education

Department:
Education
REPUBLIC OF SOUTH AFRICA

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS (PAT)

MECHANICAL TECHNOLOGY

2009

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INTRODUCTION

The 17 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 Arts 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.

Mechanical Technology PAT

Section A comprises guidelines to teachers and **Section B** is the Practical Assessment Tasks with three scenarios that should be given to learners at the beginning of 2009.

SECTION A (Teacher 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 LO2, 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 specialization; 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 4 can be used as a 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.

No	PAT Stage	PAT 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 and fitting of artefact		✓		✓				✓	✓	✓		
6	Presentation	Final Artefact assessed according to criteria		✓		✓				✓	✓	✓		
		Portfolio of Evidence assessed according to Criteria		✓	✓					✓	✓	✓		

TABLE 1: The different stages of the PAT and the assessment of each stage

2. Administration of the PAT

Teachers can attach due dates for the different stages of the PAT in Table 1 on page 5. 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 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 2008).

Educators are requested to make copies of **Section C** and distribute 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 handed out.

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 to ensure 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 teacher. Formal assessment should always be conducted by the teacher 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 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.

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 as shown below.

DECLARATION OF AUTHENTICITY

NAME OF THE SCHOOL	
NAME OF LEARNER (Full name(s) and Surname)	
EXAMINATION NUMBER	
NAME OF TEACHER	

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 TEACHER **DATE**

SECTION B: THE PRACTICAL ASSESSMENT TASK

The Practical Assessment Task (PAT) consists of a practical task to be completed over three terms. The PAT consists of a design portfolio and a product/artefact. The Practical Assessment Task (PAT) consists of three Scenarios. Learners are expected to choose **only two** to complete the Practical Assessment Task.

SCENARIO 1: MAINTENANCE - ENGINE TUNE-UP

Ms. Esther Siyabonga owns a petrol driven carburettor car which she uses daily to work and back. She covers a distance of 180 km per day. Recently she has discovered that her car has lost some power. You are requested to assist Ms Esther Siyabonga to overcome this problem.

Provide evidence of information you have gathered by means of investigation to assist you to analyse and address the problem by carrying out certain tests and repairs. Use the following steps to assist you to solve the problem:

- **Start engine**
  - Pre-checks
- **Tappet setting**
  - Specifications
  - Explain valve timing
  - Method of setting tappets
  - Remove plug using correct procedure
  - Check and set tappets
  - Which valve area is bigger and why?
  - Why is one valve gap bigger than the other?
- **Compression test**
  - Explain dry test
  - Explain wet test
  - Give reasons for carrying out these tests
- **Distributor**
  - Specifications
  - Remove and strip distributor
  - Name the parts and their functions
  - Explain the path of current flow from the ignition switch to the spark plug
  - Condition report on parts
  - Assemble distributor

- **Fitting distributor to engine**

  - Timing marks
  - Points setting
  - Explain dwell angle
  - Plug gap setting
  - Start engine

- **Carburetor setting**

  - Name the parts and their functions.
  - Start engine and allow to reach normal operating temperature (NOT). Set idle speed and CO_2.

- **Faults**

  - Misfiring
  - Rich fuel mixture effects and causes
  - Lean fuel mixture effects and causes
  - Loss of power uphill

ACTIVITY: THE TUNE UP

1. Pre-checks first

- Oil level
- Water level
- Petrol
- Battery
- Fuel filter
- Air filter [5]

2. Start engine

Allow reaching normal operating temperature.

3. Tappet setting (Obtain specification)

- Inlet valve clearance (Hot or Cold): Hot: _____ Cold: _____
- Exhaust valve clearance (Hot or Cold): Hot: _____ Cold: _____
- Firing order: _____ [5]

3.1.1 Explain valve timing. [5]

4. Method of removing spark plug

- Obtain specification: spark plug gap: _____
- Use correct spark plug spanner
- Crack open the spark plugs by half a turn
- Use compressed air to blow all the dirt out around spark plug area.
- Remove spark plugs, clean or replace. [5]

5. Check and set tappet clearances according to specification. [10]

6. Which valve area is bigger and smaller and why? [5]

7. Compression test

- Obtain specification: _____

Name and explain the TWO types of tests. [10]

8. Distributor

Obtain specifications (dwell angle): _____

Remove and strip distributor. (Complete Table 6) [10]

PART	FUNCTION	CONDITION

TABLE 6: Distributor

8.1 Explain the operation of the ignition system. [10]

8.2 Explain the procedure to fit the distributor to the engine. [10]

9. Carburettor setting

- Strip carburettor and assemble carburettor.
- Name parts and state their functions (Complete Table 7). [10]
- Start and set idle.

