



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

ENGINEERING GRAPHICS AND DESIGN

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

2015

These guidelines consist of 26 pages.

TABLE OF CONTENTS

1.	Introduction	3
SECTION A (TEACHER GUIDELINES)		3
2.	The structure of the practical assessment task (PAT) for EGD	3
	Elements that make up the PAT mark for Engineering Graphics and Design	5
3.	Administration of the PAT	5
4.	Assessment and moderation of the PAT	6
	4.1 Assessment	6
	4.2 Moderation	6
	4.3 Declaration of authenticity	6
5.	Conclusion	7
SECTION B (LEARNER TASKS)		8
6.	Practical assessment task 1 (PAT 1)	8
	6.1 A civil design project	8
	6.2 Assessment criteria and checklist for the 2015 EGD Civil PAT	13
7.	Practical assessment task 2 (PAT 2)	16
	7.1 A mechanical design project	16
	7.2 Assessment criteria and checklist for the 2015 EGD Mechanical PAT	20
8.	ANNEXURE A: Rubric for assessing drawing methods, skills and presentation	23
9.	A simplified rubric for the allocation and verification of marks	24
10.	Practical assessment task 2015: Summative assessment sheet	25
11.	Declaration of authenticity	26

1. INTRODUCTION

The 16 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
- SERVICES: Consumer Studies, Hospitality Studies, Tourism
- TECHNOLOGY: Civil Technology, Electrical Technology, Mechanical 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.

SECTION A (TEACHER GUIDELINES)

2. THE STRUCTURE OF THE PRACTICAL ASSESSMENT TASK (PAT) FOR EGD

As the Engineering Graphics and Design (EGD) **PAT** is a **compulsory national formal assessment task** that contributes 25% (i.e. 100 marks) towards a learner's final NSC mark, it is essentially the **third NSC examination paper** of EGD. All the **presentation requirements must therefore be adhered to and**, with the exception of the required research, **completed at school**, under the supervision of the EGD teacher. **Each learner must complete the PAT individually** and **ALL** the presentations must be **his/her own original work**.

The primary purpose of the EGD PAT is to assess four subjective content and concept topics which are not assessed in the examination papers. These are:

- The design process
- The application of drawing knowledge and drawing skills to the design process
- CAD management and drawings
- The quality and neatness of free-hand, instrument and CAD drawings

The EGD PAT is therefore designed to develop a learner's ability to integrate and apply knowledge and to demonstrate acquired levels of skills and competency. With the inclusion of the PAT into EGD, the learner is given an opportunity to apply

acquired knowledge, skills and values in a creative way through the design process. The learner is given an opportunity to complete the PAT in an environment which is more conducive to the creative processes. This environment should therefore provide the learner with easier access to, and a wider variety of, resource material than would be available in a formal examination.

The various components of the EGD PAT gives the learner an opportunity to demonstrate the level of drawing skill that has been attained in all the appropriate drawing methods through the presentation of the required drawings. Each EGD PAT consists of TWO parts:

- **Part A:** The design process
- **Part B:** Required working and pictorial drawings

Part A of both PATs requires that the learner demonstrates a clear understanding of, and is able to apply, the design process. As part of the design process, the learner must be able to do the following:

- Identify the problem(s) and formulate a design brief with specifications and constraints
- Conduct and use relevant external research in an appropriate way
- Generate a number of own ideas/concepts/solutions analytically and graphically through comprehensive free-hand drawings
- Select a final solution(s) that demonstrates a clear understanding of the design brief
- Present the final solution(s) as working drawings and pictorial drawings
- Provide clear evidence of continuous self-evaluation during the development of the PAT

Part B of both PATs requires that the learner demonstrates and provides evidence of a high level of knowledge and understanding of the concepts and content of Engineering Graphics and Design through the presentation of orthographic drawings and pictorial drawings.

Part A and Part B of both PATs also give the learner the opportunity to demonstrate that a high level of competency and skill has been attained in the following required EGD drawing methods:

- Freehand drawings prepared in pencil
- Instrument drawings prepared in pencil
- Using a CAD (Computer-aided Drawing/Design) system

TWO practical assessment tasks (PATs) are included in this document:

- PAT 1 is a design task in the context of civil technology.
- PAT 2 is a design task in the context of mechanical technology.

Each learner must, with the guidance of the teacher, **select ONE** of the PATs contained in this document.

Elements that make up the PAT mark for Engineering Graphics and Design

ELEMENTS OF THE MARK FOR THE PRACTICAL ASSESSMENT TASK	
ELEMENT	MARK
The design process	25
The correctness of the working and pictorial drawings	50
The drawing methods (freehand, instrument and CAD)	25
TOTAL	100

3. ADMINISTRATION OF THE PAT

At the beginning of the academic year the EGD teacher must ensure that **every Grade 12 learner receives a copy of the entire SECTION B** of the PAT document, i.e. **ALL the pages from page 8 to page 23**.

ALL the completed PATs must be submitted in time for summative assessment to be done before the commencement of provincial moderation in the third term. The PATs must therefore be **completed in the following phases during the first three terms**:

- **Phase 1:** Design process (completed by the end of the **1st term**)
- **Phase 2:** Presentation drawings (completed by the end of the **2nd term**)
- **Phase 3:** Completion of portfolio (before the commencement of moderation in the **3rd term**)

Although the phases could be done either **CYCLICALLY** or in **BLOCK TIMES** as indicated by the EGD CAPS, it is recommended that **ONE ENTIRE DAY** per term, e.g. as an extra paper during the June examinations, be allocated for each phase.

The **teaching/period time** that may be allocated **for the completion of all three phases** of the PAT is **12 hours to a maximum of 16 hours**. Additional non-teaching-/non-period time may, however, also be allocated for the completion of the PAT at the school. However, the **total maximum time** for the completion of all the phases of the PAT should **not exceed 20 hours**.

To ensure that the PAT is completed within the stipulated time it is essential that the teacher draw up a PAT **work schedule/pace setter/management plan** for the learners at the beginning of the year. Attached to the work schedule/pace setter/management plan must be target dates for the completion of the different components of the different phases. This will help learners to assess their own progress and teachers to set up intervention programmes.

