STAPLE

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2017

MARKS: 200

TIME: 3 hours

This question paper consists of 6 pages.

Barcode label

INSTRUCTIONS AND INFORMATION

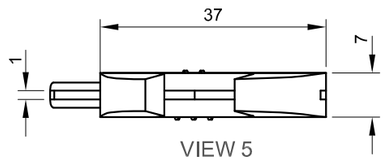
1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in third-angle orthographic projection, unless otherwise stated.
4. ALL drawings must be prepared using pencil and instruments, unless otherwise stated.
5. ALL answers must be drawn accurately and neatly.
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. Proper planning 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	½	SIGN	MODERATED	½	SIGN	RE-MARKING	½	SIGN
1											
2											
3											
4											
TOTAL											
	2 0 0			2 0 0			2 0 0				

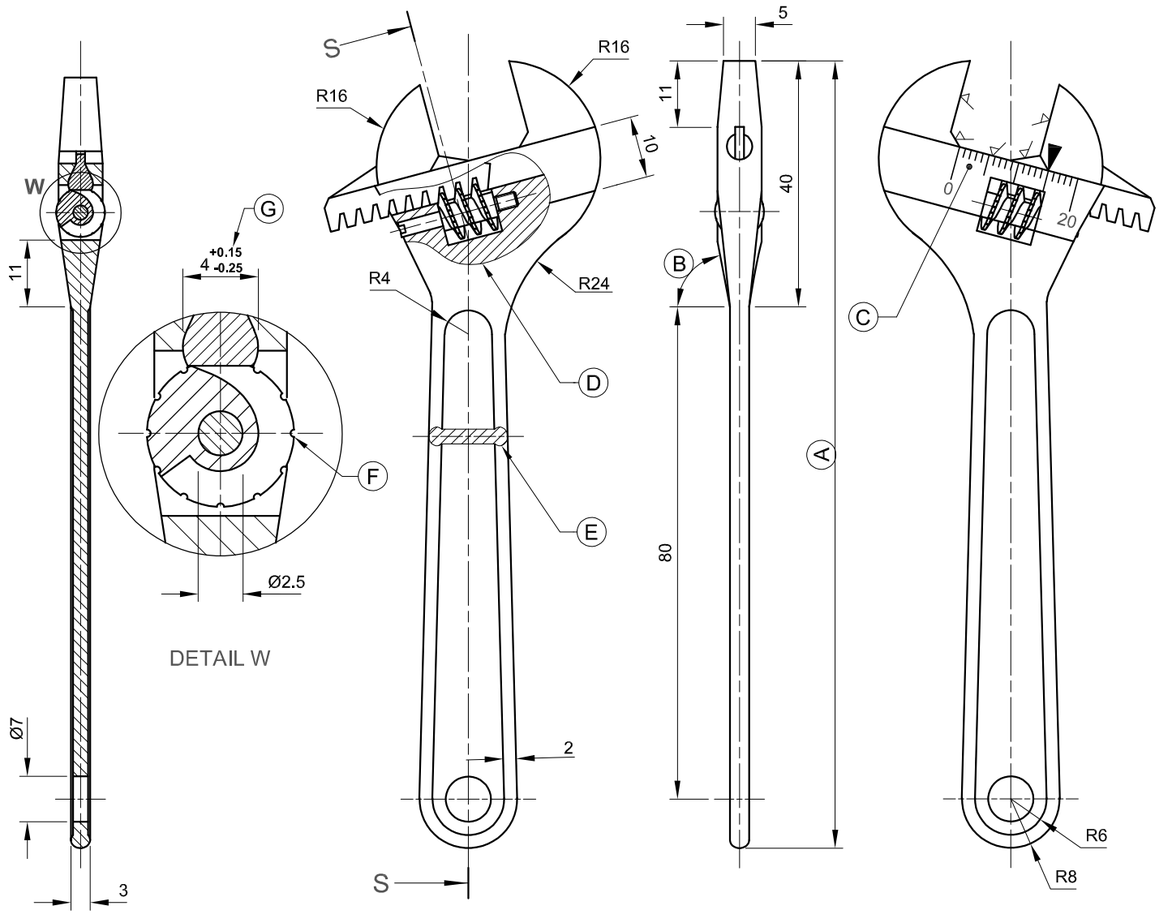
FINAL CONVERTED MARK	CHECKED BY
100	

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

STAPLE



VIEW 5



VIEW 1 VIEW 2 VIEW 3 VIEW 4

PARTS LIST			
	PART	QUANTITY	MATERIAL
1	FIXED JAW AND HANDLE	1	CHROME VANADIUM CASTING
2	ADJUSTABLE JAW	1	TOOL STEEL
3	WORM SCREW	1	EN 19
4	WORM SHAFT	1	TOOL STEEL

HEAT TREATMENT ON ALL JAWS	HARDENING
METHOD OF MACHINING	MILLING

DRAWING PROGRAM: AUTOCAD 2017 — SCALE 1 : 1

ALL UNSPECIFIED RADII ARE R2.

APPROVED: STEYN — DATE: 2017-02-28

CHECKED: JOHN — DATE: 2017-02-10

DRAWN: WERNER — DATE: 2017-01-08

TITLE

SHIFTING SPANNER

QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
Five views and a detailed enlargement of a shifting spanner assembly, a parts list, 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 drawing and the title block. **[28]**

	QUESTIONS	ANSWERS			
1	What is the title of the drawing?		1		
2	What scale is indicated for the drawing?		1		
3	What drawing program was used?		1		
4	On what date was the drawing drawn?		1		
5	Who approved the drawing?		1		
6	What is the radius of the unspecified curves?		1		
7	What material is used to manufacture the adjustable jaw?		1		
8	What type of heat treatment is required for the jaws?		1		
