basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MECHANICAL TECHNOLOGY (FITTING AND MACHINING)

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

GRADE 12

2022

These guidelines consist of 24 pages.

TABLE OF CONTENTS

1. INTRODUCTION/BACKGROUND

The 18 Curriculum and Assessment Policy Statement subjects which contain a practical component all include a practical assessment task (PAT). These subjects are:

- AGRICULTURE: Agricultural Management Practices, Agricultural Technology
- ARTS: Dance Studies, Design, Dramatic Arts, Music, Visual Arts
- SCIENCES: Computer Applications Technology, Information Technology, Technical Sciences, Technical Mathematics
- SERVICES: Consumer Studies, Hospitality Studies, Tourism
- TECHNOLOGY: **Mechanical Technology**, Civil Technology, Electrical Technology, and Engineering Graphics and Design

A practical assessment task (PAT) mark is a compulsory component of the final promotion mark for all learners offering subjects that have a practical component and counts 25% (100 marks) of the end-of-year examination mark. The PAT is implemented across the first three terms of the school year. This is broken down into different phases or a series of smaller activities that make up the PAT. The PAT allows for learners to be assessed on a regular basis during the school year and it also allows for the assessment of skills that cannot be assessed in a written format, e.g. tests or examinations. It is therefore important that schools ensure that all learners complete the practical assessment tasks within the stipulated period to ensure that learners are resulted at the end of the school year. The planning and execution of the PAT differs from subject to subject.

The PAT allows the teacher to directly and systematically observe applied competence. The PAT comprises the application/performance of the knowledge, skills and values particular to that subject and counts 25% of the total promotion/certification mark out of 400 for the subject.

The PAT is implemented across the first three terms of the school year.

Any profession requires of its members a thorough grounding in both theory and practice and MECHANICAL TECHNOLOGY is no exception. It is emphasised that the goal of the practical assessment task is to produce a skilled learner in each specialisation field. A nation's true wealth is in its manpower and education that should aim to develop the talents of a learner so that he/she can contribute to the well-being of the society by using and developing scientific and technological resources.

To prepare a learner in the MECHANICAL TECHNOLOGY specialisation fields, one must focus on the following:

- An attitude where the learner can selectively use ideas, gather evidence and facts, to drawing logical conclusions to put them to good use creatively and with imagination;
- A capability to express ideas and information clearly by speech, writing, drawing and manufacturing; and
- A willingness and capability to accept and exercise responsibility, to make decisions, and to learn by experience.

Attributes such as these cannot all be achieved in a classroom. A sound knowledge of engineering sciences is essential to equip the MECHANICAL TECHNOLOGY learner with the necessary practical capabilities for the required processes. Practical training is the application of acquiring essential skills to bridge between trade theory and practice.

Practical application in the workshop must therefore be made an interesting and challenging experience to develop the learner physically and mentally. The learner must show his/her initiative, curiosity and persistence in learning. In order to stimulate and develop self-confidence the granting of some degree of responsibility during the practical application is very important.

2. TEACHER GUIDELINES

2.1 Administration of the PAT

Teachers are requested to make copies of the different specialisation PAT documents. These documents need to be handed out to the learners at the beginning of the year. The practical assessment task for Grade 12 is externally set, internally assessed and externally moderated.

Teachers must attach due dates for the different facets of the PAT *(refer to the CAPS document)*. In this manner, learners can easily assess their progress. When formal assessment takes place it is the responsibility of the teacher to administer assessment.

The PAT should be completed within the first three terms. The PAT should be completed under controlled conditions *(refer to Mechanical Technology SPECIALISATION: CAPS Grades 10–12)*.

Teachers MUST build a prototype of the task in order to be able to demonstrate to the learners what the final product will look like. It will guide the learners with visual presentation. It provides the teacher with insight into possible challenges regarding machines, equipment or material and what possible manufacturing procedures he/she needs to follow in the workshop in order to complete the PAT.

2.2 Assessment of PAT

Frequent and developmental feedback is needed to ensure the necessary guidance and support for the learners.

Both formal and informal assessment should be conducted to ensure that the embedded skills are developed. Informal assessment can be conducted only to monitor the progress of the learners. Formal assessment should always be conducted and recorded by the teachers.

On completion of each phase in each term, the marks for the completed phase need to be recorded on the school administration system.

2.3 Moderation of PAT

The tasks, projects, assessment criteria as well as the mark sheets must be presented to the moderator during moderation of the PAT.

The moderator should be able to call on a learner to explain and demonstrate the functions, principles and skills during the moderation process.

On completion the moderator will, if necessary, adjust the marks of the group upwards or downwards depending on the decision reached as a result of moderation.

Tasks must be clearly marked with the correct initials and surname of each learner.

2.4 Consequences of absence/non-submission of tasks.

If a learner's practical assessment task is incomplete or unavailable with a valid reason, the learner may be given three weeks before the commencement of the final end-of-year examination to submit the outstanding task. Should the learner fail to fulfil the outstanding PAT requirement, such a learner will be awarded a zero mark for that PAT component.

A learner's results are regarded as incomplete if he/she does not offer any component of the PAT task. He/She will be given another opportunity based on the decision of the head of the assessment body. Should the learner fail to fulfil the outstanding PAT requirement, the marks for these components will be omitted and the final mark for Mechanical Technology will be adjusted for promotion purposes in terms of the completed tasks. If any tasks are still outstanding, the learner runs the risk of not being resulted at the end of the year.

2.5 Declaration of Authenticity

NAME OF THE SCHOOL:

_____

NAME OF LEARNER:

_____
(FULL NAME(S) AND SURNAME)

NAME OF TEACHER:

_____

I hereby declare that the project submitted for assessment is my own, original work and has not been previously submitted for moderation.

_____ _____
SIGNATURE OF LEARNER DATE

As far as I know, the above declaration by the learner is true and I accept that the work offered is his or her own.