NOTE:

- **ALL the presentation requirements** of the selected PAT **must be adhered to and**, with the exception of the required research, **completed at school under guidance and supervision of the EGD teacher**, who must observe the learners' progress at all times.
Not adhering to this instruction will be deemed to be an examination irregularity.
- It is the **teacher's responsibility** to ensure that **each learner's PAT** is of an **appropriate higher-order Grade 12 complexity**.

4. ASSESSMENT AND MODERATION OF THE PAT

4.1 Assessment

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

Both formal and informal assessment should be conducted throughout the development of the PAT. Informal assessment can be conducted by the learner, a peer, a group of learners or by the teacher. **However, the teacher must conduct ALL the formal assessment by using the official 2015 summative assessment sheet and recording the results on the official mark sheets himself/herself.**

The completed PAT must be submitted in time for final formal assessment to be done before the commencement of provincial moderation. **Once the PAT has been formally assessed the teacher must retain the PAT for the purpose of external moderation.** All the PATs must also be retained at the school for the period of time as prescribed by the provincial departments of education.

NOTE:

The concept of '**bench marking**', i.e. the identification and mark allocation of the best example(s) for each assessment criteria, should be applied when assessing the PATs.

4.2 Moderation

Monitoring and/or moderation of the PAT can take place at any time during the development of the PAT. ALL completed presentation requirements of the PAT must therefore always be available at the school. During a moderation process the moderator will randomly select the PAT files/portfolios that will be moderated. To assist the process of the final provincial moderation the teacher must supply the moderator with a completed mark sheet(s) and a merit list(s).

During the moderation process learners may be called upon to explain the functions and principles of operating a CAD system and to demonstrate drawing skills through performing capability tasks.

4.3 Declaration of authenticity

Prior to the final submission of the PAT for formative assessment ALL the learners and the teacher must complete the declaration of authenticity as laid out on the final page of this document.

NOTE:

Only the official 2015 SUMMATIVE ASSESSMENT SHEET (page 25) and the completed DECLARATION OF AUTHENTICITY (page 26) of this document must be included in the front of the learner's completed PAT file/portfolio.

5. CONCLUSION

Upon 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.

SECTION B (LEARNER TASKS)

6. PRACTICAL ASSESSMENT TASK 1 (PAT 1)

General information and instructions:

- The EGD PAT is a **compulsory national formal assessment task** that contributes 25% towards your final National Senior Certificate (NSC) mark.
- This **document contains TWO PATs**, i.e. a civil design project (PAT 1) and a mechanical design project (PAT 2). **You, the learner**, with the guidance of your EGD teacher, **must select ONE** of the PATs contained in this document.
- ALL the **presentation requirements** of the selected PAT **must be adhered to** and, with the exception of the required research, **completed at school**, under the guidance and supervision of your EGD teacher.
- The PAT must be **completed individually** and **ALL the presentations**, including the front page and index, must be **your own original work**.
- The PAT must be **completed in phases and within the given time frame** of your teacher's PAT work schedule/pace setter/management plan.
- ALL **freehand drawings** and **instrument drawings** must be **prepared in pencil**.
- The PAT must be of an appropriate **higher-order Grade 12 complexity**.
- Untidy and messy work, as well as the late submission of presentation requirements, will be penalised.

6.1 A civil design project

Scenario

A family consisting of four members lives on a picturesque estate consisting of single-storey homes. The estate is well managed and has been featured in a number of magazines over the years because of its layout, the style of the houses and the large number of indigenous trees. The indigenous trees are protected and may not be cut down or removed. Although the houses on the estate all differ in design, they all follow a contemporary style. They have green pitched roofs, timber windows and door frames and are finished with smooth plaster, painted in a soft cream colour.

A few months ago the family inherited R500 000, 00. The parents of the family, being draughtspersons specialising in safety and security systems, are currently renting offices for their own drafting firm and CAD training academy. The family members all agreed that they wanted to invest all the money by building a separate additional building that would serve as both a cottage and a drawing office and CAD training centre on the property. Although the required permission for the new building on the property has been obtained the rules of the estate stipulate that the new building must fit in with the style of the existing house and have the same finishes. The father researched the building costs in the area and found that they are currently at R5 500, 00 a square metre.

You have been commissioned as the designer and have been instructed to design **a new building**, which must consist of a **cottage section** as well as a **drawing office and CAD training centre section**.

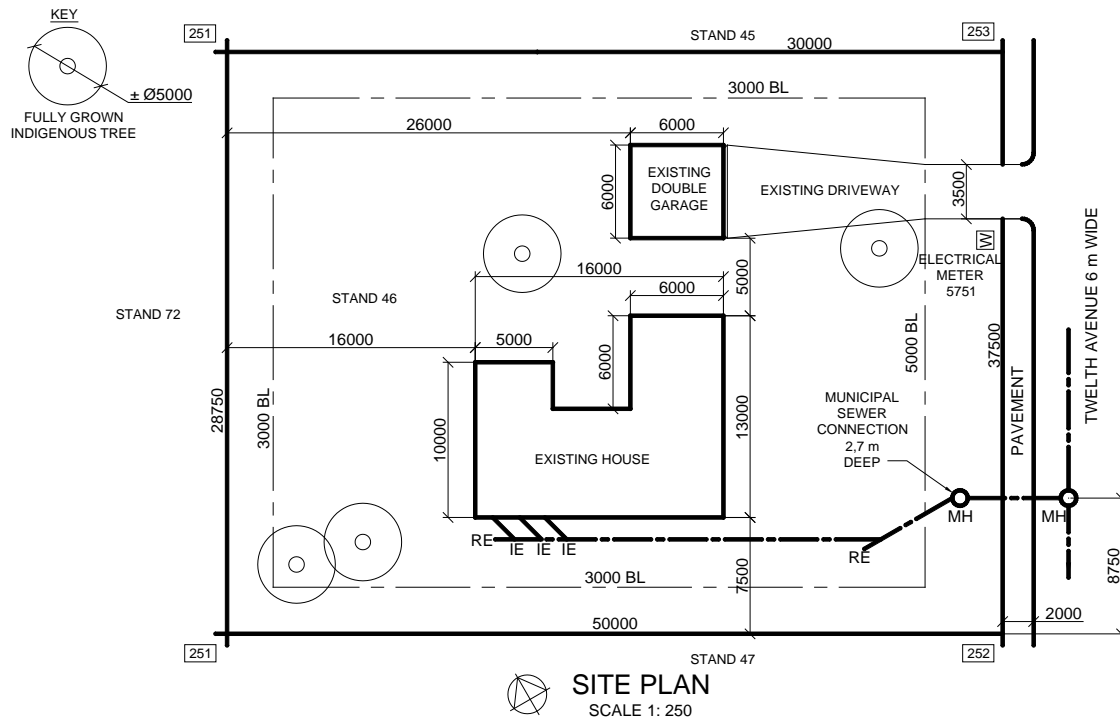
In the cottage section of the new building there must be a kitchen, lounge, bedroom and bathroom. The lounge must have three switched socket outlets. The bedroom must have a built-in cupboard and two switched socket outlets. The kitchen must have built-in cupboards, a sink, a stove, a fridge and three switched socket outlets and the bathroom must have a toilet, a shower, a wash basin and a socket outlet.

