



ENGINEERING GRAPHICS AND DESIGN
GUIDELINES FOR THE
MECHANICAL DESIGN PRACTICAL ASSESSMENT TASK (PAT)
GRADE 10
2024

The practical assessment task (PAT) is a compulsory component of the final promotion mark of 25% for all candidates in grade 10. The PAT is implemented across THREE terms of the school year.

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

- The formulation of a design brief.
- The application of quality and neat free-hand drawings
- Presenting of instrumental skills and/or CAD drawing skills
- The management of time and relevant information.

Summary of year mark		
Formal and informal assessment 2022	100	January – October
PAT (Practical Assessment Task)	100	March - June
End year Paper 1	100	November
End year Paper 2	100	November
Final promotion marks 2022	400	November

The EGD PAT consists of TWO parts:

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

Part A of this PAT requires that the learner demonstrates a clear understanding of, and can 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 several own ideas, concepts, and solutions analytically and graphically through comprehensive freehand drawings.
- Select a final solution(s) that demonstrates a clear understanding of the design brief.
- Provide clear evidence of continuous self-evaluation during the development of the PAT.

Part B of the PAT 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.

The PAT must therefore be completed in the following phases during term one & two:

Phase 1: Design process. This includes the following.

7 March 2024:

1. A design brief indicating the specifications, constraints, and management plan.
2. Preparation of the drawing paper layout.

3 April 2024:

1. Research

7-10 May 2024

1. Possible solution one
2. Possible solution two
3. Selection of the final solution

Phase 2: Presentation drawings includes the following:

24 May 2024 (EGD, PAT (P3, June exam, 2 ½ -hour paper) 08:00 – 10:30 (unless some of the drawings have already been completed during term 2).

1. Presentation of the (sectioned) front view
2. Presentation of the (sectioned) top view
3. Presentation of the (sectioned) left/ (sectioned) right view
4. Presentation of the isometric drawing

Phase 3: Completion of PAT (before the commencement of the July holidays).

Complete the PAT file by filing all the documents and drawings in the following sequence (also consult the electronic version of the learner PAT framework):

1. A complete cover page that includes your school's name, your initials and surname, WRITTEN IN PEN, your grade and class group, your teacher's initials and surname, and a copy of your own isometric drawing of this PAT.
2. A complete index (table of contents).
3. The 2024 Summative Assessment Sheet (see page 9).
4. The completed Declaration of Authenticity (see page 10).
5. ALL the design brief requirements.
6. Evidence of ALL the resource material used for this PAT.
7. The TWO freehand drawings of the possible design solutions
8. ALL the evidence of the selection of the best solution
9. ALL the working drawings in the sequence of the orthographic drawing and the isometric drawing.
10. The completed Assessment Criteria with the self-completed checklist (pages 7 and 8 of this PAT) completed.
11. Complete the index page according to the numbered pages in your PAT.

Note the following:

- Since the PAT is forming part of a third exam, this PAT can also be an exam paper allocated for specific days at school. Non-compliance to any of these, and afore-mentioned instructions, will be deemed a serious examination irregularity.
- The PAT must be completed individually.
- ALL the presentation requirements of the selected PAT must be adhered to and, except for the research, be completed at school, under the guidance and supervision of your EGD teacher.
- 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. Only the learner's name and surname, must be completed in pen.
- The PAT must be of an appropriate higher-order Grade 10 complexity.
- Untidy and messy work, as well as the late submission of presentation requirements, will be penalised.

- When learners prepare drawings in CAD, the following must be adhered to:
 - The school must provide the facilities, including the CAD software and computers.
 - The school must hold the licenses of ALL the CAD software used by the learners, and NO other software may be used by any of the learners.
 - ALL CAD drawings must be prepared at school under the supervision of the teacher.
 - The opportunity to be trained using a CAD software must be made available to ALL learners, regardless of whether they use it or not.
 - As the teacher remains responsible for assessing both the competence displayed in using a CAD software and the layout and correctness of the drawing presentations, he/she must have sufficient knowledge of and skills in the CAD software used.
 - Electronic and hard copy evidence of the history of the stage-by-stage development of each learner's CAD drawings must be retained at the school for a period as stipulated by the Department of Basic Education (DBE).
 - During the moderation process learners will be requested to explain the functions and principles of operating the CAD software, and to demonstrate drawing skills through performing capability tasks.

Scenario

An older friend of yours buys and renovate old houses and then sells them again. He constantly has to replace the carpets and old timber floors. The challenge is to effectively remove the skirting board that is fixed to the wall with nails or Hilti's. Your friend has asked you to suggest a tool that you should design to break the skirting boards.

