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EASTERN CAPE EDUCATION DEPARTMENT
OOS-KAAP ONDERWYSDEPARTEMENT

NATIONAL SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

SEPTEMBER 2025

PREPARATORY EXAMINATION

MARKS: 200

TIME: 3 hours

This question paper consists of 6 pages.

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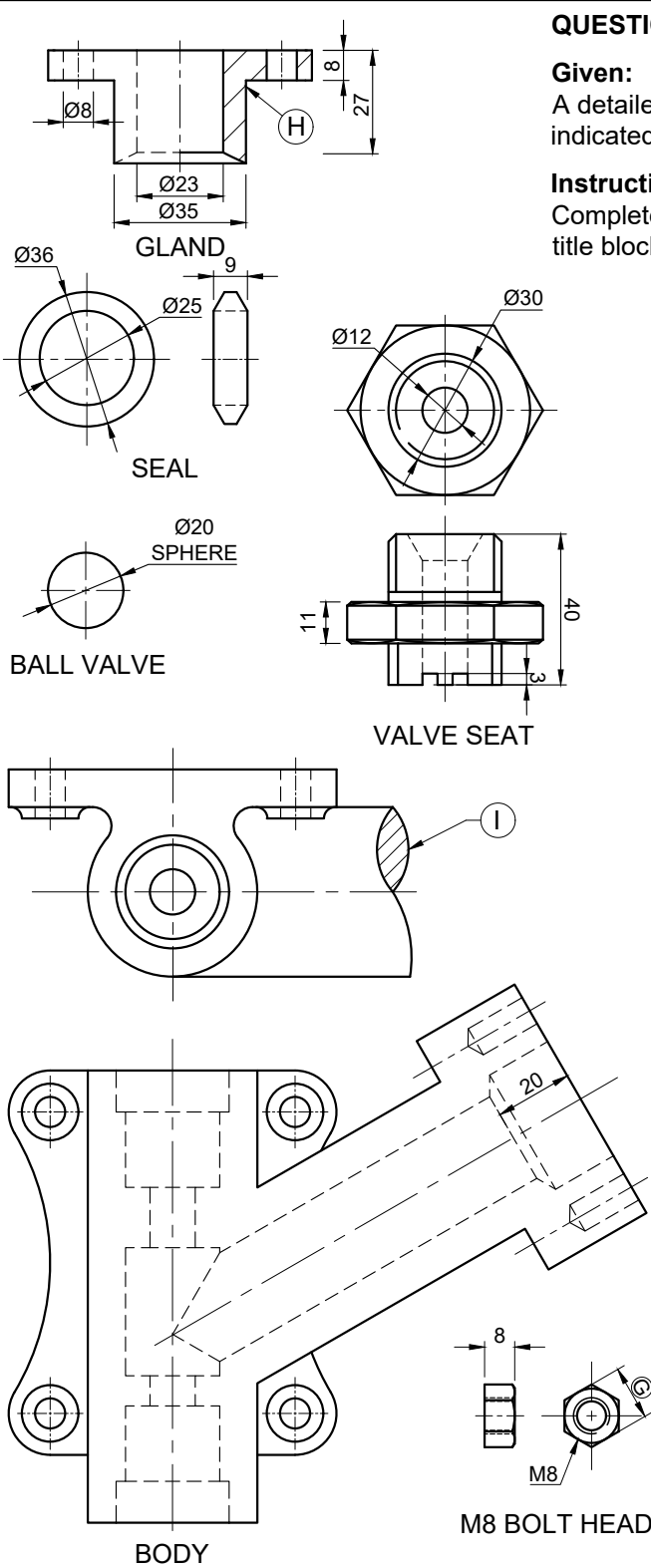
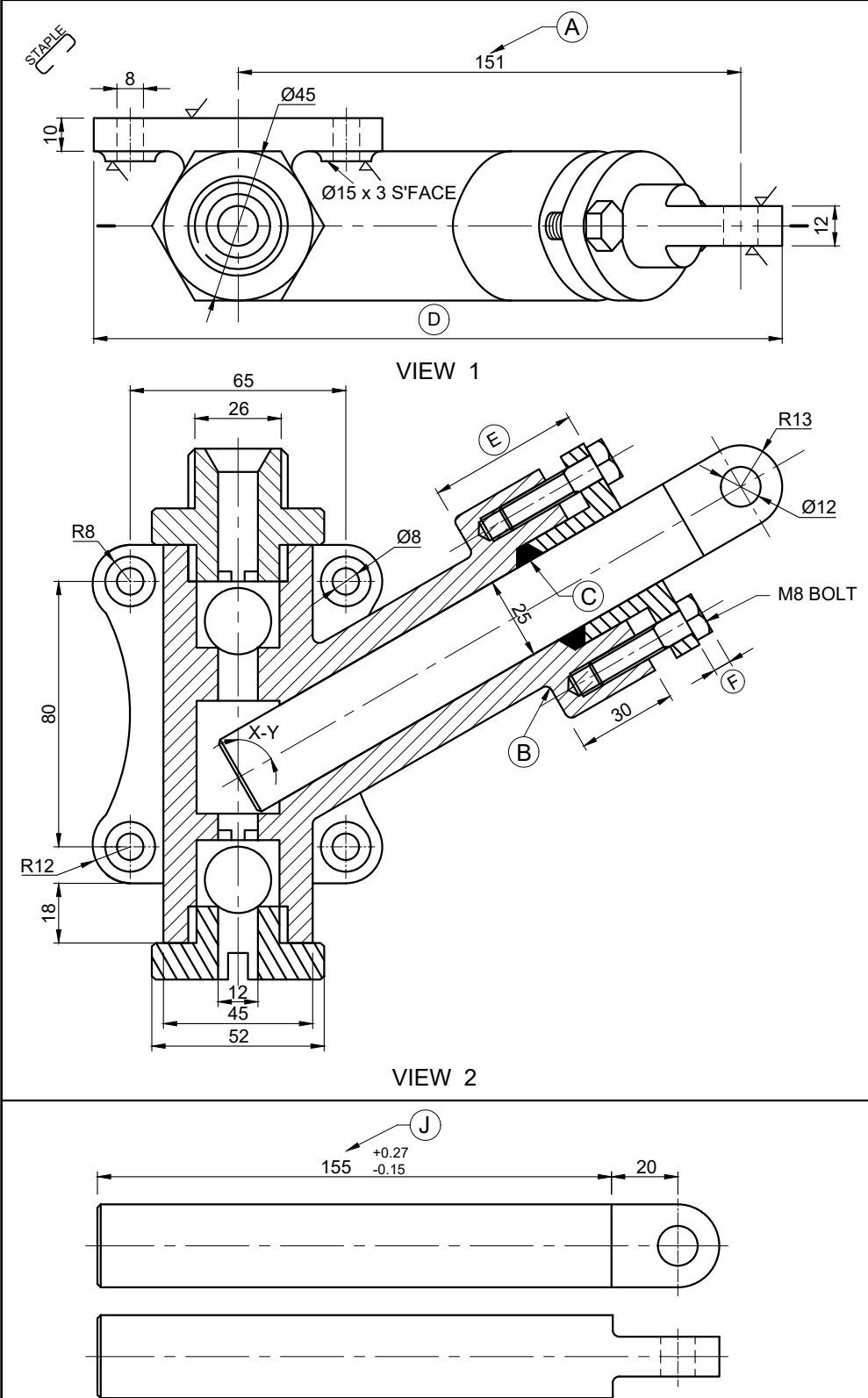
INSTRUCTIONS AND INFORMATION

1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings must be drawn to scale 1 : 1, unless otherwise stated.
4. ALL the questions must be answered on the answer sheets provided.
5. ALL the answer sheets must be re-stapled in numerical sequence and handed in irrespective of whether the question was attempted or not.
6. Careful time management is essential in order to complete all the questions.
7. Print your name in the block provided on every ANSWER SHEET.
8. ALL answers must be drawn accurately and neatly.
9. Any details or dimensions not given must be estimated in good proportion.
10. ALL drawings are in third angle orthographic projection, unless otherwise stated.