In the drawing office and CAD training centre section of the new building there must be separate working stations for both parents and the other two draughtspersons employed by them. They also need a space/place where meetings with clients can be conducted, facilities to do CAD training for up to TEN people at a time, a space/room for an A0 plotter and a 3D printer, sufficient switched socket outlets as well as toilet facilities.

In addition the parents have been saving for a small non-enclosed but covered **entertainment area with a built-in braai** and a **fibreglass swimming pool**. They now want this **next to or close to the new building** so that the entertainment area can also be used as a venue where meetings can be held with clients in summer. You are therefore instructed to include the entertainment area and swimming pool, which may not be bigger than 20 000 litres, as part of the design. You are also instructed to include **sufficient security** for the new building as well as to make provision for **enough parking** for the additional employees and trainees/students. The entertainment area, swimming pool, security and additional parking will not be paid from the inheritance.

Given: The site plan of the property

NOTE: Any details or dimensions not given may be assumed in good proportion.



PHASE 1: Presentation requirements

1. **Identify the primary and secondary problem(s)** and formulate your own **design brief** on the given scenario. Include the following as part of the design brief:
 - An **extended** and **comprehensive** list of **specifications**
 - A list of at least **FIVE constraints**
 - A list of the **main points** of **ALL** the **presentation requirements** together with a **management plan** for the development of the PAT

2. **Conduct your own research** on:
 - **Contemporary designs** and **layouts** of **one-bedroom cottages**
 - **Requirements** and **equipment** for and **layouts** of **modern drawing offices**
 - **Fibreglass swimming pools** and swimming pool sizes
 - At least **FOUR different types** of suitable **security systems** that can be used to safeguard the new building

NOTE:

- The research must be **relevant** and **usable**.
- Evidence of **ALL** the **relevant resource material used** must be **presented as proof** that the required research has been done.
- There must be clear evidence that the **research has been used**.
- Include a list of **ALL references (bibliography)**.

3. **Generate THREE detailed self-explanatory freehand drawings** of the **layout** of **THREE possible design solutions** for the new building, as well as the position of the entertainment area and swimming pool. The freehand

drawings must show **dimensions, labels and notes**, as well as the **correct presentation** of ALL **building features** and **permanent fixtures**.

NOTE:

- ALL the features should be drawn **proportionally the same size**. The use of **grid/graph paper** is therefore recommended.
 - These drawings must provide clear evidence that a high level of competency has been attained in **freehand drawings** as one of the required **EGD drawing methods**.
 - All the drawings must comply with the *SANS 10143 Guidelines*.
4. **Select the best solution**, which demonstrates an in-depth understanding of the design brief within the context of the specifications and constraints, by **evaluating and comparing** the possible design solutions of the **THREE freehand drawings**. Include a **summary** of the reasons for the selected solution.

PHASE 2: Presentation requirements

5. **Present the selected solution** as a set of **working drawings** and a **pictorial drawing** (5.1, 5.2 and 5.3) that adhere to the following:
- All the **working drawings** must be presented on appropriately sized drawing sheets, correctly set up with borders and **complete civil title panels**.
 - The drawings must provide clear evidence that a high level of competency has been attained in the following **TWO** required **EGD drawing methods**:
 - **Instrument drawings**
 - **CAD (Computer-aided Drawing/Design)**

NOTE:

- **ONE working drawing** (i.e. 5.1 or 5.2) must be prepared as an **instrument drawing** and the **other** by using a **CAD system**.
- The **perspective drawing** (5.3) may be prepared **either** as an instrument drawing **or** by using a CAD system.
- **Schools that do not have CAD facilities must prepare all the required drawings** (5.1, 5.2 and 5.3) **as instrument drawings**.
- All title panels and drawings must comply with the *SANS 10143 Guidelines*.

- 5.1 Draw a detailed **layout drawing** of the **selected proposed new building and entertainment area, clearly showing all the features**. The drawing must show a **minimum** of **FOUR** orthographic views drawn to a suitable scale(s).

The views must include the following:

5.1.1 The **floor plan**

5.1.2 A **sectional elevation**

5.1.3 **TWO elevations**, showing the **front view** and a **side view**

The following must be included on all relevant views:

- ALL sanitary, kitchen and other permanent fixtures
- ALL electrical fittings and the wiring detail
- Waste-water disposal systems (sewerage)
- The complete layout of the drawing office and CAD training centre
- Labels, notes and fixture codes
- Scale(s)
- Dimensions
- Cutting plane(s)
- All hatching detail
- North point

5.2 Draw a detailed **site plan** to a suitable scale.

The following must be included:

- ALL relevant site detail and features, e.g. building lines, natural features, etc.
- The driveways and parking areas
- ALL existing and new buildings and structures
- ALL services, sewerage and drainage connections
- Electrical supply
- Labels and notes
- Scale
- Dimensions and corner heights
- North point

NOTE: The site plan may contain artistic features.

