

STAPLE



# basic education

Department:  
Basic Education  
REPUBLIC OF SOUTH AFRICA

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**ENGINEERING GRAPHICS AND DESIGN P2**  
**NOVEMBER 2015**

**MARKS: 100**

**TIME: 3 hours**

This question paper consists of 6 pages.

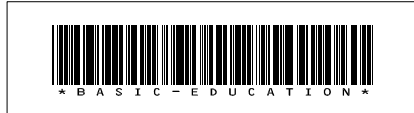
## INSTRUCTIONS AND INFORMATION

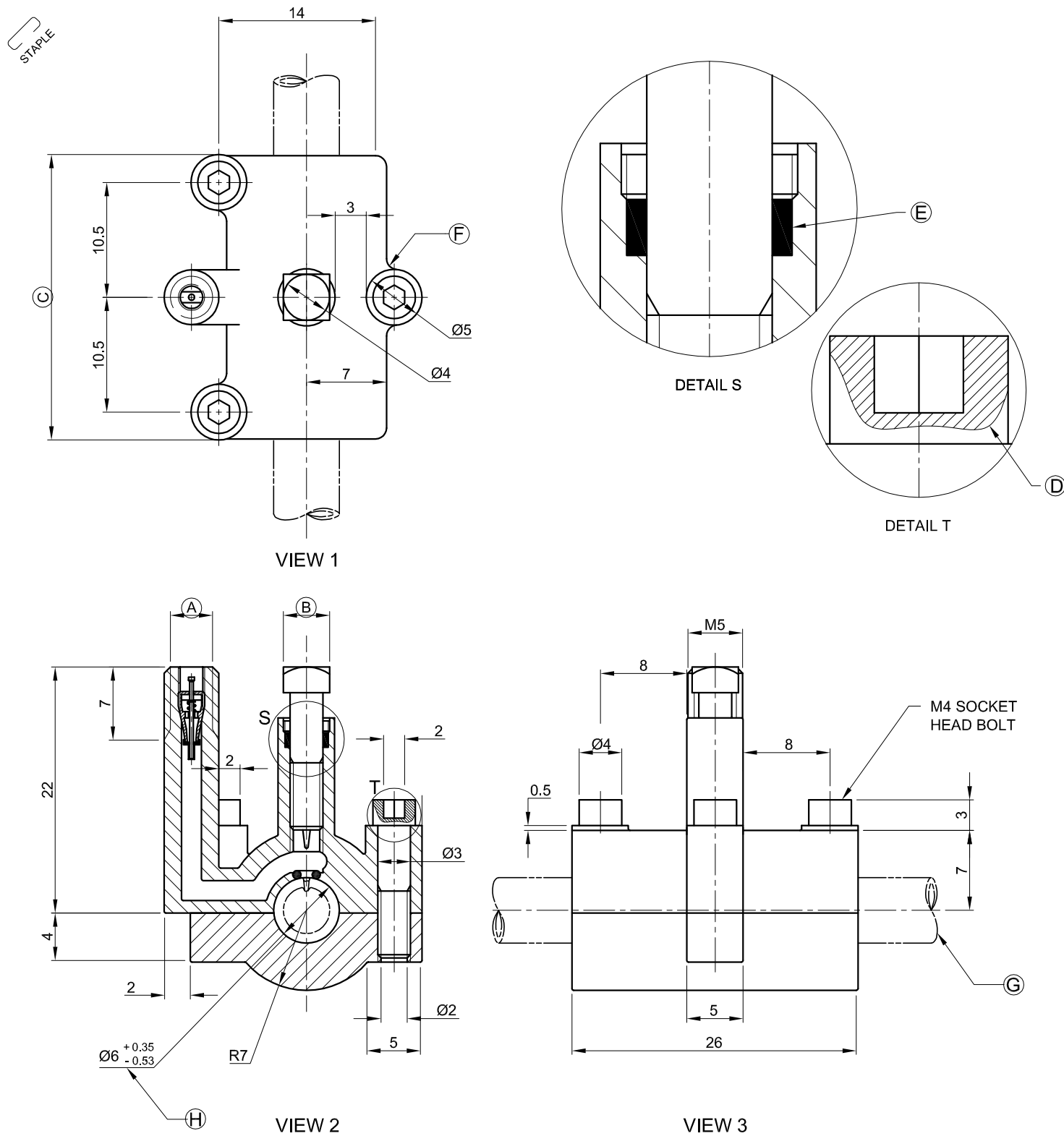
1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in third-angle orthographic projection, unless otherwise stated.
4. ALL drawings must be completed using instruments, unless otherwise stated.
5. ALL answers must be drawn accurately and neatly.
6. ALL 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	

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





**QUESTION 1: ANALYTICAL (MECHANICAL)**

**Given:**

Three views and two detailed enlargements of a tapping valve assembly, a title block and a table of questions. The drawings have not been prepared to the indicated scale.