FOR OFFICIAL USE ONLY									
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COMPLETE THE FOLLOWING:	
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EXAMINATION CENTRE	
SCHOOL	



QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
A detailed drawing of a ram pump, a title block and table of questions. The drawings are not presented to the indicated scale.

Instructions:
Complete the table below by neatly answering the questions, which all refer to the accompanying drawings, the title block and mechanical content. [29]

QUESTIONS		ANSWERS	
1	On what date was the drawing prepared?	1	
2	From what material is the ram pump body manufactured?	1	
3	What is the drawing number?	1	
4	Who was responsible for the second revision?	1	
5	What does NTS stand for?	1	
6	If the drawing was drawn to scale 1:1, what would the dimension at A read?	1	
7	Name the feature at B.	1	
8	What would VIEW 2 be called?	2	
9	Why is the component at C filled in solid?	1	
10	What is the angle between the centre lines marked X and Y in VIEW 2?	1	
11	What is the purpose of the two ball valves in the assembly?	2	
12	Determine the complete dimensions at : D: E: F: G:	4	
13	Name the type of section at H?	1	
14	What is indicated by the convention at I?	1	
15	How many surfaces need to be machined?	1	
16	With reference to the tolerance, determine the maximum dimension at J?	2	
17	Insert the cutting plane for VIEW 1. Label the cutting plane A-A.	3	
18	In the space below, draw, in neat freehand, the SANS symbol for the projection system.	4	
TOTAL		29	

JNA ENGINEERING		3 RIVER DRIVE, PRESSURE ESTATE 3132 046 821 4911
TITLE: RAM PUMP		
ALL DIMENSIONS ARE IN MILLIMETRES.		SCALE: NTS
PROGRAMME: AUTOCAD 2024		
FILE NAME: ADB-2025-1989.dwg		
DRAWING NO: 1 OF 3		
QUANTITY: 85		

PARTS LIST			
PART		MATERIAL	QUANTITY
1.	BODY	BRASS	1
2.	GLAND	BRONZE	1
3.	VALVE SEAT	BRONZE	1
4.	UNION	BRASS	1
5.	BALL VALVE	PVC PLASTIC	2
6.	SEAL	RUBBER	1
7.	RAM	STAINLESS STEEL	1
8.	M8 BOLTS	STAINLESS STEEL	2

APPROVED:	A KRUGER	2025/06/01
CHECKED:	C CARPENTER	2025/03/09
DRAWN:	S ROAN	2025/01/06
2. MATERIAL OF SEAL	2025/05/08	M COMBS
1. ADDED FILLETS	2025/04/16	G BAILEY
REVISIONS	DATE	REVISED BY