_____ _____
SIGNATURE OF TEACHER DATE

SCHOOL STAMP

3. LEARNER GUIDELINES

Instructions to the learners

- The practical assessment task (PAT) consists of a specialisation task in **Fitting and Machining**. The practical work is spread over three terms, as set out in this document. *(See CAPS document.)*
- All tasks must be completed according to the time frames set out in each of the tasks.
- Learners are requested to actively engage in all practical assessment tasks.
- Learners who are uncooperative will receive demerits or a zero mark for that particular section of the work.
- Learners who act unsafely in the workshop and place other learners in danger, will be given additional corrective tasks to improve their safety awareness.
- Your task must be fully completed by the end of August 2022 in order to be ready for provincial and/or national moderation.
- Your task must be **clearly marked** with your name and surname.
- Each term must have a completed phase in order to enter a mark on the working mark sheet and per SAMS.

4. SPECIALISATION: FITTING AND MACHINING (SPECIFIC)

TASK: TWO-LEG BEARING PULLER

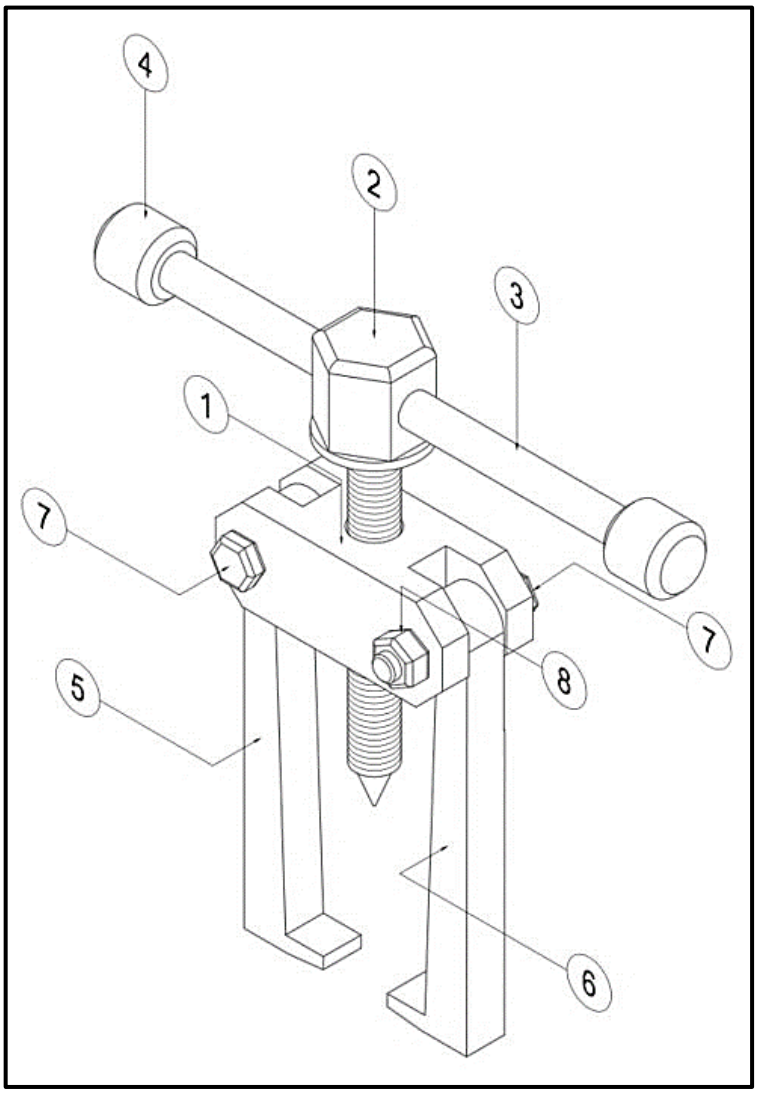


FIGURE 1: EXPLODED ISOMETRIC DRAWING

PART LIST			
	PARTS	**QUANTITY**	**MATERIAL**
1	Block	1	Mild steel/Aluminium
2	M10 x 1,50 screw	1	Mild steel/Aluminium
3	Handle bar	1	Mild steel/Aluminium
4	Handle bar knob	1	Mild steel/Aluminium
5	Left leg	1	Mild steel/Aluminium
6	Right leg	1	Mild steel/Aluminium
7	M6 hex bolt	2	Mild steel
8	M6 hex nylock nut	2	Mild steel and nylock nut

Term: 1 to 3
Starting date: January 2022
Completion date: August 2022

Follow the criteria and standards below:

- All sizes must be within the given tolerances.
- There must be no damage to tools and equipment.
- All appropriate safety procedures must be adhered to.
- The project must be well presented.

RESOURCES REQUIRED FOR PAT:

Consumable materials required per learner					
Part	**Material**	**Cutting list**	**Quantity per learner**	**No. of learner**	**Total quantity**
Block	Mild steel/Aluminium 25 x 25 square bar	70 x 25 x 25	1		
M10 x 1,50 screw	Mild steel/Aluminium 25 mm round bar	115 x 25	1		
Handle bar	Mild steel/Aluminium 16 mm round bar	160 x 16	1		
Handle bar knob	Mild steel/Aluminium 16 mm round bar	50 x 16	1		
Left leg	Mild steel/Aluminium 25 x 10 mm flat bar	110 x 25 x 10	1		
Right leg	Mild steel/Aluminium 25 x 10 mm flat bar	110 x 25 x 10	1		
M6 hex bolt	Mild steel	M6 x 1.00 x 30	2		
M6 hex nylock nut	Mild steel and nylock nut	M6 nylock nut	2		

EXAMPLES:

