

STAPLE



# basic education

Department:  
Basic Education  
REPUBLIC OF SOUTH AFRICA

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

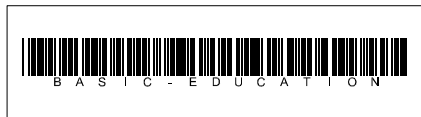
**ENGINEERING GRAPHICS AND DESIGN P2**  
**NOVEMBER 2019**

**MARKS: 100**

**TIME: 3 hours**

This question paper consists of 6 pages.

Barcode label



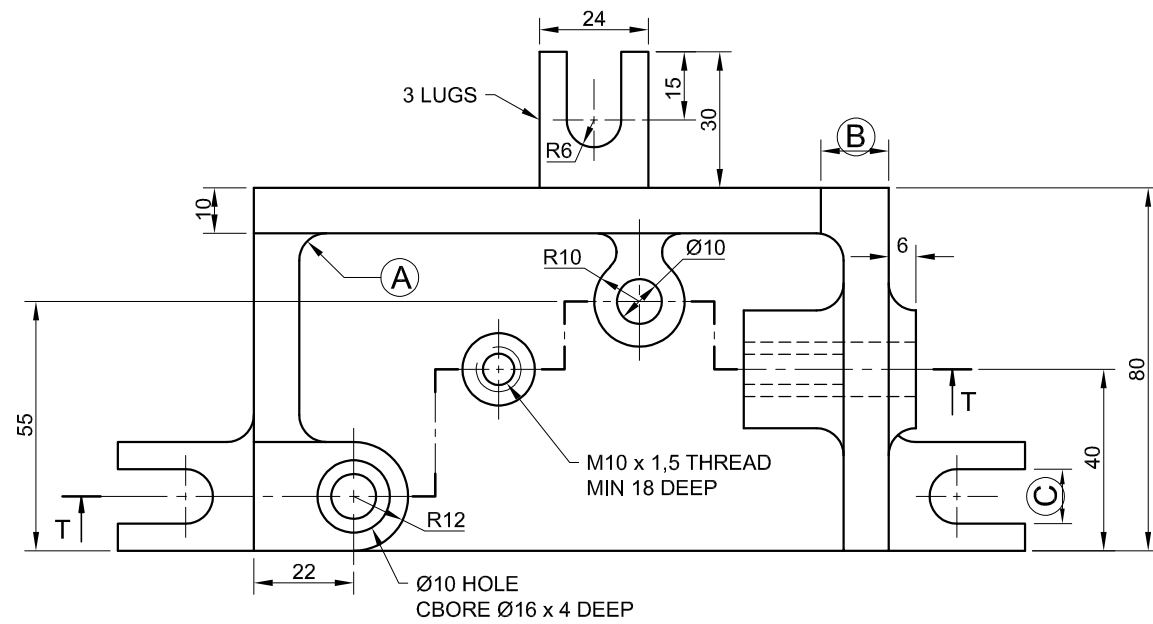
## INSTRUCTIONS AND INFORMATION

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.

