



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2025

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

Barcode label

DO NOT FOLD THE QUESTION PAPER IN HALF.

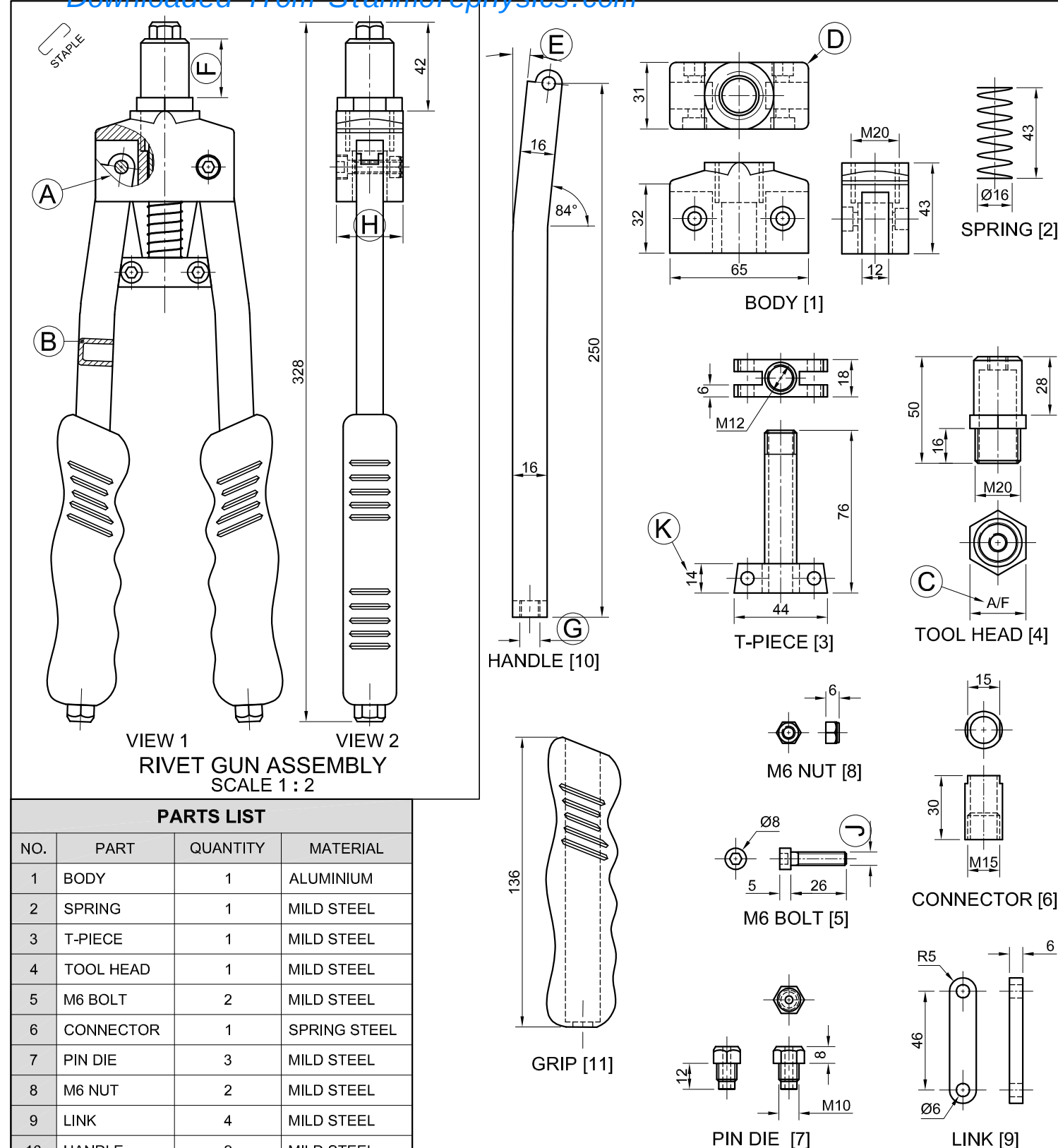
INSTRUCTIONS AND INFORMATION

- 1. This question paper consists of FOUR questions.
- 2. Answer ALL the questions.
- 3. ALL drawings are in third-angle orthographic projection, unless otherwise stated.
- 4. ALL drawings must be prepared using pencil and instruments, unless otherwise stated.
- 5. ALL answers must be drawn accurately and neatly.
- 6. ALL the questions must be answered on the QUESTION PAPER, as instructed.
- 7. ALL the pages, irrespective of whether the question was attempted or not, must be re-stapled in numerical sequence in the TOP LEFT-HAND CORNER ONLY.
- 8. Time management is essential in order to complete all the questions.
- 9. Print your examination number in the block provided on every page.
- 10. Any details or dimensions not given must be assumed in good proportion.

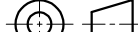
FOR OFFICIAL USE ONLY															
QUESTION	MARKS OBTAINED			$\frac{1}{2}$	SIGN	MODERATED			$\frac{1}{2}$	SIGN	RE-MARKING			$\frac{1}{2}$	SIGN
1															
2															
3															
4															
TOTAL															
	2	0	0			2	0	0			2	0	0		

FINAL CONVERTED MARK	CHECKED BY
100	

COMPLETE THE FOLLOWING:
CENTRE NUMBER
CENTRE NUMBER
EXAMINATION NUMBER
EXAMINATION NUMBER



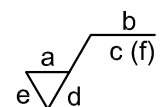
PARTS LIST			
NO.	PART	QUANTITY	MATERIAL
1	BODY	1	ALUMINIUM
2	SPRING	1	MILD STEEL
3	T-PIECE	1	MILD STEEL
4	TOOL HEAD	1	MILD STEEL
5	M6 BOLT	2	MILD STEEL
6	CONNECTOR	1	SPRING STEEL
7	PIN DIE	3	MILD STEEL
8	M6 NUT	2	MILD STEEL
9	LINK	4	MILD STEEL
10	HANDLE	2	MILD STEEL
11	GRIP	2	PLASTIC

