinding
 - Filling
 - Reaming
 - High speed-small depth of cut.
- Step 2:** Asks trainee to write answers on flipchart/paper.
- Step 3:** Ask trainees to present their answers.
- Step 4:** Address any questions or concerns from the trainees.
- Step 5:** Ask trainees to read the key reading 3.1.1 in the trainee manual.



Points to Remember

- **While** performing surface grinding remember to hold the workpiece in the table that moves back and forth while the grinding wheel makes precise cuts
- When finishing the intricate or irregular-shaped piece remember to use filing as finishing techniques.



Practical Activity 3.1.2: Applying finishing techniques, the product



Notes to the trainer

- By referring to the previous activity 3.1.1, the trainer demonstrates how to apply finishing technique to the products
- The use of images, videos, and illustrations related to the applying finishing technique can be used as didactic materials for more clarification



Key steps:

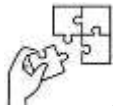
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below: you are asked to go in workshop and demonstrate the trainees how to apply polishing, grinding, filing, reaming, and high-speed small depth of cut finishing techniques on the product by finishing a turned round nut of 50mm of length, 30mm internal diameter 35mm outer diameter and 2mm threading pitch, this round nut is mad from a stainless steel bar of 40mm of diameter.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to apply the following finishing techniques: polishing, filing, grinding, reaming and high-speed small depth of cut to products.
- Step 4:** Verify whether polishing, filing, grinding, reaming and high-speed small depth of cut finishing techniques are well applied.
- Step 5:** Ask trainees to read key reading 3.1.2 in trainee manual
- Step 6:** Ask trainees to perform the task provided in the application of learning 3.1



Points to Remember

- Do not reverse the reamer while reaming as this can damage the tool and affect hole quality.
- While machining at high-speed remember to maintain a small depth of cut, to minimizes heat generation and tool wear, and improves surface finish.



Application of learning 3.1.

Ask trainees to use the school workshop and perform the bellow tasks after turning a stab end flange having the following specifications 200mm of Outer diameter of flange, 100mm of bore diameter ,200mm of length through hub, 160mm of hub diameter, 40mm of flange thickness, chamfer length of 5mm at 15° at the end of the hub. 2mm of bore corner radius.

- i. Perform polishing operation for finishing the flange thickness.
- ii. Perform grinding of operation for finishing the flange end
- iii. Perform filling operation for finishing the chamfered portion of the hub
- iv. Perform reaming operation for finishing the face of the hole through hub
- v. Perform High speed-small depth of cut for finishing the hub portion

Checklist /Solution for application:

SN	Criteria	Indicators	Yes	No
1	Polishing is well performed	1.1. Work piece is cleaned		
		1.2. Polishing material is selected		
		1.3. The work piece is mounted		
		1.4. Lathe speed is set		
		1.5. The polishing material is moved back and forth along the workpiece		
		1.6. The flange thickness is polished.		
2	Grinding is well performed	2.1. Grinding Attachment is selected		
		2.2. The Workpiece is secured		
		2.3. The Grinding Wheel is mounted		
		2.4. The Workpiece is aligned with Grinding Wheel		
		2.5. Lathe speed is set		
		2.6. Grinding wheel speed is set		
		2.7. Initial pass is performed		
		2.8. Grinding wheel is moved Longitudinally along the workpiece		
		2.9. Coolant is used during grinding		
		2.10. The flange end is smooth		
3	Filing is well performed	3.1. File is selected		
		3.2. The work piece is mounted		
		3.3. Filing angle and pressure are controlled		

		3.4. Filing stroke and motion are controlled		
		3.5. The chamfered portion of the hub is smooth.		
4	Reaming is well performed	4.1. Reamer is selected		
		4.2. The Workpiece is secured in the chuck		
		4.3. Reamer is placed into tailstock		
		4.4. Reamer is positioned		
		4.5. Lathe speed is set		
		4.6. Reamer and workpiece are lubricated		
		4.7. Reamer is advanced into the hole		
		4.8. The reamed hole is inspected		
		4.9. The face of the hole through the hub is smooth		
5	High speed-small depth of cut is well performed	5.1. High speed steel tool is selected		
		5.2. Spindle speed is set		
		5.3. Feed rate is set		
		5.4. Depth of cut is set		
		5.5. The work is secured		
		5.6. Cutting fluid is applied		
		5.7. The initial pass is performed		
		5.8. Multiple passes are performed		
		5.9. The outer hub face is smooth		