**Instructions:**

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

QUESTIONS		ANSWERS	
1	What is the title of the assembly?	1	
2	On what date was the drawing drawn?	1	
3	What is the drawing number?	1	
4	What scale is indicated for the drawing?	1	
5	Which drawing program was used?	1	
6	Who approved the drawing?	1	
7	What material is used to manufacture the main base?	1	
8	What would VIEW 2 be called?	1	
9	How many socket head bolts are there in the assembly?	1	
10	Give the complete dimensions at: A : B : C :	3	
11	Name the feature at F.	1	
12	Name the type of section at D.	1	
13	Why is the component at E filled in solid?	1	
14	What is the total height of the assembly?	1	
15	What is the purpose of the two enlarged detailed views?	2	
16	What is indicated by the convention at G?	1	
17	With reference to the tolerance, determine the maximum dimension at H?	2	
18	With reference to the tolerance, determine the minimum dimension at H?	2	
19	Insert the cutting plane on VIEW 3 and label it A-A.	3	
20	In the space provided below, draw, in neat freehand, the symbol for the projection system used.	4	
<b>TOTAL</b>		<b>30</b>	

PARTS LIST				FILE NAME: RCO/VK 0002.dwg	TITLE		ANSWER 20
PART	QUANTITY	MATERIAL		DRAWING No. 2015 - A - 005	TAPPING VALVE		
1	VALVE ASSEMBLY	1	REF: DETAILED DRAWING	ALL DIMENSIONS ARE IN MILLIMETRES.	APPROVED: ANDREW BRAND	2015/01/23	<div style="text-align: center;"> <p>-----</p> <p>SYMBOL</p> <p>EXAMINATION NUMBER</p> <p>EXAMINATION NUMBER</p> </div>
2	SOCKET HEAD BOLT	3	TOOL STEEL	DRAWING PROGRAM: AUTOCAD 2015	CHECKED: SOON DENTON	2015/01/16	
3	SQUARE BOLT WITH PUNCH	1	TOOL STEEL	MATERIALS: STEEL, PEWTER AND RUBBER	DRAWN: CHRISTI GREEF	2015/01/05	
4	MAIN BASE	1	PEWTER	<p><b>ReCO REFRIGERATION</b></p> <p>15 EDISON BLVD INDUSTRIAL PARK 1911</p>	<p>TAP VALVE TO BE USED FOR TAPPING OF 134a, R11, R22 AND 501 REFRIGERANTS IN COPPER PIPE ONLY</p>		
5	CAP	1	PEWTER				
6	O-RING	1	RUBBER				
7	O-SEAL	1	RUBBER				
					SCALE 2 : 1		<b>2</b>





**QUESTION 2: LOCI**

**NOTE:** Answer QUESTIONS 2.1 and 2.2.

**2.1 MECHANISM**

**Given:**

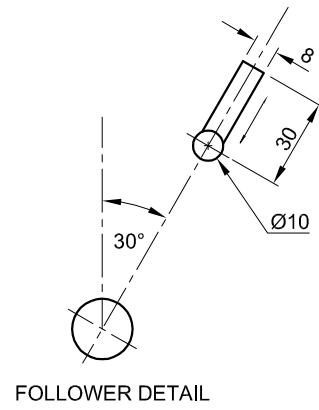
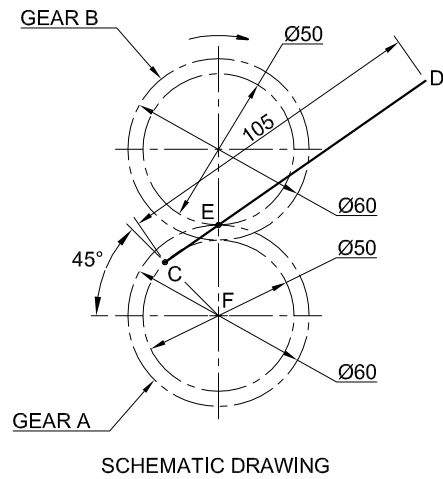
- A schematic drawing of a mechanism consisting of gear A and gear B as well as a slotted bar CD, attached at C to gear A
- The position of pin E on gear B
- The position of centre point F

**Motion:**

As gear A rotates in an anti-clockwise direction, it drives gear B in a clockwise direction. The slotted bar CD slides over pin E during the rotation.