5.3. Draw a detailed **two-point perspective drawing** that will show a view of the **swimming pool**, **entertainment area** and the **new building**. The horizon line (HL) must be placed 1,8 metres above the ground in order to produce a human eye view.

Evidence of the following must be included with the drawing:

- All views/drawings used to produce the drawing
- The construction/method used to produce the drawing

NOTE: A copy of the perspective drawing, which may contain artistic features, should be used as the picture for the cover page of the PAT file/portfolio.

PHASE 3: Presentation requirements**Create a PAT file/portfolio containing:**

- A complete **cover page**
- An **index**
- The **2015 SUMMATIVE ASSESSMENT SHEET** (see page 25)
- The completed **DECLARATION OF AUTHENTICITY** (see page 26)

Present the following Phase 1 and Phase 2 presentation requirements in the PAT file/portfolio after the DECLARATION OF AUTHENTICITY:

- ALL the design brief requirements
- Evidence of ALL the relevant resource material used for the **required research**
- The **THREE freehand drawings** of THREE possible design solutions
- ALL the evidence of the **selection** of the **best solutions**
- ALL the required **working drawings** (5.1 and 5.2) and the **pictorial drawings** (5.3)
- Clear evidence, in the form of a **checklist(s)**, of **continuous self-evaluation** of the **entire process** and of the **meeting** of all the **deadlines** during the development of the PAT

NOTE: Include the following on each page of each presentation requirement:

- Clear **numbering** in accordance with the numbers of the presentation requirements
- **Your** (the learner's) **name**
- The **date of completion** and **submission**

6.2 Assessment criteria and checklist for the 2015 EGD Civil PAT

- The **SUMMATIVE ASSESSMENT SHEET** on page 25 of the EGD PAT document must be used to indicate the final totals out of 10 for each assessment criteria.
- The **contribution** of each aspect of the PAT is as follows:
 - The **design process**, i.e. presentation requirements numbers 1, 2, 3, 4, 6 and 7, will contribute **25 marks** to the final PAT mark out of 100
 - The **working drawings and a pictorial drawing**, i.e. presentation requirement number 5, will contribute **50 marks** to the final PAT mark out of 100
 - **Drawing methods, drawing skills and presentation**, which should be assessed according to ANNEXURE A, will contribute **25 marks** to the final PAT mark out of 100

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2015 EGD CIVIL PAT							
1 mark level descriptive	0	No evidence/not done or not correct/complete/compliant/achieved			Checked	Suggested mark allocation	Own marks/ notes/ comments
	1	All evidence shown/correct/complete/compliant/achieved/clear					
2 mark level descriptive	0	No evidence/not done					
	1	Evidence shown but not correct/complete/compliant/achieved/clear					
	2	All evidence shown/correct/complete/compliant/achieved/clear					
1. Design Brief							
1.1		Identifying the primary problem and secondary problems in own words				2	
1.2		Formulating of a design brief in own words				2	
1.3		List of the specifications (extended and comprehensive and not just the given)				2	
1.4		List of at least FIVE constraints				2	
1.5		List of the entire process together with a management plan				2	
TOTAL						10	
2. Research							
Relevant and usable research on:	2.1	Contemporary designs and layouts of one-bedroom cottages				2	
	2.2	Requirements and equipment for and layouts of modern drawing offices				2	
	2.3	Fibreglass swimming pools and swimming pool sizes				2	
	2.4	At least FOUR different types of suitable security systems				2	
	Clear evidence that the research has been used						1
Sources included						1	
TOTAL						10	
3. Freehand drawings of THREE possible design solutions							
Assess each freehand solution as follows:	ALL required layout features and fixtures		2	Final mark for each solution			
	Correct presentation of building features and fixtures		2	Solution 1		10	
	Proportionality (correct size) of ALL features and fixtures		2				
	Labels and notes		1	Solution 2		10	
	Dimensioning		1				
	Design of the layout		2	Solution 3		10	
TOTAL		10					
4. Selecting the best freehand solution							
Appropriate and easily understandable presentation of the selection process						2	
The use of the requirements and specifications as criteria for the evaluation						2	
Relevant and comprehensive reasons (evaluating and comparing)						2	
A rating scale to score each solution, i.e. a mark allocation of each criteria						2	
A summary of the reasons for the selected solution(s)						2	
TOTAL						10	
5. Working drawings and a pictorial drawing of selected solution							
Drawing sheet preparation							
Appropriately sized drawing sheets						1	
Borders on all the drawing sheets of working drawings and pictorial drawing						2	
Appropriate and complete civil title panels on all the working drawings						7	
NOTE: Use the 7-mark simplified rubric on page 45 of the EGD CAPS.						TOTAL	10
5.1 Detailed layout drawings of the selected proposed solution							
5.1.1	Floor plan						
	ALL the required layout features, e.g. rooms, kitchen, entertainment area, etc.				2		
	Walls				2		
	Doors and windows				2		
	ALL sanitary, kitchen and other permanent fixtures				2		
	ALL electrical fittings and the wiring detail				2		
	Waste-water disposal systems (sewerage)				2		
	Labels, notes, fixture codes				2		
	Suitable scale selected and correctly indicated				1		
	Dimensions				2		
	Cutting plane(s)				1		
	ALL hatching detail				1		
	North point				1		
Subtotal = 20 ÷ 2 = TOTAL						10	