Indicative content 3.2: Cleaning the Machine, Tools and Workplace



Duration: 2hrs



Theoretical Activity 3.2.1: Explanation of cleaning methods for lathe machine, tools and workplace



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to explain to the trainees how to clean lathe machines, lathe tools and workplace after turning operations.
- Videos, photos or illustrations related to the methods of cleaning lathe machine, lathe tools and workplace can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and request trainees to respond to the following questions.
- i. Identify cleaning methods to be used when cleaning lathe machine, lathe tools and workplace.
 - ii. Explain the cleaning methods of lathe machine tool and workplace.
- Step 2:** Asks trainee to write answers provided on flipchart/paper.
- Step 3:** Asks trainees to present their answers
- Step 4:** Provide the expert view on the presentation
- Step 5:** Address any questions or concerns from the trainees.
- Step 6:** Ask trainees to read the key reading 3.2.1 in the trainee manual.



Points to Remember

- Chemicals like degreasers or rust inhibitors are used to remove
- To clean the heavy grease, oil stains, or rust build up that can't be cleared with just wiping or brushing remember to use Chemicals like degreasers or rust inhibitors.



Practical Activity 3.2.2: Perform cleaning the machine, tools and workplace



Notes to the trainer

- The trainer demonstrates how to clean lathe machine, lathe tools and workplace for lathe machine operations.
- The use of images, videos, and illustrations related to the cleaning machine, tools, and workplace can be used as didactic materials for more clarification



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below:
After turning a metal curtain rod of 1000mm of length and 20mm of diameter from the round rod of 30mm. you are asked to demonstrate trainees how to clean lathe machine, lathe tools and workplace for lathe after turning operations and also demonstrate the trainees how to arrange the used equipment and tools and dispose the wastes.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate to the trainees how clean lathe machine, tools and workplace.
- Step 4:** Demonstrate to the trainees how to arrange equipment, tools and how to dispose the wastes after turning operation.
- Step 5:** Verify whether lathe machine, tools and workplace are well cleaned and well-arranged after turning operation and verify if the wastes are well disposed
- Step 6:** For more information, ask trainees to read key reading 3.2.2 in trainee manual.
- Step 7:** Ask trainees to perform the task provided in the application of learning 3.2



Points to Remember

- When cleaning lathe machine Pay attention to the tool holder, area around the cutting tool and lead screw threads they are place where chips are more accumulated
- While cleaning lathe machine by using brush avoid using excessively hard brushes that can scratch surfaces.
- When disposing waste separate recyclable and non-recyclable wastes
- When disposing waste remember to Store waste containers away from other materials and equipment



Application of learning 3.2.

Ask trainees to use the manufacturing workshop at the school and turn a gear blank from 65 mm diameter to 60mm within 150mm length, after turning operation ask trainees to perform the following tasks:

- Clean equipment and tools
- Clean the workplace
- Arrange equipment and tools
- Dispose the Wastes

Checklist /Solution for learning:

SN	Criteria	Indicators	Yes	No
1	Cleaning tools, material and equipment for cleaning lathe machine and lathe tools are appropriately selected	1.1. Wire brush is selected		
		1.2. Cloth rugs are selected		
		1.3. Air compressor is selected		
		1.4. Chemical Cleaning agents are selected		
2	Lathe machine and lathe tools are well cleaned	2.1. Head stock and its spindle are cleaned		
		2.2. Chuck Jaws are cleaned		
		2.3. Carriage is cleaned		
		2.4. Tool Post is cleaned		
		2.5. Bedways are cleaned		
		2.6. Tailstock and its spindle are cleaned		
		2.7. Leadscrew is cleaned		
		2.8. Control Levers and Handles are cleaned		
		2.9. Cutting tools are cleaned		