ANSWER 18	

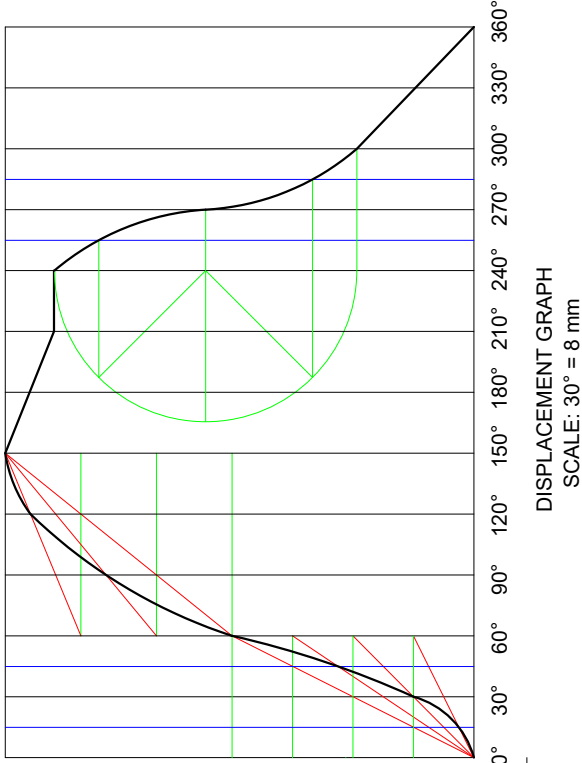
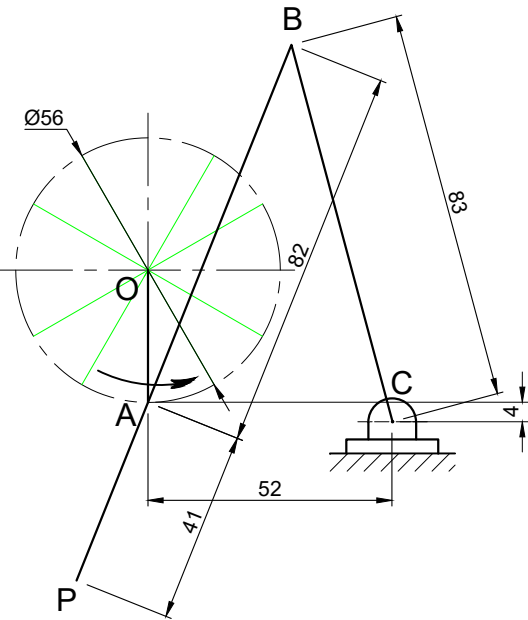
NAME	
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QUESTION 2.1: LOCI (MECHANISM)

- Given:**
- A mechanism consisting of a crank OA , with connecting rods AB and BC which are joined at pivot C. O is the centre of the crank. Rod AB is extended to P.
- Motion:**
- Crank OA rotates in an anti-clockwise direction around centre O. Rod BC pivot at A and B during rotation, while crank OA rotates.
- Instructions:**
- Draw to scale 1 : 1, the given schematic diagram, using point O as given reference point.
 - Trace the loci generated by point P, located on the connecting rod AB , as OA completes one revolution.
 - Show ALL necessary constructions.

[20]



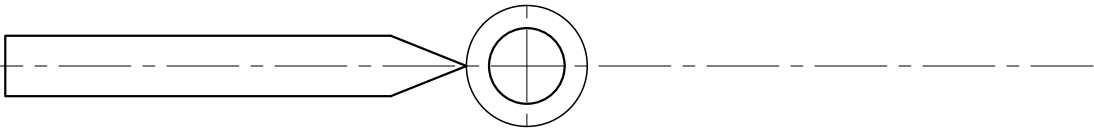
QUESTION 2.2: LOCI (CAM)

- Given:**
- The wedge-shaped follower and the camshaft, as well as the displacement graph in the correct position.
- Instructions:**
- Project and complete the cam profile, if the cam rotates anti-clockwise.
 - Indicate the rotation direction with an arrow.
 - Show ALL necessary construction. [18]