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2015 EGD CIVIL PAT				
5.1.2	Sectional elevation			
	Foundation		2	
	Walls with door(s) and window(s) included		2	
	Roof		2	
	Labels and notes		2	
	Suitable scale selected and correctly indicated		1	
	Dimensions		2	
	Section correct according to the indicated cutting plane(s)		2	
	ALL hatching detail		2	
			Subtotal = 15 ÷ 1,5 = TOTAL	10
5.1.3	TWO elevations, showing the front view and a side view			
	Relevant views selected/shown		1	
	Door and window detail		2	
	Walls and ALL other external features		2	
	Roof		2	
	Waste-water disposal system (sewerage)		2	
	Drawn to same scale as the floor plan		1	
			TOTAL	10
5.2	Detailed site plan			
	ALL relevant site detail/features, e.g. building lines, natural features, drive ways, etc.		2	
	ALL existing and new buildings/structures/civil features		2	
	ALL services, sewerage and drainage connections as well as electrical supply		2	
	Suitable scale selected and correctly indicated		1	
	Dimensions, corner heights, labels and notes		2	
	North point		1	
			TOTAL	10
5.3	Detailed two-point perspective drawing			
	Correct orientation and HL high (1,8 m)		1	
	Evidence of views/drawings and construction/method used for the drawing		2	
	Perspective drawing/answer		7	
NOTE: Use the 7-mark simplified rubric on page 45 of the EGD CAPS.			TOTAL	10
6.	Continuous self-evaluation and the meeting of deadlines			
	Checklist(s) of continuous self-evaluation of the entire process (mark out of 10 ÷ 2)		5	
	The meeting of ALL the deadlines during the development (mark out of 10 ÷ 2)		5	
			TOTAL	10
7.	Presentation of the complete PAT file/portfolio			
	Cover page		1	
	Index		1	
	Summative assessment sheet and declaration		1	
	Correct sequencing of ALL presentation requirements		1	
	Name and numbering on ALL the presentation requirements		1	
	General impression of file/portfolio, e.g. binding, appearance etc. (mark out of 10 ÷ 2)		5	
			TOTAL	10
Assessment of drawing methods, drawing skills and presentation				
a	Freehand drawings			
	Freehand drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
b	Instrument drawings			
	Use of drawing instruments, drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
c	CAD drawings			
	Competence displayed in using a CAD system/program (See ANNEXURE A on page 23)		10	
	Layout and correctness of the drawings presentation (See ANNEXURE A on page 23)		10	

7. PRACTICAL ASSESSMENT TASK 2 (PAT 2)

7.1 A mechanical design project

Scenario

You are employed as a draughtsperson by a husband and wife that have a drafting firm that specialises in providing design services on **SAFETY and/or SECURITY LOCKS and LOCKING DEVICES**.

You are tasked with investigating and analysing the design features of existing **safety and/or security locks or locking devices** and to come up with new or improved ideas. The improvement(s) to the lock/locking device could be one or more of the following:

- To improve efficiency
- To strengthen its current design
- To simplify its application

The PAT requires the following stages:

- The **first stage** involves **selecting/finding a suitable safety or security lock or locking device**, which **must** include **mechanical parts/components and movement as part of its operation/function**. The lock/locking device must be an **assembly** consisting of a **minimum of FOUR different parts/components**, e.g. pad locks, combination locks, door-locking device, security gate locking device, safe locking device, cupboard locking device, etc.

NOTE: It is not required of you to purchase a new lock/locking device. The selected lock/locking device should therefore be something that is **already available to you**.

- The **second stage** involves the **dismantling** of the selected lock/locking device so that **all the mechanisms and parts/components** can be **revealed, investigated and measured**.
- The **third stage** involves the identification of **ONE** of the **main parts/components** or a **combination of parts/components** of the selected lock/locking device which could be **improved, modified or redesigned** in some way. This will necessitate the application of the **design process**, as stipulated by the presentation requirements for this PAT.

Requirements and specifications of the selected lock/locking device:

- The **lock/locking device must be submitted as part of the PAT presentation**.
- Your **teacher must approve** the lock/locking device in order to ensure that it **meets all the requirements** and that a PAT of an **appropriate higher-order Grade 12 complexity** can be produced.
- The lock/locking device must be an **assembly** consisting of a **minimum of FOUR different mechanical parts/components**.

- The lock/locking device must include **mechanical movement** as part of its operation/function. **Electrical/Electronic locks/locking devices** that do not use mechanical movement as part of its operation/function, **may therefore not be used.**

PHASE 1: Presentation requirements

1. **Identify the primary and secondary problem(s)** and formulate a **comprehensive design brief.**

Include the following as part of the design brief:

- Your own **comprehensive** list of **specifications**
- Your own list of **constraints**
- A list of the **main points** of ALL the **presentation requirements** together with a **management plan** for the development of the PAT.

2. Conduct your own **research** on the following:

- All the **materials** that are used for **ALL the parts/components** of the selected lock/locking device
- **Specific design features** and/or **function (purpose)** of each individual part/component of the selected lock/locking device
- In-depth research of the design, components/parts and mechanical movement (working) of **at least THREE other locks/locking devices** that perform a similar function as the lock/locking device you have selected, but that differs in terms of design.

NOTE:

- The research must be **relevant** and **usable**.
- Evidence of **ALL the relevant resource material used** must be **presented as proof** that the required research has been done. The **evidence** of the **other THREE locks/locking devices** could be in the form of a **comprehensive set of photographs together with explanatory labels and notes** of each.
- There must be clear evidence that the **research has been used**.
- Include a list of **ALL references (sources)**.

3. **Generate THREE sets** of detailed **freehand drawings** that will clearly show **THREE different possible improvements, modifications or re-designs** to the identified **main part(s)/component(s)** of the **selected lock/locking device**.

Each set of freehand drawings must consist of **relevant self-explanatory orthographic views** and an **isometric drawing(s)** that must show **dimensions, labels and notes**, as well as the **correct presentation** of ALL the **features**.

NOTE:

- ALL the views and features should be drawn **proportionally the same size**.
- The use of **grid/graph paper** is therefore recommended.

- These drawings must provide clear evidence that a high level of competency has been attained in **freehand drawings** as one of the required **EGD drawing methods**.
 - All the drawings must comply with the *SANS 10111 Guidelines*.
4. **Select the best improvement/modification/re-design** which demonstrates an in-depth understanding of the design brief within the context of the specifications and constraints, by **evaluating and comparing** the possible design solutions of the **THREE freehand drawings**. Include a **summary** of the reasons for the selected solution.

