education

Department:
Education
REPUBLIC OF SOUTH AFRICA

MECHANICAL TECHNOLOGY

GUIDELINES FOR

PRACTICAL ASSESSMENT TASKS

2008

This guideline consists of 33 pages.

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TABLE OF CONTENTS

INTRODUCTION

The seventeen National Curriculum Statement subjects which contain a practical component all include a Practical Assessment Task (PAT), i.e. a Practical or Performance Assessment Task. These subjects are:

- AGRICULTURE: Agricultural Management Sciences, Agricultural Technology
- ARTS: Dance Studies, Design, Dramatic Arts, Music, Visual Arts
- HSS: Life Orientation
- SCIENCES: Computer Applications Technology, Information Technology
- SERVICES: Consumer Studies, Hospitality Studies, Tourism
- TECHNOLOGY: Civil Technology, Electrical Technology, Engineering Graphics and Design, **MECHANICAL TECHNOLOGY**

A PAT allows the educator 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% (i.e. 100 marks) of the total promotion/certification mark out of 400 for the subject. In the two Art subjects, Design and Visual Arts, the PAT counts 37,5% (i.e. 150 marks) 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 and should be undertaken as one extended task, which is broken down into different phases or a series of smaller activities that make up the PAT. The planning and execution of the PAT differs from subject to subject.

SECTION A is guidelines to educators and SECTION B should be given to learners at the beginning of 2008.

Any profession requires of its members a thorough grounding in both practice and theory, and **MECHANICAL TECHNOLOGY** is no exception. It is emphasised that the goal of the Performance Assessment Task is not to produce a skilled craftsperson but a mechanical technology learner in the broadest sense. A nation's true wealth is in its manpower and education should aim to develop the talents of the learner so that he/she can contribute to the well-being of society by using scientific and technological resources with the greatest efficiency and by continuing to develop them.

To prepare a learner in **MECHANICAL TECHNOLOGY** for one or more of these activities his/her education should develop in him/her:

- A mentality which can selectively assimilate ideas, evidence and facts, and by drawing logical conclusions put them to good use creatively and with imagination;
- An ability to express ideas and information clearly by speech, writing, sketching or drawing;
- A willingness and ability 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 science is essential to the MECHANICAL TECHNOLOGY learner, so also is the close practical acquaintance with the processes. There is no substitute for acquiring the feel of things on the shop floor, where training in the art of making things, the essential bridge between theory and practice, can be so readily obtained. Practicals must therefore be made an interesting and challenging experience, mentally and physically, with encouragement to the learner to use his/her initiative, curiosity and persistence in finding things out for hi/herself. Learning by watching should be kept to the minimum. The giving of some degree of responsibility during practicals is very important as a stimulus and to develop self-confidence.

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SECTION A (Educator Guidelines)

1. The structure of the PAT

Practical Assessment Tasks are designed to develop and demonstrate a learner's ability to integrate a variety of skills in order to solve a problem. The PAT also makes use of the technological process outlined in LO 2, to guide the learner which steps need to be followed to arrive at a solution for the problem at hand.

The PAT is based on simulations and investigations. The PAT is made up of an integration (or a combination) of two or more areas of specialisation; i.e. motor mechanics, welding and metalwork, and fitting and machining.

The Practical Assessment Task consists of two components; the design portfolio which makes up 25% of the PAT and the product or artefact, which makes up 75% of the PAT.

The design portfolio of the PAT should include evidence of how the development of the product or artefact was approached, that is:

- The planning process;
- The knowledge and skills accumulated in the process;
- The technological process followed;
- The safety and environmental aspects considered;
- The calculations used – if applicable, sketches or diagrams;
- The starting time and ending time – how long it took to complete from start to finish;
- The investigations undertaken;
- User manual of artefact;
- Bill of materials;
- List of tools needed; and
- Any other information that is relevant to the project.

As part of the design process learners must:

- Identify the problem and investigate means of solving the problem;
- Design possible solutions;
- Develop the preferred solution;
- Evaluate the solution;
- State the process followed in the project portfolio; and
- Construct the technological solution in the form of a product or artefact.

Table 1 on page 5 can be used as checklist of the stages that should be followed for the development of the PAT. This table also gives a guideline in terms of which tasks could be formally assessed and which ones could be informally assessed, and the possible assessment tool/s for the different tasks.

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No	PAT Stage	Practical Assessment Task	Purpose of Assessment		Assessment of Portfolio	Assessment of Artefact	Self	Peer	Group	Educator	Possible Assessment Tool/s			
			Informal	Formal							Rubric	Checklist	Memo	Observe
1	Scenario	Analyse the Scenario/Problem	✓		✓		✓				✓	✓		
		Identify the problem statement		✓	✓					✓	✓	✓		
2	Design Brief	List possible solutions		✓	✓					✓		✓		
3	Acquisition of information and skills	Research		✓	✓		✓	✓		✓	✓	✓		
		Investigation		✓	✓		✓	✓		✓	✓	✓		
		Case study		✓	✓					✓			✓	
4	Production and Evaluation	Layout design and drawings		✓	✓		✓			✓	✓	✓		
		Tools list		✓	✓					✓		✓		
		Simulation		✓		✓				✓		✓		✓
		Investigation		✓		✓				✓		✓		✓
		Measurement		✓		✓				✓		✓	✓	
		Manufacturing and assembly		✓		✓				✓		✓		
		Hand skills & fitting of artefact		✓		✓				✓	✓	✓		
6	Presentation	Final artefact assessed according to criteria		✓		✓				✓	✓	✓		
		Portfolio of evidence assessed according to criteria		✓	✓					✓	✓	✓		

Table 1: Table to show the different stages of PAT and how each stage could be assessed

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2. Administration of the PAT

Educators can make a pacesetter by attaching dates for the different stages of PAT in Table 1 on page 5. In this manner, learners can easily assess their progress. In instances where formal assessments take place, it is the responsibility of the educator to administer assessment.