9	Which projection system has been used for the drawing?		1		
10	Determine the dimension at A.		1		
11	Measure the angle at B.		1		
12	What is the purpose of the measurements on the fixed jaw and handle at C?		2		
13	Name the type of section at D.		1		
14	Name the type of section at E.		1		
15	What is purpose of the grooves at F?		1		
16	If view 2 is the front view, what would view 4 be called?		1		
17	What is the purpose of the enlarged detailed view?		1		
18	What type of section resulted from cutting plane S-S?		1		
19	With reference to the tolerance, determine the minimum dimension at G.		2		
20	How many surfaces of the fixed jaw and handle must be machined?		1		
21	What direction of lay must be applied to the machined surfaces?		1		
22	In the space below (ANSWER 22), draw, in neat freehand, the conventional representation of a bearing on a section of a shaft.		5		
		TOTAL	**28**		

ANSWER 22: Conventional representation of a bearing on a section of a shaft

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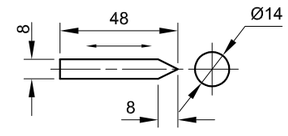
QUESTION 2: LOCI (CAM)

Given:
The detail of a wedge-shaped follower and the camshaft

Specifications:
- The follower reciprocates on the horizontal centre line of the camshaft
- The minimum distance from the follower to the centre of the camshaft = 14 mm
- Rotation = clockwise

Motion:
The cam imparts the following motion to the follower:
- It moves left with uniform acceleration and retardation for 40 mm over the first 180°
- It moves further left with uniform motion for 15 mm over the next 90°
- It moves right with simple harmonic motion back to the original position for 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. **[40]**



ASSESSMENT CRITERIA						
1	GIVEN + MINIMUM DISTANCE + CL	5				
2	GRAPH CONSTRUCTION	7				
3	PLOTTING POINTS + GRAPH CURVES	11				
4	CAM CONSTRUCTION	6				
5	PLOTTING OF CAM	7				
6	CAM PROFILE	4				
PENALTIES (-)						
	TOTAL	**40**				

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QUESTION 3: ISOMETRIC DRAWING