**Instructions:**

- Draw, to scale 1 : 1, the given schematic drawing of the mechanism.
- Trace the locus generated by point D for ONE complete revolution of the mechanism.
- Show ALL necessary construction. **[19]**



**2.2 CAM**

**Given:**

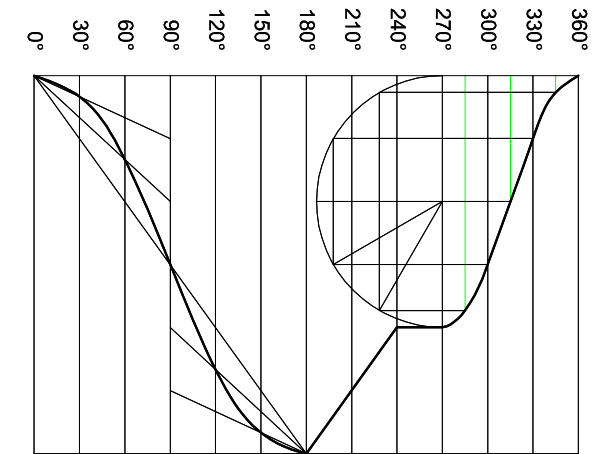
- The detail of a roller-ended follower, drawn to a reduced scale
- The displacement graph and the cam shaft, drawn to scale 1 : 1, in the correct position

**Specifications:**

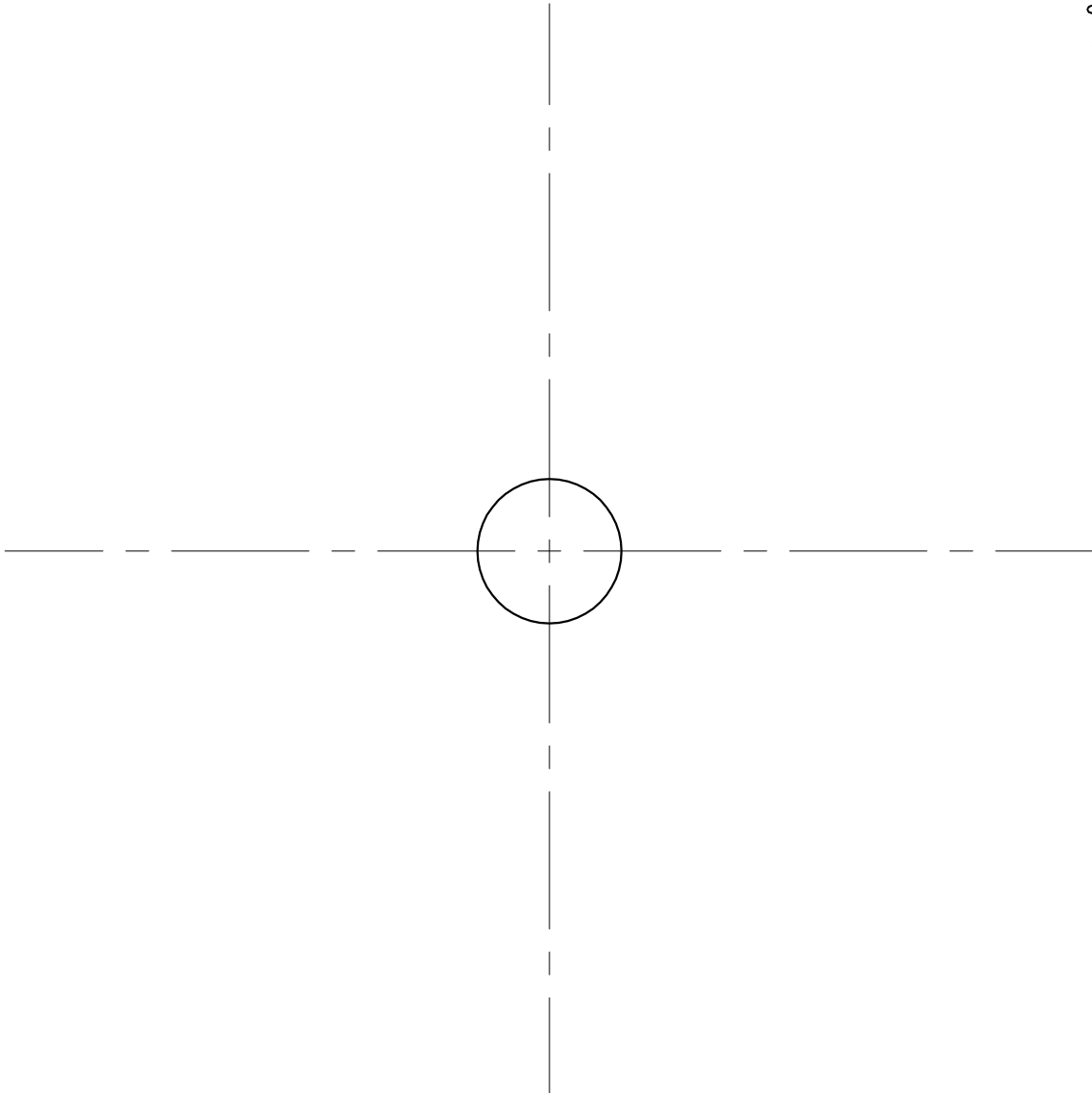
- The follower reciprocates along the 30° centre line that runs through the centre of the cam shaft
- Rotation = clockwise