The PAT should be completed in the first three terms and handed in at the end of the third term. The PAT should be based on real-life situations and completed under controlled conditions. (Refer to the SAG Jan. 2007).

Educators are requested to make copies of SECTION B and to give it to learners at the beginning of the year. Learners should receive the assessment criteria of the PAT at the beginning of the year when the PAT is given.

3. Assessment and moderation of the PAT

The Practical Assessment Task for Grade 12 is externally set and moderated, but internally assessed.

3.1 Assessment

Frequent developmental feedback is needed to guide and give support to the learner in ensuring that the learner is on the right track.

Both formal and informal assessment should be conducted on the different tasks that constitute the PAT. Informal assessment can be conducted by the learner himself or herself, by a peer group, or by the educator. Formal assessment should always be conducted by the educator and will be recorded.

Learners submit the product or artefact for assessment by the end of the third term. The accompanying design portfolio must also be submitted for assessment at this time.

3.2 Moderation

During moderation of the PAT the design portfolio and the artefact will be presented to the moderator.

Where required the moderator should be able to call on the learner to come and explain the function, principles of operation and also request the learner to exhibit the skills acquired through the capability tasks for moderation purposes. The sequence of events according to the technological process may also be requested from the learner.

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3.3 Declaration of authenticity

It is advisable that prior to the final assessment and awarding of marks on the PAT learners complete a declaration form shown below.

-

DECLARATION OF AUTHENTICITY

NAME OF THE SCHOOL: _____

NAME OF LEARNER: _____

(FULL NAME(S) AND SURNAME):_____

_____

EXAMINATION NUMBER: _____

NAME OF EDUCATOR: _____

SCHOOL STAMP

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 or her own.

_____ _____
SIGNATURE OF EDUCATOR **DATE**

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SECTION B (The Learner Task)

The PAT consists of a practical task to be completed over three terms. The PAT consists of a design portfolio and a product or artefact. This PAT consists of three questions:

- Question 1 – Joining Methods
- Question 2 – Manufacturing
- Question 3 – Maintenance

QUESTION 1

MANUFACTURING – JOINING METHODS

This question consists of:

- Investigative task
- Scenario

INVESTIGATIVE TASK: Determining the quality of a welded joint

Required tools:

- Gas welding apparatus and flint lighter
- Hammer
- Work bench
- Tongs
- Brazing rod and flux
- 50 x 20 x 5 mild steel plate
- Paper
- Pencil

Test:

- Bevel the two mild steel plates at an angle of 60 degrees;
- Tack weld the two pieces of steel and align for distortion;
- Clamp the work pieces in a workbench;
- Braze the penetration run in the mild steel plates;
- Braze other runs to make a complete joint;
- Allow the work piece some time to cool off;
- Ensure that the work piece is securely clamped to the vice;
- Use a hammer to break the weld open
- Carry out a visual inspection of the weld

Conclusion:

Briefly describe in your own words your observation and give possible reasons for some weld defects and how they could be repaired. [8]

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SCENARIO: MOTOR TRESTLE

Mr Karel is a self-employed motor mechanic doing repairs in his backyard. He is using blocks of wood to elevate cars when doing repairs under the car. Three months ago he broke his leg because one of the wooden blocks broke and the car he was working on fell on his leg. After his leg healed he approached your company with a drawing of the device he wants to use to elevate cars. However, he gave you the option of using the drawing coming up with an alternative design. You are required to design and make a device that will help Mr Karel elevate cars safely. Provide evidence that you have gathered information to assist you to address the problem of Mr Karel. Your evidence must contain the following topics:

[22]

Situation/Scenario

⇩

Analyse the situation

⇩

Write a brief

⇩

Carry out research

⇩

Write the specifications

⇩

Work out possible solutions

⇩

Select preferred solution

⇩

Prepare working drawing and plan ahead

⇩

Construct an artefact

⇩

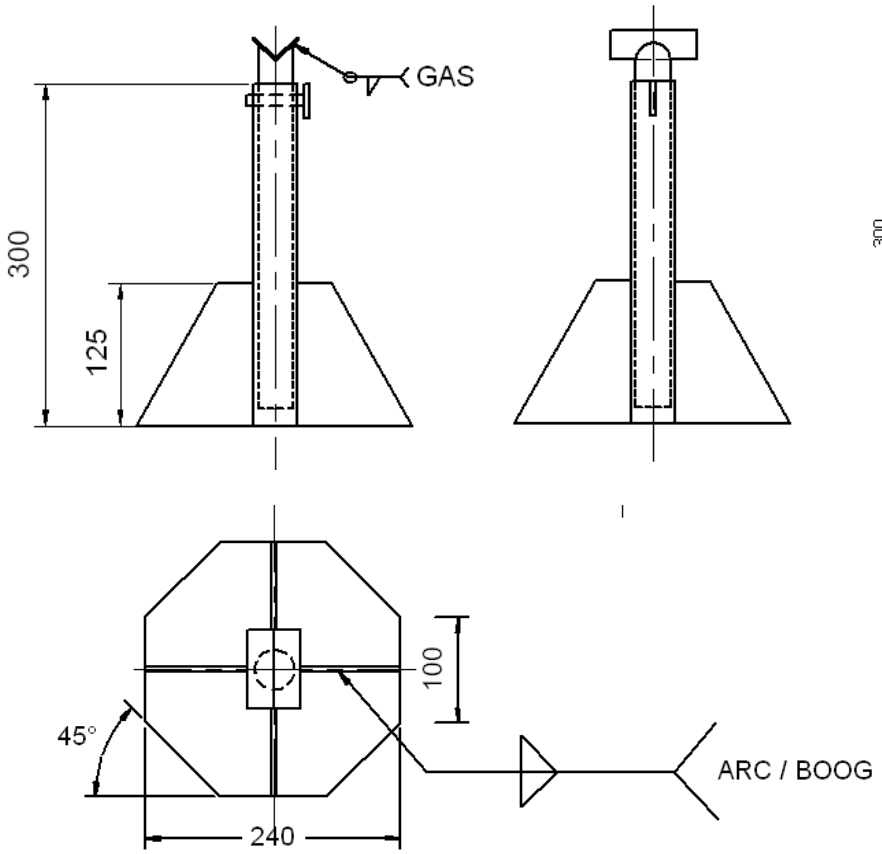
Test and evaluate the design

⇩

Prepare cost sheet for the artefact

Safety:

- Wear protective gear
- Actions/Attitude
- Correct tools/Procedures for job
- Adhering to instructions



DEEL / PART	BESKRYWING / DESCRIPTION	MATRIAAL / MATERIAL	HOEV / QUAN
1	V-STUK / V-PIECE	30 X 75 HOEKYSTER / ANGLE IRON	1
2	SKAG / STEM	Ø38 X 300 GELEIPYP / CONDUIT	1
3	PEN	Ø10 X 125 RONDE STAAL / ROUND BAR	1
4	STAANDER / STAND	Ø38 X 300 STAALPYP / STEEL PIPE	1
5	VERSTERKINGS / BRACES	3 mm STAALPLAAT / STEEL PLATE	4
6	VOETPLAAT / BASE PLATE	3 mm X 240 X 240	1

FIGURE 1: MOTOR TRESTLE

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QUESTION 2

MANUFACTURING USING MILLING MACHINE AND THE MACHINE VICE

SIMULATION TASK: SETTING UP THE MILLING MACHINE

ACTIVITY OUTCOMES

- Learners apply theoretical knowledge in practice
- Learners familiarise themselves with the use of tools
- Learners explain and demonstrate how to:

  - Set up the machines
  - Fit the end mill correctly
  - Clamp the artefact
  - Machine the artefact to size
  - Centre the cutter
  - Cut a hexagon

Resources required:

- Lathe
- Vertical or horizontal milling machine
- Machine vice
- Dividing head
- 20 millimetre end mill

Safety checks:

- No person cleaning or oiling machine while in operation.
- Never start a machine or engage a feed until you are certain that the work is adequately secured.
- Spanners or keys must never be left on rotary parts.
- Stop the machine before attempting to make adjustments or measurements.

Knowledge assessment/Process

- Identify the TWO types of machines shown in Figure 1 and 2. (2)
- Discuss the THREE movements of the machine shown in Figure 1. (3)
- Identify the TWO processes indicated in Figure 3 and Figure 4. (2)
- Calculate the differential indexing for the hexagon in Figure 5. (5)
- Calculate the depth of the hexagon cut in Figure 5. (8)

[20]