3	Workplace cleaning tool ,material and equipment are well selected	3.1. Broom is selected		
		3.2. Mop is selected		
		3.3. Soapy water is selected		
		3.4. Air compressor is selected		
		3.5. Air blower is selected		
4	Workplace is properly cleaned	4.1. Floor is cleaned		
		4.2. Walls are cleaning		
		4.3. Roof is cleaned		
		4.4. Lighting equipment are cleaned		
		4.5. Aisles are cleaned		
		4.6. Storage space is cleaned		
		4.7. Work benches are cleaned		
		4.8. Tools and equipment are cleaned		
		4.9. Wastes are disposed		
5	Storage solutions are selected	5.1. Tool boxes are selected		
		5.2. Tool racks are selected		
		5.3. Drawers and Cabinets are selected		
		5.4. Shelves are selected		
6	Equipment and tools are well arranged	6.1. Equipment of the same use are arranged together		
		6.2. Equipment of the same size are arranged together		
		6.3. Equipment of the same type are arranged together		
		6.4. Frequently used equipment are located		
		6.5. Tools of the same use are arranged together		
		6.6. Tools of the same size are arranged together		
		6.7. Tools of the same type are arranged together		
		6.8. Frequently used tools are located		
7	Waste are correctly disposed	7.1. Waste are collected		
		7.2. Wastes are sorted		
		7.3. Wastes containers are selected		
		7.4. Wastes are placed in the container		
		7.5. Wastes container is labelled		
		7.6. Wastes container is stored		



Indicative content 3.3: Storing Techniques for the Products



Duration: 2hrs



Theoretical Activity 3.3.1: Description of techniques for storing the product.



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to describe the techniques of storing the turned products.
- Images, videos, illustrations related reflecting to the techniques of storing turned products can be used as didactic material



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and request trainees to respond to the following question:
- Describe the bellow techniques of storing product turned on the lathe machine:
 - Arranging
 - Shelving
- Step 2:** Asks trainee to write answers provided on flipchart/paper.
- Step 3:** Asks trainees to discuss the provided answer and choose correct answers
- Step 4:** Address any questions or concerns from the trainees.
- Step 5:** For more information, ask trainees to read the key reading 3.3.1 in the trainee manual.



Points to Remember

- To reduce the time spent searching for the products remember to arrange the product based on factors such as size, shape, usage, frequency of use, material type and stage of production.

- When preparing for product shelving take into consideration the strength of the shelves, they must be strong enough to support the weight of metal components and machined products.



Practical Activity 3.3.2: applying techniques of storing product



Notes to the trainer

- The trainer demonstrates the techniques of storing turned products by performing arranging and shelving techniques.
- The use of images, videos, and illustrations related to the arranging and shelving technique of turned products can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to perform the task described below: you are asked to go in the workshop and demonstrate trainees how to store the product by using the arranging and shelving techniques with the help of the following example:

Assume the below products are found in the workshop at your school, you are requested to go in the workshop for arranging and shelving these mentioned products

- i. Five bolts of 13 mm of diameter
- ii. Three screw of 8mm of diameter
- iii. Two metal curtain of 1000 of length and 40mm of diameter
- iv. Three live centers of 300mm of length
- v. Two gear blank of 200mm of diameter and 150mm of length
- vi. The one dead solid center of 300mm of length
- vii. One lead screw of 1000mm length and 40mm of diameter
- viii. Two feed rod of 100mm of length and 40mm of diameter
- ix. Two chucks of 200mm of diameter and 150mm of length.

Step 2: Explain the task and provide clear work instruction (Task, Time allocated).

Step 3: Demonstrate how to arrange and shelve products

Step 4: Verify whether product arrangement and shelving is well performed.

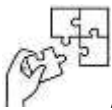
Step 5: For more information, ask trainees to read key reading 3.3.2 in trainee manual

Step 6: Ask trainees to perform the task provided in the application of learning 3.3



Points to Remember

- Before arranging the product remember to plan the layout that best suits your space and objectives.
- When shelving the products do not place the long and heavier products on the upper shelves.
- When shelving smaller or fragile parts remember to place them in protective bins or trays before shelving



Application of learning 3.3.

Ask trainees to join the manufacturing team at any manufacturing workshop that produce the lathe turned products and perform the following tasks.

