



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
1											
2											
3											
4											
TOTAL											
	2	0	0			2	0	0			2 0 0

FINAL CONVERTED MARK

100

CHECKED BY

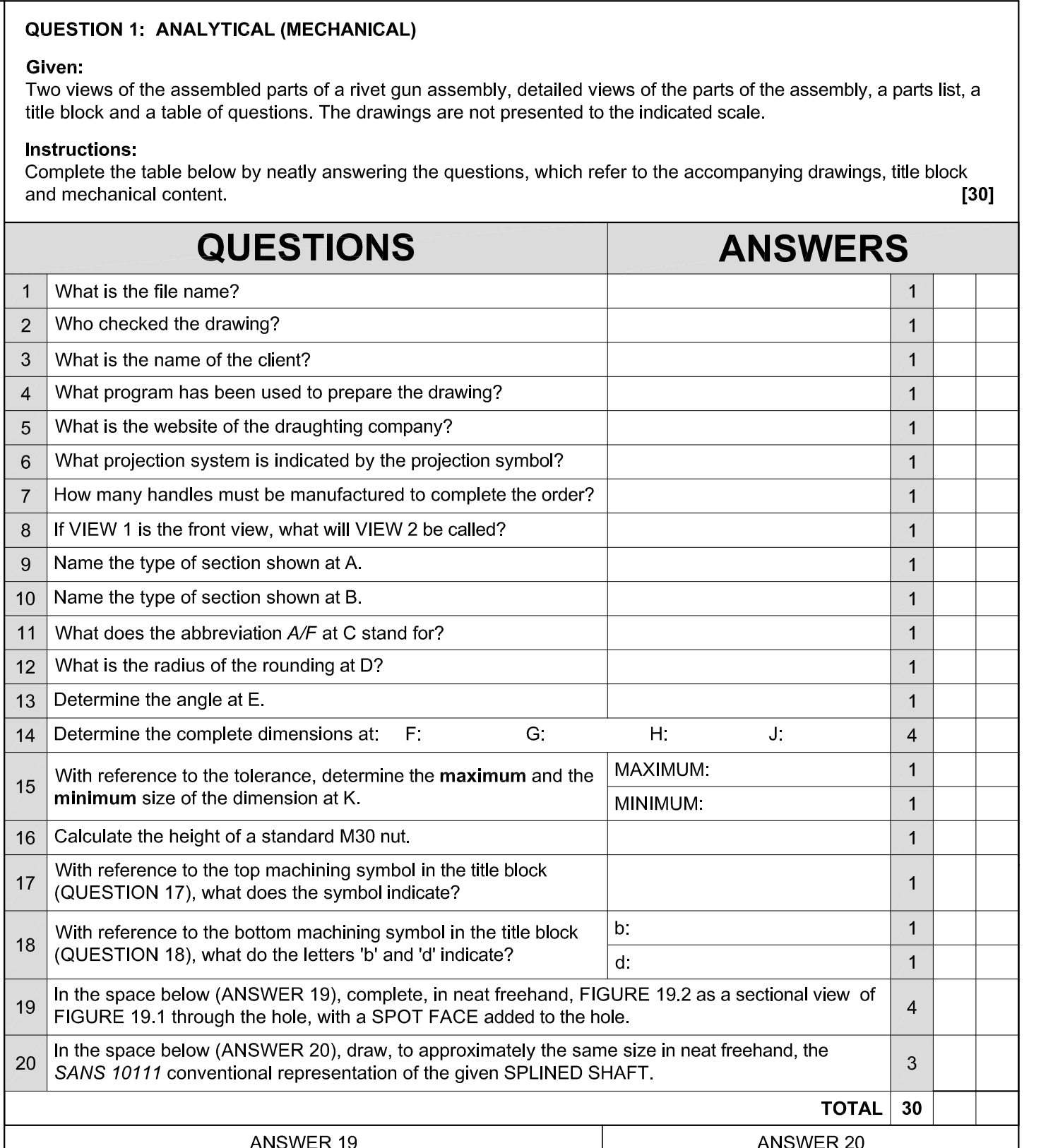
COMPLETE THE FOLLOWING:

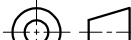
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CENTRE NUMBER