FIGURE 2: M6 HEX BOLTS

FIGURE 3: M6 NYLOCK NUTS

OVERALL VIEW AND GENERAL DIMENSIONS

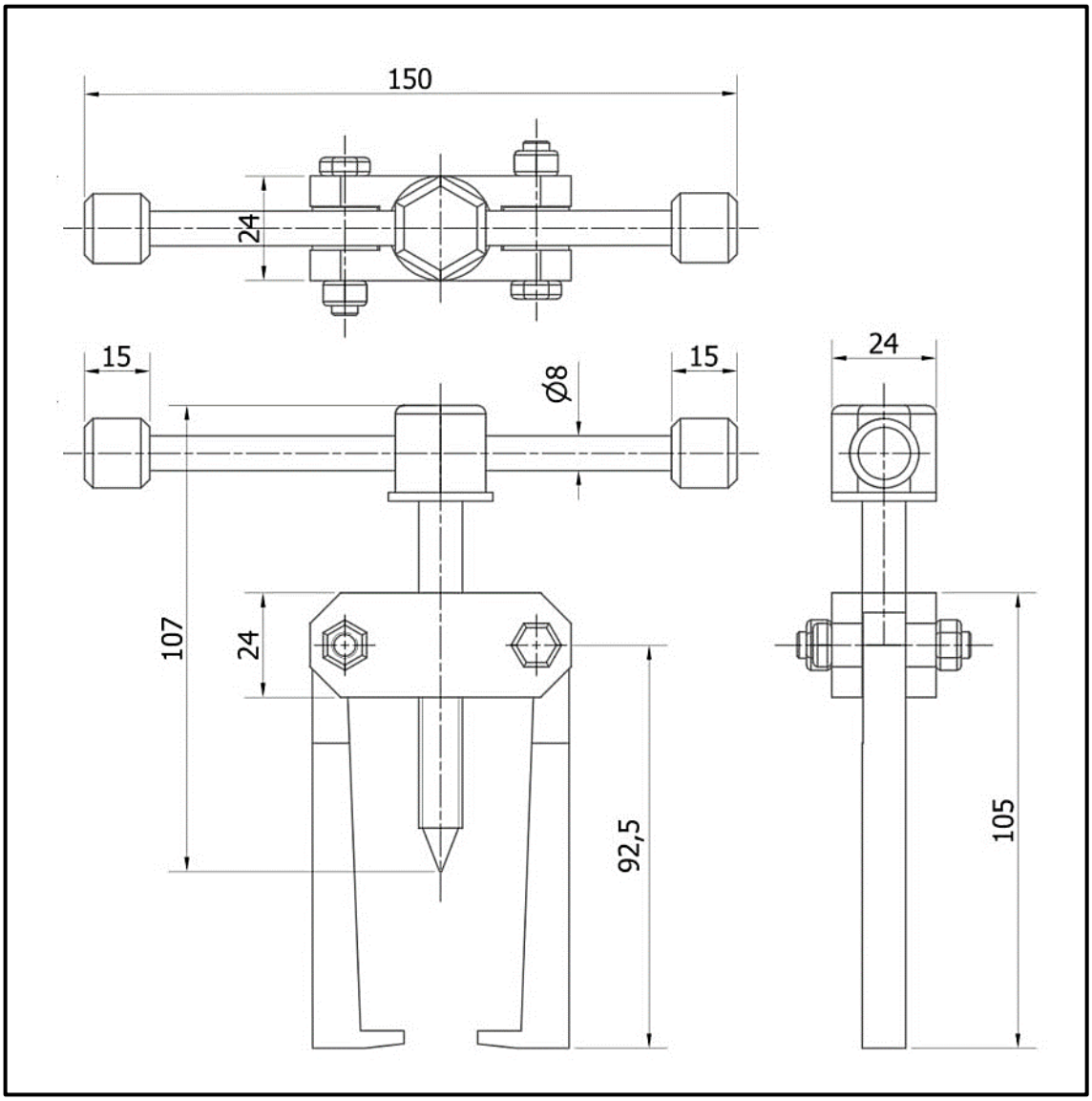
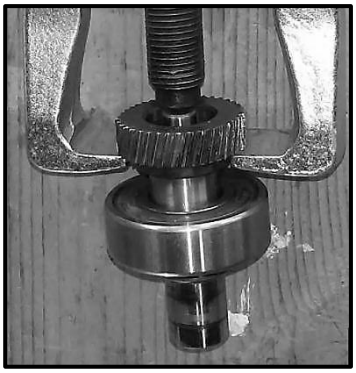


FIGURE 4: BEARING PULLER

NOTE TO TEACHER: TEST FOR FUNCIONALITY

The teacher should manufacture a simple shaft with a press fit ring/bearing/pulley in order to test for the functionality of the completed bearing puller. It may be made from nylon. Alternative measures may also be used, e.g. a shaft with fitted bearing/-pulley/-gear.



EXAMPLE 1

RUBRICS

DRILLING AND TAPPING

NOTE: Use RUBRIC A below for assessment of all holes to be drilled.

RUBRIC A: DRILLING OF HOLES	
Assessment facet	**Mark**
Drilling of correct diameter of hole	1
Depth correctly drilled	1
Hole clean and without burrs	1
Hole perpendicular to work piece	1
Hole drilled to correct position on work piece	1
SUBTOTAL:	**5**

NOTE: Use RUBRIC B below for assessment of all internal and external screw threads to be tapped.

RUBRIC B: TAPPING OF SCREW THREADS	
Assessment facet	**Mark**
Cut correct screw thread	1
Screw thread perpendicular to work piece	1
Screw thread has no burs on the outside	1
Depth/length tapped correctly	1
No defects (e.g. cross thread)	1
SUBTOTAL:	**5**

TOLERANCE RANGE

LENGTH AND DIAMETERS

NOTE: On all the lengths and diameters learners will lose 1 mark for every 0,1 mm deviation from the basic size. Use RUBRIC C below for assessment of all lengths and diameters.

RUBRIC C: LENGTHS AND DIAMETERS	
DEVIATION	**MARK DEDUCTIONS**
0–0,1	-0
0,1–0,2	-1
0,2–0,3	-2
0,3–0,4	-3
0,4–0,5	-4
0,5 and more	-5