- a) Arrange the lathe turned products
- b) Shelf the lathe turned products

Checklist /Solution for application:

SN	Criteria	Indicators	Yes	No
1	Product arrangement is well performed	1.1. Products are categorized		
		1.2. Product are cleaned		
		1.3. Products are labelled		
		1.4. Products layout is designed		
		1.5. Storage system are used		
		1.6. Products arrangement zones are created		
		1.7. Product stability is maintained		
		1.8. Product accessibility is maintained		
2	Product shelving is appropriately performed	2.1. Products are categorized		
		2.2. Shelving areas are prepared		
		2.3. Products are cleaned		
		2.4. Shelves are labelled		
		2.5. Heavier Products are placed on Lower Shelves		
		2.6. Small or Delicate Products are arranged on Higher Shelves		
		2.7. Protective bins or trays are used for smaller items		
		2.8. Product visibility is maintained		
		2.9. Product accessibility is maintained		



Indicative content 3.4: Reporting the Work Done



Duration: 2 hrs



Theoretical Activity 3.4.1: Description of forms of report for reporting of work done on lathe machine



Notes to the trainer:

- Trainer may deliver this content in classroom or in other learning place by using small groups to describe the forms of report for reporting the work done
- For the effective delivery, it is recommended to have the Completed work and report template.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and request trainees to respond to the following questions.

- Describe the following forms of report for reporting the work done
 - Oral report
 - Written report
- What do you understand by report template?

Step 2: Asks trainee to write answers provided on flipchart/paper.

Step 3: Asks trainees to discuss on the provided answer and choose correct answers

Step 4: Address any questions or concerns from the trainees.

Step 5: For more information, ask trainees to read the key reading 3.4.1



Points to Remember

- When reporting the work done using either written report or oral report form, summarize the key aspects of the work process, findings, or challenges encountered.
- When reporting the work done using written report remember to use the appropriate report template.



Practical Activity 3.4.2: Reporting the work done



Notes to the trainer

- The trainer demonstrates how to fill the report template
- The use of images, videos, and illustrations reflecting on how to fill the report template for the work done can be used as didactic materials.



Key steps:

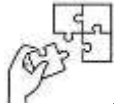
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the task described below:
As a manufacturing technician you are asked to go in workshop and demonstrate trainees how to fill the report template for the work done with the help of the following example:
Use a report template and make a report on the turned U-sliding gate roller wheel from mild steel round rod of 20 mm of diameter by HS company Ltd. the turned roller wheel has the following specifications:
- i. Material: Mild steel
 - ii. Bore diameter: 4mm
 - iii. Wheel diameter: 18mm
 - iv. Thickness: 6mm
 - v. Groove width: 3.5mm
 - vi. Groove depth: 1.5mm.
- Step 2:** Explain the task and provide clear work instruction (Task, Time allocated).
Step 3: Demonstrate how the way of filling report template for the work done.
Step 4: Verify whether the report template is well filled
Step 5: For more information, ask trainees to read key reading 3.4.2
Step 6: Ask trainees to perform the task provided in the application of learning 3.4.



Points to Remember

- When reporting the work done remember to attach the Drawing of the final workpiece.
- While reporting the work done remember to indicate the status of the used machine and tools



Application of learning 1.1.

Aske trainees to go in the manufacturing workshop at school and turn a V -type wheel pulley from round bar of 90mm of diameter, after completion of this task, you are requested to report the work you have performed by using a report template. the wheel pulley to be turned must have the bellow specifications

- i. Material: Mild steel
- ii. Bore diameter: 30mm +0.05mm
- iii. Wheel diameter: 80mm+0.05mm
- iv. Thickness: 6mm
- v. Groove width: 18mm
- vi. Groove depth: 20mm

Checklist /Solution for application:

SN	Criteria	Indicators	Yes	No
1	Report template is well filled	1.1. Title of the work is filled		
		1.2. Date is filled		
		1.3. Operator names are filled		
		1.4. Objective of the work is filled		
		1.5. Workpiece Material is filled		
		1.6. Cutting Tools are filled		
		1.7. Measuring Instruments are filled		
		1.8. Machine settings are filled		
		1.9. Observations are filled		
		1.10. Results are filled		
		1.11. Safety Measures are filled		
		1.12. Conclusion is filled		
		1.13. Appendix is attached		



Learning outcome 3 end assessment

Written assessment

Q1. Read and complete the following sentence by the appropriate word selected from the following list: **Polishing, Grinding, Filing, Reaming, High speed-small depth of cut**