Tools

- Centre drill
- Parting tool
- Cutting tool
- Micrometer

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FIGURE 1

FIGURE 2

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turn over

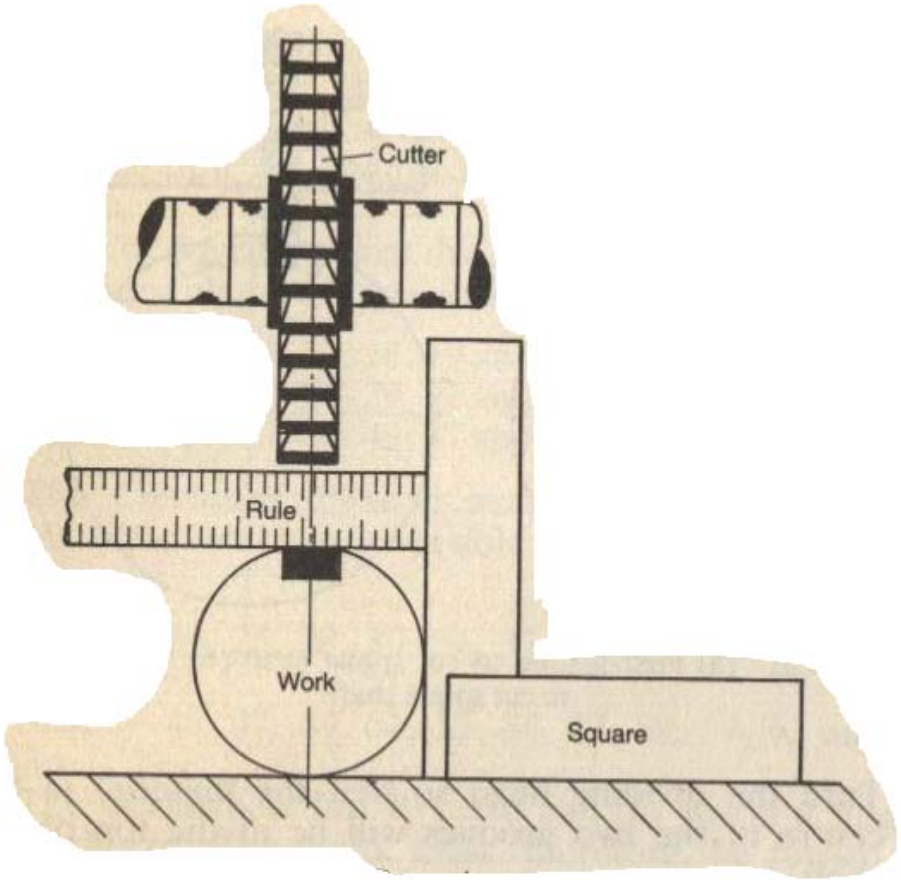

FIGURE 3

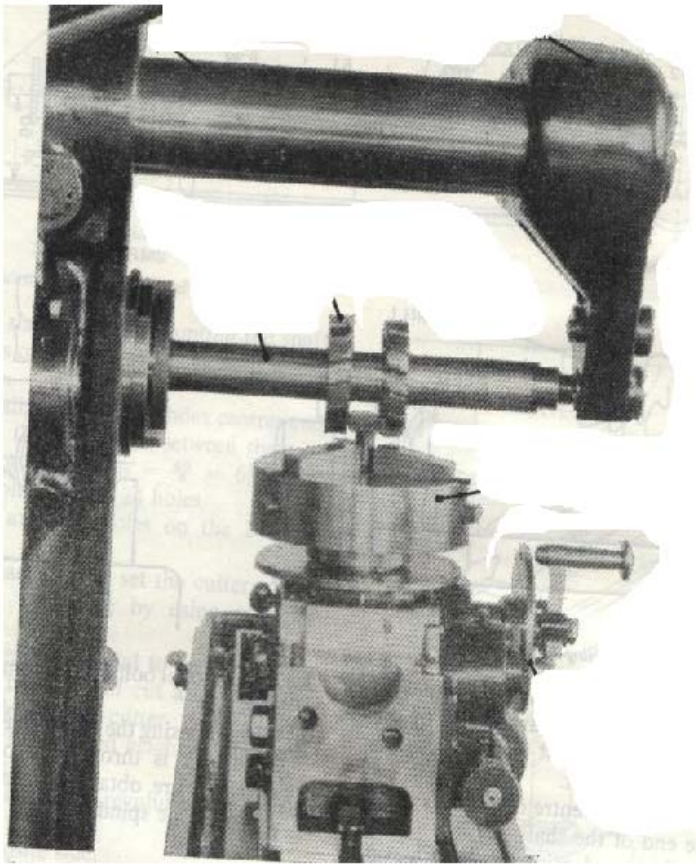

FIGURE 4

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Scenario:

You work in a factory that manufactures machine parts. The client reported that the transmission of the overhead crane broke down. You are requested to manufacture the replacement part according to the specifications given in Figure 5. A hexagon needs to be milled on the 20 mm diameter shaft.

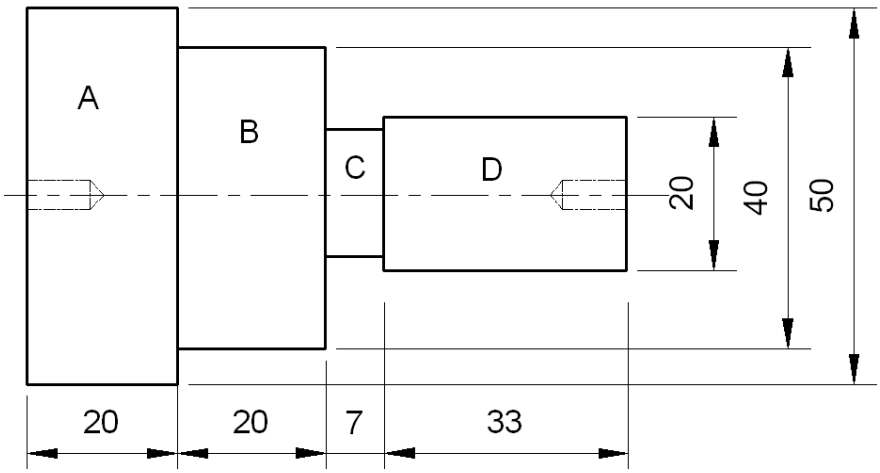

FIGURE 5

Provide evidence that you have gathered information to manufacture the replacement part. Your evidence must contain the following topics:

Situation/Scenario
⇩
Analyse the situation
⇩
Write a brief
⇩
Carry out research
⇩
Write the specifications
⇩
Work out possible solutions
⇩
Select preferred solution
⇩
Prepare working drawing and plan ahead
⇩
Construct an artefact
⇩
Test and evaluate the design
⇩
Prepare cost sheet for the artefact

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Method (Lathe):

Use the lathe and cut the following part to size (remember that the undercut diameter needs to be smaller than 20 mm – hint: deduct the depth of the cut from the 20mm diameter) [10]

Method (Milling machine):

- ❖ Set the part up in the milling machine:
  - ➢ Calculate the differential indexing for the hexagon
  - ➢ Calculate the depth of the cut
  - ➢ Machine and dividing head to be bolted down
  - ➢ Adjust the dividing head to the calculated indexing
  - ➢ Centre the cutter – adjust the graduation dials to zero
  - ➢ Centre the part between the dividing head and the centre
  - ➢ Set the end mill to the depth of the cutter
  - ➢ Cut the first side of the hexagon [10]

TOLERANCE	TURNING		FILLING	MILLING
	DIAMETER	LENGTH		
	+ 0,03	+ 0,09	+ 0,09	+ 0,09
	- 0,03	- 0,09	- 0,09	- 0,09
DEVIATION	0,03 = 100%	0,09 = 100%	0,09 = 100%	0,09 = 100%
	0,06 = 80%	0,18 = 80%	0,18 = 80%	0,18 = 80%
	0,12 = 60%	0,27 = 60%	0,27 = 60%	0,27 = 60%
	0,18 = 40%	0,36 = 40%	0,36 = 40%	0,36 = 40%
	0,21 = 20%	0,45 = 20%	0,45 = 20%	0,45 = 20%
	0,24 = 0%	0,54 = 0%	0,54 = 0%	0,54 = 0%

TOTAL MARKS QUESTION 2: 40

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QUESTION 3

INTERNAL COMBUSTION ENGINES

1. Assessment

- Measurements on the size of the engine
- Calculations on the volume of the cylinder
- State possible methods to increase the compression ratio
- Calculations on the new compression ratio if dimensions is altered

2. Requirements

- Inside micrometer
- Depth micrometer
- Calculator
- Engine: cylinder head removed

3. Method

- Measure the diameter of the cylinder with an inside micrometer or telescopic gauge
- Measure the total length of the cylinder from the B.D.C (Bottom dead centre) to the T.D.C (Top dead centre).

