

STAPLE



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

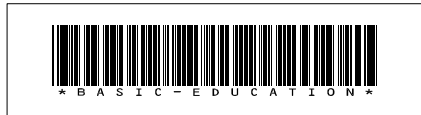
ENGINEERING GRAPHICS AND DESIGN P2
NOVEMBER 2018

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

Barcode label



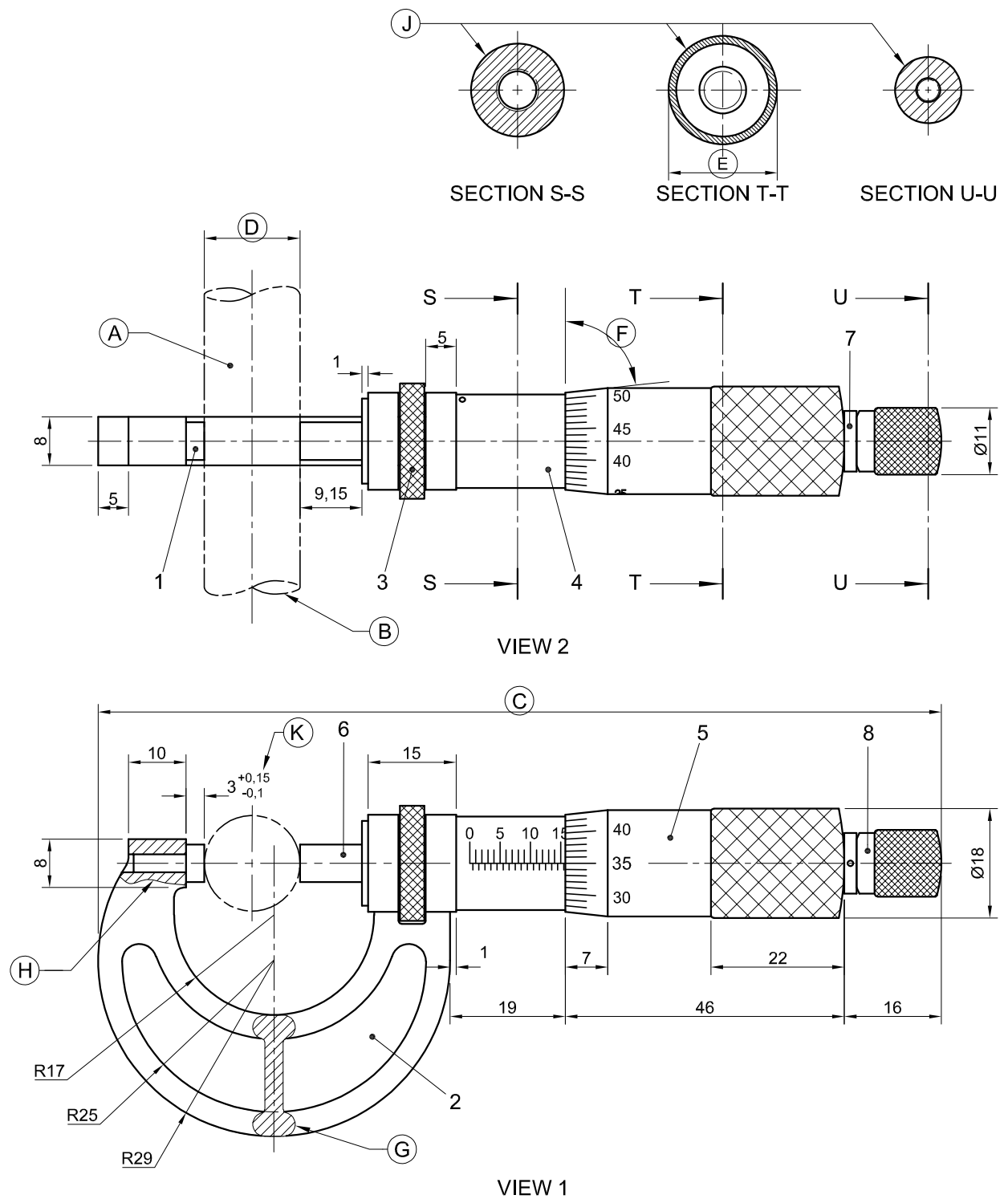
INSTRUCTIONS AND INFORMATION

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



QUESTION 1: ANALYTICAL (MECHANICAL)

Given:

The front view and top view of a micrometer, sections, a parts list, a title block and a table of questions. The drawing has not been prepared to the indicated scale.