PHASE 2: Presentation requirements

5. **Present the selected lock/locking device** and the **selected improvement/modification/re-design** as a set of **working drawings** and a **pictorial drawing** (5.1, 5.2 and 5.3) that adhere to the following:
- All the drawings must be presented on appropriately sized drawing sheets, correctly set up with borders and **appropriate mechanical title blocks**.
 - The drawings must provide clear evidence that a high level of competency has been attained in the following **TWO** required **EGD drawing methods**:
 - **Instrument drawings**
 - **CAD (Computer-aided Drawing/Design)**

NOTE:

- **ONE working drawing** (i.e. 5.1 or 5.2) must be prepared as an **instrument drawing** and the **other** by using a **CAD system**.
 - The **isometric drawing** (5.3) may be prepared **either** as an instrument drawing **or** by using a CAD system.
 - **Schools that do not have CAD facilities must prepare all the required drawings** (5.1, 5.2 and 5.3) **as instrument drawings**.
 - All drawings must comply with the *SANS (SABS) 10111 Guidelines*.
- 5.1 Draw an **assembly drawing** of the **selected lock/locking device**, clearly showing all the parts **before** any improvements, modifications or re-designs have been effected. The drawing must show a **minimum** of **FOUR appropriate** orthographic views drawn to a suitable scale.

The views must include:

- 5.1.1 The **front view**
- 5.1.2 A **second primary (main) view**
- 5.1.3 Any **TWO** other **secondary views**

NOTE: **TWO** of the **views must be sectioned** or contain **types of section**.

The following must be included:

- Scale
- Dimensions
- Labels and notes
- Cutting planes
- ALL hatching detail

- 5.2 Draw a **detailed drawing** of the **identified main part(s)/component(s)** of the **selected lock/locking device**, clearly showing the **selected improvement/modification/re-design**. The drawing must show a **minimum of THREE appropriate** orthographic views drawn to a suitable scale.

The views must include:

5.2.1 The **front view**

5.2.2 Any **TWO** other **views**

NOTE: ONE of the **views must be sectioned** or contain **types of section**.

The following must be included:

- A comprehensive list of explanatory labels and notes
- Relevant welding and/or machining symbols
- Scale
- Dimensions
- Cutting plane(s)
- ALL hatching detail

- 5.3 Draw a detailed **isometric drawing** of the selected lock/locking device or of the improved, modified or re-designed main part(s)/ component(s) of the lock/locking device, to a suitable scale.

Evidence of the following must be shown:

- All views/drawings used to produce the drawing
- The constructions/methods used to produce the drawing

NOTE:

- Include relevant labels and notes.
- A copy of the isometric drawing, which may contain artistic features, should be used as the picture for the cover page of the PAT file/portfolio.

PHASE 3: Presentation requirements

Create a PAT file/portfolio containing:

- A complete **cover page**
- An **index**
- The **2015 SUMMATIVE ASSESSMENT SHEET** (see page 25)
- The completed **DECLARATION OF AUTHENTICITY** (see page 26)

Present the following Phase 1 and Phase 2 presentation requirements in the PAT file/portfolio after the DECLARATION OF AUTHENTICITY:

- ALL the **design brief** requirements
- The evidence of ALL the relevant resource material used for the **required research**
- The **THREE freehand drawings** of THREE possible design solutions
- ALL the evidence of the **selection** of the **best solution**

- ALL the required **working drawings** (5.1 and 5.2) and the **pictorial drawing** (5.3)
- Provide clear evidence in the form of a **checklist(s)**, of **continuous self-evaluation** of the **entire process** and of the **meeting** of all the **deadlines** during the development of the PAT.

NOTE: Include the following on each page of each presentation requirement:

- Clear **numbering** in accordance with the numbers of the presentation requirements
- **Your** (the learner's) **name**
- The **date of completion** and **submission**

7.2 Assessment criteria and checklist for the 2015 EGD Mechanical PAT

- The **SUMMATIVE ASSESSMENT SHEET** on page 25 of the EGD PAT document must be used to indicate the final totals out of 10 for each assessment criteria.
- The **contribution** of each aspect of the PAT is as follows:
 - The **design process**, i.e. presentation requirements numbers 1, 2, 3, 4, 6 and 7, will contribute **25 marks** to the final PAT mark out of 100
 - The **working drawings and a pictorial drawing**, i.e. presentation requirement number 5, will contribute **50 marks** to the final PAT mark out of 100
 - **Drawing methods, drawing skills** and **presentation**, which should be assessed according to ANNEXURE A, will contribute **25 marks** to the final PAT mark out of 100.

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2015 EGD MECHANICAL PAT								
1 mark level descriptive	0	No evidence/not done or not correct/complete/compliant/achieved				Checked	Suggested mark allocation	Own notes/Comments
	1	All evidence shown/correct/complete/compliant/achieved/clear						
2 mark level descriptive	0	No evidence/not done				Checked	Suggested mark allocation	Own notes/Comments
	1	Evidence shown but not correct/complete/compliant/achieved						
	2	All evidence shown/correct/complete/compliant/achieved/clear						
1	Design Brief							
1.1	Identifying the primary problem and secondary problems in own words					2		
1.2	Formulating of a design brief in own words					2		
1.3	Creating a comprehensive list of the specifications for the selected lock and task					2		
1.4	List of constraints for the selected lock and/or task					2		
1.5	List of the entire process together with a management plan					2		
					TOTAL	10		
2	Research							
Relevant and usable research on:	2.1	Materials that are used for the parts/components of the selected lock					1	
	2.2	Design features and/or function (purpose) of each individual part					1	
	2.3.1	The design and mechanism (working) of another lock No. 1					2	
	2.3.2	The design and mechanism (working) of another lock No. 2					2	
	2.3.3	The design and mechanism (working) of another lock No. 3					2	
	Clear evidence that the research has been used					1		
Sources included					1			
					TOTAL	10		
3	Freehand drawings of THREE possible design solutions							
Assess each freehand solution as follows:	Relevant orthographic views and isometric drawing		2	Final mark for each solution				
	Correct presentation of ALL the features		2	Solution 1	10			
	Proportionality (correct size) of ALL features		2					
	Labels and notes		1	Solution 2	10			
	Dimensioning		1					
	Possible improvement, modification or redesign		2	Solution 3	10			
	TOTAL		10					
4	Selecting the best freehand solution							
Appropriate and easily understandable presentation of the selection process					2			
The use of the requirements and specifications as criteria for the evaluation					2			
Relevant and comprehensive reasons (evaluating and comparing)					2			
A rating scale to score each solution, i.e. a mark allocation of each criteria					2			
A summary of the reasons for the selected solution(s)					2			
					TOTAL	10		
5	Working drawings and a pictorial drawing of selected lock/locking device and solution							
Drawing sheet preparation								
Appropriately sized drawing sheets					1			
Borders on all the drawing sheets of working drawings and pictorial drawing					2			
Appropriate and complete mechanical title blocks on all the working drawings					7			
NOTE: Use the 7-mark simplified rubric on page 45 of the EGD CAPS.				TOTAL	10			
5.1	Assembly drawing of the selected lock/locking device before any improvements/modifications/redesigns							
5.1.1	Front view before any changes							
ALL the parts included and correctly drawn according to actual lock/locking device					2			
All hatching detail or, if not sectioned, ALL external features					2			
ALL bolts and nuts and other fastening methods correct in ALL FOUR views					2			
Labels and notes for ALL FOUR views					2			
Projection symbol					1			
Suitable scale selected and correctly indicated for ALL FOUR views					1			
					TOTAL	10		