**Instructions:**

- Draw, to scale 1 : 1, the roller-ended follower in its correct position.
- Project and draw the cam profile from the given displacement graph.
- Show the direction of rotation on the cam profile.
- Show ALL necessary construction. **[21]**



DISPLACEMENT GRAPH  
SCALE 6 mm = 30°



ASSESSMENT CRITERIA 2.1			
1	GIVEN + CENTRE LINES	5	
2	CONSTRUCTION	6	
3	POINTS + CURVE	8	
<b>SUBTOTAL 2.1</b>		<b>19</b>	
ASSESSMENT CRITERIA 2.2			
1	CONSTRUCTION + FOLLOWER + DIRECTION	8	
2	PLOTTING	7	
3	CAM PROFILE	6	
<b>SUBTOTAL 2.2</b>		<b>21</b>	
PENALTIES (-)			
<b>TOTAL</b>		<b>40</b>	
EXAMINATION NUMBER			
EXAMINATION NUMBER			

3





**QUESTION 3: ISOMETRIC DRAWING**

**Given:**

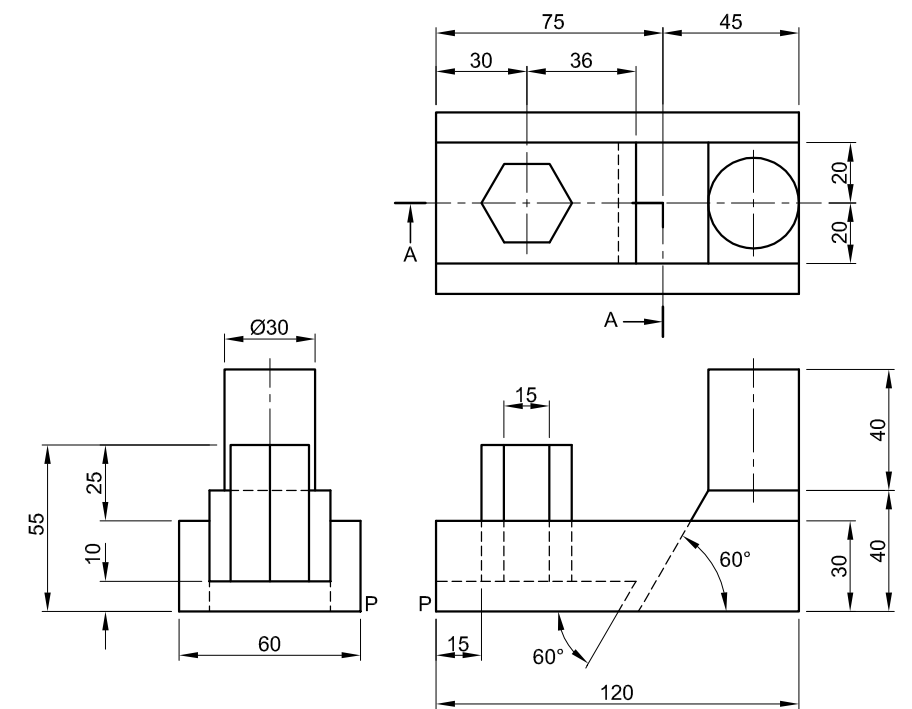
- The front view, top view and left view of a woodworking plane
- The position of point P on the drawing sheet