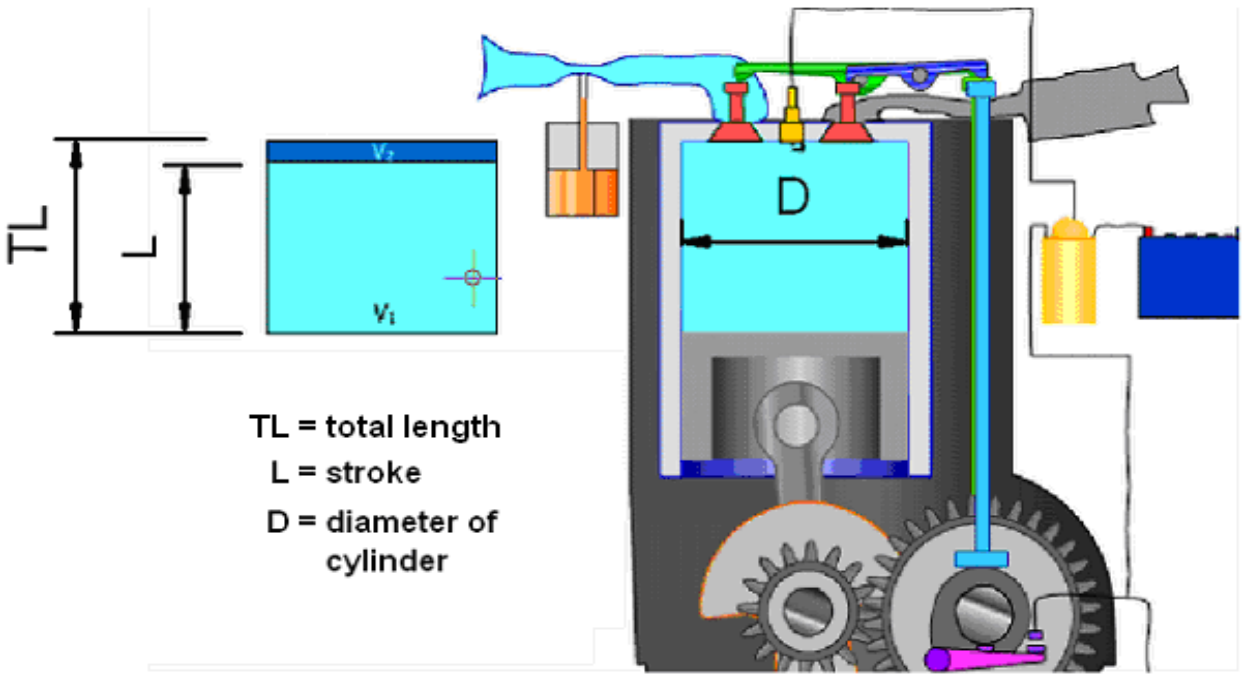

FIGURE 6

ASSESSMENT:

Use an internal combustion engine to perform the following measurements and tests:

3.1 Measure the diameter of the cylinder with an inside micrometer. Neatly draw the reading according to the scale. (2)

3.2 Measure the total length of the cylinder from the Bottom Dead Centre (B.D.C) to the Top Dead Centre. (1)

3.3 State TWO possible reasons for increasing the compression ratio of an internal combustion engine. (2)

3.4 State seven methods on how the compression ratio of an internal combustion engine can be increased. (7)

3.5 Calculate the volume of the cylinder. (2)

3.6 Calculate the size of the engine (i.e. for a four-/or a six-cylinder engine). (1)

3.7 Show by means of calculations how the compression ratio is affected by altering the diameter of the cylinder. (2)

3.8 Calculate the stroke volume (SV = V_1). See figure 6. (2)

3.9 Calculate the clearance volume (CV = V2). See figure 56. (2)

3.10 Calculate the compression ratio (CR). (1)

3.11 Calculate the compression ratio if the diameter of the cylinder is increased by 1,0 mm. (2)

3.12 Carry out a compression pressure test on the engine using a compression gauge. Clearly outline the procedure that has been used. (6)
[30]

TOTAL MARKS: 100

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Calculations:

Hint: Use the rubrics as for milling and turning. Each measurement will differ from engine to engine.

- Measure the diameter of the cylinder with an inside micrometer = D
- Measure the total length of the cylinder from the B.D.C (Bottom dead centre) to the T.D.C (Top dead centre) = L
- Calculate the stroke volume = SV (V_1)

$$\text{Stroke volume} = \frac{\Pi \times D^2}{4} \times L \qquad (\text{Area x stroke (L)})$$

- Calculate the clearance volume = CV (V_2)

$$\text{Clearance volume} = \frac{\Pi \times D^2}{4} \times (TL - L) \qquad (\text{Area x Clearance length})$$

Clearance length = TL - L

- Calculate the compression ratio = CR

$$C.R = \frac{S.V + C.V}{C.V}$$

C.R = Compression ratio

S.V = Stroke volume

C.V = Clearance volume

ASSESSMENT GUIDELINES

METHODS OF ASSESSMENT *(Who carries out the assessment?)*
Self-assessment Peer assessment Group assessment Educator assessment

ASSESSMENT FORMS	
Presentation	Debate or argument
Interview	Demonstration
Questionnaire	Role-play
Test	Examination
Project	Simulation
Research or investigation	Assignment
Case study	Practical task

TOOLS FOR ASSESSING LEARNER PERFORMANCE
Rubrics Rating scales, Checklists, Observation sheets, Marking memoranda, Assessment grids, etc.