- a) is a manual finishing technique that uses a file a hardened steel tool with abrasive teeth to remove material from the product. **(Answer: Filing)**
- b)is a finishing operation that enlarges and refines a previously drilled hole to achieve precise dimensions and surface finish. **(Answer: reaming)**
- c)is a machining process that involves removing material from a work piece using a grinding wheel or other abrasive tools. **(Answer: grinding)**
- d) involves refining its surface to improve its appearance, smoothness, and functionality **(Answer: polishing)**
- e) cut is a finishing technique that involves using high cutting speeds with a shallow depth of cut **(Answer: High speed-small depth of cut)**

Q2. Ready the following statement and write the letter corresponding to the correct answer

- I. Template report for the work done should represent the following information except:
 - a) Part list
 - b) Title
 - c) Introduction
 - d) Appendices
- II. The followings are the products storing technique except:
 - a) Arranging
 - b) Shelving
 - c) Hanging
 - d) All answers are correct

Answers: I. (a)

II, (d)

Q3. Read the following statement and answer **true** if the statement is correct, and **false** if the statement is not correct

- a. A report template is a pre-designed format or layout used for creating reports.
- b. Written reports provide a permanent record that can be shared, reviewed, and referenced as needed.

- c. Shelving is a systematic and organized manner based on their size, shape, or other relevant criteria
- d. Arranging is product storage technique where items are systematically placed on shelves to organize and maximize space in a workshop or production facility.

Answers: A. True

B, True

C, False

D, False

Q4. Match column A representing parts of report template and explanation in column B.
Use each letter only once and write it in the provide blank space provide blank space

Answers	Column A	Column B
1 → E	1. Introduction	A. Summarize the key findings and outcomes of the work.
2 → C	2. Objective	B. Include any supplementary materials, data, or supporting documents
3 → A	3. Conclusion	C. Specify the objectives or goals of the work
4 → B	4. Appendices	D. Cite any references or sources used in the report.
		E. Provide background information and context for the work done.

Practical assessment

AB company ltd is a manufacturing facility specialized in turning plumbing bushing used for continuous piping and rotary shafts, this company has a tender of turning 5000 solid hexes double tapped bushings having the following specifications, External Thread: M22 x 1.5, Internal Thread: M18 x 1.5, Material: Brass, Hex Size: 22 mm) and 40mm of length and 50 rotary shafts with both ends stepped having the following specifications, the ends stepped portion has 40mm of diameter, 150mm of length and chamfered both ends at 5X15o, larger step has 80mm diameter and 700mm of length. when the turning operation reached on the finishing stage before threads cutting, the turning technician was hired by another competitor company of AB Company ltd, as a new hired technician at AB company ltd you are requested to perform the following activities for completing this task:

- i. Perform grinding on the side faces of hexagon head of the bushings.
- ii. Perform reaming operation on the faces of bushings hole

- iii. Perform filing operation on the top bottom face of the bushing.
- iv. Perform High speed-small depth of cut on the external face of 22mm of diameter.
- v. performs polishing operation for finishing shafts surfaces.
- vi. Clean the equipment and tools
- vii. Clean the workplace
- viii. Arrange equipment and tools
- ix. Dispose the wastes
- x. Store the turned bushings
- xi. Report the work done.

Checklist for practical assessment:

SN	Criteria	Indicators	Yes	No
1	Grinding is well performed	1.1. Grinding Attachment is selected		
		1.2. The Workpiece is secured		
		1.3. The Grinding Wheel is mounted		
		1.4. The Workpiece is aligned with Grinding Wheel		
		1.5. Lathe speed is set		
		1.6. Grinding wheel speed is set		
		1.7. Initial pass is performed		
		1.8. Grinding wheel is moved Longitudinally along the workpiece		
		1.9. Coolant is used during grinding		
		1.10. The flange end is smooth		
2	Filing is well performed	2.1. File is selected		
		2.2. The work piece is mounted		
		2.3. Filing angle and pressure are controlled		
		2.4. Filing stroke and motion are controlled		
		2.5. The bottom face of the bushing is filed		
3	Reaming is well performed	3.1. Reamer is selected		
		3.2. The Workpiece is secured in the chuck		
		3.3. Reamer is placed into tailstock		
		3.4. Reamer is positioned		
		3.5. Lathe speed is set		
		3.6. Reamer and workpiece are lubricated		
		3.7. Reamer is advanced into the hole		
		3.8. The reamed hole is inspected		