FILE NAME: JJ-14213	QUANTITY: 75 RIVET GUNS	ALL UNSPECIFIED RADII ARE 3 mm.	TOLERANCE: +0,35 -0,25
DRAWING No. R0722	SCALE 1 : 2		
COMMISSIONED BY: CUSTOM CONTAINERS	DRAWING PROGRAMME: AUTOCAD 2024	ALL DIMENSIONS ARE IN MILLIMETRES.	
PRO-DRAUGHTSMEN CC 65 CHARLES ROAD, INDUSTRIA 6584 www.prodraw.co.za  099 050 6167		DRAWN: TOBIAS	DATE: 03-07-2025
		CHECKED: THOMAS	DATE: 23-07-2025
TITLE: RIVET GUN		APPROVED: KELLY	DATE: 13-08-2025

QUESTION 17:



QUESTION 18:



QUESTION 1: ANALYTICAL (MECHANICAL)

Given:

Two views of the assembled parts of a rivet gun assembly, detailed views of the parts of the assembly, a parts list, a title block and a table of questions. The drawings are not presented to the indicated scale.

Instructions:

Complete the table below by neatly answering the questions, which refer to the accompanying drawings, title block and mechanical content. [30]

[30]

QUESTIONS		ANSWERS		
1	What is the file name?		1	
2	Who checked the drawing?		1	
3	What is the name of the client?		1	
4	What program has been used to prepare the drawing?		1	
5	What is the website of the draughting company?		1	
6	What projection system is indicated by the projection symbol?		1	
7	How many handles must be manufactured to complete the order?		1	
8	If VIEW 1 is the front view, what will VIEW 2 be called?		1	
9	Name the type of section shown at A.		1	
10	Name the type of section shown at B.		1	
11	What does the abbreviation A/F at C stand for?		1	
12	What is the radius of the rounding at D?		1	
13	Determine the angle at E.		1	
14	Determine the complete dimensions at: F: G: H: J:		4	
15	With reference to the tolerance, determine the maximum and the minimum size of the dimension at K.	MAXIMUM:	1	
		MINIMUM:	1	
16	Calculate the height of a standard M30 nut.		1	
17	With reference to the top machining symbol in the title block (QUESTION 17), what does the symbol indicate?		1	
18	With reference to the bottom machining symbol in the title block (QUESTION 18), what do the letters 'b' and 'd' indicate?	b:	1	
		d:	1	
19	In the space below (ANSWER 19), complete, in neat freehand, FIGURE 19.2 as a sectional view of FIGURE 19.1 through the hole, with a SPOT FACE added to the hole.		4	
20	In the space below (ANSWER 20), draw, to approximately the same size in neat freehand, the SANS 10111 conventional representation of the given SPLINED SHAFT.		3	
TOTAL			30	

ANSWER 19

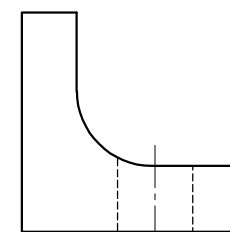


FIGURE 19.1

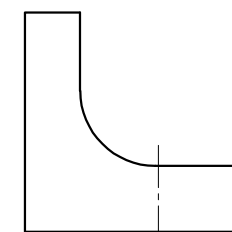
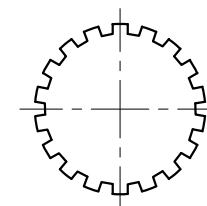


FIGURE 19.2

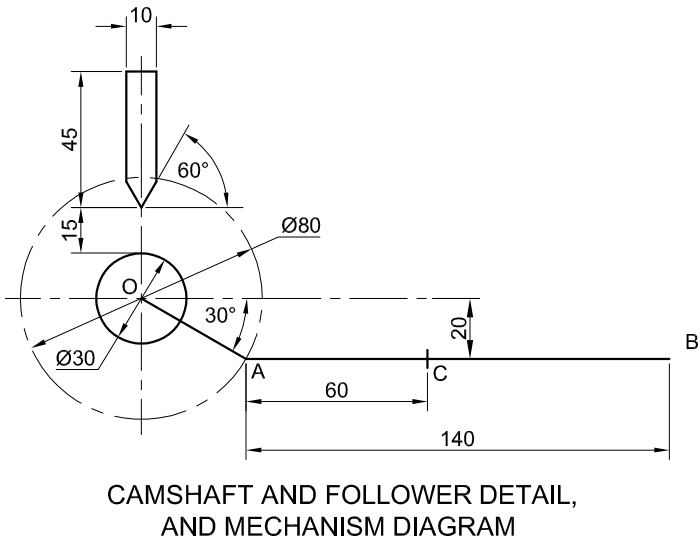
ANSWER 20



EXAMINATION NUMBER

EXAMINATION NUMBER

2



QUESTION 2: LOCI (CAM WITH A MECHANISM)

- Given:**
- The detail of a camshaft and a wedge-shaped follower at the **minimum** distance from the camshaft centre
 - Fixed to the given camshaft is a mechanism, consisting of crank OA, connecting rod AB and swivel guide C, shown as a schematic diagram
 - The position of centre point O on the drawing sheet

- Specifications of the cam:**
- The wedge-shaped follower reciprocates along the vertical centre line of the camshaft.
 - Rotation = clockwise.

- Motion of the cam:**
- The cam imparts the following motion to the wedge-shaped follower:
- It rises 25 mm over the first 75° with uniform motion.
 - It rises a further 26 mm over the next 90° with simple harmonic motion.
 - There is a dwell period for the next 15°.
 - It returns to its original position with uniform motion over the remainder of the rotation.

- Specifications of the mechanism:**
- Connecting rod AB is pin-joined to crank OA at A.
 - The position of swivel guide C is fixed.

Motion of the mechanism:

As crank OA rotates with the camshaft, connecting rod AB slides through swivel guide C.