RECORDING TOOLS
Class list, Mark sheet, **Day-by-day assessment sheets,** Promotion schedule, etc

REPORTING TOOLS
Report card using national codes and comments on competence, Educator-parent interview, Educator-learner interview, Written comments in learner work books, Day-by-day assessment sheets, etc.

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GRADE 12 - PROGRAMME OF ASSESSMENT

INTERNAL ASSESSMENT TASKS(100 marks)	EXTERNAL ASSESSMENT TASKS (300 marks)	
25%	**75%**	
	PAT	**EXAM PAPER**
	25% (100 marks)	**50% (200 marks)**
• 2 tests • 2 exams (June & Trial) • 2 practical tasks	• Integrate project portfolio with the practical project LO1-4 • Main focus LO4 • Portfolio = 25% • Project/artefact = 75%	• Written exam LO1-4 • Main focus LO1-3

Assessment Tasks		Term One	Term Two	Term Three	Term Four	Marks
Tests		1		1		5
Examination (mid-year)			1	1		10
Practical tasks (simulations, investigations, small practical tasks)		1	1			10
Total assessment tasks						25
End-of-year Assessment	Written Theory Paper				1	50
	Practical Assessment Task			1		25

PUNTESTAAT: GRAAD 12 / MARK SHEET: GRADE 12

VAK: **SUBJECT:**	**ONDERWYSER:** **EDUCATOR:**	**GRAAD:** **GRADE:**
SKOOL: **SCHOOL:**	**AREA-PROJEKKANTOOR:** **AREA PROJECT OFFICE:**	**AANTAL LEERDERS:** **NUMBER OF STUDENTS:**
SENTRUM NOMMER: **CENTRE NUMBER:**	**STREEK:** **REGION:**	**JAAR:** **YEAR:**

		SURNAMES OF STUDENTS (ALPHABETICAL)	**INITIALS**	**ASSESSMENT TASKS**							**PRACTICAL ASSESSMENT TASK**			**FINAL EXAMI-NATION**	**FINAL PROMO-TION MARK**
				TEST 1ST TERM	**TEST 3RD TERM**	**JUNE EXAM**	**TRAIL EXAM**	**MANUFACTURING JOINING**	**MAINTENANCE**	**FINAL MARK**	**PROJECT PORTFOLIO**	**PROJECT**	**FINAL PAT**		
				10	**10**	**20**	**20**	**20**	**20**	**100**	**25**	**75**	***100***	***200***	***400***
1.	•										•				
2.	•											•			
3.							•								
4.				•	•	•									
5.	•								•						
6.	•														
7.															
8.				•	•	•									
9.															
10.															
EVIDENCE OF ALL MARKS MUST BE IN LEARNERS PORTFOLIO		**TOTAL**													
		AVERAGE													

EDUCATOR: **DATE:**	**HOD:** **DATE:**	**PRINCIPAL:** **DATE:**	**SUBJECT ADVISOR:** **DATE:**

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ANNEXURE A: RUBRIC FOR ASSESSMENT OF DESIGN PORTFOLIO

CRITERIA	7	6	5	4	3	2	1
	80 –100%	**70 - 79%**	**60 - 69%**	**50 - 59%**	**40 - 49%**	**30 - 39%**	**0 - 29%**
Presentation	Exceeded the required information, extremely neat: Name Register class Year 20… Appropriate cover illustration Appropriate title Index All sections Page numbers	Required information extremely neat: Name Register class Year 20… Appropriate cover illustration Appropriate title Index All sections Page numbers	Adequate information from list below, neatly presented: Name Register class, Year 20… Appropriate cover illustration Appropriate title Index All sections Page numbers	Necessary information from list below, neatly presented: Name Register class Year 20… Appropriate cover illustration Appropriate title Index All sections Page numbers	Limited information from list below, neatly presented: Name Register class Year 20… Appropriate cover illustration Appropriate title Index All sections Page numbers	Lack of essential information, not very neatly presented	Only name and register class untidily presented
Development of a design brief	The design brief is extremely well formulated and defines the need or opportunity. It lists detailed specifications and constraints.	The design brief is very well constructed and defines the need or opportunity. It lists detailed specifications and constraints.	The design brief is well constructed and defines the need or opportunity. It lists detailed specifications and constraints.	The design brief defines the need or opportunity and provides a list of specifications and constraints.	The design brief defines the needs or opportunity and provides limited specifications.	The simple design brief makes little reference to the need or problem.	The design brief is vague and lists no specifications or constraints.
Investigation and analyses information	Shows evidence of a variety of strategies *(6) of investigation used to obtain all relevant information to assist in developing innovative design ideas.	Uses a wide range*(5) of appropriate information sources to develop innovative design options.	Uses of a range of information sources*(4) which shows understanding for the problem or need.	Uses adequate sources *(3) to collect relevant information to assist with design ideas.	Uses relevant research *(2) to address the problem or need identified in the design brief.	Uses less than adequate sources* (1) and collects less than adequate information.	Collects very little relevant information *(0).

