basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

FEBRUARY/MARCH 2011

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

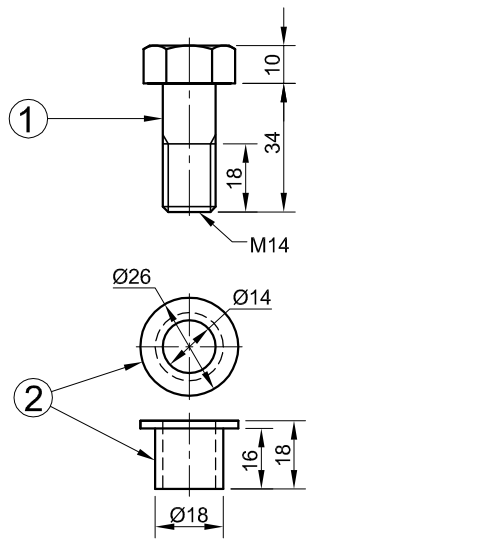
INSTRUCTIONS AND INFORMATION

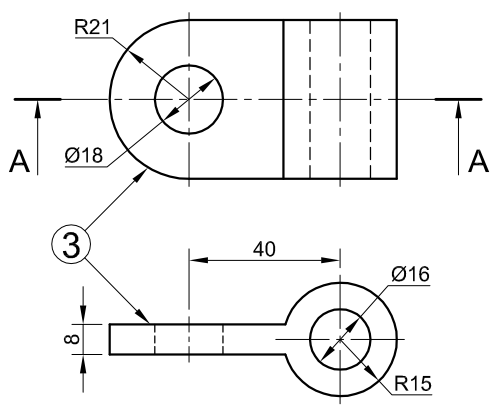
1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in third-angle orthographic projection, unless stated otherwise.
4. ALL drawings must be drawn to scale 1:1, unless stated otherwise.
5. ALL the questions must be answered on the QUESTION PAPER as instructed.
6. ALL the pages must be restapled in numerical sequence, irrespective of whether the question was attempted.
7. Time management is essential in order to complete all the questions.
8. Print your examination number in the block provided on every page.
9. Any details or dimensions not given, must be assumed in good proportion.
10. ALL answers must be drawn accurately and neatly.

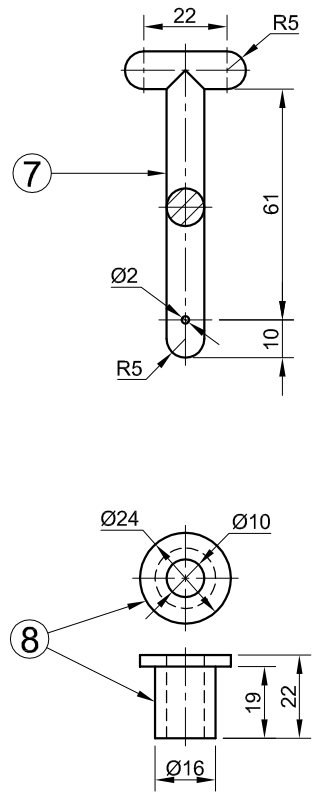
FOR OFFICIAL USE ONLY										
QUESTION	MARKS OBTAINED			½	SIGN	MODERATED			½	SIGN	
1											
2											
3											
4											
TOTAL											
	2	0	0			2	0	0			

