



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MECHANICAL TECHNOLOGY (FITTING AND MACHINING)

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

GRADE 12

2021

These guidelines consist of 24 pages.

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1. INTRODUCTION/BACKGROUND

The 18 Curriculum and Assessment Policy Statements 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 candidates 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. test or examination. 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 emphasized 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 MECHANICAL TECHNOLOGY'S 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. Instances where formal assessments take 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.)

2.2 Assessment of the PAT

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

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

2.3 Moderation of the 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 purposes.

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

2.4 Consequences of absence/non-submission of tasks

If a learner's practical assessment task is incomplete or unavailable with 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.

2.5 Declaration of Authenticity

NAME OF 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 CANDIDATE

DATE

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

SIGNATURE OF TEACHER

DATE

SCHOOL STAMP

3. LEARNER GUIDELINES

Instructions to the learner

- The 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.

4. SPECIALISATION
FITTING AND MACHINING
TASK: BENCH VICE

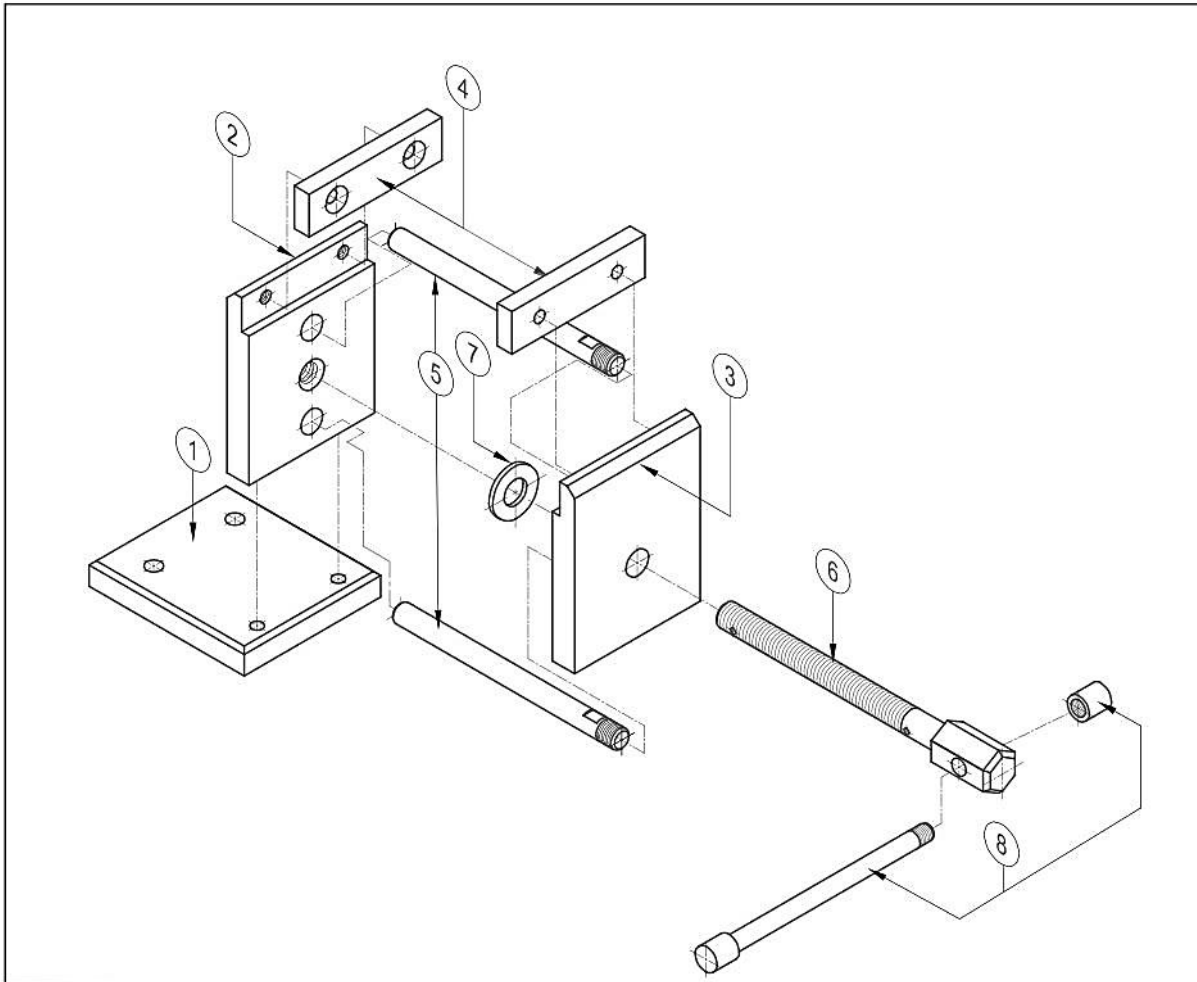


FIGURE 1: EXPLODED ISOMETRIC DRAWING

PARTS LIST			
	PARTS	QUANTITY	MATERIAL
1.	Base	1	Mild steel/Aluminium
2.	Fixed jaw	1	Mild steel/Aluminium
3.	Moving jaw	1	Mild steel/Aluminium
4.	Jaw linings	2	Mild steel/Aluminium
5.	Guide pins	2	Bright mild steel/Aluminium
6.	M12 x 1,75 screw	1	Bright mild steel/Aluminium
7.	Retaining washer	1	Mild steel/Aluminium
8.	Handle set	1	Bright mild steel/Aluminium

Term: 1 to 3**Start date: January 2021****Completion date: August 2021****The following standards must be achieved:**

- All sizes must be within the given tolerance.
- 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	Dimensions	Quantity per learner	No. of learners	Total quantity
Fixed jaw	Mild steel/ Aluminium 70 x 12 flat bar	86 x 68 x 12	1		
Moving jaw	Mild steel/ Aluminium 70 x 12 flat bar	86 x 68 x 12	1		
Jaw linings	Mild steel/ Aluminium 20 x 8 flat bar	72 x 18 x 8	2		
Guide pins	Bright mild steel/ Aluminium 12 mm round bar	120 x 12	2		
Screw	Bright mild steel/ Aluminium 20 mm round bar	145 x 20	1		
Handle	Bright mild steel/ Aluminium 12 mm round bar	120 x 12	1		
Base	Mild steel/ Aluminium 70 x 12 flat bar	± 100 x 70	1		
Retaining washer	Mild steel/ Aluminium 20 mm round bar	20 x 2	1		
Split pins	Split pins	20 x 3	2		
Bolts	Countersink screws	M6 x 1 x 12	4		
Bolts	Allen key cap screws	M6 x 1 x 25	2		

NOTE: This material list is NOT a cutting list. The teacher must determine and create the cutting list.