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Generation of design ideas	Generates an excellent variety of alternative and innovative ideas with different approaches to address the problem or need. Justifies the preferred option with clear links to the design brief.	Shows evidence of a wide range of communication methods used to develop original and creative design options. Substantiates well choice of final design.	Shows evidence of a range of communication methods used to develop original and creative design options including modelling design ideas. Explains well reasoned choice of final design.	Uses a good variety of alternatives exploring different approaches. Well reasoned choice of final design.	Considers alternatives but lacks in originality and flair. Indicates final design choice.	Offers some alternatives but tends to be a collection of existing products with limited reasoning of choice. Shows limited links with research done.	Shows little or no exploration of alternatives.
Communication of ideas	Develops a very interesting solution and communicates it exceptionally well using appropriate techniques and methods. Uses modelling ideas to test and explore design thinking.	Develops a very interesting solution and communicated it very well using appropriate techniques and methods.	Develops an interesting solution and effectively communicates it effectively using appropriate techniques.	Reasons well for choice of solution. Uses good overall communication techniques.	The solution lacks creativity with limited communication techniques used.	The solution lacks creativity with inappropriate communication techniques used.	The solution lacks detail, making interpretation difficult. Scant attention is given to communication techniques.
Evaluation of product or artefact	Comprehensively evaluates the product against the design brief taking account of the user and cost-effectiveness. Evaluates procedures, techniques and processes and indicates possible improvements. Evaluates the appropriateness of the materials used.	Evaluates the product against the design brief taking account of the user and cost-effectiveness. Evaluates procedures, techniques and processes and indicates possible improvements. Evaluates the appropriateness of the materials used.	Evaluates the product against the design brief. Present suggestions to improve on function. Evaluates the appropriateness of the materials used with limited suggestions for improvement.	Evaluates the product against the design brief. Evaluates the appropriateness of the materials used.	Superficially evaluates the product against the design brief. Makes recommendations to improve its functionality.	Very superficially evaluates with limited recommendations.	Shows little or no evidence of an evaluation of the project.

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ANNEXURE B: RUBRIC FOR ASSESSMENT OF FINAL PRODUCT/ARTEFACT

CRITERIA	7	6	5	4	3	2	1
	80 -100%	70 - 79%	60 - 69%	50 - 59%	40 - 49%	30 - 39%	0 - 29%
FITNESS FOR PURPOSE	This product has an outstanding level of functionality. It shows a very high level of innovation that is appropriate to the design brief.	The product demonstrates a high level of functionality. It shows a high level of innovation that is appropriate to the design brief.	The product fulfils adequately the purpose for which it was designed. It shows some innovation that is appropriate to the design brief.	The product fulfils satisfactorily the purpose for which it was designed. It shows limited innovation for the identified need/problem.	The product fulfils its functional requirements. No evidence of innovation in the solution to the identified need/problem.	The product barely fulfils functional requirements but lacks any refinement/innovation.	The project is incomplete and does not fulfil the identified need/problem.
MANUFACTURING COMPETENCY	Demonstration of an outstanding level of skill/competence in the correct and safe use of a wide range of materials, tools, equipment and machines under educator supervision.	Demonstrates a very high level of skill/competence in the correct and safe use of a wide range of materials, tools, equipment and machines under educator supervision.	Demonstrates a high level of skill/competence in the correct and safe use of a range of materials, tools, equipment and machines under educator supervision.	Demonstrates a satisfactory level of skill/competence in the correct and safe use of appropriate materials, tools, equipment and machines under educator supervision.	Demonstrates an acceptable level of skill/competence in the correct and safe use of appropriate materials, tools, equipment and machines under educator supervision.	Demonstrates some regard for accuracy and safety in the use of materials, tools, equipment and machines under educator supervision.	Demonstrates a lack of skill/competence in the use of appropriate materials, tools, equipment and machines under educator supervision. Pays little attention to safety.
PLANNING	Demonstrates continual review of the making process. Shows outstanding ability to adapt and modify the design when difficulties arise. Adopts procedures to minimise waste, manages time outstandingly well.	Reviews design during the making process, demonstrates resourcefulness and adaptability in making modifications to ensure a high quality product. Excellent waste and time management.	Shows ability to adapt and modify the design when difficulties arise. Adequate planning to minimise waste, manages time well.	Apply knowledge of materials and processes to overcome problems in making when these arise. Demonstrates a good sense of material and time management.	Shows evidence of adopting alternative ways of proceeding when difficulty is experienced. Seeks assistance from educator to proceed. . Demonstrates some sense of material and time management.	Shows little evidence of alternative ways of proceeding when difficulty is experienced. Does not seek assistance from educator and to proceeds regardless of time and material management.	No attempt made to overcome making problems. No proper planning evident resulting in any regard for time and material management.

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SURFACE FINISH (where applicable in construction) OR	An outstanding degree of skill in the surface finishing is demonstrated. The surface finish is of an exceptional quality.	A very high degree of skill in the surface finishing is demonstrated. The surface finish is blemish free.	A high degree of skill in the surface finishing is demonstrated.	A satisfactory level of skill in the surface finish is demonstrated but with some blemishes evident.	A low level of skill in the surface finishing is demonstrated. Blemishes are evident.	A very low level of skill in the surface finishing is demonstrated.	No surface finish evident.
MODELLING THE PRODUCT (where product is not a construction)	Exceptionally modelled to illustrate, realistically, its function for which it was developed	Specialist modelling techniques used to demonstrate, realistically, the function for which it was developed.	Product is effectively modelled to illustrate the function for which it was developed.	Product is adequately modelled to illustrate the function for which it was developed.	Product is modelled to illustrate the function for which it was developed.	Product barely illustrates the function for which it was developed.	No clarity as to how the product is to function.

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PUNTESTAAT VIR PRAKTIESE ASSESSERINGSTAAK
MARK SHEET FOR PRACTICAL ASSESSMENT TASK

GRAAD: **JAAR/YEAR:**	**SKOOL/SCHOOL:**
DATUM BEGIN/DATE STARTED:	**DATUM VOLTOOI/DATE COMPLETED:**
VAK/SUBJECT: MECHANICAL TECHNOLOGY	**ONDERWYSER/EDUCATOR:**
PROJEK/PROJECT: MANUFACTURING/JOINING METHODS	**GETAL LEERLINGE/NUMBER OF LEARNERS:**

FASETTE/FACETS INVESTIGATIVE TASK	PUNTE/ MARKS	NAME VAN LEERDERS/NAMES OF LEARNERS														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Preparation of mild steel plates	10															
Alignment	5															
Brazing	10															
Break test	5															
Visual inspection	10															
Discussion	5															
FINISHING	5															
TYD/TIME																
TOTAAL/TOTAL	50															
÷ 50 X 8	8															