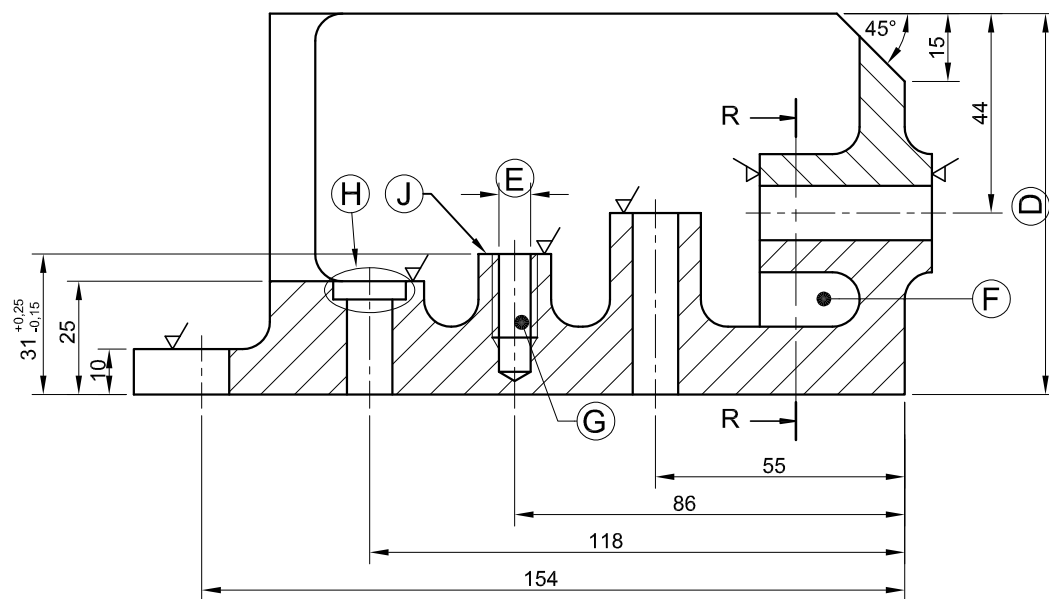
FOR OFFICIAL USE ONLY															
QUESTION	MARKS OBTAINED			$\frac{1}{2}$	SIGN	MODERATED			$\frac{1}{2}$	SIGN	RE-MARKING			$\frac{1}{2}$	SIGN
1															
2															
3															
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	2	0	0			2	0	0			2	0	0		

FINAL CONVERTED MARK	CHECKED BY
100	

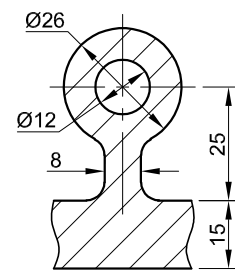
<b>COMPLETE THE FOLLOWING:</b>
CENTRE NUMBER
CENTRE NUMBER
EXAMINATION NUMBER
EXAMINATION NUMBER



VIEW 2



VIEW 1



VIEW R-R

**QUESTION 1: ANALYTICAL (MECHANICAL)**

**Given:**

Two views and a section of a mechanical jig, a title block and a table of questions. The drawing has not been prepared to the indicated scale.

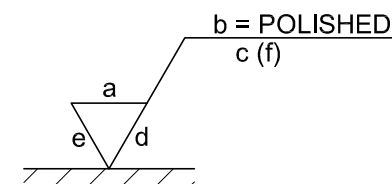
**Instructions:**

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

QUESTIONS		ANSWERS	
1	What was Ingrid's responsibility?	1	
2	What is the manufacturer's website address?	1	
3	What is the file name?	1	
4	Who is the client?	1	
5	How many jigs must be manufactured?	1	
6	What is VIEW 1 called?	2	
7	What type of section is VIEW R-R?	1	
8	Name the type of section produced by cutting plane T-T.	1	
9	Determine the complete dimensions at: A: B: C: D: E:	5	
10	Determine the total length of the jig.	1	
11	Name the feature at F.	1	
12	What is the minimum depth of the thread required for the hole at G?	1	
13	Name the feature at H.	1	
14	How many surfaces of the jig must be machined?	1	
15	Describe the hatching mistake on VIEW 1.	2	
16	With reference to the tolerance, determine the minimum height at J.	1	
17	With reference to the machining symbol below, match the letter on the symbol with the correct label in the column to the right of this question.	4	
		DIRECTION OF LAY	
		ROUGHNESS VALUE	
		SAMPLING LENGTH	
		MACHINING ALLOWANCE	
18	In the space below (ANSWER 18), draw, in neat freehand, the symbol for the projection system used.	4	
<b>TOTAL</b>		<b>30</b>	

QUESTION 17:

ANSWER 18:



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FILE NAME: MJIG-12-V5	MATERIAL: CAST IRON	QUANTITY: 30 UNITS	FINISH:  POLISHED
DRAWING No. 3	SCALE 1 : 2	ALL DIMENSIONS ARE IN MILLIMETRES	
COMMISSIONED BY: JR MANUFACTURES 105 FIRST AVENUE, BRITS	DRAWING PROGRAMME: AUTOCAD 2018	ALL UNSPECIFIED RADII ARE 4 mm	
<b>CASTFORM</b> ENGINEERING	98 BROAD STREET MIDDELFONTEIN 4070 www.foundry.co.za 003 645 7820	DRAWN BY: SIPHO	DATE: 2018-11-13
		CHECKED BY: INGRID	DATE: 2018-12-14
		APPROVED BY: NDIINGI	DATE: 2019-01-21

TITLE **MECHANICAL JIG**

EXAMINATION NUMBER	
EXAMINATION NUMBER	<b>2</b>





**QUESTION 2: LOCI (CAM)**

**Given:**

- The detail of a wedge-shaped follower and the camshaft
- The position of centre point S on the drawing sheet

**Specifications:**

- The follower reciprocates on the vertical centre line of the camshaft
- The minimum distance from the follower to the centre of the camshaft = 17 mm
- Rotation = anti-clockwise

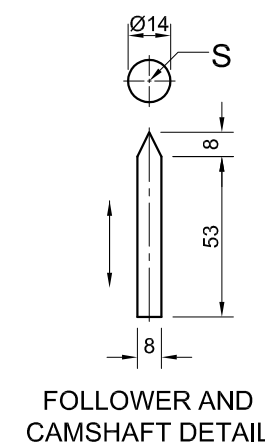
**Motion:**

The cam imparts the following motion to the follower:

- It descends 56 mm with uniform acceleration and retardation over the first 180°
- It rises 20 mm with uniform motion over the next 45°
- There is a dwell period for the next 45°
- It returns to its original position with simple harmonic motion over the rest of the rotation

**Instructions:**

- Draw, to scale 1 : 1, the given camshaft and the wedge-shaped follower at the minimum distance.
- Draw to a rotational scale of 30° = 8 mm and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
- Label the displacement graph and include the scale.
- Project and draw the cam profile from the displacement graph.
- Show the direction of rotation on the cam profile.
- Show ALL construction and projection. **[38]**



FOLLOWER AND CAMSHAFT DETAIL

ASSESSMENT CRITERIA				
1	GIVEN + MINIMUM DISTANCE + CENTRE LINES	5		
2	GRAPH CONSTRUCTION	7		
3	DISPLACEMENT GRAPH	9		
4	CAM CONSTRUCTION	6		
5	CAM + CURVE QUALITY	11		
PENALTY (-)				
<b>TOTAL</b>		<b>38</b>		
EXAMINATION NUMBER				
EXAMINATION NUMBER				<b>3</b>





**QUESTION 3: ISOMETRIC DRAWING**

**Given:**

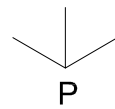
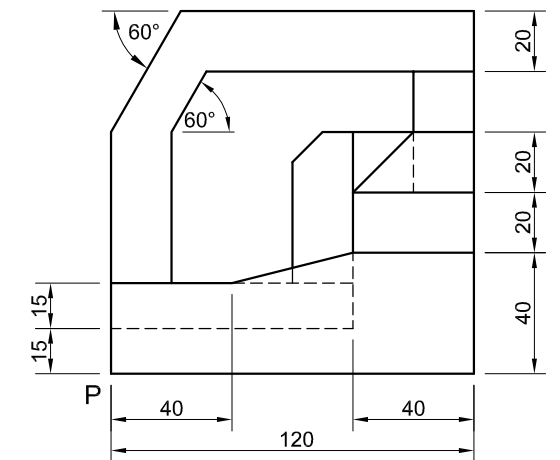
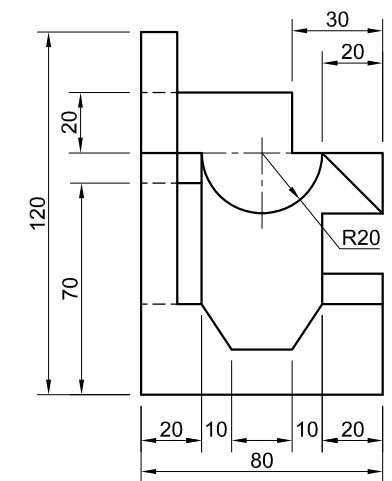
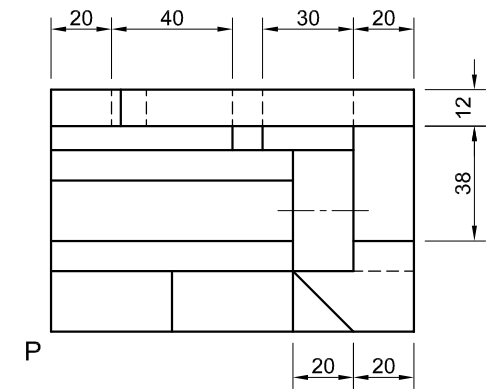
- The front view, top view and left view of a tool jig
- The position of point P on the drawing sheet