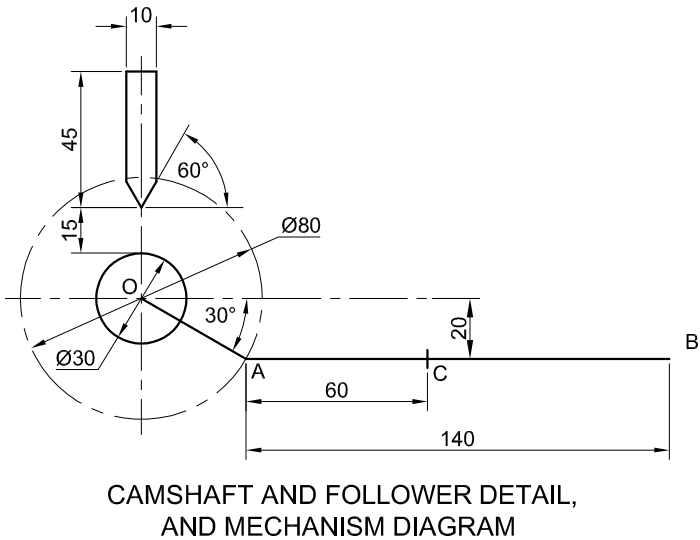
EXAMINATION NUMBER

EXAMINATION NUMBER



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

Please turn over



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.

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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					
											3



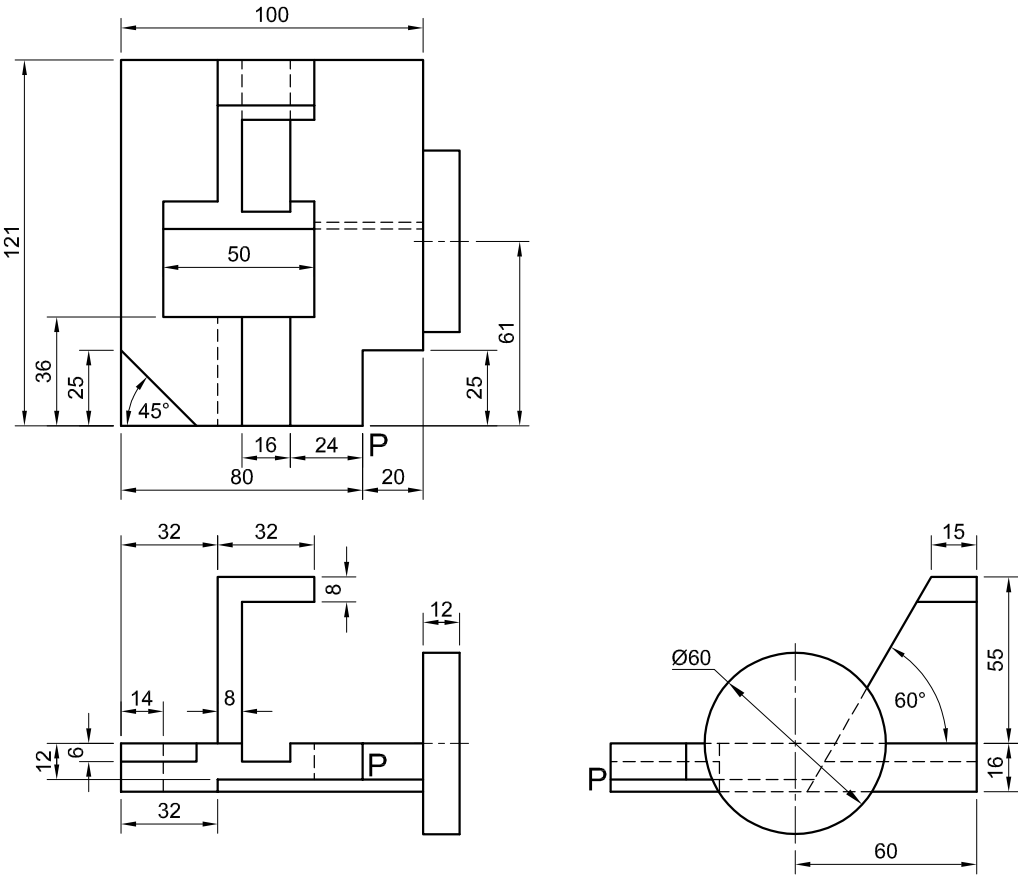
QUESTION 3: ISOMETRIC DRAWING

- 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.