FIGURE A
Allen key cap screws



FIGURE B
Countersink screws



FIGURE C
Split pin

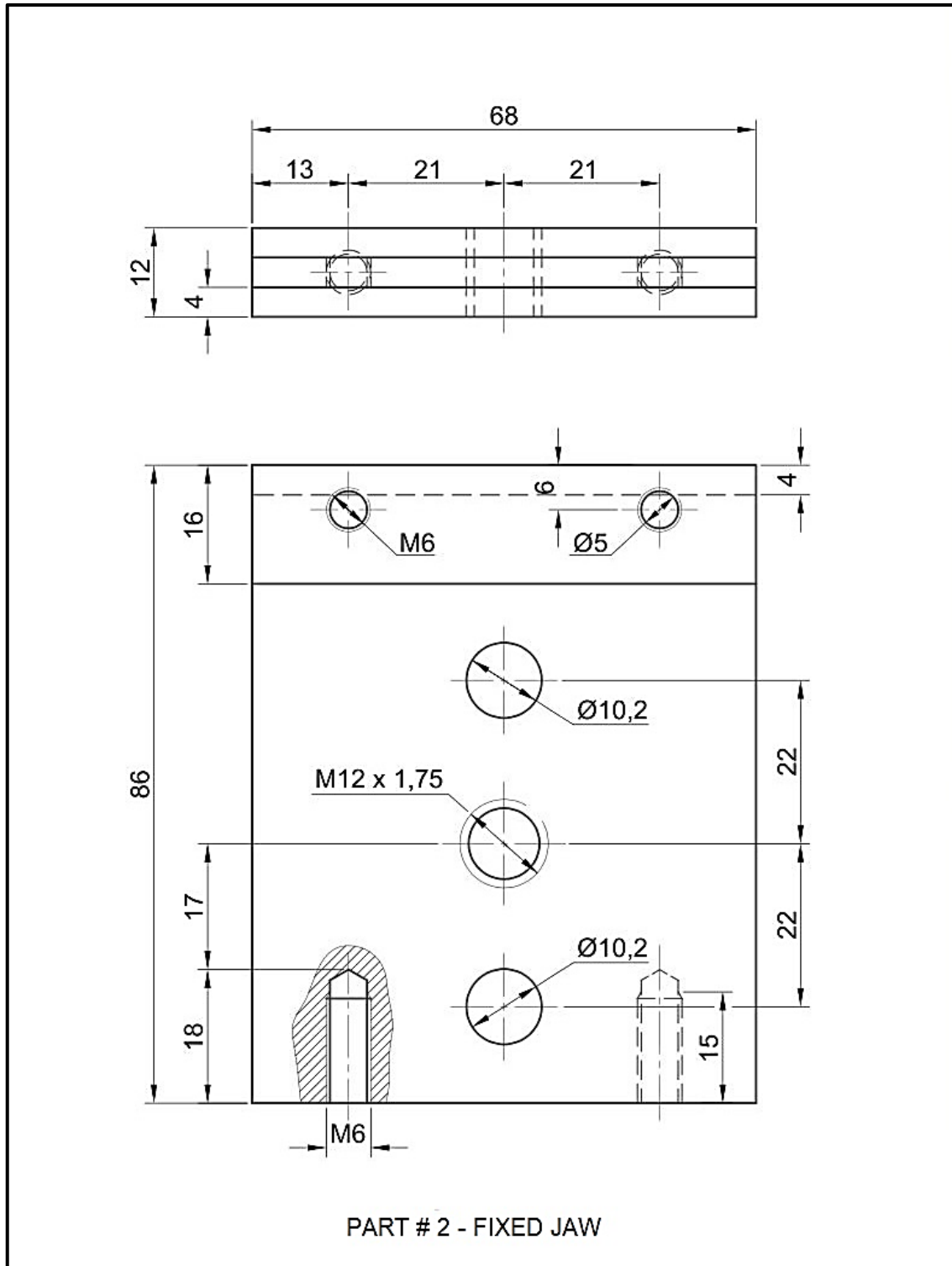


FIGURE 2: FIXED JAW

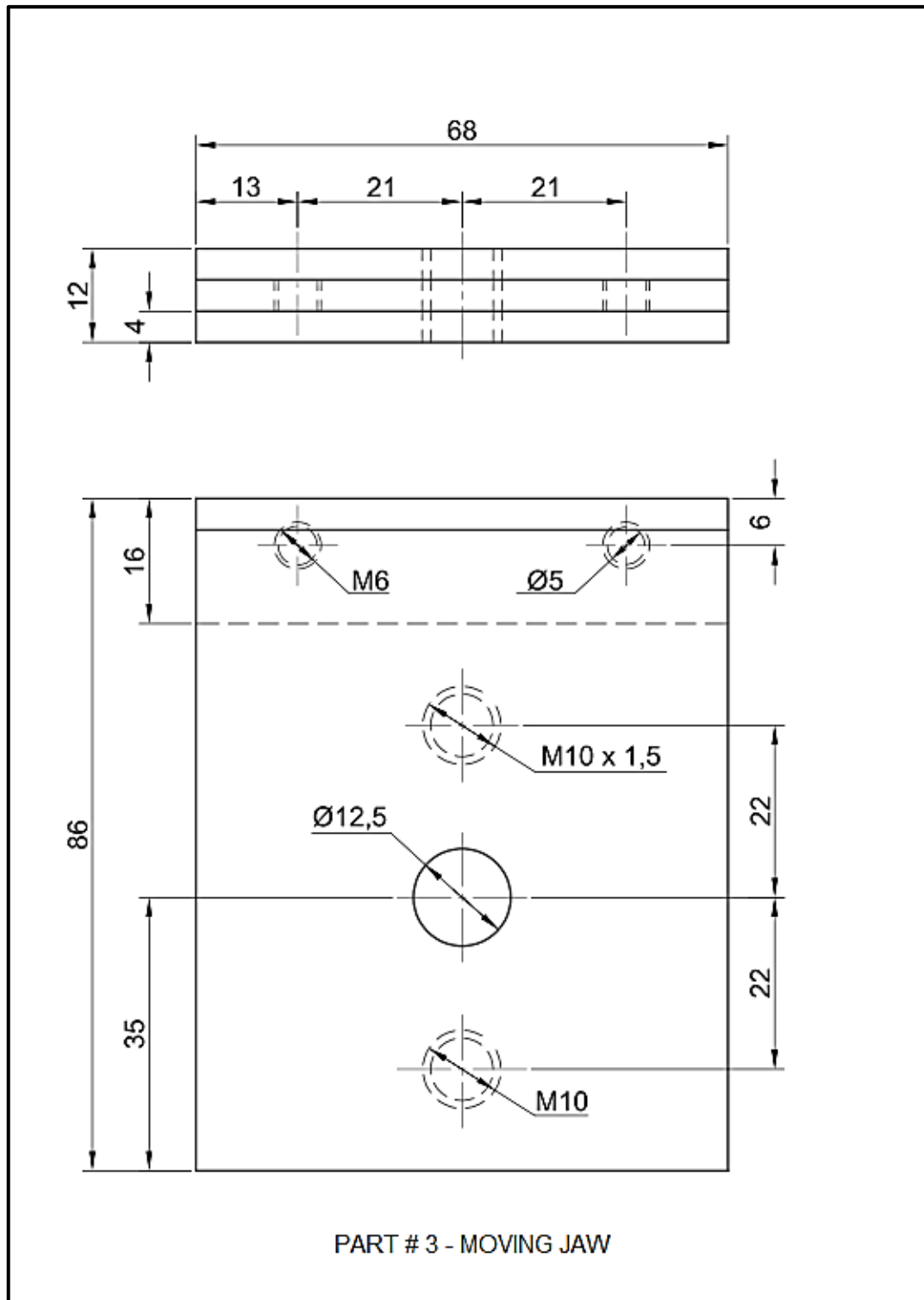