PARTS	FUNCTION	CONDITION

TABLE 7: The carburettor

10. Faults (Test drive vehicle to determine the state of the tune-up)

- Misfiring
- Rich fuel mixture effects and causes
- Lean fuel mixture effects and causes
- Loss of power up hills [5]

GRADE:	YEAR:	SCHOOL:
DATE STARTED:		DATE COMPLETED:
SUBJECT: MECHANICAL TECHNOLOGY		TEACHER:
MAINTENANCE - ENGINE TUNE UP		NUMBER OF LEARNERS:

		NAMES OF LEARNERS														
FACETS CASS ENGINE TUNE UP	MARKS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Start pre-checks	5															
Valve timing	10															
Remove spark plug	5															
Tappet setting	10															
Valve size	5															
Compression test	10															
Distributor - parts	10															
Ignition systems	10															
Fitment of distributor	10															
Carburettor parts	10															
Test drive	5															
TIME																
TOTAL	90															

SIGNATURE OF TEACHER:	
SIGNATURE OF HEAD OF DEPARTMENT:	
SIGNATURE OF PRINCIPAL:	
SIGNATURE OF SUBJECT ADVISOR:	

MEMORANDUM

Scenario 1: Tune up:

3.1.1 Explain valve timing.

- Valve timing is the relationship between the crankshaft and camshaft. In other words the position of the piston determines when the inlet valve or exhaust will open or close depending on the stroke.

- Method of setting the valve clearance

  - Firing order 1 3 4 2
  - Take firing order 13/42 = 1342 (Pair off 1 and 3 and 4 and 2)
  - When No. 1 cylinder valves rock (i.e when inlet valve closed and exhaust valve opens, when the crankshaft is rotated clockwise or anti-clockwise direction) you set No. 4 cylinder valves.
  - When No. 4 cylinder valves rock set No. 1 cylinder valves
  - When No. 3 cylinder valves rock set No.2 cylinder valves
  - When No. 2 cylinder valves rock set No.3 cylinder valves

6. Which valve area is bigger and smaller and why? [5]

- Inlet valve area is bigger because it requires the maximum volume of fuel mixture needs to be sucked to enter into the combustion chamber. In most cases the inlet valve is bigger in size.
- Exhaust valve is smaller, because it will easily dissipate the heat from the hot exhaust gases.

7. Name and explain the TWO types of compression tests. [10]

- **Dry test**
  - Engine must be hot (NOT).
  - Remove plugs according to procedure.
  - Fit compression tester to plug opening.
  - Throttle valve must be fully opened (State reason).
  - Disconnect coil wire (State reason).
  - Crank engine 3 to 5 times and check and record reading.
  - Carry out the same procedure for remaining cylinders.
  - Compare readings of the compression tester to the specification. NB. If reading differs greatly, i.e. it is lower or higher than the specification carry out wet test.

- **Wet test**
  - Squirt a little oil into the cylinder with low reading.
  - First turn engine by hand to allow the oil to act as a seal around the piston head.
  - Carry out compression test the same as for dry test.
  - If the reading increased it indicates that the piston rings are worn or broken or the cylinder bore is worn.
  - If the reading remains the same it will indicate that the valves are not sealing properly.
  - If possible carry out valve leakage test.
  - Faulty inlet valve air will escape through the air filter.
  - Faulty exhaust valve air will escape through the exhaust pipe.