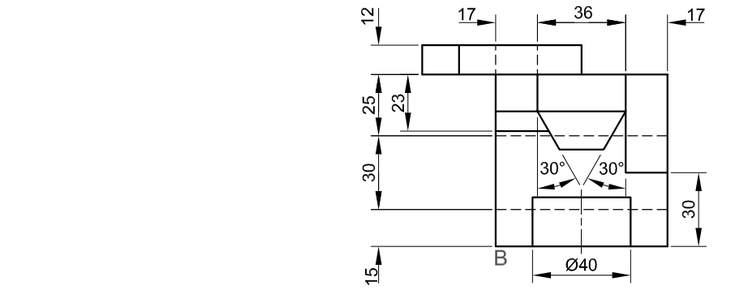
Given:

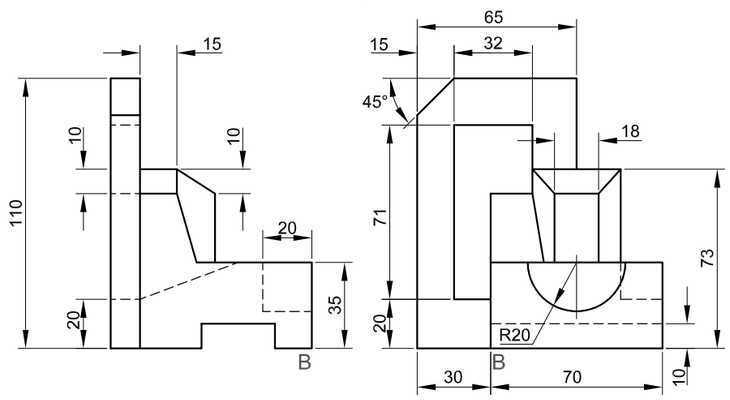
- The front view, top view and left view of a guide
- The position of point B on the drawing sheet

Instructions:

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

- Make B the lowest point of the drawing.
- Show ALL construction.
- NO hidden detail is required. **[36]**





B

ASSESSMENT CRITERIA					
1	PLACEMENT + AUX. VIEW	2			
2	FRONT + REAR	18			
3	MIDDLE SECTION	10			
4	CIRCLE + CIRCLE CONSTRUCTION + CL	6			
PENALTIES (-)					
	TOTAL	**36**			

EXAMINATION NUMBER

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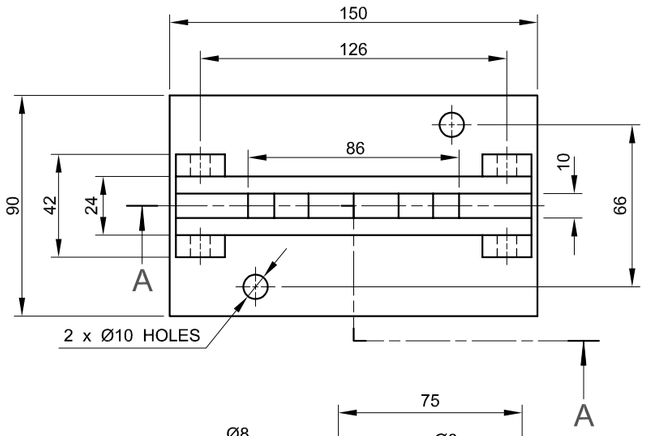
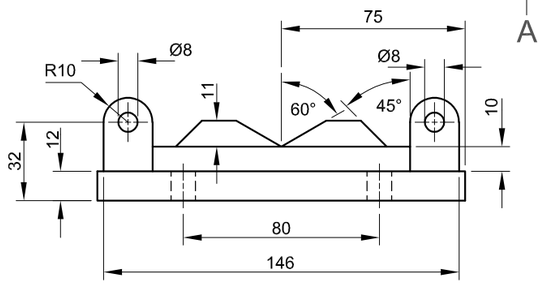
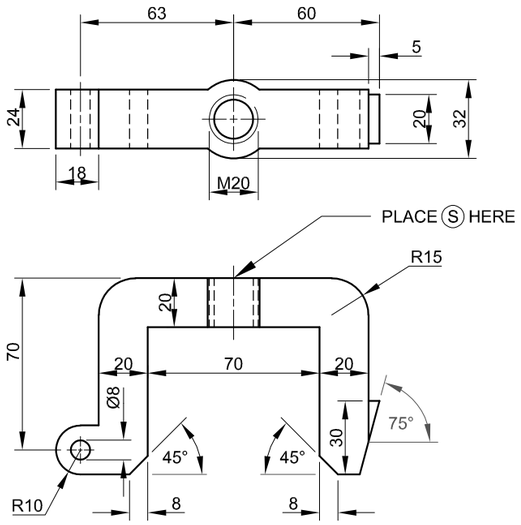
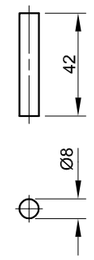