**Instructions:**

Using scale 1 : 1, convert the orthographic views of the woodworking plane into a sectional isometric drawing on cutting plane A-A.

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

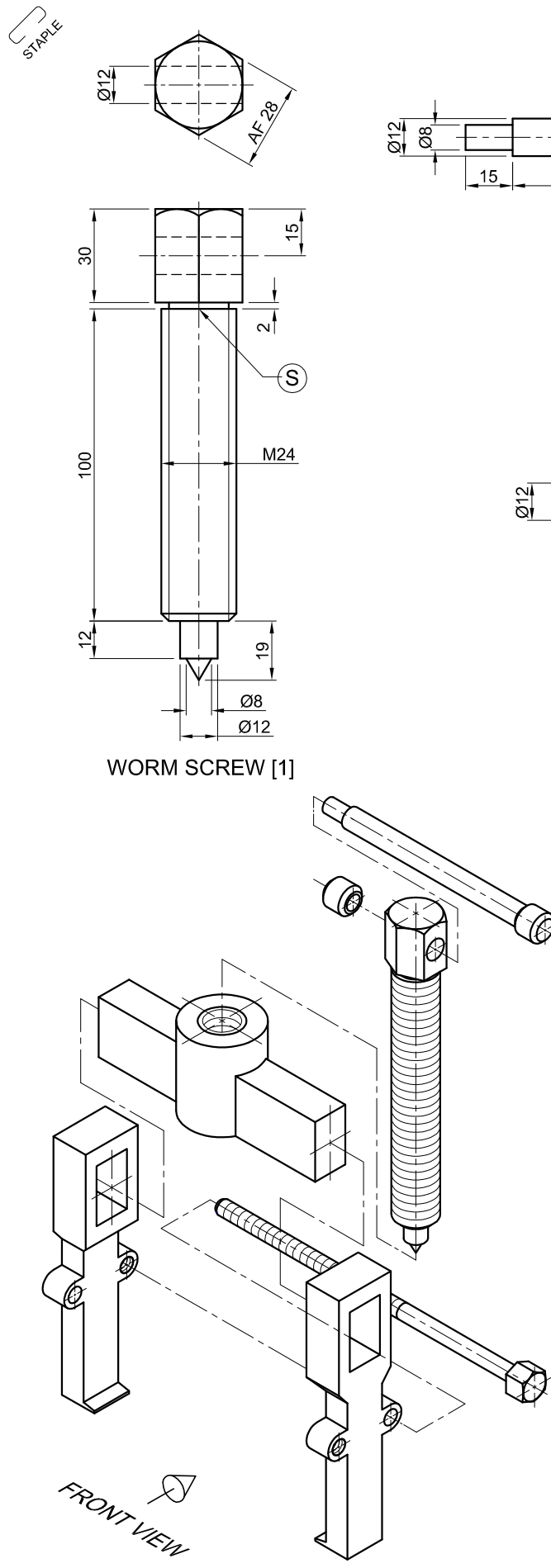
[34]



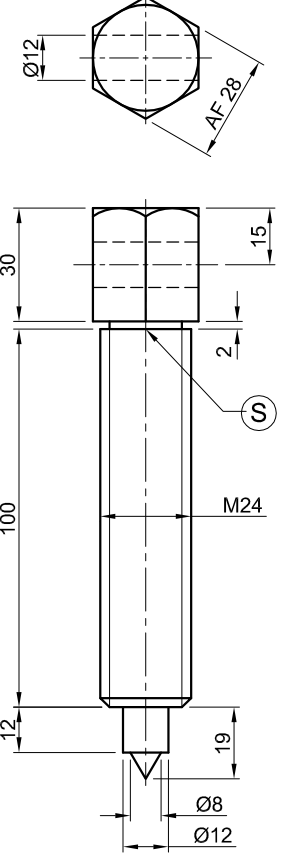
P

ASSESSMENT CRITERIA			
1	AUXILLIARY VIEW + PLACING	3	
2	ISOMETRIC + NON-ISOMETRIC	12 1/2	
3	HEXAGON	2 1/2	
4	CIRCLES + CONSTRUCTION + CL	6	
5	SECTION	8	
6	HATCHING	2	
PENALTIES (-)			
<b>TOTAL</b>		<b>34</b>	
EXAMINATION NUMBER			
EXAMINATION NUMBER			4