8.1 Explain the operation of the ignition system. [10]

- POINTS CLOSED: Ignition switch on, the current flows to the coil through the primary winding creating a magnetic field, through the points down to earth
- POINTS OPENED: The magnetic field is interrupted creating a high voltage in the secondary windings. The high voltage then flows to the centre terminal of the coil to the distributor centre terminal, from there to the rotor and then to the plug wire
- This high voltage is sent to the spark plug by high-tension leads. The high voltage then jumps across the gap between the centre electrode and earth electrode of the spark plug creating a spark igniting the air-fuel mixture
- The high voltage is sent to the spark plug according to firing order

8.2 Explain the procedure to fit the distributor to the engine. [10]

- Remove tappet cover
- Turn engine until No.4 cylinder valves are rocking. Number one cylinder valves will be closed on compression stroke, timing marks should correspond
- Set point gap
- Turn rotor so that it faces No.1 lead
- Insert distributor into place
- Fit HT leads according to firing order
- Set spark plug gap
- Start engine
- Allow engine to heat up (NOT)
- Use timing light to set static timing.

SCENARIO 2: SYSTEMS AND CONTROL AND JOINING METHODS

The world cannot go on forever exhausting natural resources and wasting energy. The recycling of beverage cans is one way of solving the problem and it can also be profitable at the same time.

Show evidence that you gathered information to assist you to design and make a device to address the problem of disposing of beverage cans for recycling.

Specifications and constraints:

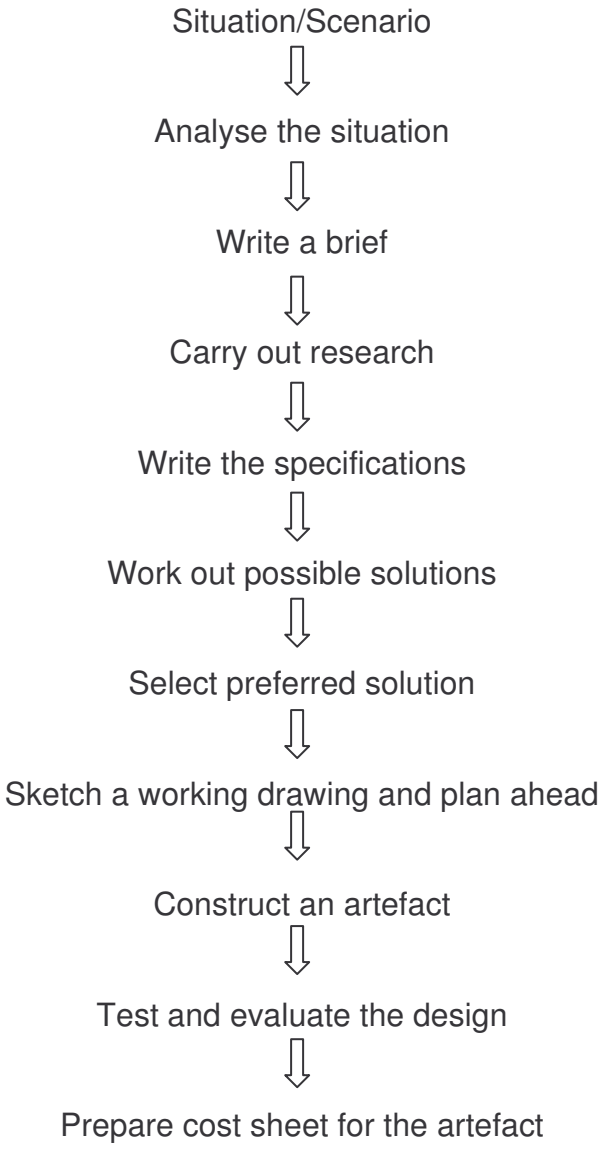
- A practical way to overcome the storage problem of beverage cans stored for recycling would be to design and make a device that can be used to compress the cans.

- The device must be:

  - Able to compress four cans at a time
  - Easy to operate and safe
  - Portable and mountable on a table
  - Durable and cost efficient

Provide evidence that you have gathered information to manufacture the device. The following flow chart may help you to complete the PAT and your PAT portfolio.