PHASE 1: BLOCK
January–March 2022

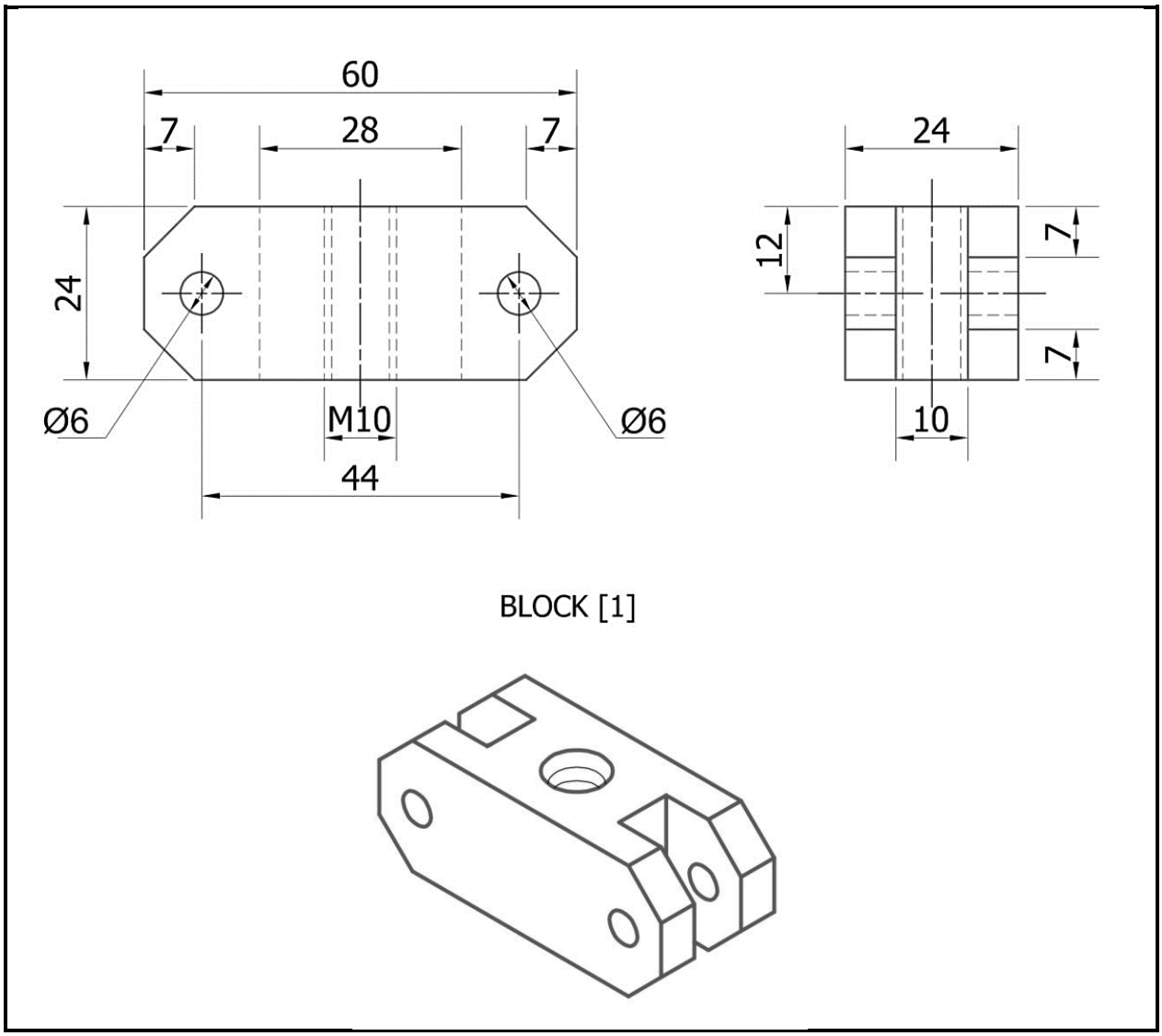


FIGURE 5: BLOCK

MECHANICAL TECHNOLOGY											
FITTING AND MACHINING											
MARK SHEET – BLOCK – PHASE 1											
GRADE	**12**	**DATE**									
PROJECT	**BEARING PULLER**										
FACETS	**MARKS**	**LEARNERS**									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Machine measuring/marking of 60 mm length	**2**										
Machine measuring/marking of 24 x 24 thickness	**2**										
Cutting/Machining 60 mm length	**5**										
Cutting/Machining 24 x 24 mm thickness	**5**										
Marking of Ø6 mm holes (2 x 2)	**4**										
Marking of Ø8,5 mm hole (to tap M10) (1 x 2)	**2**										
Marking of 45° angles (4 x 2)	**8**										
Drill Ø6 mm holes (2 x 5)	**10**										
Drill Ø8,5 mm hole	**5**										
Tap Ø8,5 mm hole to M10	**5**										
Cutting/Machining of 45° angles (4 x 5)	**20**										
Cutting/Machining recess (2 x 5)	**10**										
Finishing	**2**										
SUBTOTAL:	**80**										
PHASE 1 TOTAL:	**50**										
NAME AND SIGNATURE OF TEACHER											
NAME AND SIGNATURE OF DEPARTMENT HEAD											
NAME AND SIGNATURE OF SUBJECT MODERATOR											