A request is made to you to do the following for the possible solution:

- researching different examples of a useful tool that can be used as a wedge to wedge between the wall and the skirting board. Your friend showed an example of an old axe blade that could possibly serve as a wedge if wedged parallel, and between the wall and the skirting board.
- the tool piece must have a flat, strong anvil shaped surface on the top, which is strong enough to be able to drive the wedge (axe's blade) deeper between the wall and the skirting board with a hammer.
- the tool must have a handle of ± 400 mm to act as a lever that can be pulled upwards after being wedged between the wall and the skirting board, so that the skirting board can be broken free from the wall.
- all three of the above parts must be welded together function as a unit (casting). Note, the weld symbols and finish symbols do not need to be shown.
- at least two freehand sketches of possible options of skirting wedges must be drawn. With one option, the handle must be represented as a solid square handle of $\square 25$. The second option should be a solid round rod handle with $\varnothing 25$. In both representations, a small hole must be drilled at the end (farthest from the wedge) of the handle so that the tool can be hung up after use.
- to draw the freehand drawings as large as possible, the handle on one freehand drawing must be interrupted by the correct SANS 1011 symbol for solid square bar while the second freehand drawing an interrupted view for a solid round bar must be applied.
- choosing the best of the above two freehand options by following a structured process and presenting it in a table.
- draw one formal working drawing with a front view, top view and a left view or right view. One of these three views must be a sectional view.
- In both the freehand sketches and the formal drawing, the use of a SANS 10111 convention for a partial section on the hole that has been drilled as well as an interrupted view on the handle which must be correctly applied and hatched.

- An isometric drawing of the solution must be drawn.
Note: the handle of the tool may be made of square material because the drawing of cylindrical objects in isometric drawings has not yet been explained to learners.
- All drawing representations must be drawn in third-angle orthographic projection.

PHASE 1: PRESENTATION REQUIREMENTS

1. Analyse the given scenario and formulate a design brief in two paragraphs:
 - The first paragraph must, in your own words, include a brief background to the project, as well as a detailed and comprehensive description of what must be designed.
 - The second paragraph must, in your own words, give a clear overview of your role in the project, as well as the design process that you are going to follow to get to a proposed solution.

From the scenario and your teacher's management plan, include the following as part of the design brief:

- Identify and list ALL the specifications.
 - List a minimum of THREE possible constraints raised by you. (Constraints are areas named in the PAT which is unknown to your current EGD content knowledge).
 - A management plan, in the form of a table (see electronic version of the learner PAT framework) has already been given to learners. The dates in the column with the heading "expected date of completion" have already been given. Just complete the dates in the column with the heading "date completed" once you have executed the specific assignment.
2. During the research, it is expected from you to do your own research, providing at least three to four examples on the following:
 - Different design examples and possible variations of a wedge tool that can be used to remove skirting boards.
 - Different materials suitable for manufacturing the wedge tool.
 - Methods of enduring and protection against natural elements.
 - The SANS 10111 principles when using a part sectioned and interrupted view.
 - Include a list (Bibliography) of ALL references for each sketch shown at your research used.

NOTE

- The research must be primarily in the form of pictures and/or illustrations rather than words, sentences, and paragraphs.
- Evidence of all the required research material must be included in the PAT portfolio. More pages for your PAT research may be added to your portfolio.
- The presentation of the research material should be aesthetically presented and may not exceed three A4 pages.
- There must be clear evidence that the research has been used in your proposal of design solutions.
- If the research is not completed or available during the next phase, the candidate will not be able to continue with the rest of the PAT. He/she will therefore forfeit the rest of the PAT marks.

Possible websites to visit for research:

- SANS 10111 mechanical symbols for grade 10, 11 and 12: (Consult an EGD textbook for more information)
- <http://e-learn.gc.co.za/moodle/course/index.php?categoryid=38>

3 Prepare neat detailed freehand drawings of TWO design solutions.

NOTE:

- Grid/Graph paper has already been added to your learner PAT framework and can be used to generate the freehand drawings. The reason for the Grid/Graph paper is so that ALL the features and fittings are drawn in proportion. Evidence of the pad/graph paper used must remain included in the PAT portfolio.
- ALL aspects of the freehand drawing, including dimensions, tables, labels and possible information blocks must be prepared using a pencil ONLY. The use of any other drawing instruments, e.g. a ruler or compass, will be penalised.
- The drawings must be prepared on an A3 drawing sheet (also consult the electronic version of the learner PAT framework).
- NO borders or title panels are required for the freehand drawing sheets.
- All the drawings must comply with the SANS 10111 Guidelines.
- These drawings must provide clear evidence that a high level of competency has been attained in freehand drawing.