Instructions:

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

QUESTIONS		ANSWERS	
1	Who prepared the drawing?	1	
2	On what date was the drawing checked?	1	
3	What was Siyabongi's responsibility?	1	
4	What is the drawing number?	1	
5	What material is used to manufacture the anvil?	1	
6	How many parts make up this micrometer?	1	
7	At what temperature will the micrometer be accurate?	1	
8	What is the maximum size that this micrometer can measure?	1	
9	Why is the shaft at A drawn as a phantom line (double chain line)?	1	
10	What does the S-break at B indicate?	1	
11	Give TWO uses of chain lines on mechanical drawings.	2	
12	How many surfaces on this micrometer are knurled?	1	
13	What is VIEW 1 called?	1	
14	Determine the complete dimensions at: C: D: E:	5	
15	Measure the angle at F.	1	
16	Name the type of section at G.	1	
17	Name the type of section at H.	1	
18	Name the type of section at J.	2	
19	With reference to the tolerance at K, determine the minimum dimension.	2	
20	In the space below (ANSWER 20), draw, in neat freehand, the symbol for the projection system used.	4	
TOTAL		30	

PARTS LIST			DRAWING PROGRAM: AUTOCAD 2018	SCALE 1 : 1
PART	QUANTITY	MATERIAL	DIMENSIONS ARE ACCURATE AT 20 °C	DRAWING NUMBER MC 25-V2018
1 ANVIL	1	TUNGSTEN	ACCURACY: 1 TURN OF THE OUTER SLEEVE = 0,5 mm	
2 FRAME	1	CAST IRON	MEASUREMENT RANGE: MINIMUM = 0,01 & MAXIMUM = 25,00	
3 SPINDLE LOCKNUT	1	TOOL STEEL	APPROVED: SIYABONGI	DATE: 2018-02-28
4 INNER SLEEVE	1	TOOL STEEL	CHECKED: JACQUES	DATE: 2018-02-10
5 OUTER SLEEVE	1	TOOL STEEL	DRAWN: WENDY	DATE: 2018-01-08
6 SPINDLE	1	SILVER STEEL	TITLE MICROMETER	
7 SCREW	1	TOOL STEEL		
8 RATCHET	1	TOOL STEEL		

ANSWER 20: Projection symbol



EXAMINATION NUMBER	
EXAMINATION NUMBER	2





QUESTION 2: LOCI

NOTE: Answer QUESTIONS 2.1 and 2.2.

2.1 CAM

Motion:

A cam rotates at constant velocity imparting the following motion to a follower:

- It rises with uniform motion for 21 mm over the first 60°.
- There is a dwell period for the next 75°.
- It rises with uniform motion for a further 43 mm over the next 45°.
- It descends with simple harmonic motion back to the original position over the rest of the rotation.

Instructions:

- Draw, to a rotational (horizontal) scale of 360° = 114 mm and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
- Label the displacement graph and include the scale.

Show ALL construction.

[11]

ASSESSMENT CRITERIA 2.1			
1	CONSTRUCTION	4	
2	POINTS + CURVE	6	
3	LABELS	1	
PENALTIES (-)			
SUBTOTAL		11	

2.2 MECHANISM

Given:

- A schematic drawing of a mechanism consisting of crank OA, sliding rod AB, rod CD, horizontal groove FG and swivel guide E
- The position of centre point O on the drawing sheet

Specifications:

- The positions of centre point O, swivel guide E and groove FG are fixed
- Sliding rod AB is pin-jointed to crank OA at A
- Rod CD is pin-jointed to sliding rod AB at C
- CD = 90 mm

Motion:

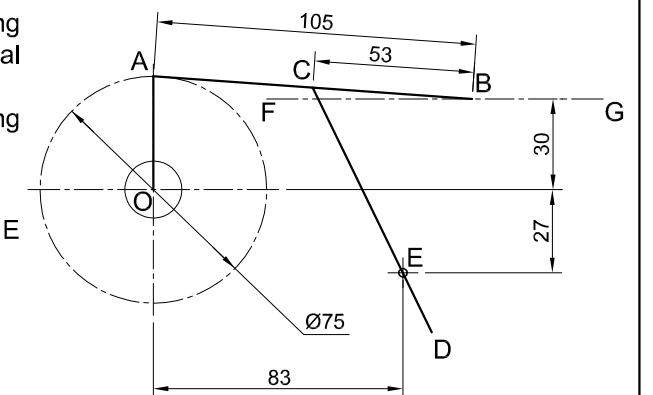
As crank OA rotates in a clockwise direction, point B, of sliding rod AB, reciprocates along groove FG, and rod CD slides through swivel guide E.

Instructions:

- Draw, to scale 1 : 1, the given schematic drawing of the mechanism.
- Trace the loci generated by point C and by point D for ONE complete rotation of crank OA.