Your evidence must contain the following topics:



GRADE:	YEAR:	SCHOOL:
DATE STARTED:		DATE COMPLETED:
SUBJECT: MECHANICAL TECHNOLOGY		TEACHER:
PROJECT: SYSTEMS AND CONTROL AND JOINING METHODS		NUMBER OF LEARNERS:

		NAMES OF LEARNERS														
FACETS PAT SCENARIO 2	MARKS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Able to compress four cans at a time	10															
Safe and easy to operate	15															
Portable and mountable on a table	10															
Durable and cost-effective	10															
Appropriate use of resources (materials)	10															
Choice of components	10															
Application of scientific principles	10															
TIME																
TOTAL	**75**															

SIGNATURE OF TEACHER:	
SIGNATURE OF HEAD OF DEPARTMENT:	
SIGNATURE OF PRINCIPAL:	
SIGNATURE OF SUBJECT ADVISOR:	

Scenario 3: Terminology

You are an artisan in a mechanical engineering factory that manufactures machine parts. Your client who is the maintenance foreman in a plant wants you to manufacture a shaft, keyway and hexagon by using the lathe and milling machine. The specifications of the parts to be manufactured are shown in Figure 3.1. Provide evidence that you have gathered information to manufacture the parts.

Method (Lathe)

Use the lathe and cut the shaft as specified in Figure 3.1. The portfolio needs to include information such as:

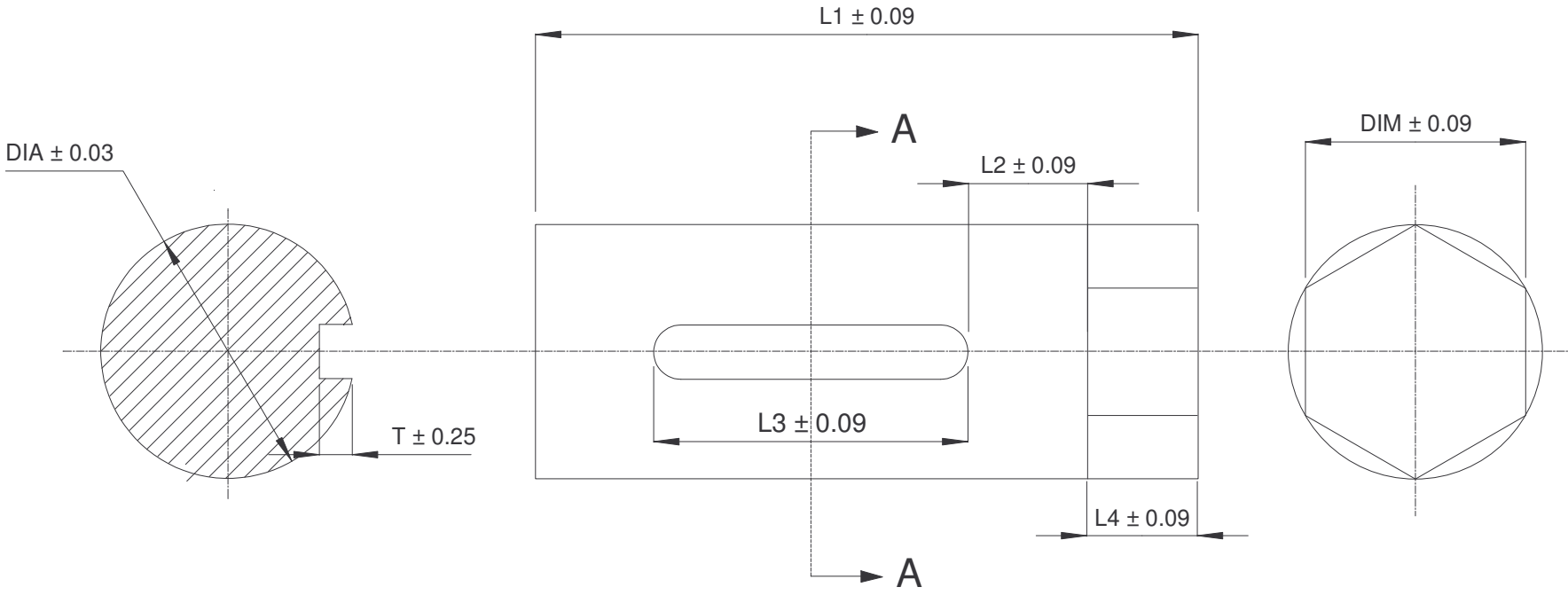
- Choice of material and why
- Choice of cutting tools and why
- Choice of cutting speed – motivate
- Safety precautions
- Which processes were used to ensure a good surface finish?
- Adjustments that were made to the lathe when cutting diameters and when cutting the screw thread.