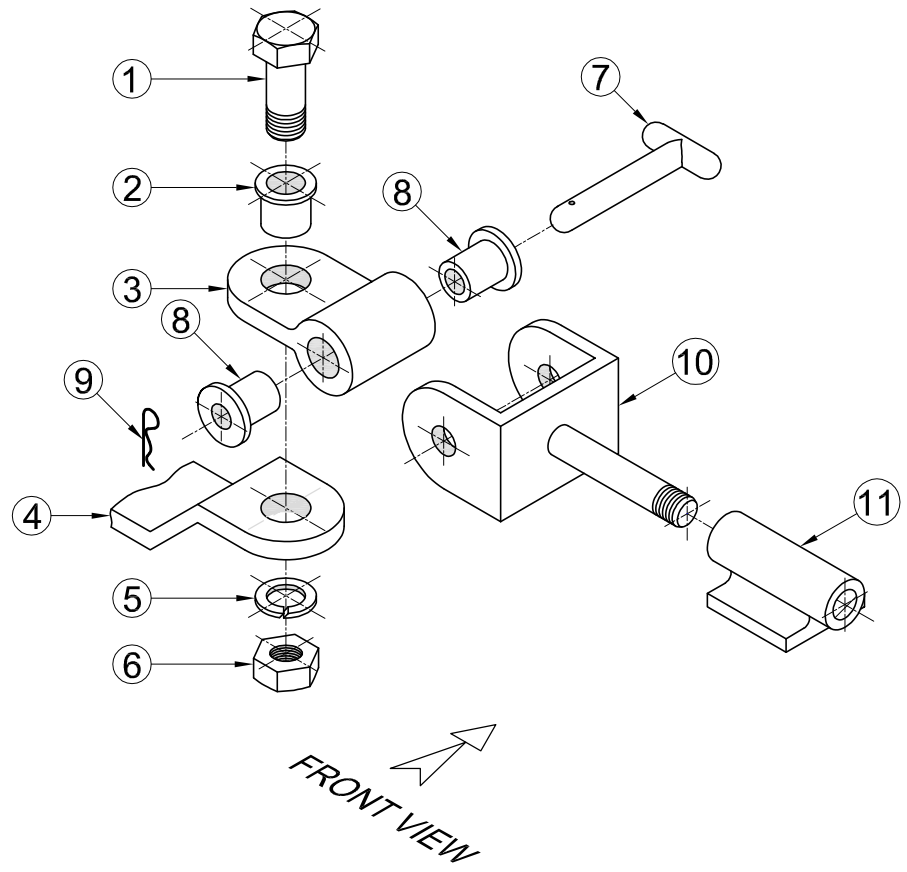
FINAL CONVERTED MARK	CHECKED BY
____ 100	

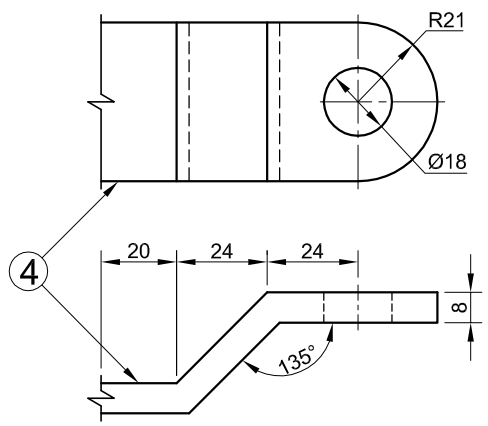
COMPLETE THE FOLLOWING:
CENTRE NUMBER
CENTRE NUMBER
EXAMINATION NUMBER
EXAMINATION NUMBER