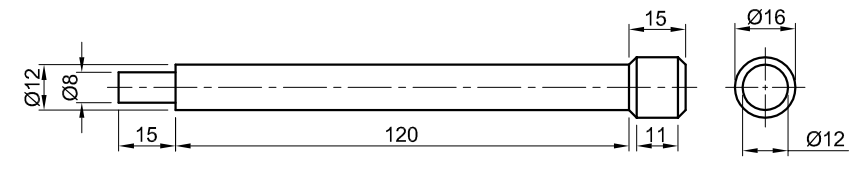




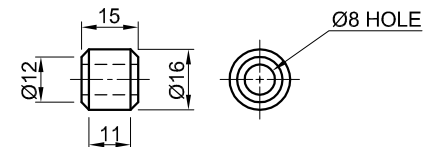
EXPLODED ISOMETRIC DRAWING



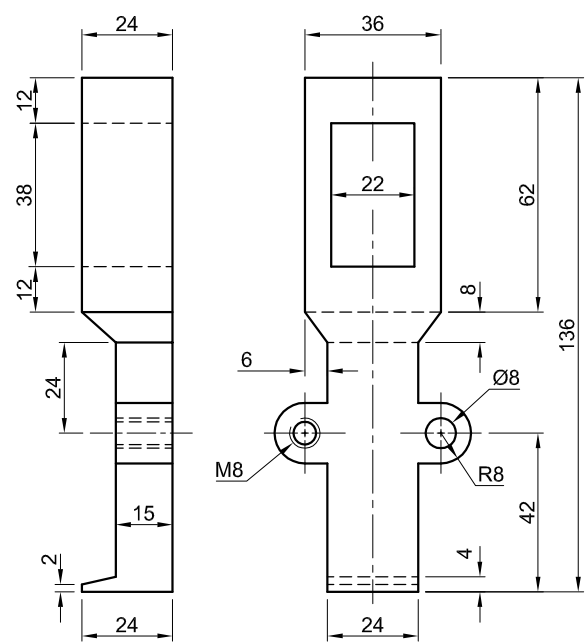
WORM SCREW [1]



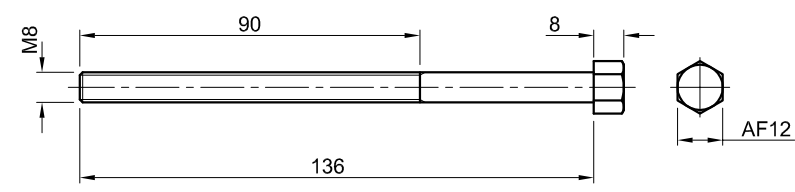
LEVER [2]



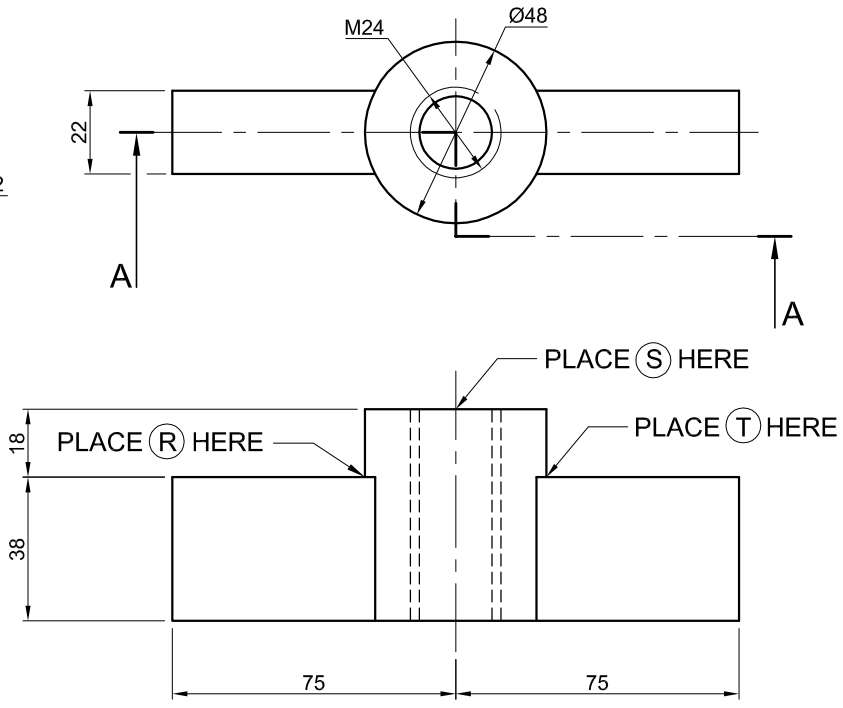
END RING [3]