		3.9. The face of the hole bushing is smooth		
4	High speed-small depth of cut is well performed Polishing is well performed	4.1. High speed steel tool is selected		
		4.2. Spindle speed is set		
		4.3. Feed rate is set		
		4.4. Depth of cut is set		
		4.5. The work is secured		
		4.6. Cutting fluid is applied		
		4.7. The initial pass is performed		
		4.8. Multiple passes are performed		
		4.9. The outer face at 22mm of diameter is smooth		
		4.10. Polishing material is selected		
		4.11. The work piece is mounted		
		4.12. Lathe speed is set		
		4.13. The polishing material is moved back and forth along the workpiece		
		4.14. The shafts are polished.		
5	Cleaning tools, material and equipment for cleaning lathe machine and lathe tools are appropriately selected	5.1. Wire brush is selected		
		5.2. Cloth rugs are selected		
		5.3. Air compressor is selected		
		5.4. Chemical Cleaning agents are selected		
6	Lathe machine and lathe tools are well cleaned	6.1. Head stock and its spindle are cleaned		
		6.2. Chuck Jaws are cleaned		
		6.3. Carriage is cleaned		
		6.4. Tool Post is cleaned		
		6.5. Bedways are cleaned		
		6.6. Tailstock and its spindle are cleaned		
		6.7. Leadscrew is cleaned		
		6.8. Control Levers and Handles are cleaned		
		6.9. Cutting tools are cleaned		
7	Workplace cleaning tool ,material and equipment are well selected	7.1. Broom is selected		
		7.2. Mop is selected		
		7.3. Soapy water is selected		
		7.4. Air compressor is selected		
		7.5. Air blower is selected		
8	Workplace is properly cleaned	8.1. Floor is cleaned		
		8.2. Walls are cleaning		
		8.3. Roof is cleaned		
		8.4. Lighting equipment are cleaned		

		8.5. Aisles are cleaned		
		8.6. Storage space is cleaned		
		8.7. Tools and equipment are cleaned		
		8.8. Wastes are disposed		
9	Storage solutions are selected	9.1. Tool boxes are selected		
		9.2. Tool racks are selected		
		9.3. Drawers and Cabinets are selected		
		9.4. Shelves are selected		
10	Equipment and tools are well arranged	10.1. Equipment of the same use are arranged together		
		10.2. Equipment of the same size are arranged together		
		10.3. Equipment of the same type are arranged together		
		10.4. Frequently used equipment are located		
		10.5. Tools of the same use are arranged together		
		10.6. Tools of the same size are arranged together		
		10.7. Tools of the same type are arranged together		
		10.8. Frequently used tools are located		
11	Waste are correctly disposed	11.1. Waste are collected		
		11.2. Wastes are sorted		
		11.3. Wastes containers are selected		
		11.4. Wastes are placed in the container		
		11.5. Wastes container is labelled		
		11.6. Wastes container is stored		
12	Product arrangement is well performed	12.1. Products are categorized		
		12.2. Product are cleaned		
		12.3. Products are labelled		
		12.4. Products layout is designed		
		12.5. Storage system are used		
		12.6. Products arrangement zones are created		
		12.7. Product stability is maintained		
		12.8. Product accessibility is maintained		
13	Product shelving is appropriately performed	13.1. Products are categorized		
		13.2. Shelving areas are prepared		

		13.3. Products are cleaned		
		13.4. Shelves are labelled		
		13.5. Heavier Products are placed on Lower Shelves		
		13.6. Small or Delicate Products are arranged on Higher Shelves		
		13.7. Protective bins or trays are used for smaller items		
		13.8. Product visibility is maintained		
		13.9. Product accessibility is maintained		
14	Report template is well filled	14.1. Title of the work is filled		
		14.2. Date is filled		
		14.3. Operator names are filled		
		14.4. Objective of the work is filled		
		14.5. Workpiece Material is filled		
		14.6. Cutting Tools are filled		
		14.7. Measuring Instruments are filled		
		14.8. Machine settings are filled		
		14.9. Observations are filled		
		14.10. Results are filled		
		14.11. Safety Measures are filled		
		14.12. Conclusion is filled		
		14.13. Appendix is attached		
Marks:/112				
Passing line: /70%				

END



Further information to the trainer

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