- Instructions:**
- Using centre point O on the drawing sheet, draw, to scale 1 : 1, the given **camshaft** and **wedge-shaped follower detail** at the **minimum position**, together with the **schematic diagram** of the **mechanism**.
 - Draw, to a rotational scale of 30° = 8 mm and a displacement scale of 1 : 1, the displacement graph for the required motion of the cam.
 - Project and draw the complete cam profile from the displacement graph.
 - Show the direction of rotation of the cam profile with an arrow.
 - Indicate the rotational scale of the displacement graph.
 - Trace the locus generated by point B of the **mechanism** for ONE complete rotation of the camshaft.
 - Show ALL construction and projection.

[41]

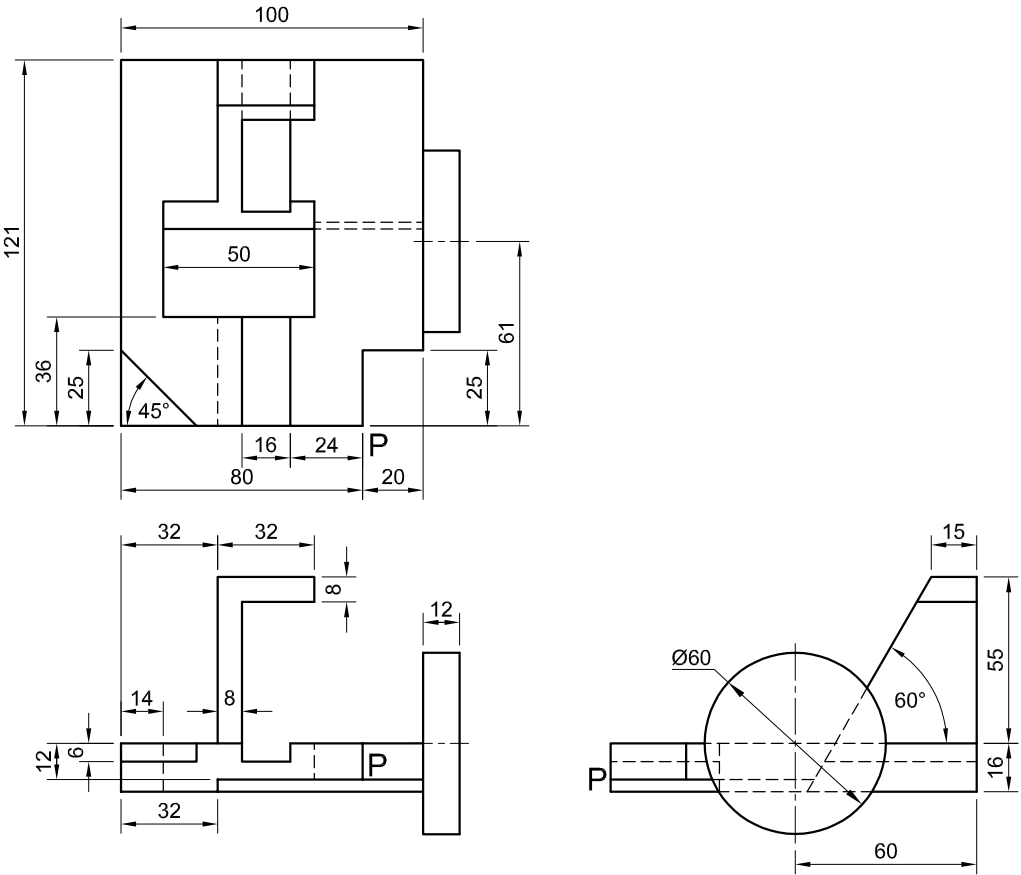
ASSESSMENT CRITERIA: CAM						ASSESSMENT CRITERIA: MECHANISM					
1	GIVEN + MINIMUM DISTANCE + CL	4 1/2				1	GIVEN	3 1/2			
2	GRAPH CONSTRUCTION	3 1/2				2	CONSTRUCTION	3			
3	PLOTTING GRAPH + GRAPH CURVES	6				3	POINTS + CURVE	7			
4	CAM CONSTRUCTION	4				PENALTIES (-)					
5	PLOTTING + CAM PROFILE	9 1/2				SUBTOTAL					
PENALTIES (-)						TOTAL					
SUBTOTAL		27 1/2				EXAMINATION NUMBER					
						EXAMINATION NUMBER					
						3					



QUESTION 3: ISOMETRIC DRAWING

- Given:**
- The front view, top view and right view of a casting
 - The position of point P on the drawing sheet

- Instructions:**
- Using scale 1 : 1, convert the orthographic views of the casting into an isometric drawing.
- Use point P as the starting point of the drawing.
 - Show ALL construction.
 - NO hidden detail is required.
- [39]



P

ASSESSMENT CRITERIA					
1	PLACING + AUX. VIEW	2			
2	FRONT PORTION	14 1/2			
3	BACK PORTION	14 1/2			
4	CIRCLES + CONSTR. + CL	8			
PENALTIES (-)					
TOTAL		39			
EXAMINATION NUMBER					
EXAMINATION NUMBER					
					4



FOR OFFICIAL USE ONLY	
INCORRECT ORTHOGRAPHIC PROJECTION	
INCORRECT OVERALL SCALE	
INCORRECT HATCHING	
PARTS NOT ASSEMBLED	
TOTAL PENALTIES (-)	

ASSESSMENT CRITERIA					
RIGHT VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	HOUSING + SYMMETRY	6			
2	COVER + SCREWS	4			
3	FLANGE COUPLING	2			
4	M16 NUT + SHAFT	4			
SUBTOTAL		16			
SECTIONAL FRONT VIEW					
1	HOUSING	10 $\frac{1}{2}$			
2	COVER	4 $\frac{1}{2}$			
3	M10 SCREW	7			
4	SPUR GEAR	9			
5	BALL BEARING	2 $\frac{1}{2}$			
6	SHAFT + KEY + BUSH	15 $\frac{1}{2}$			
7	FLANGE COUPLING	9			
8	M16 NUT	4			
SUBTOTAL		62			
GENERAL					
1	CENTRE LINES	3			
2	ASSEMBLY	9			
SUBTOTAL		12			
TOTAL		90			
PENALTIES (-)					
GRAND TOTAL					
EXAMINATION NUMBER					
EXAMINATION NUMBER					6