PHASE 2: SCREW
April–June 2022

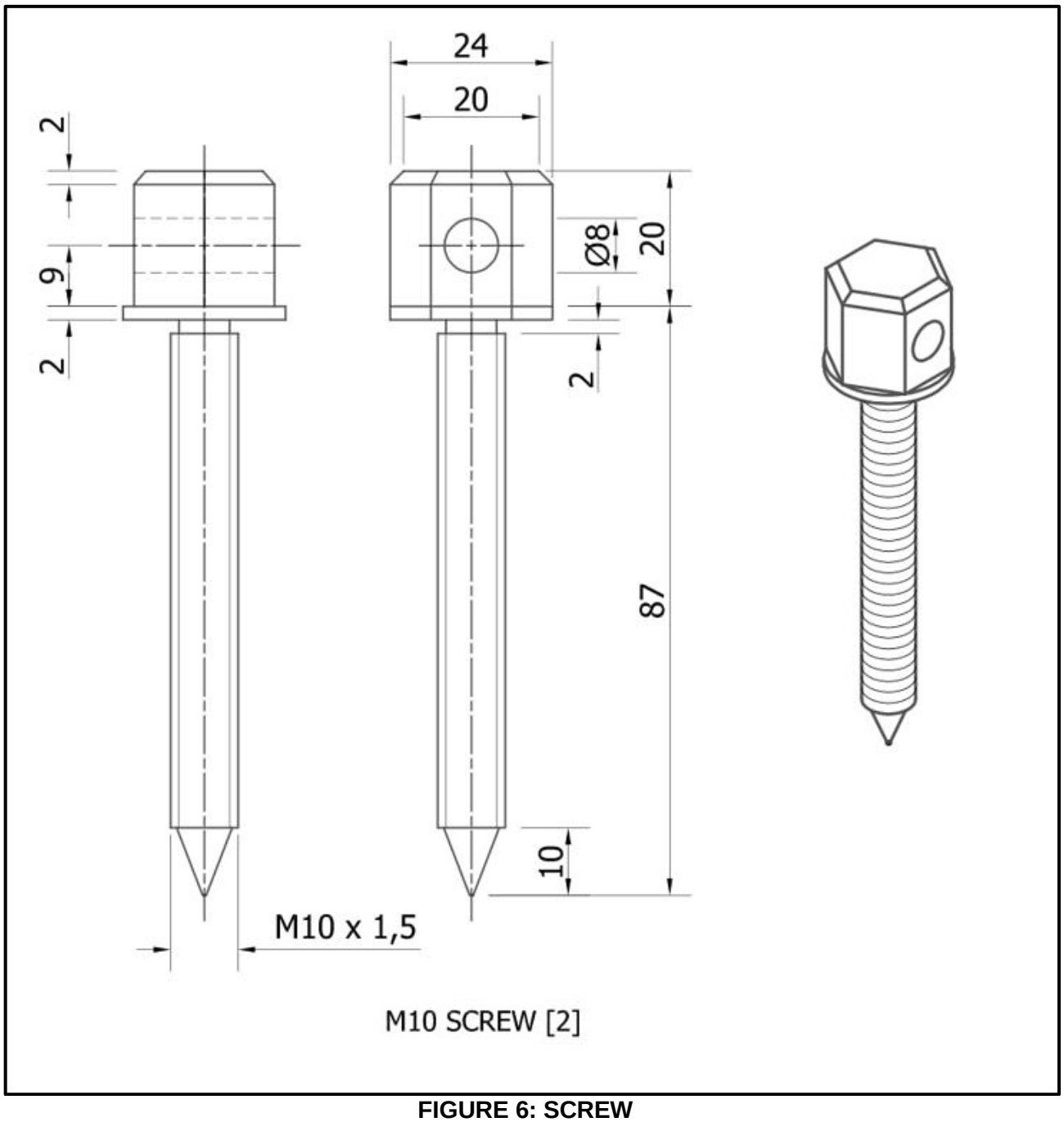


FIGURE 6: SCREW

MECHANICAL TECHNOLOGY													
FITTING AND MACHINING													
MARK SHEET – SCREW – PHASE 2													
GRADE	**12**	**DATE**											
PROJECT	**BEARING PULLER**												
FACETS		**MARKS**	**LEARNERS**										
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
LENGTH	Total length of screw to 107 mm	**5**										
	Screw thread total length – 73 mm	**5**										
	Groove behind shoulder – 2 mm	**5**										
	Centre point – 10 mm	**5**										
	Hexagon length to 20 mm	**5**										
	Shoulder length – 2 mm	**5**										
	Chamfer length – 2 mm	**5**										
CUTTING SCREW THREAD	Calculate cutting depth of screw thread **(Worksheet 1.1)**	**2**										
	Screw thread depth cut correctly	**5**										
	Screw thread cut cleanly (No tears)	**2**										
HEXAGON	Calculate cutting depth of hexagon **(Worksheet 1.2)**	**5**										
	Cut to correct depth	**5**										
	Machine all sides equal to size.	**5**										
	Chamfer back of hexagon	**2**										
DRILLING	Marking of Ø8 mm in centre of side	**2**										
	Drilling of Ø8 mm hole	**5**										
Finishing		**2**										
	SUBTOTAL:	**70**										
	PHASE 2 TOTAL:	**50**										

NAME AND SIGNATURE OF TEACHER		
NAME AND SIGNATURE OF DEPARTMENT HEAD		
NAME AND SIGNATURE OF SUBJECT MODERATOR		

WORKSHEET 1: SCREW THREAD CALCULATIONS.	
LEARNER NAME:	

1.1	Calculate the cutting depth of the screw thread.		
		(2)	

1.2	Calculate the cutting depth of the hexagon		
		(5)	

NOTE: This worksheet MUST be evident in the learner's portfolio of evidence.