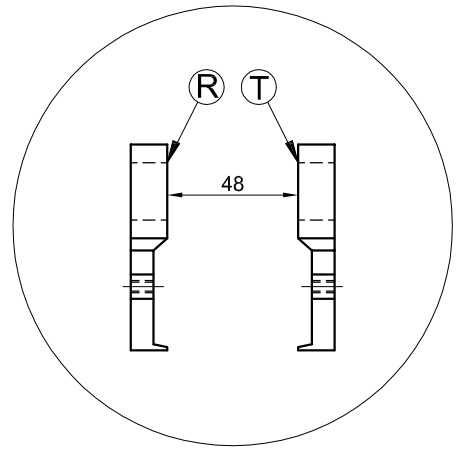
STRONG ARM [5]



M8 BOLT [6]



BEAM [4]



PLACEMENT OF STRONG ARMS

**QUESTION 4: MECHANICAL ASSEMBLY**

**Given:**

- The exploded isometric drawing of the parts of a bearing puller assembly, showing the position of each part relative to all the others
- Orthographic views of each of the parts of the bearing puller 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 bearing puller assembly:

**4.1 A half sectional front view** according to cutting plane A-A. Show the left side in section, 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 beam (part 4).

**4.2 The top view.**

- ALL drawings must comply with the guidelines as contained in the SANS 10111.

**NOTE:**

- The two strong arms (part 5) must be placed against the cylindrical part of the beam (part 4) so that points R and T will be at the indicated positions.
- The worm screw (part 1) must be completely screwed into the beam (part 4) so that point S will be at the indicated position.
- The lever (part 2) must be placed in the centre of the worm screw (part 1).
- Draw only the rear M8 bolt, as indicated by the exploded isometric drawing.
- Show THREE faces of the head of the M8 bolt in the front view.
- Add the cutting plane A-A to the drawing
- NO hidden detail is required.

[96]

**PARTS LIST**

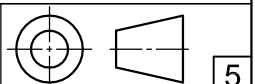
PARTS		QUANTITY	MATERIAL
1	WORM SCREW	1	HARDENED STEEL
2	LEVER	1	HARDENED STEEL
3	END RING	1	MILD STEEL
4	BEAM	1	HARDENED STEEL
5	STRONG ARM	2	HARDENED STEEL
6	M8 BOLT	2	MILD STEEL



8 VON WHEILIG STREET  
ALIES PARK 1791  
www.sn\_king.co.za  
069 313 1574

**BEARING PULLER**

ALL DIMENSIONS ARE IN MILLIMETRES.





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

ASSESSMENT CRITERIA					
TOP VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	WORM SCREW	3½			
2	LEVER	4			
3	END RING	3			
4	BEAM	4½			
5	STRONG ARM	10			
6	M8 BOLT	7			
<b>SUBTOTAL</b>		<b>32</b>			
SECTIONAL FRONT VIEW					
1	WORM SCREW	15			
2	LEVER	7			
3	END RING	3			
4	BEAM	5½			
5	STRONG ARM	10½			
6	M8 BOLT	9			
<b>SUBTOTAL</b>		<b>50</b>			
GENERAL					
1	CENTRE LINES	3			
2	ASSEMBLY	6			
3	CUTTING PLANE	5			
<b>SUBTOTAL</b>		<b>14</b>			
<b>TOTAL</b>		<b>96</b>			
TOTAL PENALTIES(-)					
<b>GRAND TOTAL</b>					
EXAMINATION NUMBER					
EXAMINATION NUMBER					
6					