FIGURE 3: MOVING JAW

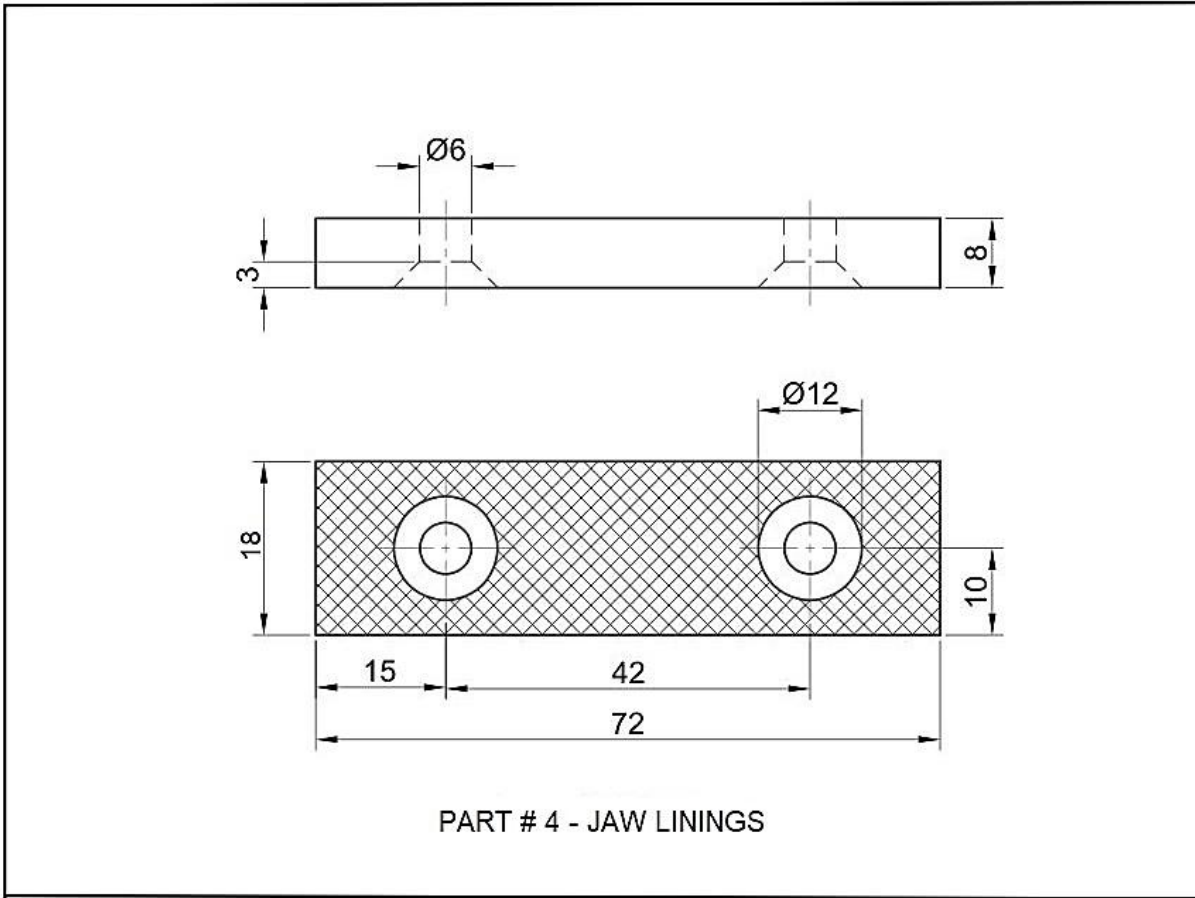
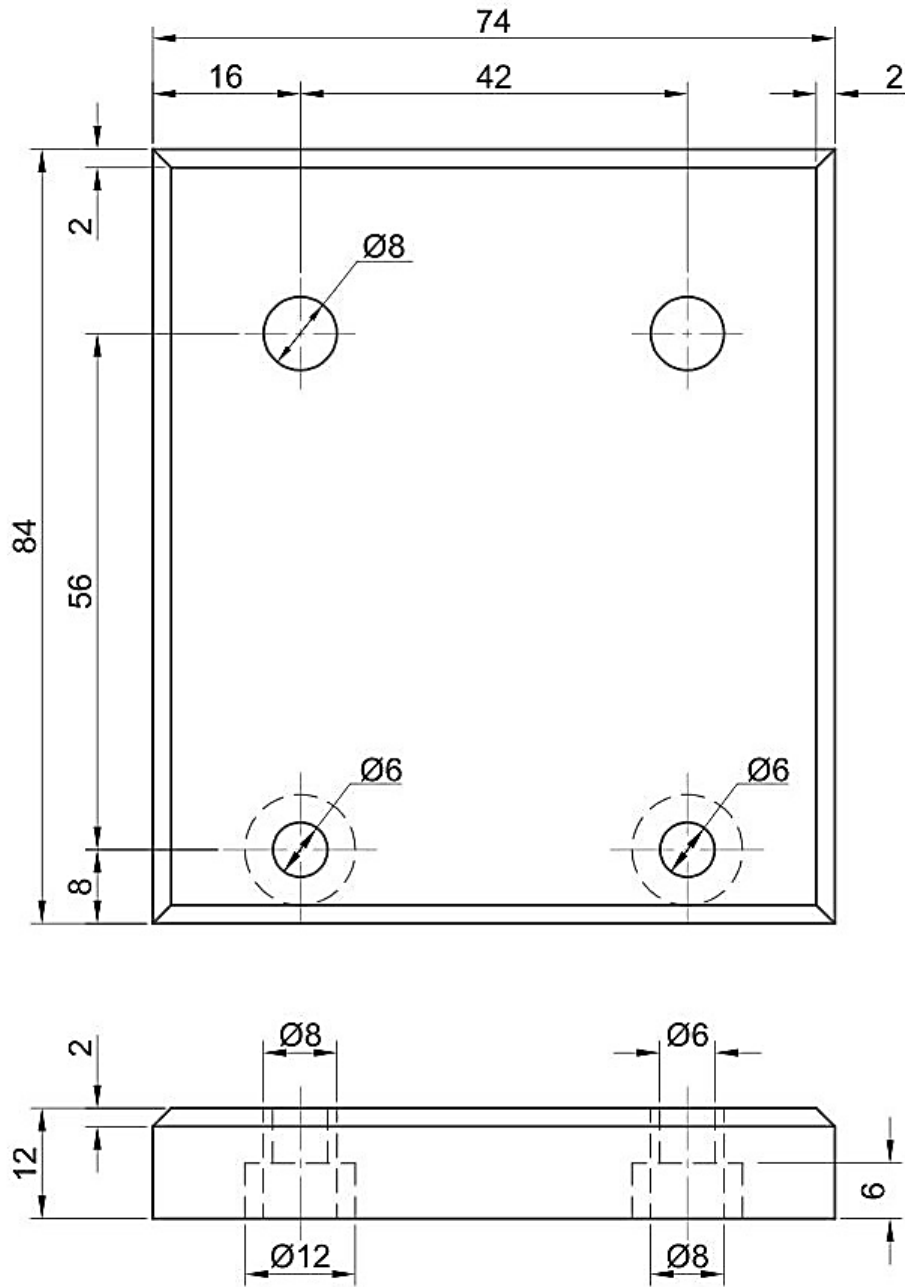