PHASE 3: HANDLE BAR
July–August 2022

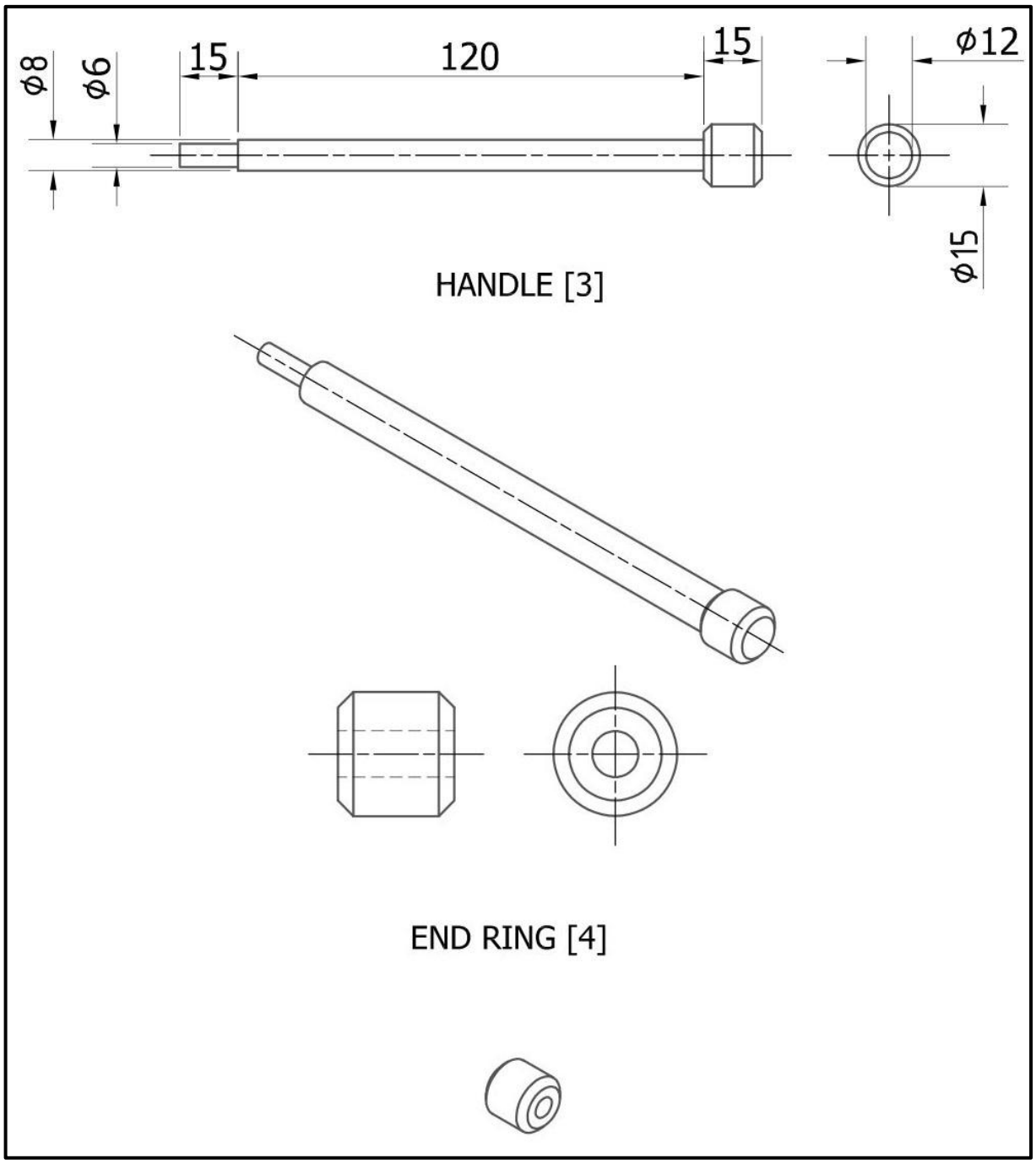


FIGURE 7: HANDLE BAR

MECHANICAL TECHNOLOGY												
FITTING AND MACHINING												
MARK SHEET – HANDLE BAR– PHASE 3												
GRADE		12	DATE									
PROJECT		BEARING PULLER										
FACETS			LEARNERS									
		MARKS										
			1	2	3	4	5	6	7	8	9	10
LENGTH	Total length of 150 mm	5										
	Screw thread length to 15 mm	5										
	Ø8 mm length to 120 mm	5										
	Fixed knob to 15 mm	5										
	Chamfer fixed knob both sides to both sides 1,5 mm (2 x 2)	4										
DIAMETER	Ø6 to size	5										
	Ø8 to size	5										
	Ø12 to size	5										
	Ø15 to size	5										
END RING	Ø15 to size	5										
	Drill 5 mm hole to tap M6	2										
	Tap M6	5										
	Length of 15 mm	5										
	Chamfer both sides 1,5 mm (2 x 2)	4										
	Fit end ring straight and neatly	3										
Finishing		2										
	SUBTOTAL:	70										
	PHASE 3 TOTAL:	50										