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MARKING GUIDELINES

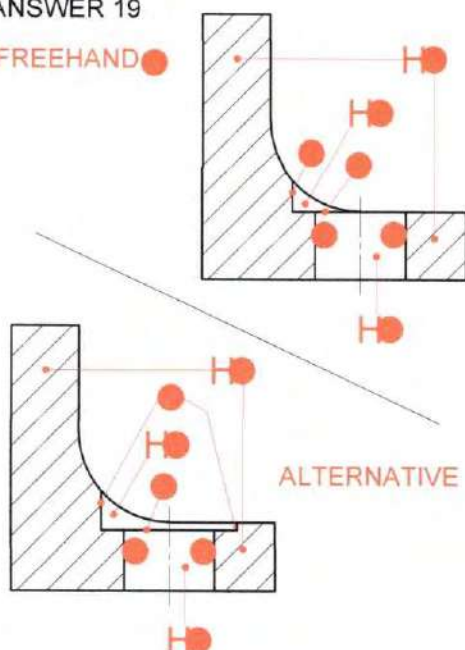
MARKS: 100

These marking guidelines consist of 7 pages.

ANSWERS					
1	JJ-14213		1		
2	THOMAS		1		
3	CUSTOM CONTAINERS		1		
4	AUTOCAD 2024		1		
5	www.prodraw.co.za		1		
6	THIRD-ANGLE ORTHOGRAPHIC PROJECTION		1		
7	150		1		
8	RIGHT VIEW		1		
9	PARTIAL		1		
10	REVOLVED		1		
11	ACROSS FLATS		1		
12	3		1		
13	6°		1		
14	F: 28	G: M10	H: 31	J: M6	4
15	MAX - 14.35				1
	MIN - 13.75				1
16	24				1
17	NO MACHINING				1
18	b: <u>PRODUCTION METHOD</u> / <u>TREATMENT</u> / <u>COATING</u> / <u>FINISH</u>				1
	d: <u>DIRECTION OF LAY</u>				1
19	See below				4
20					3
TOTAL					30