FIGURE 4: JAW LININGS



PART # 1 - BASE

FIGURE 5: BASE

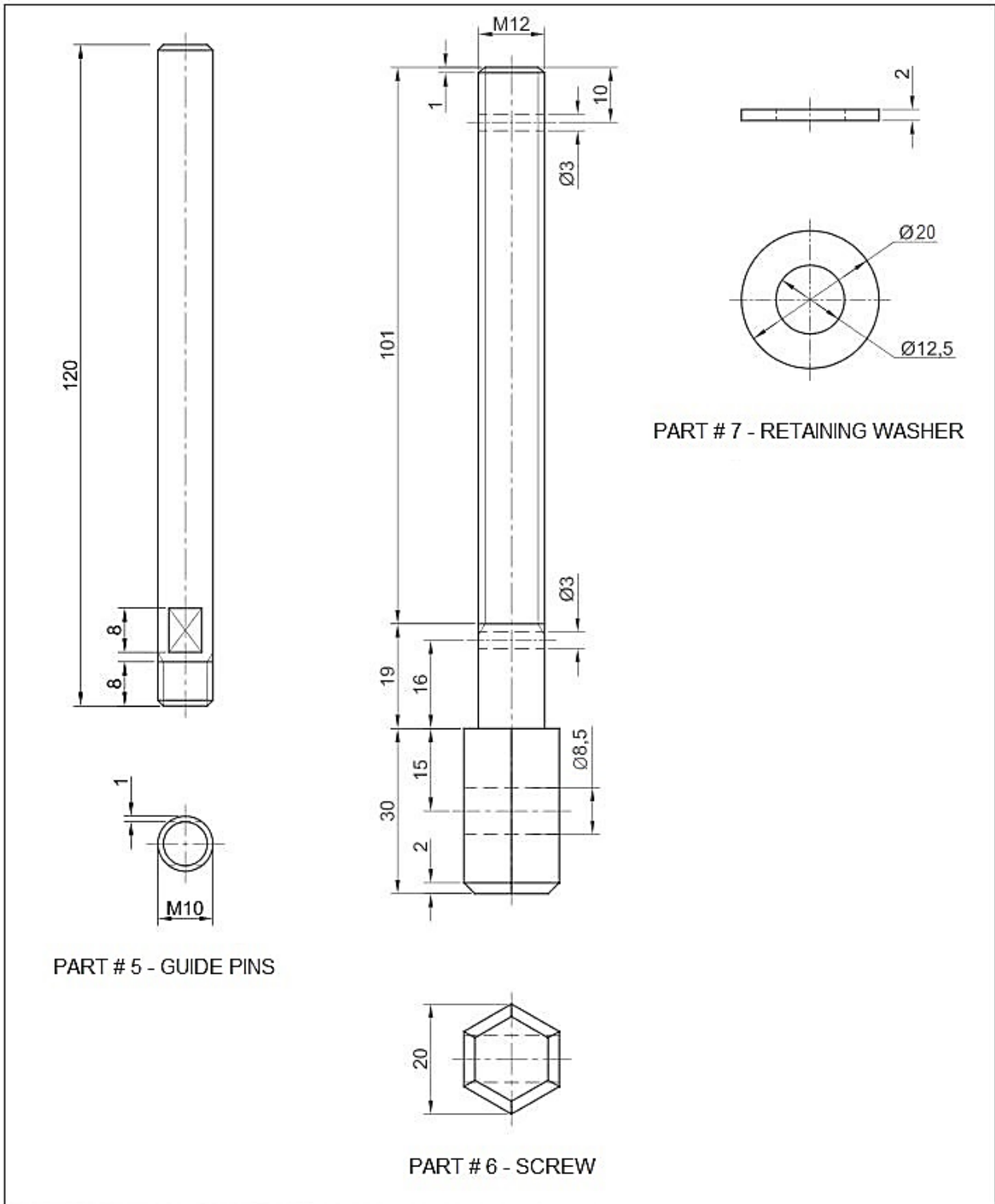


FIGURE 6: SCREW, GUIDE PINS AND RETAINING WASHER

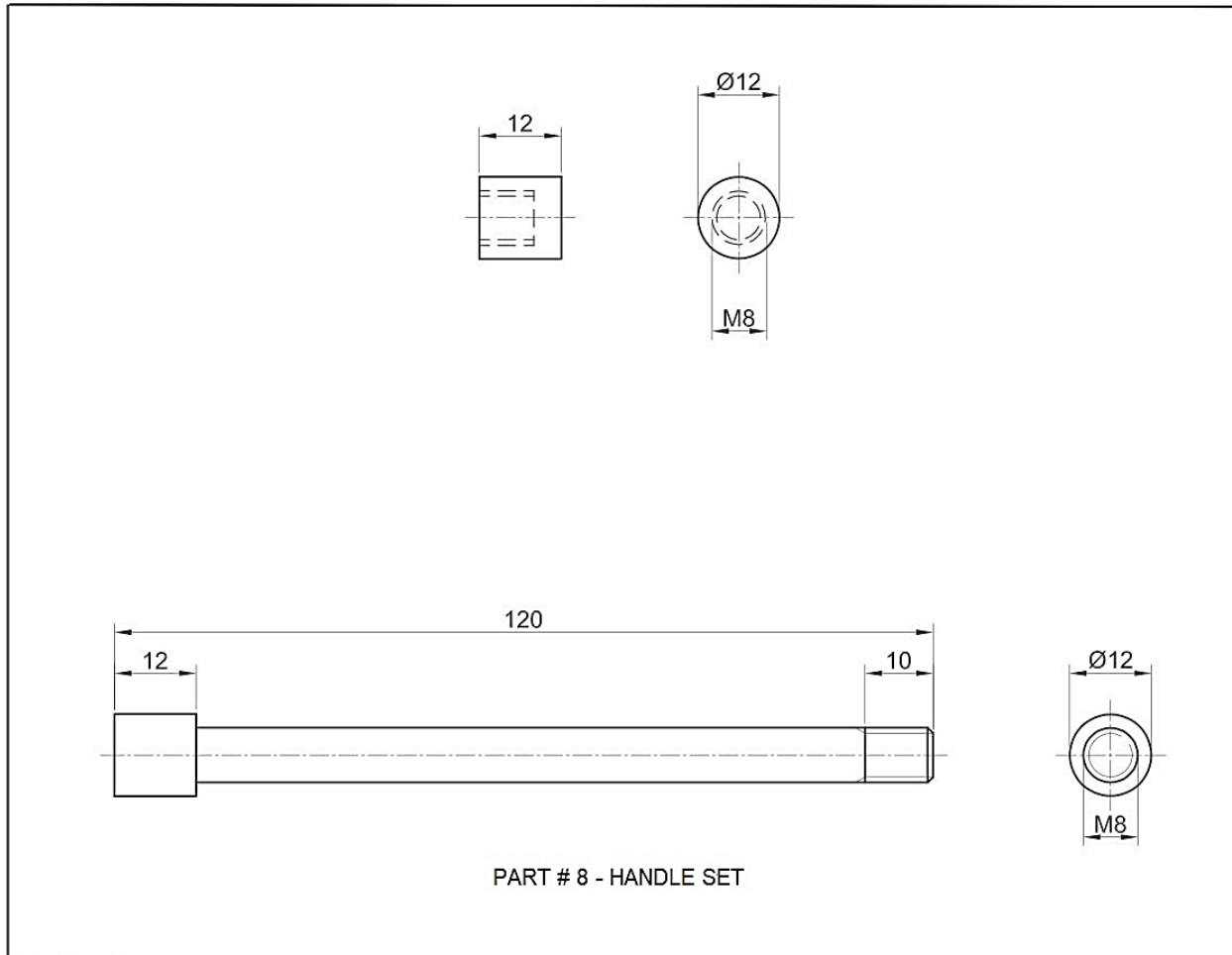


FIGURE 7: HANDLE SET

RUBRICS**DRILLING AND TAPPING**

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

RUBRIC A: DRILLING	
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 for the assessment of all internal and external screw threads to be tapped.

RUBRIC B: TAPPING OF SCREW THREADS	
Assessment facet	Mark
Correct screw thread cut	1
Screw thread perpendicular to work piece	1
Screw thread has no burrs on outside	1
Depth/Length tapped correctly	1
No defects (e.g. cross thread)	1
Subtotal:	5

TOLERANCES**LENGTH AND DIAMETERS**

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

MECHANICAL TECHNOLOGY												
FITTING AND MACHINING												
MARK SHEET – FIXED JAW (Part # 2) – PHASE 1												
GRADE		12	DATE									
PROJECT		BENCH VICE										
FACETS			LEARNERS									
			MARKS									
LENGTH AND WIDTH	Check 86 mm length	5										
	Check 12 mm thickness	5										
	Check 68 mm width	5										
MILLING OF STEP	Milling 16 mm width	5										
	Milling 4 mm deep	5										
Ø5 DRILLING	Drilling of 4 x Ø5 mm holes (4 x 5)	20										