Method: 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 cut.
- Cut the first side of the hexagon and complete the rest.

TOLERANCE	TURNING		FILING	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%

DIMENSIONS			
L1	130 mm	T	5
L2	30 mm	W	12
L3	50 mm	DIA	48
L4	20 mm		



PRACTICAL ASSESSMENT TASK		
Scenario 3	Terminology	Turning and milling

FIGURE 3.1: Turning and milling project

Cutting keyway

- Work out the speed and feed for the slot drill.
- Set the speed and feed on the machine.
- Start the machine and feed the saddle in slowly by hand until the slot drill has cut a flat, equal to its own diameter, on the shaft centre.
- Zero the saddle micrometer dials.
- Start the cutting fluid pump and direct a strong flow of coolant at the point of the slot drill.
- Feed the saddle in slowly by hand to half the depth of the keyway.
- Subtract the diameter of the slot drill from the length of the keyway to give the distance (X) to be cut.
- Check that the table micrometer dials are set to zero.
- Make a mark or take note of the position on the dial that will indicate the point to disengage the feed.
- Engage the feed and start machining the keyway.
- Count the revolutions of the dial and disengage the feed when your mark or noted position lines up with the datum line on the dial.
- Switch off the coolant and return the table to the start of the cut.
- Wind the saddle in slowly by hand to the full depth of the keyway.
- Switch on the coolant and direct it at the cutter point.
- Engage the feed and take the final cut, disengaging the feed at the same point as before.
- Wind saddle out to its full extent.
- Clean off all the burrs on the keyway with a small smooth flat file.
- Measure the depth of the keyway with a depth micrometer.

GRADE:	YEAR:	SCHOOL:
DATE STARTED:		DATE COMPLETED:
SUBJECT: MECHANICAL TECHNOLOGY		TEACHER:
PROJECT: TERMINOLOGY (milshaft, keyway and hexagon)		NUMBER OF LEARNERS:

		NAMES OF LEARNERS														
FACETS / PAT	MARKS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
The keyway is on the diametric centre of the shaft ±0,05 mm	10															
All the lengths are correct within the limits specified on the drawing	10															
The keyway is the correct depth within the limits specified on the drawing	5															
The keyway is the correct width within the limits specified on the drawing	5															
The hexagon is positioned in the centre of the shaft	10															
The keyway is correctly positioned in relation to the hexagon	10															
Sizes across flats of hexagon are within limits	10															
All finishes comply with specifications on the drawings	5															
All the burrs and sharp corners were removed	5															
The equipment is undamaged	5															
TIME																
TOTAL	**75**															

SIGNATURE OF TEACHER:	
SIGNATURE OF HEAD OF DEPARTMENT:	
SIGNATURE OF PRINCIPAL:	
SIGNATURE OF SUBJECT ADVISOR:	

THE TECHNOLOGICAL PROCESS MUST BE EVIDENT

Specifications and constraints

Cost factor must be taken into consideration. The product must be affordable. The weight of the artefact must also be taken into consideration. Use your knowledge of different metals to assist you to come up with the best possible solution.

1. Design brief, and artefact

The design brief should be clearly written. Design the artefact so that it could easily be stored. The artefact must be manufactured to full scale. The product must be neat and absolutely functional.

2. The Design Portfolio *The documentation you will compile*

The portfolio must contain the following:

- Drawings of the artefact
- Pictures of the artefact
- Description of its operation
- The original design and all the changes you made to it
- The portfolio must contain a list of the tools used to build it.
- The portfolio must contain a parts list of the artefact.
- The design portfolio must **not be less than four pages** and **not more than eight** pages.