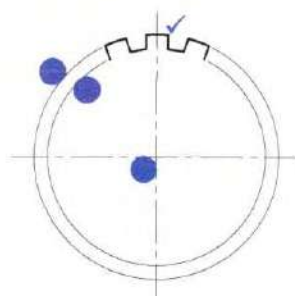
ANSWER 19

FREEHAND

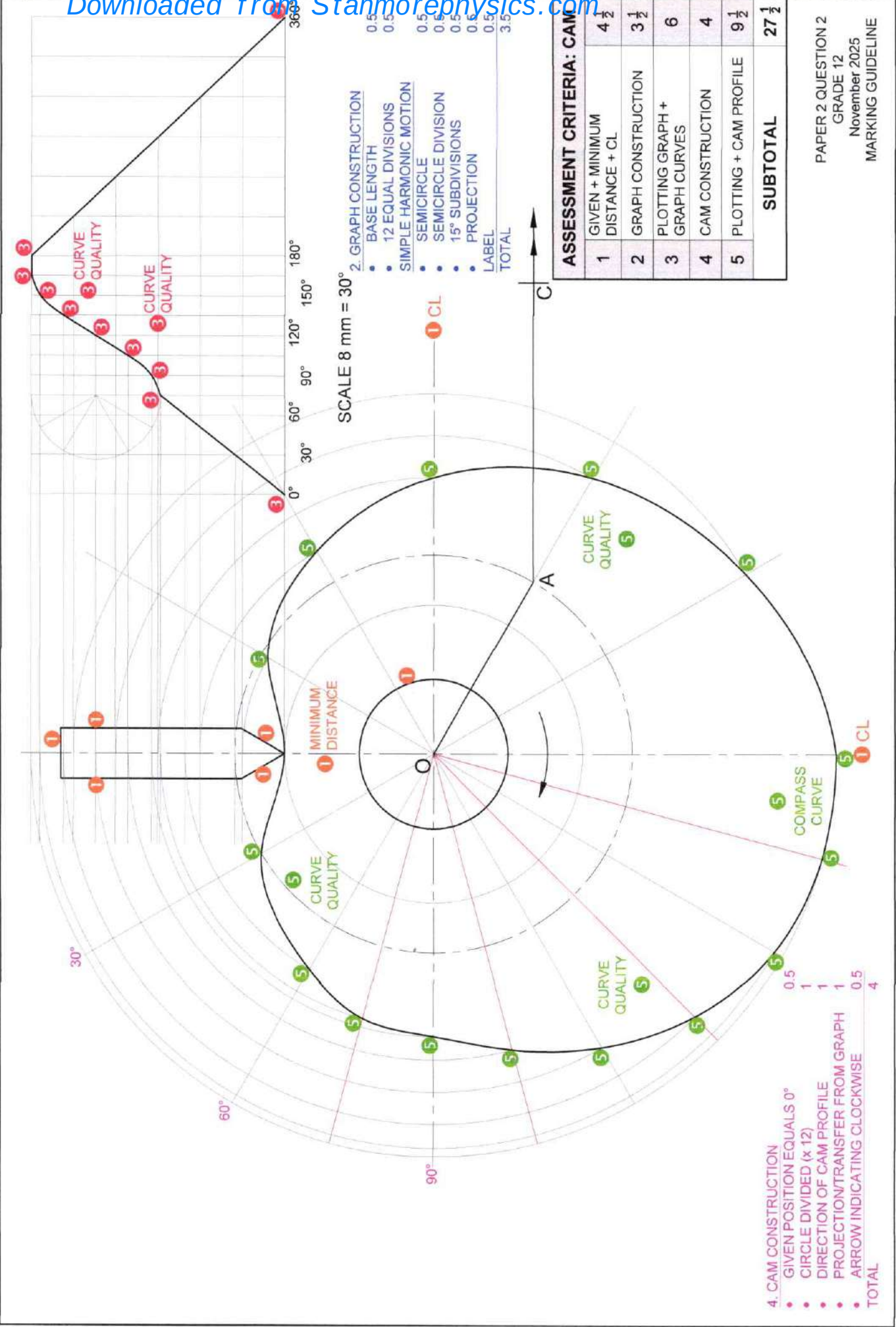


ANSWER 20

FREEHAND



PAPER 2 QUESTION 1
GRADE 12
November 2025
MARKING GUIDELINE



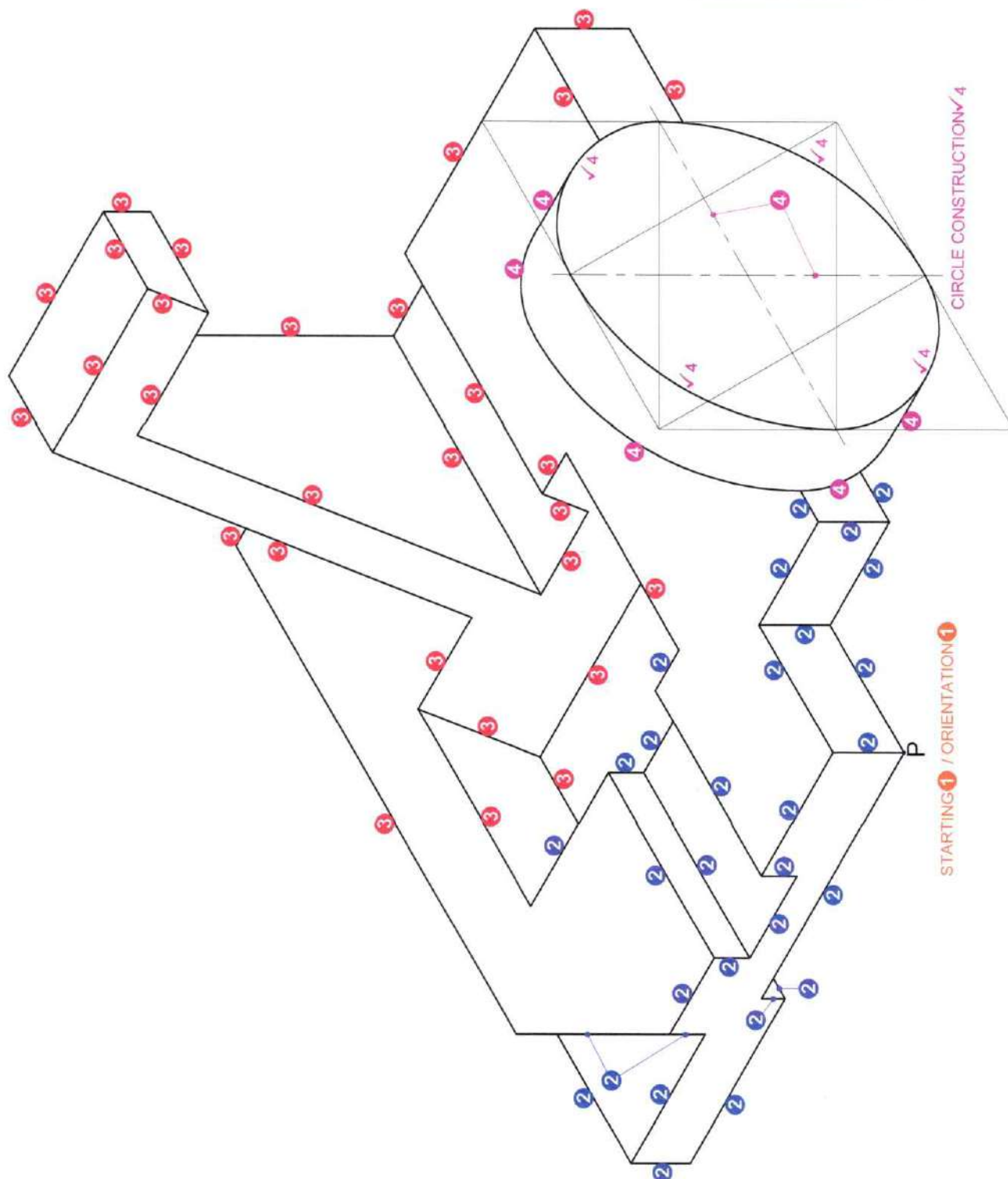


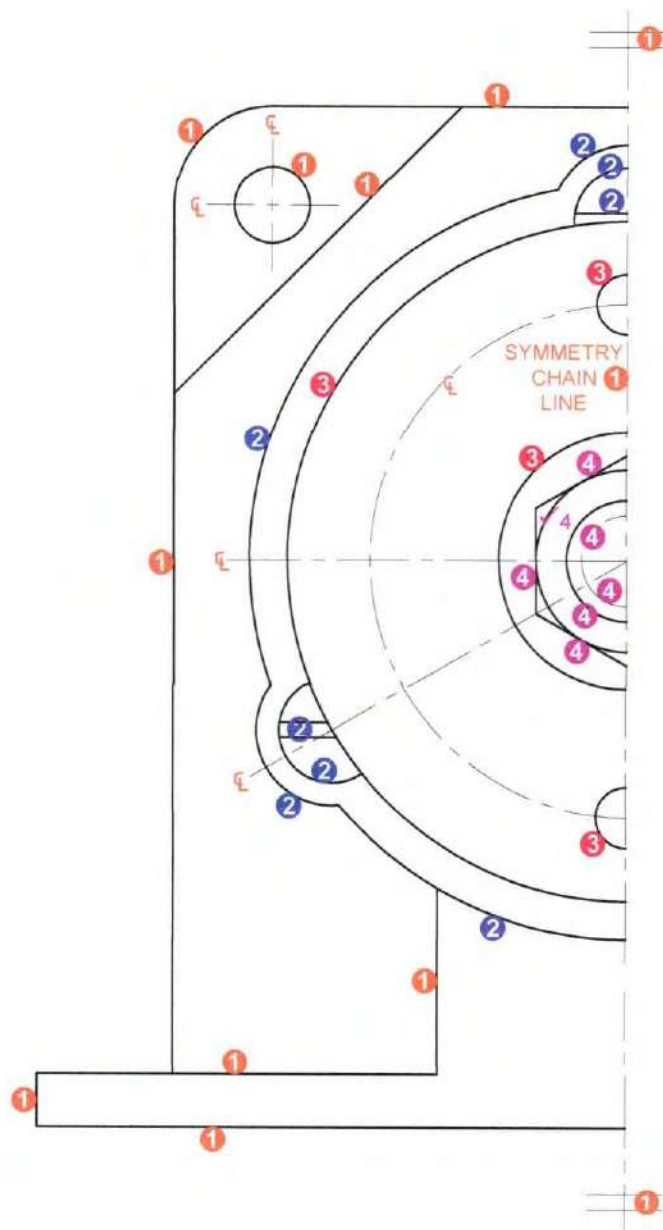
ASSESSMENT CRITERIA: MECHANISM		
1	GIVEN	$3\frac{1}{2}$
2	CONSTRUCTION	3
3	POINTS + CURVE	7
SUBTOTAL		$13\frac{1}{2}$

PAPER 2 QUESTION 2
GRADE 12
November 2025
MARKING GUIDELINE