ASSESSMENT CRITERIA			
1	CAM CONSTRUCTION	6	
2	CURVE QUALITY	4	
3	CAM PROFILE	8	
PENALTY (-)			
SUB-TOTAL		18	
TOTAL		38	

+

ASSESSMENT CRITERIA			
1	GIVEN	7	
2	CONSTRUCTION OF DIAGRAM	5	
3	CONSTRUCTION OF LOCI	8	
PENALTY (-)			
SUB-TOTAL		20	



NAME	
NAME	3

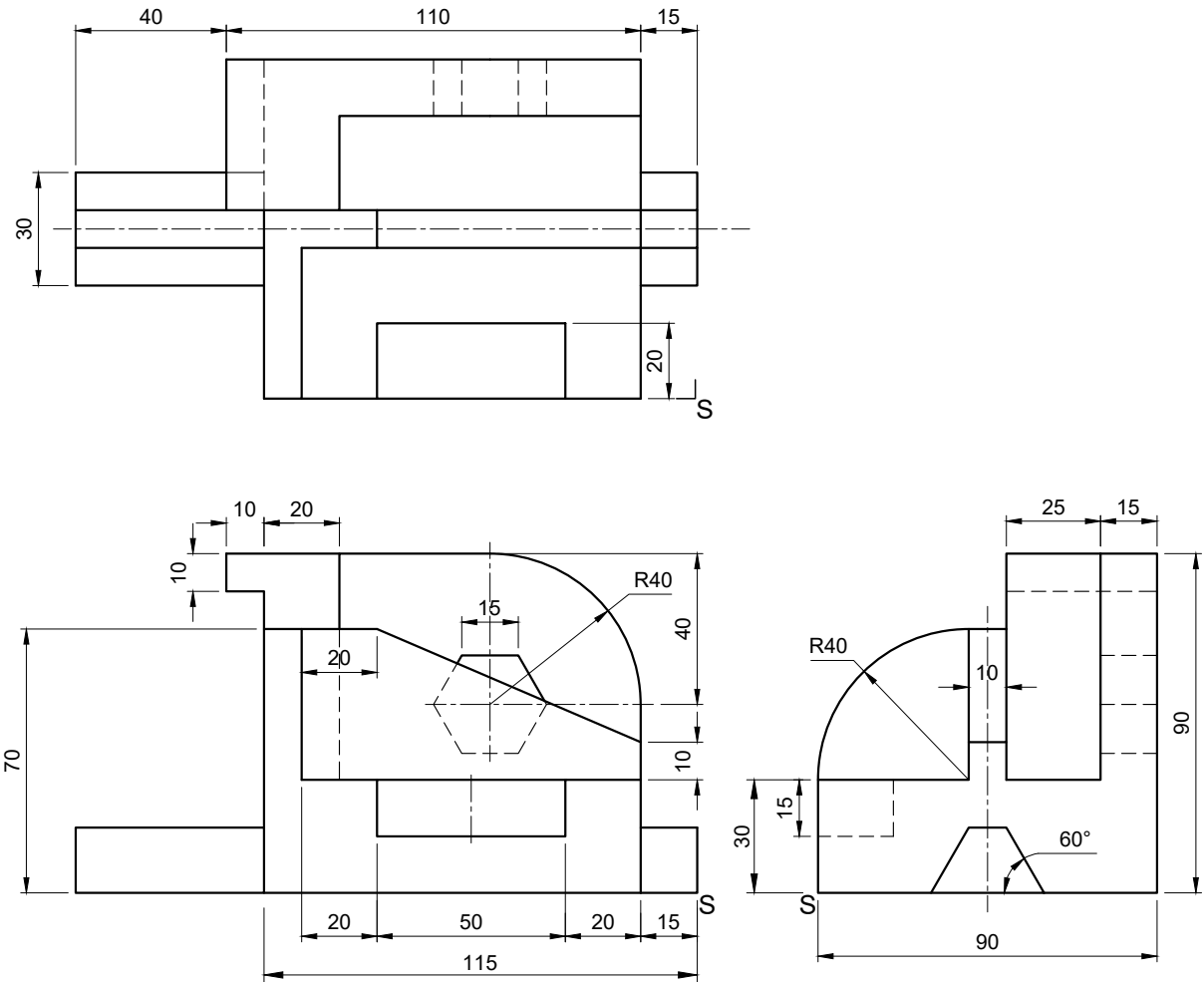


QUESTION 3: ISOMETRIC

- Given:**
- Three views of a SUPPORT BRACKET in third angle orthographic projection.
 - Starting point S.