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2015 EGD MECHANICAL PAT				
5.1.2	Second primary (main) view before any changes			
	ALL the parts included and correctly drawn according to actual lock/locking device		2	
	All hatching detail or, if not sectioned, external features		2	
	Dimensions for ALL FOUR views		2	
	ALL centre lines on ALL FOUR views		2	
	ALL FOUR views correctly drawn in third-angle orthographic projection		2	
		TOTAL	10	
5.1.3	TWO other secondary views before any changes			
	Appropriate secondary views selected		2	
	ALL the parts included and correctly drawn according to actual lock/locking device		2	
	All hatching detail or, if not sectioned, external features		2	
	TWO views sectioned or contain types of section		2	
	Correct cutting planes for the TWO sectional views and/or types of sections		2	
		TOTAL	10	
5.2	Detailed drawing of the selected improvement/modification/redesign of the main part(s)/component(s)			
	Front view correctly selected and drawn		2	
	TWO other views correctly selected and drawn		2	
	Selected improvement/modification/re-design correlates and is clearly shown		2	
	Comprehensive list of explanatory labels and notes		2	
	Dimensions		2	
	ONE view sectioned , or contain types of section , and correctly drawn		2	
	Cutting plane(s)		1	
	ALL hatching detail		2	
	Relevant welding symbols and/or machining symbols and/or tolerances		2	
	Projection symbol		1	
	Suitable scale selected and correctly indicated		1	
	Drawing is in third-angle orthographic projection		1	
		Subtotal = 20 ÷ 2 = TOTAL	10	
5.3	Detailed isometric drawing			
	Suitable scale selected and correctly indicated		1	
	Evidence of views/drawings and construction/method used for the drawing		2	
	Isometric drawing/answer		7	
	NOTE: Use the 7-mark simplified rubric on page 45 of the EGD CAPS.	TOTAL	10	
6	Continuous self-evaluation and the meeting of deadlines			
	Checklist(s) of continuous self-evaluation of the entire process (mark out of 10 ÷ 2)		5	
	The meeting of ALL the deadlines during the development (mark out of 10 ÷ 2)		5	
		TOTAL	10	
7	Presentation of the complete PAT file/portfolio			
	Cover page		1	
	Index		1	
	Summative assessment sheet and declaration		1	
	Correct sequencing of ALL presentation requirements		1	
	Name and numbering on ALL the presentation requirements		1	
	General impression of file/portfolio, e.g. binding, appearance etc. (mark out of 10 ÷ 2)		5	
		TOTAL	10	
Assessment of drawing methods, drawing skills and presentation				
a	Freehand drawings			
	Freehand drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
b	Instrument drawings			
	Use of drawing instruments, drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
c	CAD drawings			
	Competence displayed in using a CAD system/program (See ANNEXURE A on page 23)		10	
	Layout and correctness of the drawings presentation (See ANNEXURE A on page 23)		10	

8. ANNEXURE A: RUBRIC FOR ASSESSING DRAWING METHODS, DRAWING SKILLS AND PRESENTATION

			LEVELS OF PERFORMANCE										
MARK ALLOCATION			10	9	8	7	6	5	4	3	2	1	0
			100%	99%–90%	89%–80%	79%–70%	69%–60%	59%–50%	49%–40%	39%–30%	29%–20%	19%–1%	0%
Freehand drawing	METHODS AND SKILLS	The drawings display correct freehand drawing methods and skills as well as good proportion and size	The drawings display excellent drawing methods and skills and all the features show outstanding proportion and size .	The drawings display satisfactory drawing methods and skills and most/some features show satisfactory proportion and size .	The drawings display poor drawing methods and skills and the features show poor proportion and size .	The drawings display very poor drawing methods and skills and the features show very little or no correct proportion .							
		Final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning	Drawings are very neat and all line work/line quality, printing and dimensioning are outstanding and consistent .	Drawings are neat and line work/line quality, printing and dimensioning are generally good and mostly consistent .	Drawings are untidy with inconsistent line work/line quality, printing and dimensioning .	The line work/line quality, printing and dimensioning are unacceptable .							
Pencil instrument drawing	METHODS AND SKILLS	The drawings display the correct use of drawing instruments, drawing methods and skills .	The drawings display the correct use of drawing instruments and an outstanding application of drawing methods and skills .	The drawings display the correct use of drawing instruments and a satisfactory and mostly correct application of drawing methods and skills .	The drawings display poor use of drawing instruments and a poor and incorrect application of drawing methods and skills .	The drawings display an incorrect use of drawing instruments with incorrect applications of drawing methods and skills .							
		The final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning	Drawings are very neat and all line work/line quality, printing and dimensioning are outstanding and consistent .	Drawings are neat and the line work/line quality, printing and dimensioning are generally good and mostly consistent .	Drawings are untidy and the line work/line quality, printing and dimensioning are inconsistent .	The line work/line quality, printing and dimensioning are unacceptable .							
CAD drawing	METHODS AND SKILLS	The level of competence displayed in using a CAD system	Displays a high level of skills, knowledge and ability in using a CAD system	Displays a satisfactory level of skills, knowledge and ability in using a CAD system	Displays a poor level of skills, knowledge and ability in using a CAD system	Shows little to no skills, knowledge or ability in using a CAD system							
		The layout of the final drawing is correct and the line work, printing and dimensioning is compliant and consistent	The layout of the drawings is correct and the line work, printing and dimensioning are compliant and consistent	The layout of the drawings is acceptable and the line work, printing and dimensioning are mostly compliant and consistent	The layout of the drawings is very poor and the line work, printing and dimensioning are not compliant and inconsistent	The layout, line work, printing and dimensioning are unacceptable .							