ASSESSMENT CRITERIA			
1	PLACING + AUX. VIEW	2	
2	FRONT PORTION	14 $\frac{1}{2}$	
3	BACK PORTION	14 $\frac{1}{2}$	
4	CIRCLES + CONSTR. + CL	8	
TOTAL		39	

PAPER 2 QUESTION 3
GRADE 12
November 2025
MARKING GUIDELINE





1. CENTRE LINES (CL)

SANS COMPLIANT

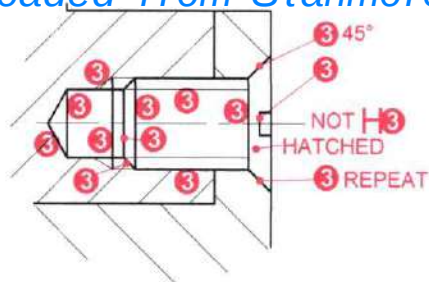
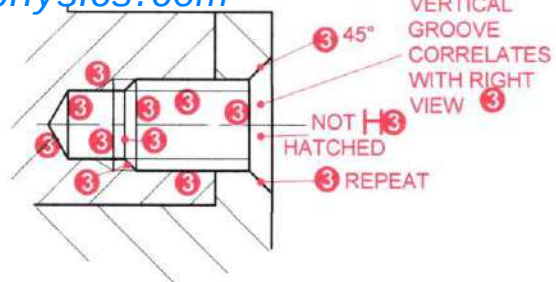
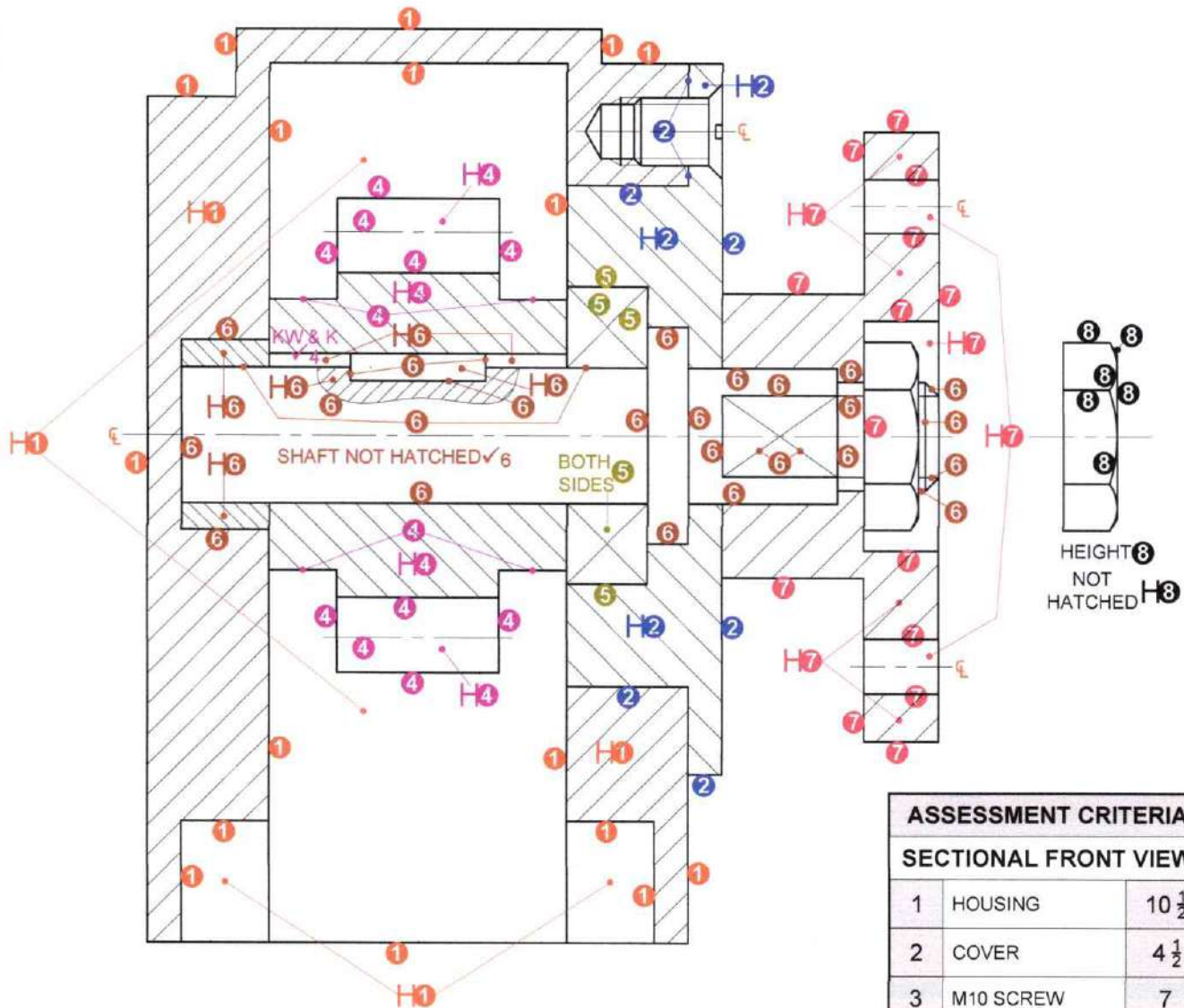
CENTRE LINES (1 - 3 = 0,5; 4 - 5 = 1; 6 - 7 = 1,5; 8 - 9 = 2) $\frac{1}{2}$ $\frac{2}{3}$