- Instructions:**
- Draw, to scale 1 : 1, a isometric view of the SUPPORT BRACKET.
 - Make point S the lowest point of the drawing.
 - Show ALL necessary construction.
 - NO hidden detail is required.

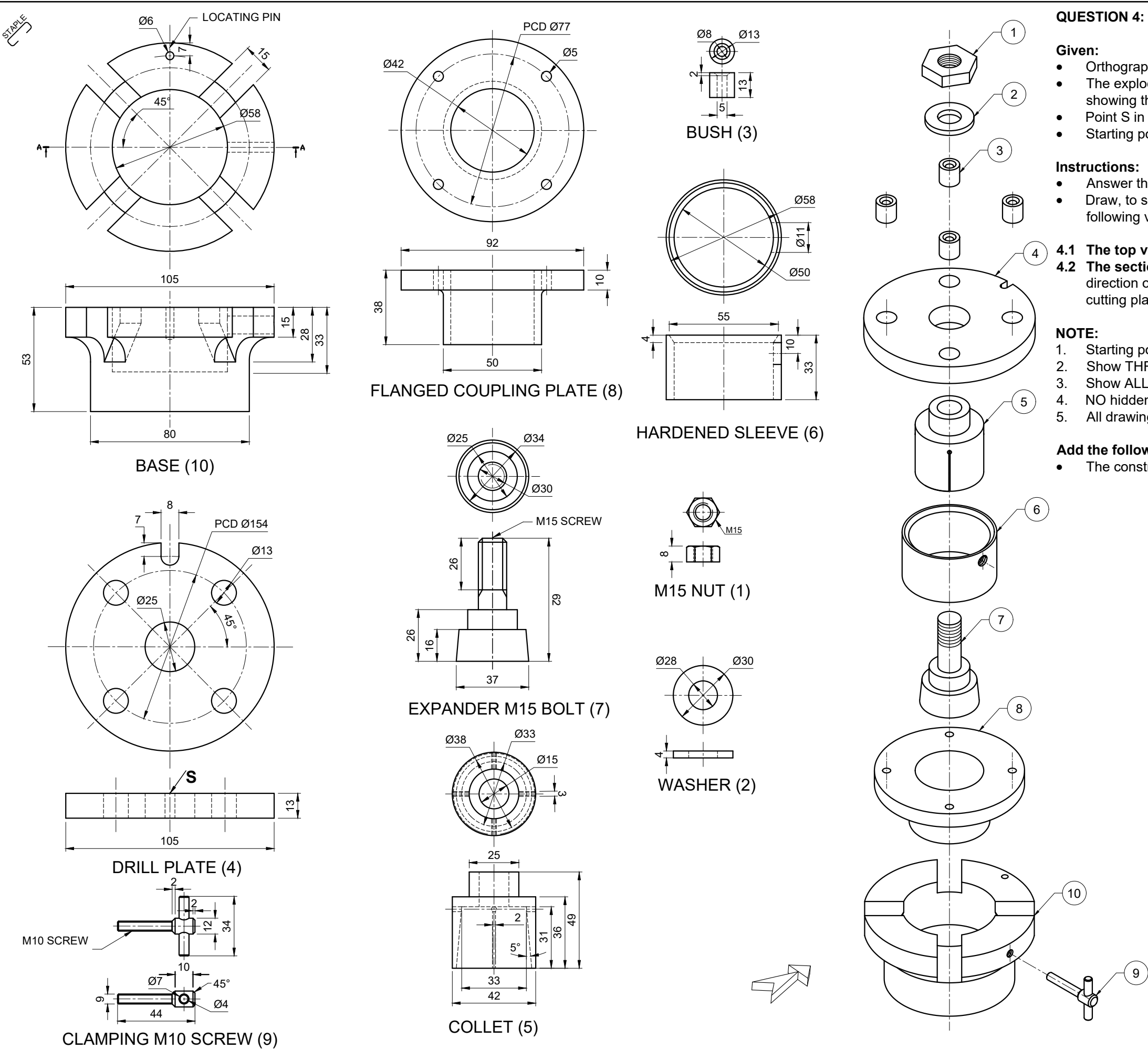
[40]