4 Select the best solution, which demonstrates an in-depth understanding of the scenario within the context of the design brief, specifications, and constraints.

On a separate page, evaluate and compare the TWO freehand solutions by:

- Creating a table with a minimum of FOUR descriptive criteria.
- Creating and applying a simple rating scale to score each solution against each criterion.
- Justifying each score by describing the positive and/or negative aspects of each solution against each criterion.

Complete the process by writing a comprehensive summary, giving reasons for the selected freehand solution. The summary must also include **whether** there were any late changes made to the selected freehand solution **or not**.

PHASE 2: PRESENTATION REQUIREMENTS

Present the selected solution as a set of work drawings and a pictorial drawing (6, 7, 8 and 9) that meet the following criteria:

- All the work drawings must be presented on A3 drawing sheets, set up with a border. Only ONE working drawing's drawing sheet, must be set up with a complete mechanical title panel.

NOTE:

- Work drawing (i.e., 6, 7, 8 and 9) must be prepared using drawing instruments while one drawing using a CAD program if learners are equipped with the necessary skills.
- The title panel and ALL the working drawings must comply with the SANS 10 111 guidelines.

Draw detailed drawings of the selected freehand solution, clearly showing all the required features. Only one of the work drawings listed below must be a sectioned view. Show the section plane in all the views with the exception of the sectioned view.

- 6 The (sectional) **FRONT VIEW**.
- 7 **A** (sectional) **TOP VIEW**
- 8 **A** (sectional) **LEFT VIEW** or a (sectional) **RIGHT VIEW**

Include the following on ALL relevant views:

- Titles, labels, and notes.
 - The scale of the drawing.
 - Detailed dimensioning.
 - The cutting plane(s) of the sectioned view.
 - All hatching detail
 - A part sectioned view as well as an interrupted view.
- 9 Draw an **ISOMETRIC VIEW** of the structure. The handle of the isometric view must be drawn as a square handle and not as a cylindrical handle since isometric circles does not forms part of grade 11 content.

NOTE:

Use a copy of the isometric drawing, as a picture for the cover page of the PAT portfolio to promote your project.

PHASE 3: PRESENTATION REQUIREMENTS

Complete the PAT file by filing all the documents and drawings in the following sequence (also consult the electronic version of the learner PAT framework):

1. A complete cover page that includes your school's name, your initials and surname, WRITTEN IN PEN, your grade and class group, your teacher's initials and surname, and a copy of your own isometric drawing of this PAT.
2. A complete index (table of contents).
3. The 2024 Summative Assessment Sheet (see page 11).
4. The completed Declaration of Authenticity (see page 10).
5. ALL the design brief requirements.
6. Evidence of ALL the resource material used for this PAT.
7. The first of two freehand drawings of the possible design solutions
8. The second of two freehand drawings of the possible design solutions
9. ALL the evidence of the selection of the best solution
10. ALL the working drawings in the sequence of the orthographic drawing and the isometric drawing.
11. The completed Assessment Criteria with the self-completed checklist (pages 8 & 9 of this PAT) completed.
12. Complete the index page according to the numbered pages in your PAT.
13. Your name and surname (written in pen) must appear on each page of your PAT.

Use the table below and complete the date column to manage your time when completing this PAT.

Engineering Graphics and Design
2023 Grade 10 Practical Assessment Task (PAT)