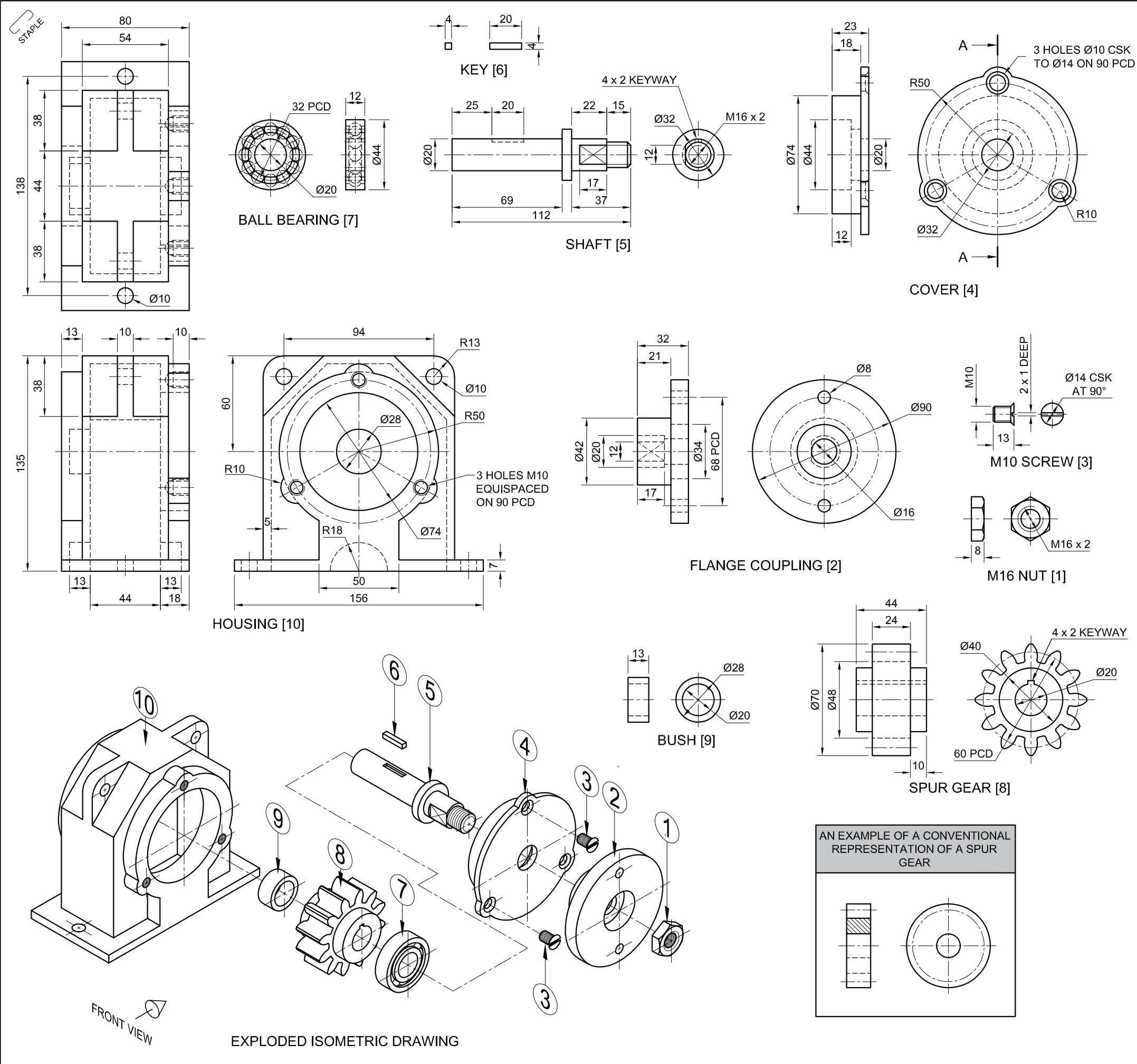
- Use point P as the starting point of the drawing.
- Show ALL construction.
- NO hidden detail is required.

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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



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- The exploded isometric drawing of the parts of a gearbox assembly, showing the position of each part relative to all the others
 - Orthographic views of each of the parts of the gearbox assembly
 - An example of a conventional representation of a spur gear

- 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 gearbox assembly:
 - 4.1 **A sectional front view** on cutting plane A-A, as seen from the direction of the arrow on the exploded isometric drawing. The cutting plane is shown on the right view of the cover (part 4).
 - 4.2 **ONLY** the left half of the **right view**, by applying the convention of symmetry

- NOTE:**
- Planning is essential.
 - The drawing must comply with the *SANS 10111* guidelines.
 - Show **THREE** faces of the M16 nut (part 1) in the sectional front view.
 - Draw the ball bearing (part 7) and the spur gear (part 8) as conventional representations in the sectional front view.
 - **NO** hidden detail is required.

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PARTS LIST			
PART		QUANTITY	MATERIAL
1	M16 NUT	1	MILD STEEL
2	FLANGE COUPLING	1	CAST IRON
3	M10 SCREW	3	MILD STEEL
4	COVER	1	MILD STEEL
5	SHAFT	1	CAST IRON
6	KEY	1	MILD STEEL
7	BALL BEARING	1	MILD STEEL
8	SPUR GEAR	1	CAST IRON
9	BUSH	1	BRASS
10	HOUSING	1	CAST IRON

WHS
DRAUGHTING

21 NORTH STREET
KLERKSDORP
www.hjc-draught.co.za
062 431 5690

GEARBOX

ALL DIMENSIONS ARE IN MILLIMETRES.

5



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 ¹ / ₂			
2	COVER	4 ¹ / ₂			
3	M10 SCREW	7			
4	SPUR GEAR	9			
5	BALL BEARING	2 ¹ / ₂			
6	SHAFT + KEY + BUSH	15 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