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S

ASSESSMENT CRITERIA			
1	CONSTR' + PLACEMENT	2 ¹ ₂	
2	ISO'- + NON ISO' LINES	27 ¹ ₂	
3	HEXAGON	5	
4	HALF CIRCLES + CL'S	5	
TOTAL		40	

NAME	
NAME	4



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- Orthographic views of each of the parts of the drilling jig.
 - The exploded isometric drawing of the parts of a drilling jig assembly, showing the position of each part relative to the others.
 - Point S in the front view of the drill plate.
 - Starting point S on the answer sheet, page 6.

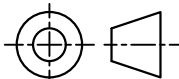
- Instructions:**
- Answer this question on page 6.
 - Draw, to scale 1 : 1 and in third angle orthographic projection, the following views of the assembled parts of the drilling jig.

- 4.1 The top view.**
4.2 The sectional front view, on cutting plane A-A, as seen from the direction of the arrow shown on the exploded isometric drawing. The cutting plane is shown on the top view of the base (part 10).

- NOTE:**
1. Starting point S is indicated on the front view of the drill plate (part 4).
 2. Show THREE faces of the M15 nut in the sectional front view.
 3. Show ALL construction.
 4. NO hidden detail is required.
 5. All drawings must comply with the guidelines contained in SANS 10111.

- Add the following features on the drawing:**
- The construction method for the M15 nut.

[91]

TITLE: <div>DRILLING JIG</div>		
PORTFOMATION INC.		1 SUPIRO RD. BUPIROBAN 9347 ☎ 045 730 5801
ALL DIMENSIONS ARE IN MILLIMETRES,		
ALL UNSPECIFIED RADII ARE R3,		
LIST OF PARTS		
PART	MATERIAL	QUANTITY
1. M15 NUT	MILD STEEL	1
2. WASHER	MILD STEEL	1
3. BUSH	MILD STEEL	4
4. DRILL PLATE	ALUMINUM	1
5. COLLET	STAINLESS STEEL	1
6. HARDENED SLEEVE	BRONZE	1
7. EXPANDER M15 BOLT	MILD STEEL	1
8. FLANGED COUPLING PLATE	STAINLESS STEEL	1
9. CLAMPING M10 SCREW	STAINLESS STEEL	1
10. BASE	STAINLESS STEEL	1

STABLE



PENALTIES			ASSESSMENT CRITERIA		
1	WRONG SCALE		TOP VIEW		
2	PARTS NOT ASSEMBLED		1	DRILL PLATE & BUSH	8
3	WRONG HATCHING		2	BASE & FLANGED COUPLING PLATE	1
TOTAL PENALTIES (-)			3	WASHER & NUT	5
			4	CLAMPING SCREW	5
			5	SECTION A - A	3
			SUB-TOTAL		22
			SECTIONAL FRONT VIEW		
			1	EXPANDER M15 BOLT	10½
			2	M15 NUT & WASHER	6½
			3	DRILL PLATE	4½
			4	FLANGED COUPLING PLATE	5½
			5	COLLET	6
			6	HARDENED SLEEVE	5½
			7	BASE	7½
			8	M10 CLAMPING SCREW	11½
			SUB-TOTAL		57½
			GENERAL		
			1	CENTRE LINES	3
			2	ASSEMBLY	9
			SUB-TOTAL		12
			TOTAL		91½
			PENALTIES (-)		
			TOTAL		91½

NAME	
NAME	6