**Instructions:**

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

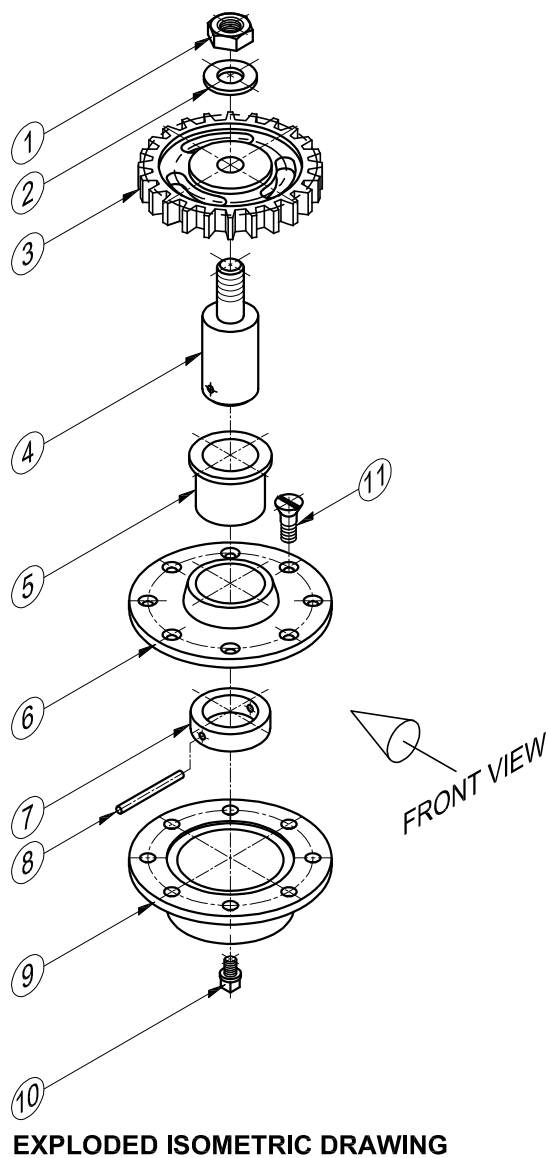
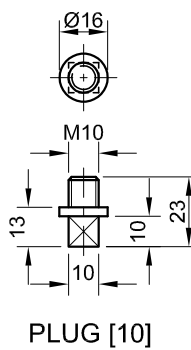
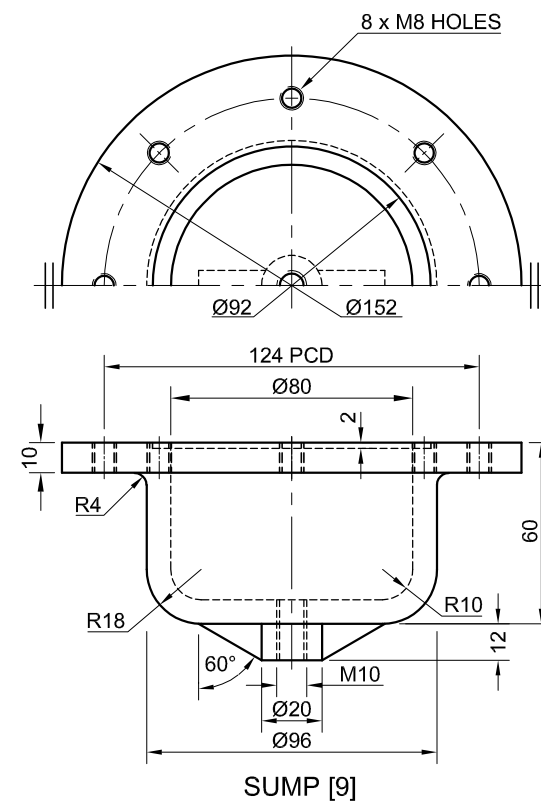