ASSESSMENT CRITERIA

RIGHT VIEW

1	HOUSING + SYMMETRY	6
2	COVER + SCREWS	4
3	FLANGE COUPLING	2
4	M16 NUT + SHAFT	4
SUBTOTAL		16

PAPER 2 QUESTION 4
GRADE 12
November 2025
MARKING GUIDELINE

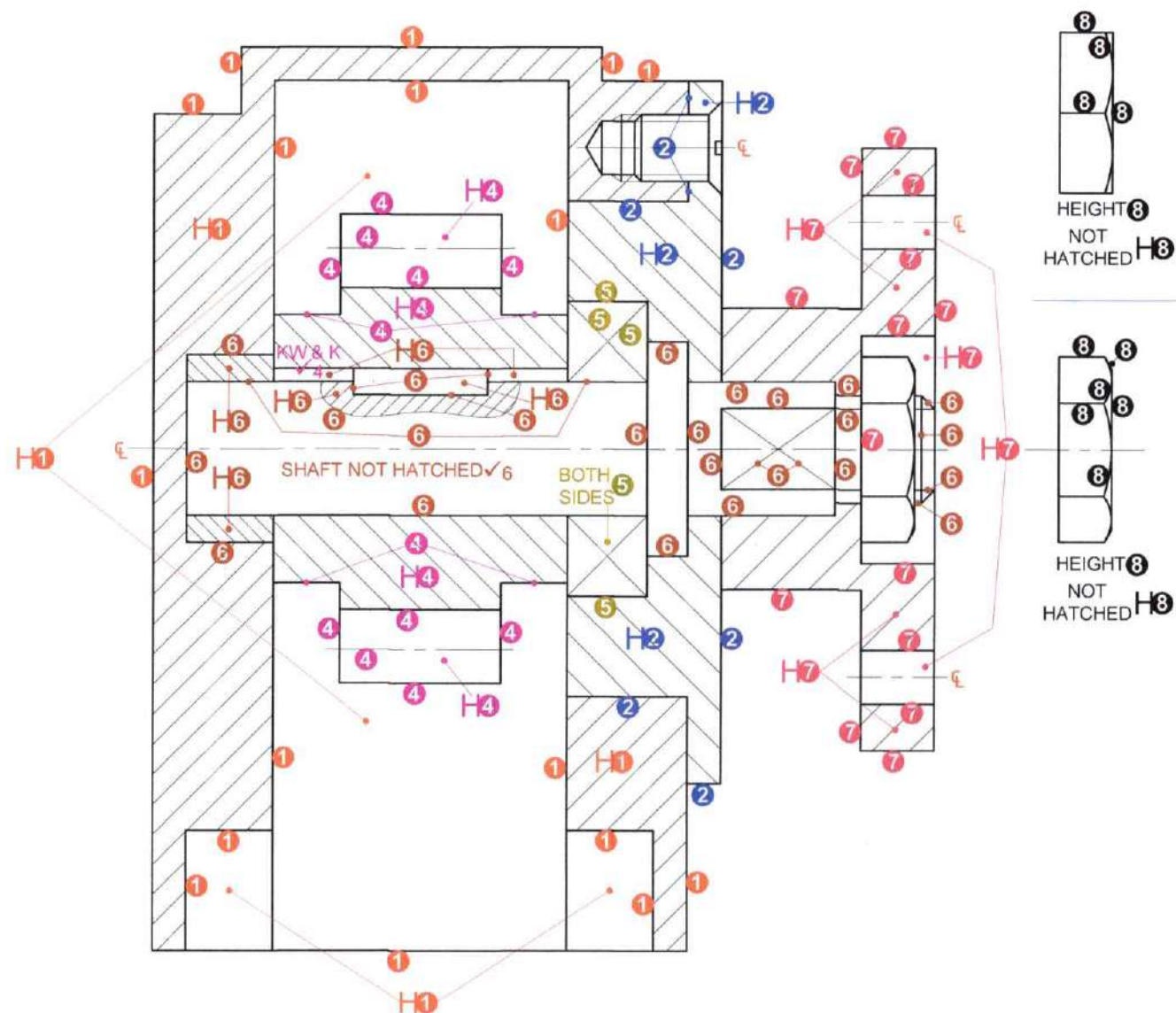
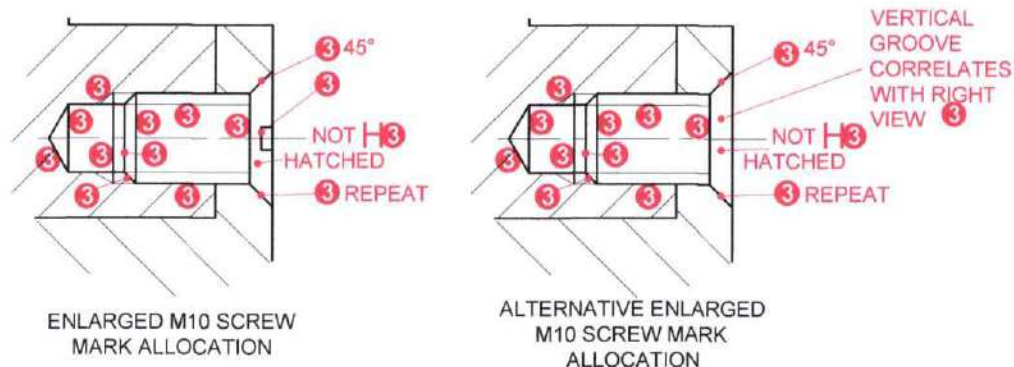
ENLARGED M10 SCREW
MARK ALLOCATIONALTERNATIVE ENLARGED
M10 SCREW MARK
ALLOCATION