Show ALL construction.

[25]



ASSESSMENT CRITERIA 2.2			
1	GIVEN	6	
2	CONSTRUCTION	5	
3	POINTS + CURVE	14	
PENALTIES (-)			
2.2 SUBTOTAL		25	
2.1 SUBTOTAL		11	
TOTAL		36	

EXAMINATION NUMBER	
EXAMINATION NUMBER	3

O+





QUESTION 3: ISOMETRIC DRAWING

Given:

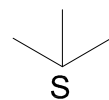
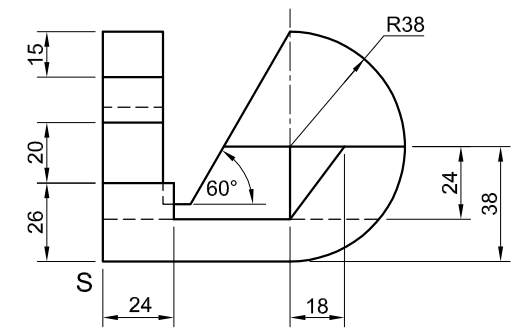
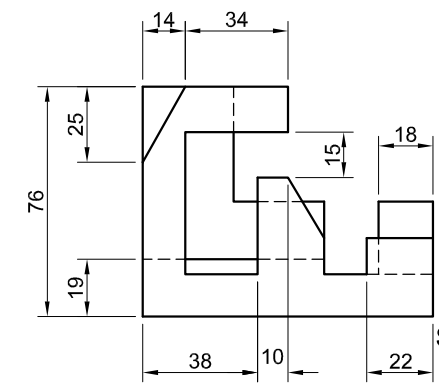
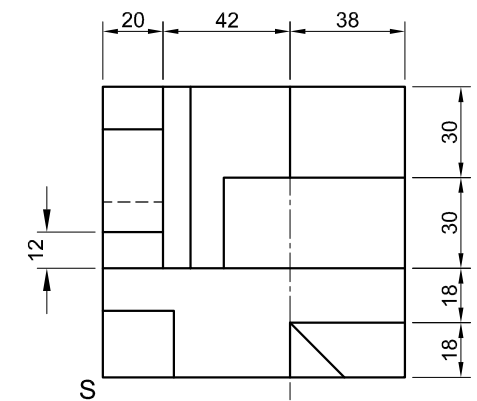
- The front view, top view and left view of a bracket
- The position of point S on the drawing sheet

Instructions:

Using scale 1 : 1, convert the orthographic views of the bracket into an isometric drawing.

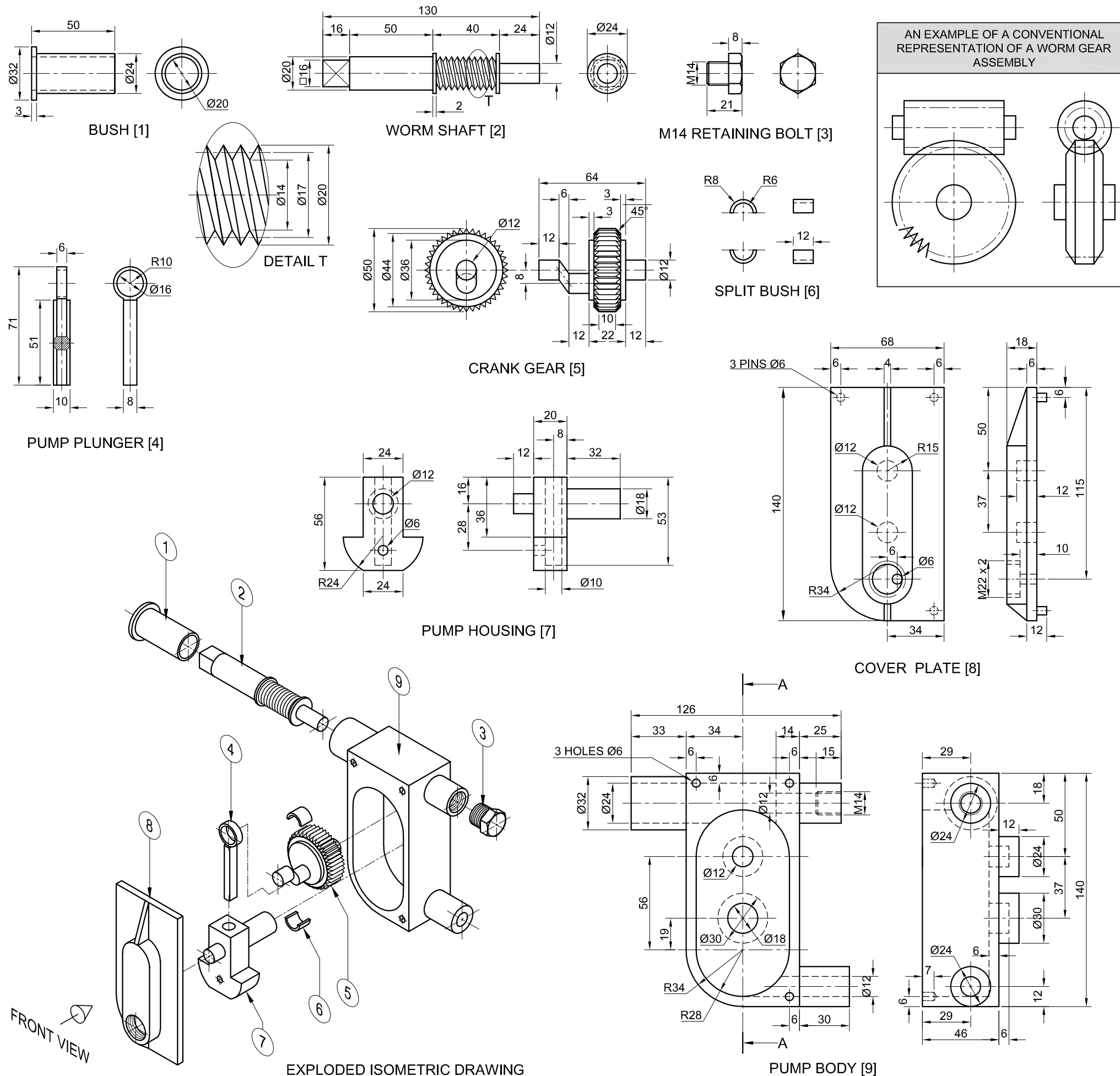
- Make S the lowest point of the drawing.
- Show ALL construction.
- NO hidden detail is required.