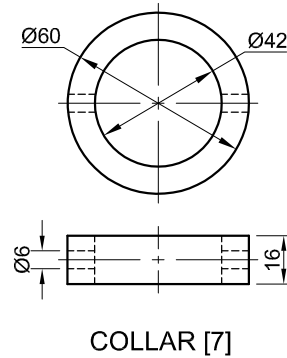
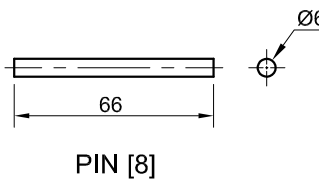
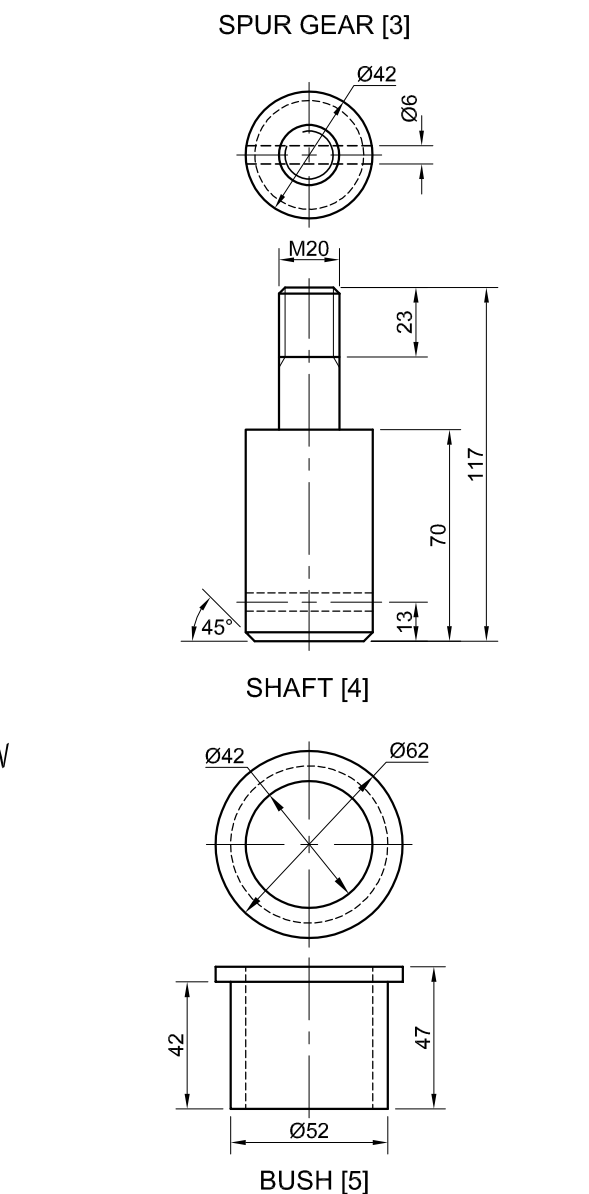
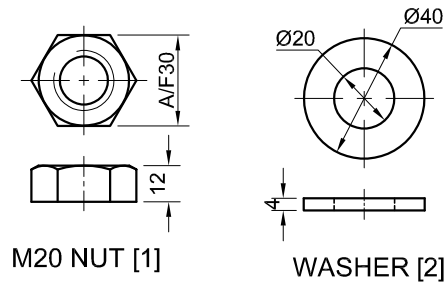
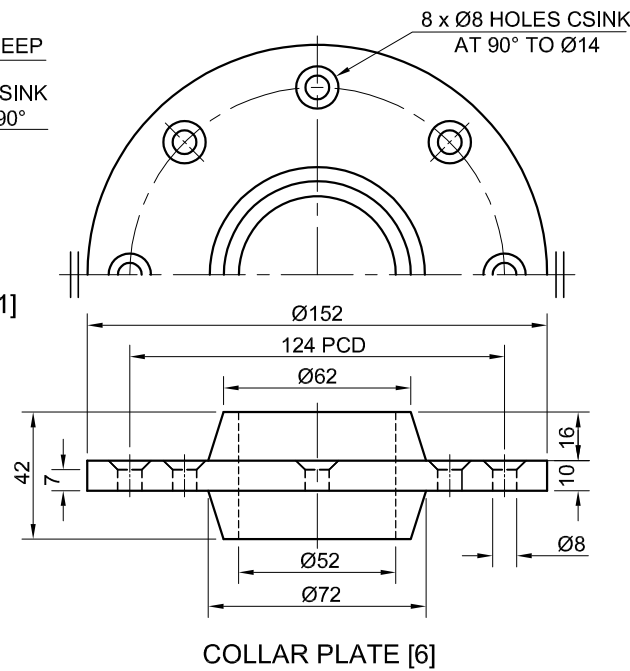