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2024, EGD, GRADE 10, MECHANICAL PAT									
NAME OF SCHOOL									
NAME AND SURNAME OF LEARNER:									
NAME AND SURNAME OF TEACHER									
NAME AND SURNAME OF MODERATOR									
1 mark level descriptive	0	No evidence/not done or not correct/complete/complaint/achieved/very poor	Due date for completion	Completed	Self evaluation	Maximum mark	Moderated mark		
	1	All evidence shown/correct/complete/complaint/achieved/clear							
2 mark level descriptive	0	No evidence/not done/very poor							
	1	Evidence shown but not correct/complete/complaint/achieved/clear/average							
	2	All evidence shown/correct/complete/complaint/achieved/clear/very good							
1 Design Brief									
	1.1	1st paragraph of design brief: identify problem(s) and what is required to be done						2	
	1.2	2nd paragraph of design brief: your role & the process to be followed						2	
	1.3	Lists of all the given specifications						2	
	1.4	List of THREE constraints						2	
	1.5	A management plan with target dates for ALL the presentation requirements						2	
						TOTAL		10	
2 Research (This should be restricted to a maximum of TWO A4 or ONE A3 page)									
Relevant and usable research on:	2.1	Design examples and possible variations						2	
	2.2	Materials suitable for manufacturing						2	
	2.3	Enduring and protection against natural elements						2	
		Is there evidence that the research has been used in the PAT?						2	
		Bibliography/List of sources included						2	
						TOTAL		10	
3 TWO detailed freehand drawings of possible design solutions									
							SOLUTION	No:1	No:2
Assess each freehand solution as follows:	3.1	Drawn freehand						2	
	3.2	Correct presentation in correlation with the assignment						2	
	3.3	Relative size/proportion of features to each other.						2	
	3.4	Supply the necessary labels (1) & notes (1).						2	
	3.5	Supply the necessary dimensions						2	
	3.6	A freehand Isometric drawing per solution is shown for more clarity						2	
	3.7	Functionality of the new design (practicability for the purpose)						3	
						Subtotal = 15 ÷ 1,5 = TOTAL		10	
(1 = 1 ; 2 = 1 ; 3 = 2 ; 4 = 3 ; 5 = 3 ; 6 = 4 ; 7 = 5 ; 8 = 5 ; 9 = 6 ; 10 = 7 ; 11 = 7 ; 12 = 8 ; 13 = 9 ; 14 = 9 ; 15 = 10)									
4 Selecting the best freehand solution (This must be a separate presentation)									
	4.1	The given table used for easy to understand representation of the selection process						1	
	4.2	Select FOUR different criteria to evaluate and compare the two PAT freehand options.						2	
	4.3	Discuss (reason) the advantages and disadvantages of each criteria.						2	
	4.4	Implement values in the given rating scale to evaluate three options						2	
	4.5	Total the two options to determine the best option						1	
	4.6	Summarize and explain why you have chosen the selected drawing and mentioned changes or no changes						2	
						TOTAL		10	
5 Layout drawings and a pictorial drawing of selected solution									
Drawing sheet preparation									
	5.1	Two A3 drawing sheets						1	
	5.1.1	A complete frame around all work drawing sheets						2	
	5.1.2	Complete mechanical title panel on the first working drawing sheet						7	
		NOTE: Use the 7 mark simplified rubric on page 45 of the EGD CAPS							
						TOTAL		10	
6 Detailed layout drawings of the selected proposed solution									
	6	The SECTIONAL FRONT VIEW (Presentation drawing 1)							
	6.1	All parts are shown						1	
	6.2	Dimensions shown						1	
	6.3	Section line correctly placed or part section on handle correctly shown						2	
	6.4	Section line arrow direction correct or SANS compliant hatching detail shown correct on this view.						1	
	6.5	Notes and labels added						1	
	6.6	The title and scale indicated						2	
	6.7	An interrupted view shown on handle						2	
						TOTAL		10	

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7	The TOP VIEW (Presentation drawing 2)								
7.1	View placed in Third-Angle Orthographic Projection (T.A.O.P.)						2		
7.2	All parts are shown						1		
7.3	Dimensions shown						1		
7.4	Section line correctly placed or part section correctly shown						2		
7.5	Section line arrow direction correct or SANS compliant hatching shown correctly						2		
7.6	An interrupted view shown on handle						2		
	TOTAL						10		
8	The LEFT/RIGHT VIEW (Presentation drawing 3)								
8.1	View placed in Third-Angle Orthographic Projection (T.A.O.P.)						2		
8.2	All parts are shown						1		
8.3	Dimensions shown						1		
8.4	Section line correctly placed or part section correctly shown						2		
8.5	Section line arrow direction correct or SANS compliant hatching shown correctly						2		
8.6	An interrupted view shown on handle						2		
	TOTAL						10		
9	Detailed ISOMETRIC drawing (Presentation drawing 4)								
9.1	Isometric construction principles and methods applied correct (30° - 90° - 30°)						1		
9.2	Show all auxiliary views, construction lines and non-isometric lines						1		
9.3	Correct orientation of the isometric drawing according to the drawn views						1		
9.4	Correct scale used to maximise the isometric drawing on the A3 page						1		
9.5	Isometric answer correct.						6		
	TOTAL						10		
Assessment of drawing methods, drawing skills and presentation									
10	Assessment of FREEHAND.								
10.1	Freehand drawings METHODS (grid paper) & skills (see rubric grd 12 PAT – p 24)						10		
10.2	Consistency of line quality (see rubric grd 12 PAT – p 24).						10		
	TOTAL						20		
11	Assessment of INSTRUMENT drawings.								
11.1	Drawing method & skills. Use of drawing instruments (see rubric grd 12 PAT – p 24).						10		
11.2	Consistency of, line quality and annotation (see rubric grd 12 PAT – p 24).						10		
	TOTAL						20		
12	Assessment of CAD drawings								
12.1	Competence displayed in using a CAD program (see rubric grd 12 PAT – p 24).						10		
12.2	Layout and correctness of the drawings presentation (see rubric grd 12 PAT – p 24).						10		
	TOTAL						20		
13	Continuous self-evaluation and the meeting of deadlines								
13.1	Checklist completed as evidence of continuous self-evaluation (mark out of 10 ÷ 2)						5		
13.2	The meeting of ALL the deadlines during the development (mark out of 10 ÷ 2)						5		
	(NOTE: Use 7-mark rubric on page 45 of the EGD CAPS)								
	TOTAL						10		
14	The FINAL PRESENTATION of the complete PAT portfolio								
14.1	Develop your own designed front page (copy isometric drawing add initials, surname & grade)						2		
14.2	Prepare the final Index with page references						2		
14.3	Summative assessment sheet and declaration added						2		
14.4	The presentation requirements of this document is filed in the correct sequencing						2		
14.5	The present the final presentation in a file format.						2		
	TOTAL						10		
Learner total without CAD									
									/100
Learner total with CAD									
									/100