9. A SIMPLIFIED RUBRIC FOR THE ALLOCATION AND VERIFICATION OF MARKS

NOTE:

- This rubric should be used to allocate marks for all aspects of the assessment criteria which require a mark out of 10.
- This rubric should also be used to verify that the overall level of achievement, i.e. the final mark out of 10, of each assessment criteria is in accordance with the presentation requirement.
- The concept of '**bench marking**', i.e. the identification and mark allocation of the best example(s) for each assessment criteria, should be applied when assessing the PATs.

MARK ALLOCATION for all assessment criteria of the PAT			
DESCRIPTION FOR MARK	GENERAL INDICATOR	± %	MARK
ALL/MORE than ALL the REQUIREMENTS are met. - PERFECT -	Error free	100%	10
ALL (ALMOST ALL) the REQUIREMENTS are met. - OUTSTANDING -	Very few errors	90% +	9
ALMOST ALL (MOST OF) the REQUIREMENTS are met. - VERY GOOD -	Few errors	80% +	8
The REQUIREMENTS are SUBSTANTIALLY met. - GOOD -	Some errors	70% +	7
The REQUIREMENTS are ADEQUATELY met. - SATISFACTORY -		60% +	6
The REQUIREMENTS are MODERATELY met. - ACCEPTABLE -	Many errors	50% +	5
ONLY SOME of the REQUIREMENTS are met. - UNACCEPTABLE -		40% +	4
VERY FEW of the REQUIREMENTS are met. - NOT ACHIEVED -	Mostly wrong	30% + Only a few correct features	3
The REQUIREMENTS are NOT met. - VERY POOR -	Completely wrong	29% and LESS Something done incorrectly/poorly	2
			1
NOT DONE!	No work handed in!	Nothing to mark!	0

10. PRACTICAL ASSESSMENT TASK 2015: SUMMATIVE ASSESSMENT SHEET

PRACTICAL ASSESSMENT TASK 2015 SUMMATIVE ASSESSMENT SHEET									
SCHOOL:									
NAME OF LEARNER: (SURNAME AND INITIALS)									
EXAMINATION NUMBER:									
PART A: Design Process			PART B: Working and pictorial drawings				Drawing competency and skill		
CRITERIA		MARK	CRITERIA		MARK	CRITERIA		MARK	
1	A design brief demonstrating a clear understanding of the scenario with a list of the specifications and constraints		All drawing sheets are appropriately set up with a border and an appropriate title block/panel .			Freehand drawings ANNEXURE A	METHOD	The drawings display correct freehand drawing methods and skills as well as good proportion and size	
	2	Evidence of relevant and usable research with the inclusion of a source		Orthographic drawings <small>Assess each view's accuracy and correctness according to the selected solution, the stipulated requirements and EGD drawing principals</small>				The final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning	
3		THREE freehand drawings of detailed possible solutions	1st Solution				5.1.1	View 1 PAT 1: Plan PAT 2: Front view	
	2nd Solution		5.1.2	View 2 PAT 1: Section PAT 2: 2nd main view		The final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning			
	3rd Solution		5.1.3	View 3 PAT 1: 2 elevations PAT 2: 2 secondary views		CAD drawings ANNEXURE A		METHOD	The level of competence displayed in using a CAD system
4	Selecting the final/best solution which demonstrates a clear understanding of the design brief		5.2	PAT 1: Site plan PAT 2: Detailed drawing					The layout of the final drawing is correct and the line work, printing and dimensioning is compliant and consistent
			6	Clear evidence of continuous self-evaluation and the meeting of deadlines of all the requirements		Pictorial drawing 5.3 The correct drawing method and the presentation of the drawing PAT 1: 2-point perspective PAT 2: Isometric			TOTAL without CAD
7 The presentation of the complete PAT file/portfolio									TOTAL with CAD
					Criteria Total		Criteria Total		CALCULATION without CAD
CALCULATION		CALCULATION		CALCULATION with CAD					
Teacher's TOTAL			Teacher's TOTAL			Teacher's TOTAL			
TOTAL: A		/ 25	TOTAL: B		/ 50	TOTAL: C		/ 25	
Moderated TOTAL			Moderated TOTAL			Moderated TOTAL			
TOTAL: A		/ 25	TOTAL: B		/ 50	TOTAL: C		/ 25	
TEACHER'S TOTAL:			A + B + C =		/ 100	ASSESSOR: Initial		MODERATOR: Initial	
MODERATED TOTAL:			A + B + C =		/ 100				

11. DECLARATION OF AUTHENTICITY

DECLARATION OF AUTHENTICITY

To be submitted with each learner's Practical Assessment Task portfolio

NAME OF THE SCHOOL:

NAME OF LEARNER:
(SURNAME AND INITIALS)

EXAMINATION NUMBER:

I hereby declare that all the contents of the Practical Assessment Task submitted by myself for assessment is my own original work and has not been plagiarised, copied from someone else or previously submitted for assessment.

SIGNATURE OF CANDIDATE

___ / ___ / 2015
DATE (DD/MM/YYYY)

NAME OF TEACHER:
(SURNAME AND INITIALS)

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

SIGNATURE OF TEACHER

___ / ___ / 2015
DATE (DD/MM/YYYY)