The following criteria can be considered additional:
The portfolio must include a marketing strategy which shows:

- A retail price at which the unit could be sold to the public. (Show your percentage profit margin.)
- An advertisement of the device which could be published in the local community newspaper. (Not smaller than 15 cm x 15 cm)

List who you will think might buy a device like this. (Target market)

3. Completing the PAT

In completing the PAT you will have to go through a number of phases.

3.1 Phase 1 - Problem Statement (Identify/Investigate)

The Scenario is given to you. You must respond by writing a design brief.

Design Brief	Identify the problem you are being faced with. What is it that is being asked of you? Write down in your own words what the problem is: _____ _____ _____ _____ _____
Solution Statement	List not fewer than THREE possible solutions you might consider to solve the problem that you have been tasked to solve: _____ _____ _____ _____ _____

Time needed for completion – 1 month. This part of the PAT should be completed by the end of February.

3.2 Phase 2 – The Design (*acquisition of information and skills)*

3.2.1 Research Task

- Find information on each of the possible solutions you have listed.
- Compile a criteria list to assist you in choosing the best solution. The list must contain all the requirements that must be met and you are allowed to add your own criteria as well.
- Using your criteria, judge the possible solutions above and eliminate all but one.
- Motivate why you have decided on the chosen solution.
- Plan how long it will take you to complete the project. Set short-term and long-term goals and also set dates by when you plan to reach each phase.
- Place all your research in the Design Portfolio under the heading **Research Task.**

3.2.2 Design Portfolio

- A neatly drawn diagram of the artefact.
- List your tools required
- Compile a components list with cost and specifications.
- Choose a possible name or names for your device.
- Design a logo for the device.
- Compile all your designed material and place it in the design portfolio under **Ability Task.**
- Prepare the production procedure and place it in the design portfolio under **Ability Task.**

3.3 Phase 3 – The Make (*Production and evaluation)*

On completion of your design and drawings, proceed to the production of the artefact. Consider the following points:

Manufacturing / Modification of the artefact:

- Take care that you follow the initial design you made for the artefact.
- Should you need to adapt your design at this phase, capture your design changes in a drawing and add that to the initial design. This happens a great deal in industry and is normal.
- Motivate why you changed your initial design.

3.4 Evaluation

Upon completion of the artefact, finalize the Design Portfolio for assessment.

3.5 Communication: The **Design Portfolio** must contain the following sub-divisions:

- **The Learner Task**
- **Declaration of Authenticity by the Learner**
- **Summarising Record Sheet**
- **Research:**
  - Listed information
  - Criteria list
  - Possible solutions
  - Chosen solution
  - Planning and goal setting

- **Design and manufacturing:**
  - Enclosed design
  - Tools list
  - Components list with cost and specifications
  - Artefact design
  - Name and logo of the device
  - Production procedure
  - Evidence of prototyping
  - Tabulated Prototyping findings

- **Evaluation and communication**
  The artefact needs to remain with the design portfolio.

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
Identify and Develop 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).

CRITERIA	7	6	5	4	3	2	1
	80 –100%	70 - 79%	60 - 69%	50 - 59%	40 - 49%	30 - 39%	0 - 29%
Communication of ideas	Develops a very interesting solution and communicates it exceptionally well using appropriate techniques and methods. Uses modeling 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-effective-ness. 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 appropriatenes s 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 recommendation s to improve its functionality.	Very superficially evaluates with limited recommendations.	Shows little or no evidence of an evaluation of the project.
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 fulfills adequately the purpose for which it was designed. It shows some innovation that is appropriate to the design brief.	The product fulfills satisfactorily the purpose for which it was designed. It shows limited innovation for the identified need/problem.	The product fulfills its functional requirements. No evidence of innovation in the solution to the identified need/problem.	The product barely fulfills functional requirements but lacks any refinement/innovati on.	The project is incomplete and does not fulfill the identified need/problem.

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%
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/competenc e 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.
MODELLING OF PRODUCT (where the product is not in 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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