Engineering Graphics and Design
2023 Grade 10 Practical Assessment Task (PAT)

PRACTICAL ASSESSMENT TASK 2024 SUMMATIVE ASSESSMENT SHEET									
NAME OF SCHOOL									
NAME & SURNAME OF LEARNER:									
NAME & SURNAME OF TEACHER									
NAME & SURNAME OF MODERATOR									
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 and the specifications, constraints and a management plan	/10	All drawing sheets are appropriately set up with a border and an appropriate title block/panel.		/10	Freehand drawings ANNEXURE A	METHOD	The drawing display correct freehand drawing method and skills and the method used to ensure proportion and size	/10
			Orthographic drawings	Assess each view's accuracy and correctness according to the selected solution, the stipulated requirements and EGD drawing principles				6	
7	Front view	/10							
	8				View 2	/10			
Top view									
3	TWO detailed freehand drawings of possible solutions 1st Solution	/10	7	View 3	/10	Instrument drawings: ANNEXURE A	METHOD	The drawings display the correct use of drawing instruments, drawing methods and skills	/10
				2nd Solution				8	
4	Selecting the best solution which demonstrates a clear understanding of the design brief	/10	9	View 4	/10	CAD drawings ANNEXURE A	METHOD		The level of competence displayed in using a CAD system
				The correct drawing method and the presentation of the drawing				/10	The layout of the final drawing is correct and the line work, printing and dimensioning is compliant and consistent
13	Clear evidence of evaluation and meeting the of all the requirements	/10	9	Isometric drawing	/10	NO CAD drawings	METHOD		
								WITH CAD drawings	/60
SUB TOTAL			SUB TOTAL			CALCULATION without CAD			
CALCULATION		/70	CALCULATION		/50	CALCULATION with CAD			
Teacher's TOTAL			Teacher's TOTAL			Teacher's TOTAL			
TOTAL: A		/25	TOTAL: B		/50	TOTAL: C		Without CAD	
								With CAD	/25
TEACHER'S TOTAL:			A+B+C WITHOUT CAD =		/100	A+B+C WITH CAD			/100
Moderated TOTAL			Moderated TOTAL			Moderated TOTAL			
TOTAL: A		/25	TOTAL: B		/50	TOTAL: C		Without CAD	
								With CAD	/25
MODERATED TOTAL:			A+B+C WITHOUT CAD =		/100	A+B+C WITH CAD			/100

DECLARATION OF AUTHENTICITY

NAME OF THE SCHOOL: _____

INITIALS AND SURNAME OF LEARNER: _____

GRADE: 10__

Learner information:

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.

By signing this page, you as learner commit yourself to the responsibilities and your cooperation to submit the grade 10 PAT as part of your year mark. By failing to submit this PAT before the date of moderation (October), it will be an exam irregularity resulting a zero (0) mark for EGD (despite all exam and SBA efforts committed) during your grade 10 year.

SIGNATURE OF ABOVE-
MENTIONED CANDIDATE

DATE

Teacher information:

By signing this page, you as the teacher of above-mentioned learner, indicate that all the information was given to the learner during term 1 and that the terms and conditions as well as the consequences of no submission of the 2022, grade 10 PAT was explained to the learner.

SIGNATURE OF TEACHER

DATE