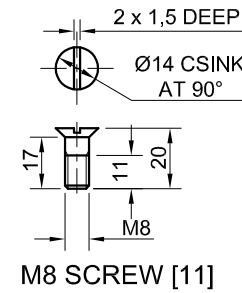
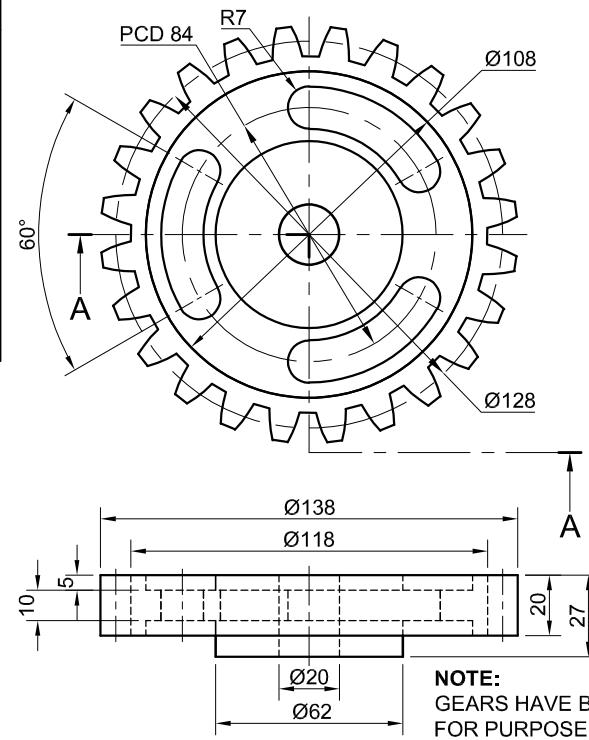
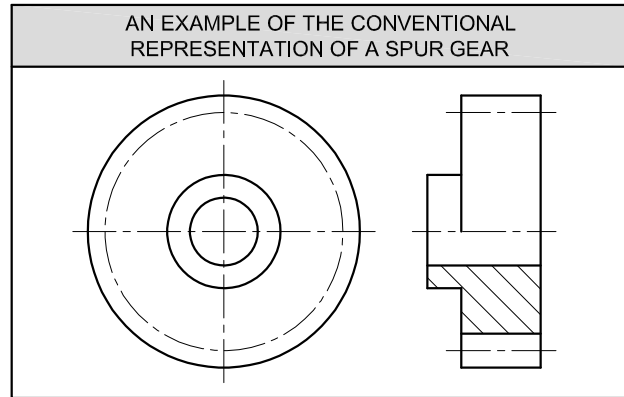
- Make P the lowest point of the drawing.
- Show ALL construction.
- NO hidden detail is required.