M6 TAPPING	Tapping of 4 x M6	20										
Ø10.2	Drilling of 3 x Ø10,2 mm holes	15										
M12 TAPPING	Tapping of M12 x 1,75	5										
Milling of chamfer – 45° angle and 4 mm		5										
Subtotal:		90										
PHASE 1 TOTAL:		50										
SIGNATURE OF TEACHER												
SIGNATURE OF SUBJECT HEAD												
SIGNATURE OF MODERATOR												

MECHANICAL TECHNOLOGY													
FITTING AND MACHINING													
MARK SHEET – MOVING JAW (Part # 3) – PHASE 2													
GRADE	12	DATE											
PROJECT	BENCH VICE												
FACETS		MARKS	LEARNERS										
			1	2	3	4	5	6	7	8	9	10	
LENGTH AND WIDTH	Check 86 mm length	5											
	Check 12 mm thickness	5											
	Check 68 mm width	5											
MILLING OF STEP	Milling 16 mm width	5											
	Milling 4 mm deep	5											
Ø5 DRILLING	Drilling of 2 x Ø5 mm holes (2 x 5)	10											
M6 TAPPING	Tapping of 2 x M6 holes (2 x 5)	10											
Ø8,5	Drilling of 2 x Ø8,5 mm holes	10											
Ø12,5	Drilling of 1 x Ø12,5 mm hole	5											
M10 TAPPING	Tapping of 2 x M10 x 1,5 (2 x 5)	10											
Milling of chamfer – 45° angle and 4 mm		5											
Subtotal:		75											
PHASE 2 TOTAL:		50											
SIGNATURE OF TEACHER													
SIGNATURE OF SUBJECT HEAD													
SIGNATURE OF MODERATOR													