NAME AND SIGNATURE OF TEACHER		
NAME AND SIGNATURE OF DEPARTMENT HEAD		
NAME AND SIGNATURE OF SUBJECT MODERATOR		

PHASE 4: PULLER LEGS
January–August 2022

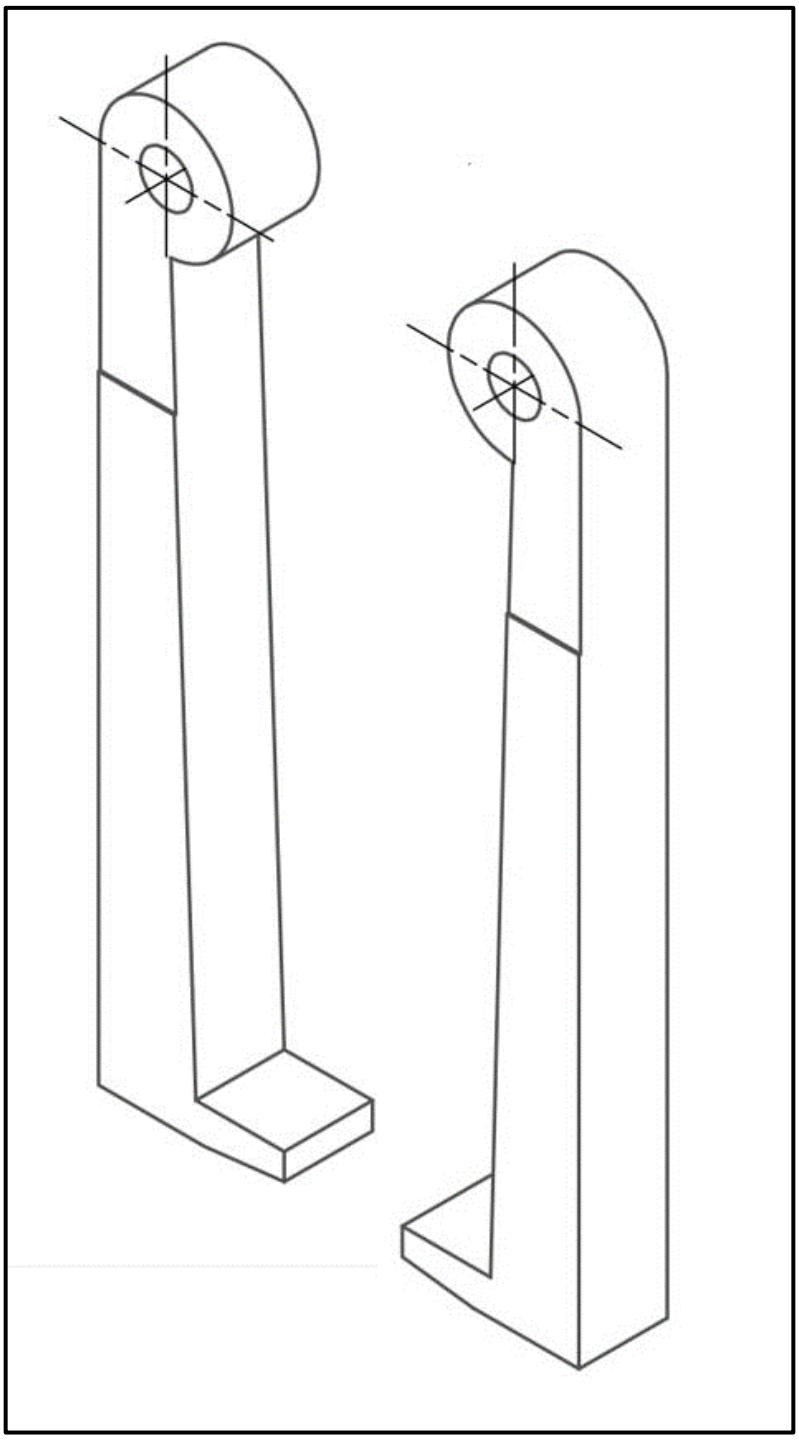


FIGURE 8: PULLER LEGS

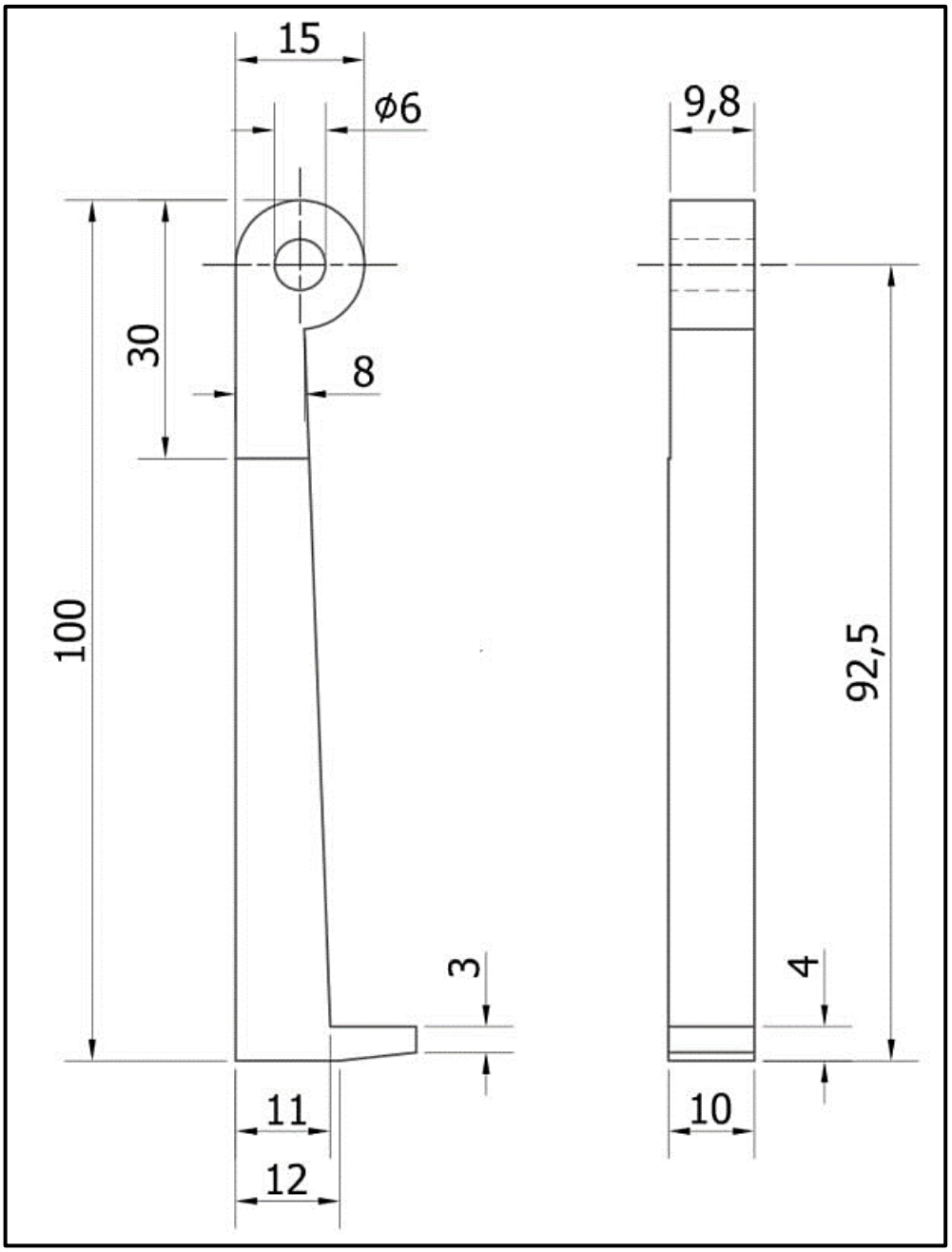


FIGURE 9: PULLER LEG – LEFT

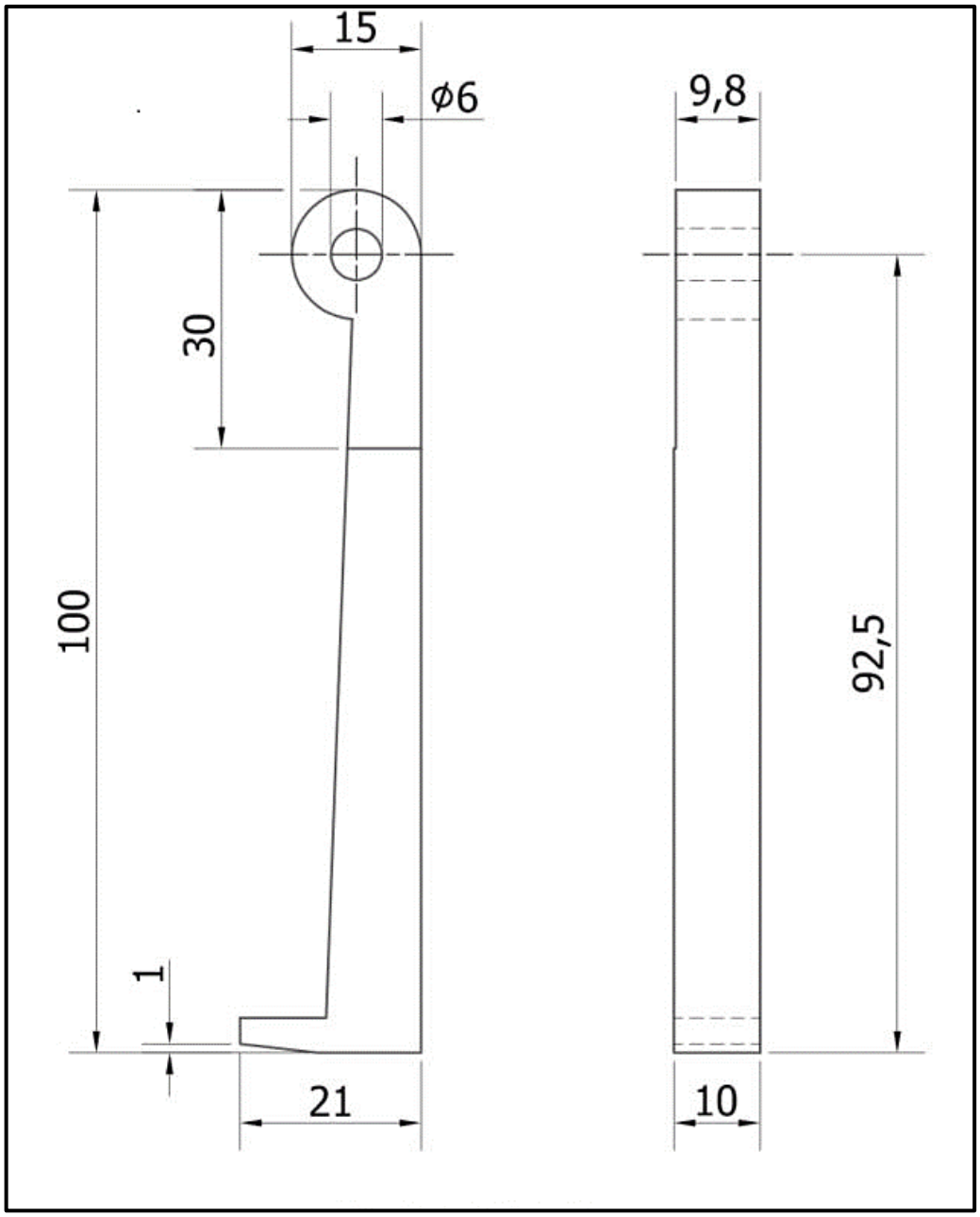


FIGURE 10: PULLER LEG – RIGHT

MECHANICAL TECHNOLOGY			
FITTING AND MACHINING			
MARK SHEET – PULLER LEGS AND ASSEMBLY– PHASE 4			
GRADE	12	DATE	
PROJECT	BEARING PULLER		

	FACETS – LEFT LEG	MARKS	LEARNERS									
			1	2	3	4	5	6	7	8	9	10
LEFT LEG	Marking out of blank metal piece	10										
	Drill Ø6 mm hole	5										
	Reduce from 10 mm to 9,8 mm thickness	5										
	Reducing of leg 30 mm in length	5										
	Machining of taper side	5										
	Small end of taper – 8 mm	5										
	Big end of taper – 11 mm	5										
	Machine/File jaw of leg – 21 mm	5										
	Reduce taper of jaw from 4 mm to 3 mm towards the end	5										
	Jaw length – 12 mm	5										
	Machining/Filing of round section according to given dimensions	5										
	Total length of leg – 100 mm	5										
	Finishing (Machining/Drilling/Filing)	5										
	SUBTOTAL for left leg:	**70**										

NAME AND SIGNATURE OF TEACHER		
NAME AND SIGNATURE OF DEPARTMENT HEAD		
NAME AND SIGNATURE OF SUBJECT MODERATOR		

MECHANICAL TECHNOLOGY												
FITTING AND MACHINING												
MARK SHEET – PULLER LEGS AND ASSEMBLY– PHASE 4												
GRADE	12	DATE										
PROJECT	BEARING PULLER											
FACETS – RIGHT LEG		MARKS	LEARNERS									
			1	2	3	4	5	6	7	8	9	10
RIGHT LEG	Marking out of blank metal piece	10										
	Drill Ø6 mm hole	5										
	Reduce from 10 mm to 9,8 mm thickness	5										
	Reducing of leg 30 mm in length	5										