**[41]**



ASSESSMENT CRITERIA			
1	PLACEMENT + AUX. VIEW	3	
2	FRONT PORTION	11	
3	BACK PORTION	21 1/2	
4	CIRCLE + CIRCLE CONSTRUCTION + CL	5 1/2	
PENALTIES (-)			
<b>TOTAL</b>		<b>41</b>	
EXAMINATION NUMBER			
EXAMINATION NUMBER			4





**QUESTION 4: ASSEMBLY DRAWING**

**Given:**

- The exploded isometric drawing of the parts of a gear and sump assembly, showing the position of each part relative to all the others.
- Orthographic views of each of the parts of the gear and sump assembly
- An example of the 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 gear and sump assembly:
  - 4.1 The half-sectional front view** on cutting plane A-A. Show the left half in section, as seen from the direction of the arrow on the exploded isometric drawing. The cutting plane is shown on the top view of the spur gear (part 3).
  - 4.2 The top view.** Show only the top half of the view by applying the convention for the presentation of a symmetrical object.

**NOTE:**

- Planning is essential.
- ALL drawings must comply with the guidelines as contained in the SANS 10111.
- Show THREE faces of the M20 nut (part 1).
- Draw the conventional representation of the spur gear (part 3) in both views.
- NO hidden detail is required. [93]

PARTS LIST			
PART	QUANTITY	MATERIAL	
1	M20 NUT	1	MILD STEEL
2	WASHER	1	MILD STEEL
3	SPUR GEAR	1	CAST IRON
4	SHAFT	1	CAST IRON
5	BUSH	1	MILD STEEL
6	COLLAR PLATE	1	MILD STEEL
7	COLLAR	1	MILD STEEL
8	PIN	1	MILD STEEL
9	SUMP	1	CAST IRON
10	PLUG	1	CAST IRON
11	M8 SCREW	8	MILD STEEL

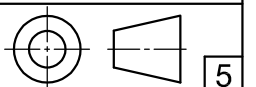
**CASTFORM**  
ENGINEERING (PTY) LTD

98 BROAD STREET  
MIDDELFontein  
4070  
www.foundry.co.za

**GEAR AND SUMP ASSEMBLY**

ALL DIMENSIONS ARE IN MILLIMETRES

ALL UNSPECIFIED RADII ARE 3 mm





FOR OFFICIAL USE ONLY	
INCORRECT OVERALL SCALE	
INCORRECT HATCHING	
PARTS NOT ASSEMBLED	
<b>TOTAL PENALTIES (-)</b>	

ASSESSMENT CRITERIA					
TOP VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	GEAR	6			
2	COLLAR PLATE	$\frac{1}{2}$			
3	M20 NUT + WASHER	$4\frac{1}{2}$			
4	SYMMETRY	1			
<b>SUBTOTAL</b>		<b>12</b>			
SECTIONAL FRONT VIEW					
1	SUMP	$16\frac{1}{2}$			
2	PLUG	7			
3	COLLAR PLATE	$4\frac{1}{2}$			
4	BUSH	3			
5	COLLAR + PIN	5			
6	SHAFT	$9\frac{1}{2}$			
7	GEAR	10			
8	M20 NUT + WASHER	$6\frac{1}{2}$			
9	M8 SCREW	6			
<b>SUBTOTAL</b>		<b>68</b>			
GENERAL					
1	CENTRE LINES	3			
2	ASSEMBLY	10			
<b>SUBTOTAL</b>		<b>13</b>			
<b>TOTAL</b>		<b>93</b>			
PENALTIES (-)					
<b>GRAND TOTAL</b>					
EXAMINATION NUMBER					
EXAMINATION NUMBER					
<b>6</b>					