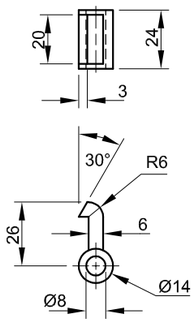
BASE [1]



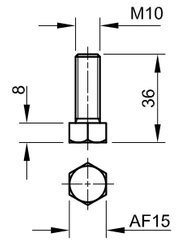
FRAME [2]



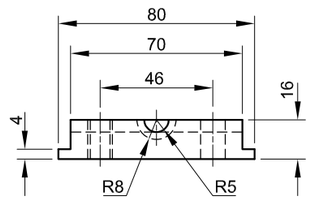
PIN [3]

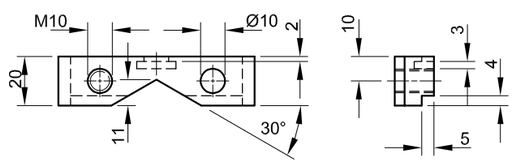


HOOK [4]

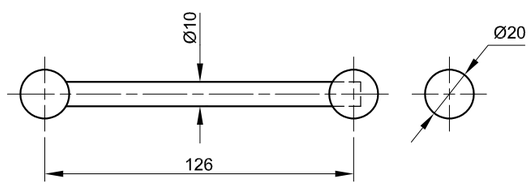


M10 BOLT [6]

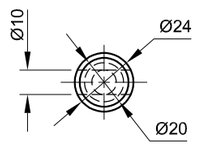


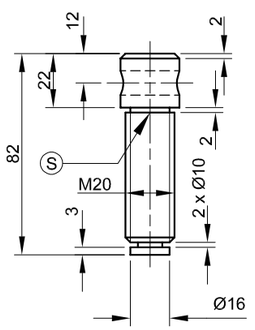


JAW [5]