2. ASSEMBLY
1 MARK FOR EVERY PART CORRECTLY ASSEMBLED
(10 PARTS - 1) = 9

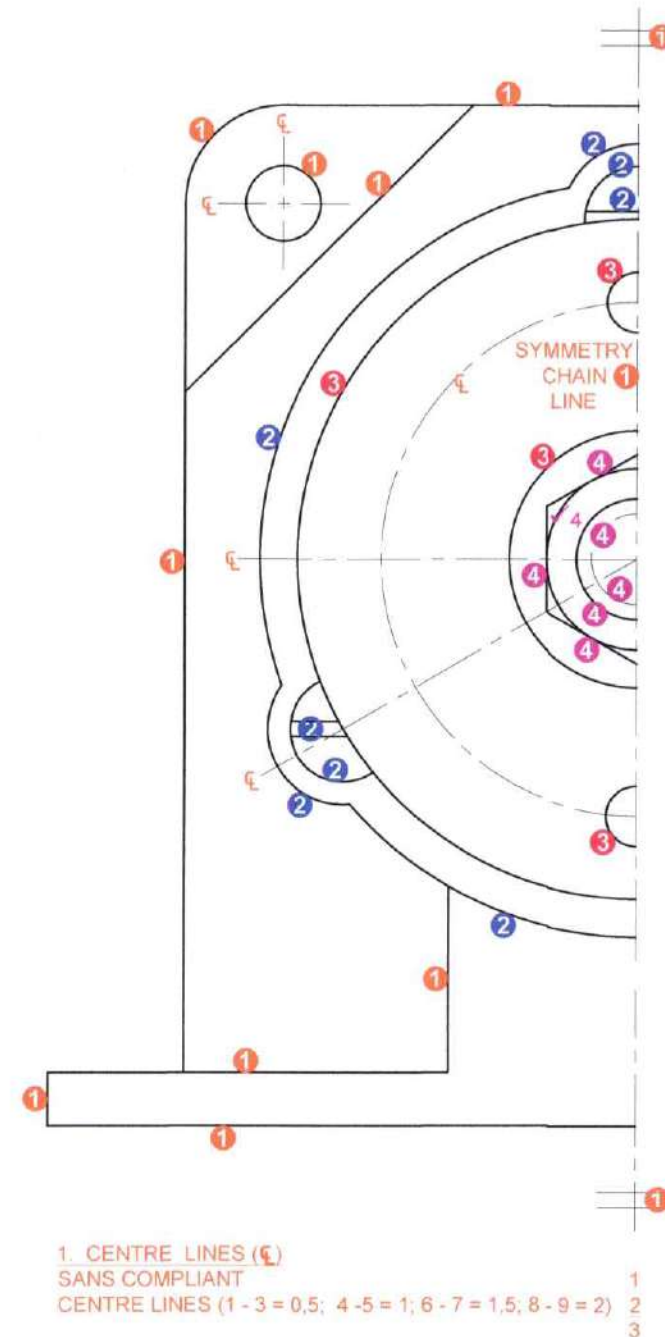
ASSESSMENT CRITERIA**SECTIONAL FRONT VIEW**

1	HOUSING	10 $\frac{1}{2}$
2	COVER	4 $\frac{1}{2}$
3	M10 SCREW	7
4	SPUR GEAR	9
5	BALL BEARING	2 $\frac{1}{2}$
6	SHAFT + KEY + BUSH	15 $\frac{1}{2}$
7	FLANGE COUPLING	9
8	M16 NUT	4
SUBTOTAL		62

PAPER 2 QUESTION 4
GRADE 12
November 2025
MARKING GUIDELINE



2. ASSEMBLY
1 MARK FOR EVERY PART CORRECTLY ASSEMBLED
(10 PARTS - 1) = 9



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INCORRECT OVERALL SCALE	
INCORRECT HATCHING	
PARTS NOT ASSEMBLED	
TOTAL PENALTIES (-)	

ASSESSMENT CRITERIA					
RIGHT VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	HOUSING + SYMMETRY	6			
2	COVER + SCREWS	4			
3	FLANGE COUPLING	2			
4	M16 NUT + SHAFT	4			
SUBTOTAL		16			
SECTIONAL FRONT VIEW					
1	HOUSING	10 $\frac{1}{2}$			
2	COVER	4 $\frac{1}{2}$			
3	M10 SCREW	7			
4	SPUR GEAR	9			
5	BALL BEARING	2 $\frac{1}{2}$			
6	SHAFT + KEY + BUSH	15 $\frac{1}{2}$			
7	FLANGE COUPLING	9			
8	M16 NUT	4			
SUBTOTAL		62			
GENERAL					
1	CENTRE LINES	3			
2	ASSEMBLY	9			
SUBTOTAL		12			
TOTAL		90			
PENALTIES (-)					
GRAND TOTAL					