	Machining of taper side	5										
	Small end of taper – 8 mm	5										
	Big end of taper – 11 mm	5										
	Machine/File jaw of leg – 21 mm	5										
	Reduce taper of jaw from 4 mm to 3 mm towards the end	5										
	Jaw length – 12 mm	5										
	Machining/Filing of round section according to given dimensions	5										
	Total length of leg – 100 mm	5										
	Finishing (Machining/Drilling/Filing)	5										
SUBTOTAL for right leg:		70										
SUBTOTAL for left leg:		70										
LEFT LEG + RIGHT LEG:		140										
SUBTOTAL:		70										
Legs same size and shape		10										
Assembly		10										
Functionality test		10										
PHASE 4 TOTAL:		100										

NAME AND SIGNATURE OF TEACHER		
NAME AND SIGNATURE OF DEPARTMENT HEAD		
NAME AND SIGNATURE OF SUBJECT MODERATOR		

MECHANICAL TECHNOLOGY											
FITTING AND MACHINING											
MARK SHEET – TOTALS											
GRADE		**12**		**DATE**							
PROJECT		**BEARING PULLER TOTALS**									
		LEARNERS									
FACETS	**MARKS**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PHASE 1	50										
PHASE 2	50										
PHASE 3	50										
PHASE 4	100										
TOTAL:	**250**										
TOTAL PAT MARK:	**100**										

NAME AND SIGNATURE OF TEACHER		
NAME AND SIGNATURE OF DEPARTMENT HEAD		
NAME AND SIGNATURE OF PRINCIPAL		
NAME AND SIGNATURE OF SUBJECT MODERATOR		

5. CONCLUSION

On completion of the practical assessment task learners should be able to demonstrate their understanding of the industry, enhance their knowledge, skills, values and reasoning abilities as well as establish connections to life outside the classroom and address real-world challenges. The PAT furthermore develops the learner's life skills and provides opportunities for learners to engage in their own learning.