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VAK/SUBJECT: MECHANICAL TECHNOLOGY	**ONDERWYSER/EDUCATOR:**
PROJEK/PROJECT: MANUFACTURING/JOINING METHODS	**GETAL LEERLINGE/NUMBER OF LEARNERS:**

		NAME VAN LEERDERS/NAMES OF LEARNERS														
FASETTE/FACETS MOTOR TRESTLE	PUNTE/ MARKS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Drilling	5															
Pitch of hole	10															
Square ness of braces	10															
Tack welding	5															
Arc welding	20															
Gas welding	10															
Assembly	10															
Safety	5															
FINISHING	10															
TYD/TIME	5															
TOTAAL/TOTAL	90															
÷ 90 X 22	22															

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QUESTION 2: MILLING

MEMORANDUM

1. Milling machines

Figure 1 – Vertical milling machine
Figure 2 – Horizontal milling machine (2)

2. Movements

- X – horizontal – left and right
- Y – in and out
- Z – up and down (3)

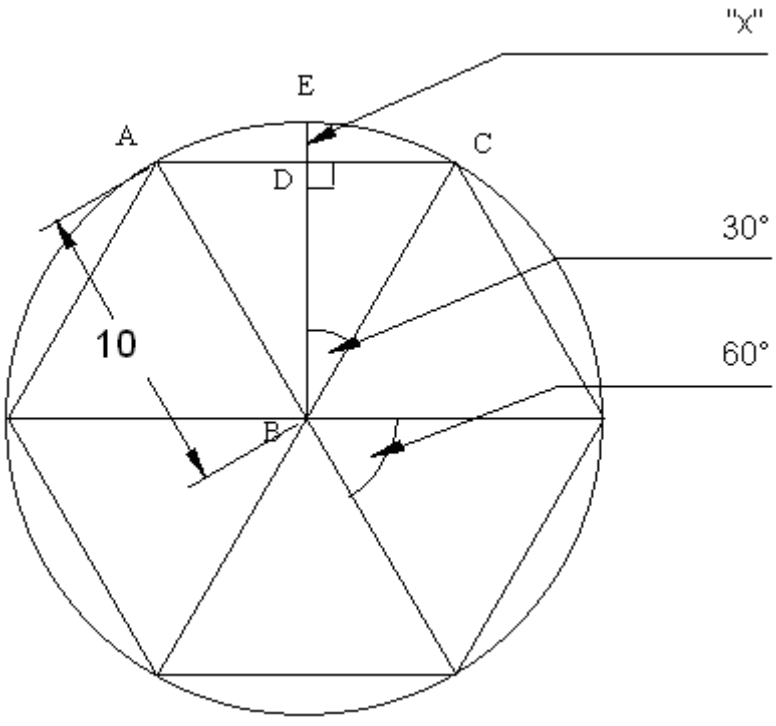
3. Type of procedures

Figure 3 – Centring of cutter
Figure 4 – Straddle milling (2)

4. Differential indexing

Simple indexing = 40 / 6 = 6 4/6 = 6 (2/3 x 8/8) = 6 16/24
= 6 full turns and 16 holes on a 24 hole circle (5)

5. Depth of the cut



"x" = BE – BD

uit Δ BDC volg dat / from Δ BDC

cos 30° = BD/BC

BD = BC x cos 30°

= 10 x 0.866

= 8.66 mm

dus is / thus:

"x" = 10 – 8.66

DE = 1.34 mm (8)

[20]

****

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PROJEK/PROJECT: MANUFACTURING	**GETAL LEERLINGE/NUMBER OF LEARNERS:**

		NAME VAN LEERDERS/NAMES OF LEARNERS														
FASETTE/FACETS	PUNTE/ MARKS															
TURNING		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Diameter A	10															
Diameter B	10															
Diameter C	10															
Diameter D	10															
Total Length	10															
FNISHING	10															
TYD/TIME																
TOTAAL/TOTAL	60															
÷ 60 X 10	10															

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PROJEK/PROJECT: MANUFACTURING	**GETAL LEERLINGE/NUMBER OF LEARNERS:**

		NAME VAN LEERDERS/NAMES OF LEARNERS														
FASETTE/FACETS	PUNTE/ MARKS															
MILLING		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Bolt down of dividing head	5															
Assembly of cutter	5															
Clamping of shaft	5															
Centring of cutter	10															
Setting up the index plate indexing	10															
Setting of depth	5															
Use of dividing head / sector arms	10															
Accuracy of hexagon – use rubric	10															
FINISHING	5															
TYD/TIME	5															
TOTAAL/TOTAL	70															
÷ 70 X 10	10															

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PROJEK/PROJECT: MANUFACTURING		**GETAL LEERLINGE/NUMBER OF LEARNERS:**	

		NAME VAN LEERDERS/NAMES OF LEARNERS														
FASETTE/FACETS	PUNTE/ MARKS															
MILLING – FINAL MARKS		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Calculations	20															
Lathe	10															
Milling	10															
FINISHING																
TYD/TIME																
TOTAAL/TOTAL	40															

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VAK/SUBJECT: MECHANICAL TECHNOLOGY	**ONDERWYSER/EDUCATOR:**
PROJEK/PROJECT: PRACTICAL ASSESSMENT TASK	**GETAL LEERLINGE/NUMBER OF LEARNERS:**

		NAME VAN LEERDERS/NAMES OF LEARNERS														
FASETTE/FACETS	PUNTE/ MARKS															
FINAL MARKS		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
QUESTION 1: JOINING																
Investigative task	8															
Motor trestle	22															
QUESTION 2: MILLING	40															
QUESTION 3: ENGINE	30															
FINISHING	0															
TYD/TIME	0															
TOTAAL/TOTAL	100															
%	100															

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