MECHANICAL TECHNOLOGY												
FITTING AND MACHINING												
MARK SHEET – SCREW (Parts # 6 and 7) – PHASE 3												
GRADE		12	DATE									
PROJECT		BENCH VICE										
FACETS			LEARNERS									
			MARKS									
		1		2	3	4	5	6	7	8	9	10
LENGTH	Total 150 mm length		5									
	30 mm length of Ø20 section		5									
	Ø12 to a total length of 120 mm		5									
	Check back of hexagon to be 19 mm length at Ø12 section		5									
CUTTING SCREW THREAD	Calculate cutting depth of screw thread		4									
	Screw thread depth cut correctly		5									
	Screw thread to a length of 101 mm		5									
	Screw thread cut cleanly (no tears)		3									
HEXAGON	Calculate cutting depth of hexagon		4									
	Cut to correct depth		5									
	All sides equal to size		6									
	Chamfering of hexagon		3									
DRILLING	Drilling of 2 x Ø3 holes (2 x 5)		10									
	15 mm distance of Ø8,5 hole		5									
RETAINING WASHER	Ø20 diameter		5									
	Inside hole – Ø12,5		5									
	Parting to a thickness of 2 mm		5									
Subtotal:			85									
PHASE 3 TOTAL:			50									
SIGNATURE OF TEACHER												
SIGNATURE OF SUBJECT HEAD												
SIGNATURE OF MODERATOR												

MECHANICAL TECHNOLOGY													
FITTING AND MACHINING													
MARK SHEET – PARTS (Parts # 1, 4, 5 and 8) – PHASE 4													
GRADE		12	DATE										
PROJECT		BENCH VICE											
FACETS			LEARNERS										
			MARKS										
				1	2	3	4	5	6	7	8	9	10
JAW LININGS	Jaw 1	Check 72 mm length	5										
		Check width of 18 mm	5										
		Drilling of 2 x Ø6 mm holes	10										
		Countersink hole	2										
		Create clamping surface	3										
	Jaw 2	Check 72 mm length	5										
		Check width of 18 mm	5										
		Drilling of 2 x Ø6 mm holes	10										
		Countersink hole	2										
		Create clamping surface	3										
Subtotal:			50										
GUIDE PINS	Guide pin 1	Total length of 120 mm	5										
		Size: Ø10 mm	5										
		Cut M10 screw thread 8 mm long	5										
		Cut 2 x flat surfaces 1 mm deep	5										
	Guide pin 2	Total length of 120 mm	5										
		Size: Ø10 mm	5										
		Cut M10 screw thread 8 mm long	5										
		Cut 2 x flat surfaces 1 mm deep	5										
Subtotal:			40										

HANDLE SET	Sliding part: Cut Ø8: 108 mm long	5																			
	Sliding part: Cut M8 thread: 10 mm long	5																			
	Sliding part: Cut Ø12: 12 mm long	5																			
	Turn loose head to Ø12 mm	5																			
	Turn loose head to 12 mm length	5																			
	Drill loose head to M8 tapping size	5																			
	Tap M8 screw thread	5																			
Subtotal:		35																			
BASE	Check 84 mm length	5																			
	Check 74 mm width	5																			
	Drilling of 2 x Ø6 mm holes (2 x 5)	10																			
	Countersink 2 x Ø12 (2 x 5)	10																			
Subtotal:		30																			
ASSEMBLY	Safety	5																			
	Finish	5																			
	Composition	5																			
	Presentation	5																			
Subtotal:		20																			
Subtotal:		175																			
PHASE 4 TOTAL:		100																			
SIGNATURE OF TEACHER																					
SIGNATURE OF SUBJECT HEAD																					
SIGNATURE OF MODERATOR																					

MECHANICAL TECHNOLOGY											
FITTING AND MACHINING											
MARK SHEET – TOTALS											
GRADE		12	DATE								
PROJECT		BENCH VICE 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										
SIGNATURE OF TEACHER											
SIGNATURE OF SUBJECT HEAD											
SIGNATURE OF 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 learners' life skills and provides opportunities for learners to engage in their own learning.