[38]



ASSESSMENT CRITERIA			
1	PLACEMENT + AUX. VIEW	2	
2	FRONT PORTION	22½	
3	BACK PORTION	5	
4	CIRCLE + CIRCLE CONSTRUCTION + CL	8½	
PENALTIES (-)			
TOTAL		38	
EXAMINATION NUMBER			
EXAMINATION NUMBER			4





QUESTION 4: MECHANICAL ASSEMBLY

Given:

- The exploded isometric drawing of the parts of an oil pump assembly, showing the position of each part relative to all the others
- Orthographic views of each of the parts of the oil pump assembly
- An example of a conventional representation of a worm gear assembly.

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 oil pump assembly:
 - 4.1 **The front view** as seen from the direction of the arrow shown on the exploded isometric drawing.
 - 4.2 **A sectional right view** on cutting plane A-A. The cutting plane, which passes vertically through the oil pump assembly, is shown on the front view of the pump body (part 9).

NOTE:

- Planning is essential.
- The drawing must comply with the guidelines as contained in the SANS 10111.
- Show THREE faces of the M14 retaining bolt (part 3) in the front view.
- Draw a conventional representation of the worm gear assembly in the sectional right view.
- Add cutting plane A-A.
- NO hidden detail is required.

[96]

PARTS LIST

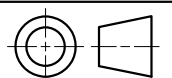
PARTS	QUANTITY	MATERIAL
1 BUSH	1	BRONZE
2 WORM SHAFT	1	EN 8
3 M14 RETAINING BOLT	1	BRASS
4 PUMP PLUNGER	1	BRASS
5 CRANK GEAR	1	EN 19
6 SPLIT BUSH	2	BRONZE
7 PUMP HOUSING	1	BRASS
8 COVER PLATE	1	MILD STEEL
9 PUMP BODY	1	STAINLESS STEEL

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OIL PUMP

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					
FRONT VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	COVER PLATE	8			
2	PUMP BODY + BUSH	5			
3	WORM SHAFT	2 ½			
4	M14 RETAINING BOLT	4 ½			
SUBTOTAL		20			
SECTIONAL RIGHT VIEW					
1	COVER PLATE	11 ½			
2	PUMP BODY	11 ½			
3	CRANK GEAR + SHAFT	17			
4	PUMP PLUNGER	7			
5	SPLIT BUSH	3			
6	PUMP HOUSING	10			
SUBTOTAL		60			
GENERAL					
1	CENTRE LINES	4			
2	SECTION A-A	3			
3	ASSEMBLY	9			
SUBTOTAL		16			
TOTAL		96			
PENALTIES (-)					
GRAND TOTAL					
EXAMINATION NUMBER					
EXAMINATION NUMBER					
6					