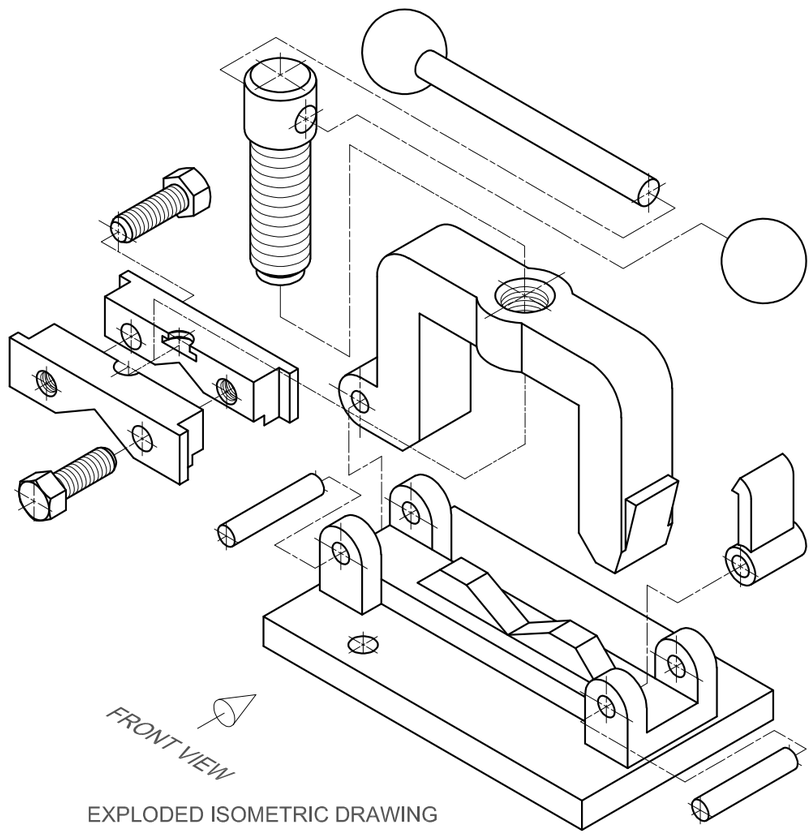


LEVER [8]





WORM SCREW [7]



EXPLODED ISOMETRIC DRAWING

QUESTION 4: MECHANICAL ASSEMBLY

Given:

- The exploded isometric drawing of the parts of a pipe clamp assembly, showing the position of each part relative to all the others
- Orthographic views of each of the parts of the pipe clamp 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 pipe clamp assembly:
  - **4.1 A half-sectional front view** on 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 base (part 1).
  - **4.2 The top view**

NOTE:

- Planning is essential.
- ALL drawings must comply with the guidelines as contained in the *SANS 10111*.
- The convention of symmetry may not be applied.
- The worm screw (part 7) must be completely screwed into the frame (part 2) so that point S will be at the indicated position.
- The lever (part 8) must be placed in the centre of the worm screw (part 7).
- In the top view, draw only the right-side M10 bolt. Show TWO faces of the bolt.
- Add cutting plane A-A.
- NO hidden detail is required. **[96]**

PARTS LIST

	PART	QUANTITY	MATERIAL
1	BASE	1	CAST IRON
2	FRAME	1	MILD STEEL
3	PIN	2	MILD STEEL
4	HOOK	1	MILD STEEL
5	JAW	2	TOOL STEEL
6	M10 BOLT	2	TOOL STEEL
7	WORM SCREW	1	HARDENED STEEL
8	LEVER	1	HARDENED STEEL

ALL DIMENSIONS ARE IN MILLIMETRES	DRAWN: WILLEM DATE: 10/11/2016
FILLETS ARE R3 AND ROUNDINGS ARE R5	DRAWING PROGRAM: CAD 2016

WR
PROJECTS
8 VON WHEILIG STREET
ALIES PARK 1791
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☎ 069 313 1574

TITLE
PIPE CLAMP

Please turn over

STAPLE

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

ASSESSMENT CRITERIA

TOP VIEW

		POSSIBLE	OBTAINED	SIGN	MODERATED
1	BASE	8			
2	FRAME	5			
3	HOOK	5			
4	JAW + M10 BOLT	$6\frac{1}{2}$			
5	WORM SCREW + LEVER	4			
SUBTOTAL		**$28\frac{1}{2}$**			

SECTIONAL FRONT VIEW

1	BASE	$9\frac{1}{2}$			
2	FRAME	8			
3	PINS + HOOK	$3\frac{1}{2}$			
4	JAW + M10 BOLT	$9\frac{1}{2}$			
5	WORM SCREW	$9\frac{1}{2}$			
6	LEVER	3			
SUBTOTAL		**43**			

GENERAL

1	CENTRE LINES	$10\frac{1}{2}$			
2	ASSEMBLY	9			
3	CUTTING PLANE	5			
SUBTOTAL		**$24\frac{1}{2}$**			
TOTAL		**96**			
PENALTIES (-)					
GRAND TOTAL					

EXAMINATION NUMBER

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