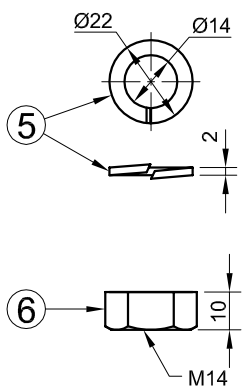


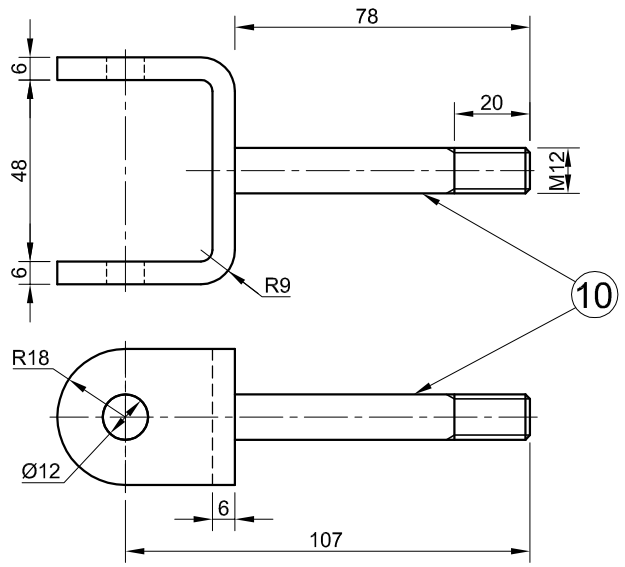


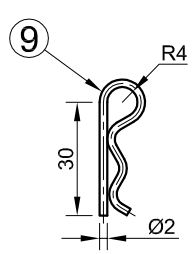


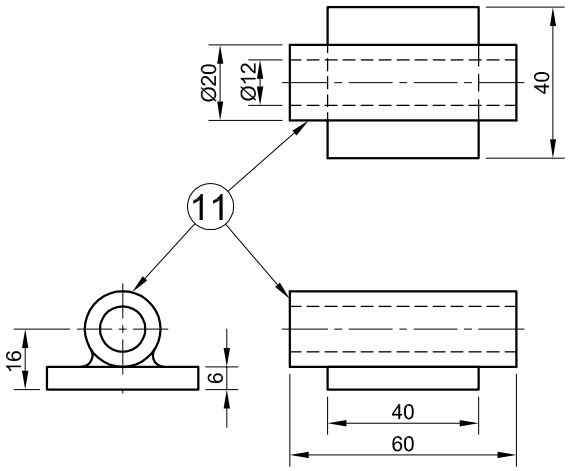












QUESTION 4: MECHANICAL ASSEMBLY

Given:

- The exploded isometric drawing of the parts of a coupling assembly for a trailer, showing the position of each part relative to all the others
- Orthographic views of each of the parts of the coupling 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 coupling assembly:
  - **4.1 A sectional front view** on cutting plane A-A, as seen from the arrow shown on the exploded isometric drawing. The cutting plane is shown on the top view of the swivel (part 3).
  - **4.2 The top view.**
- ALL drawings must comply with the guidelines contained in the *SABS 0111.*

NOTE:

- Show THREE faces of the M14 bolt and nut and ALL necessary construction.
- NO hidden detail is required.

Add the following feature to the drawing:

- The cutting plane A-A **[97]**

PARTS LIST		
PART	QUANTITY	MATERIAL
1. M14 BOLT	1	MILD STEEL
2. BUSH	1	HIGH-TENSILE STEEL
3. SWIVEL	1	MILD STEEL
4. FIXED ARM	1	MILD STEEL
5. SPRING WASHER	1	HARDENED STEEL
6. M14 NUT	1	MILD STEEL
7. PIN	1	HARDENED STEEL
8. BUSH	2	NYLON
9. LOCKING PIN	1	SPRING STEEL
10. YOKE	1	MILD STEEL
11. MOUNTING BRACKET	1	MILD STEEL

ALL DIMENSIONS ARE IN MILLIMETRES.	DRAWN BY: NDIVHUWO	IBAYHI STEEL MANUFACTURING	OLD CAPE ROAD GREENBUSHES 6025 www.ibayhisteel.co.za
	DATE: 23/05/2010		
	CHECKED BY: MARY		
ALL UNSPECIFIED RADII ARE R3.	DATE: 12/06/2010	TITLE: TRAILER COUPLING	
	APPROVED BY: PHATHU		
DRAWING PROGRAM: AUTOCAD 2008	DATE: 05/07/2010	NATIONAL SENIOR CERTIFICATE GRADE 12 FEB./MAR. 2011	5
	SCALE: 1 : 2		

STAPLE

QUESTION 3: ISOMETRIC DRAWING

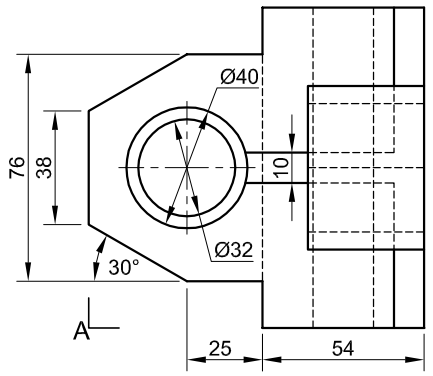
Given:

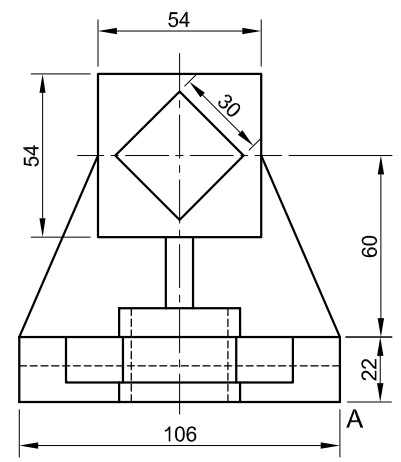
- The front view, top view and left view of a movable coupling
- The position of point A on the drawing sheet

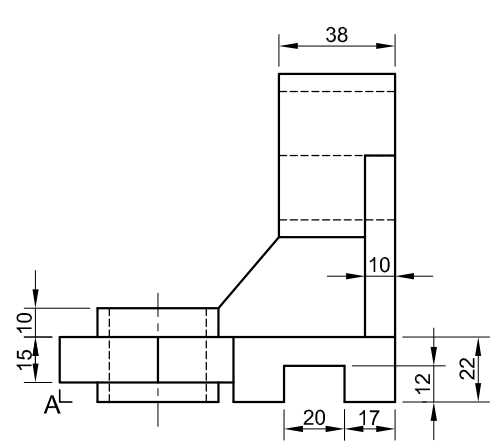
Instructions:

Convert the orthographic views of the movable coupling into a scale 1 : 1 isometric drawing.

- Make corner A the lowest point of the drawing.
- Show ALL necessary circle and other construction.
- NO hidden detail is required. **[39]**







A

ASSESSMENT CRITERIA				
1. AUX. VIEW + PLACING	4			
2. ISOMETRIC LINES	20			
3. NON-ISOMETRIC LINES	$6\frac{1}{2}$			
4. ISOMETRIC CIRCLES	$5\frac{1}{2}$			
5. CIRCLE CONSTRUCTION	2			
6. CENTRE LINES	1			
TOTAL	**39**			
EXAMINATION NUMBER				
EXAMINATION NUMBER				4

STAPLE

QUESTION 2: LOCI (HELIX)

A manufacturing company designed a single-start square threaded worm gear with the following specifications:

- Right handed
- One and a half revolutions
- Outside diameter = 120 mm
- Core diameter = 80 mm
- Pitch = 60 mm

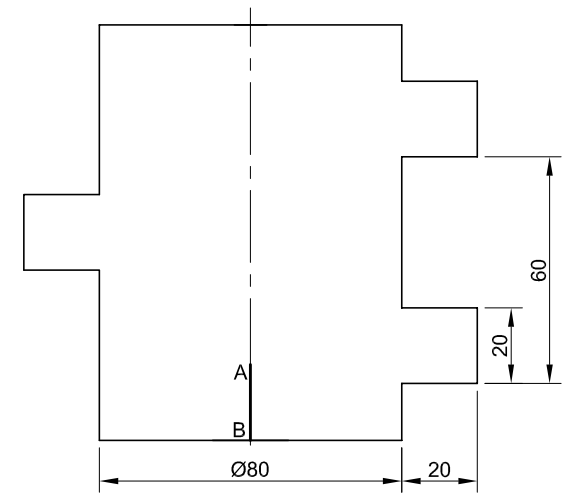
Given:

- The incomplete front view of the worm gear showing the profile of the thread and the starting position AB, at the centre front of the shaft
- The centre line and starting position AB as a reference on the drawing sheet

Instructions:

Draw, to scale 1 : 1, the complete front view of the worm gear using the given centre line and starting position AB.

- Show ALL necessary construction.
- NO hidden detail is required. **[39]**

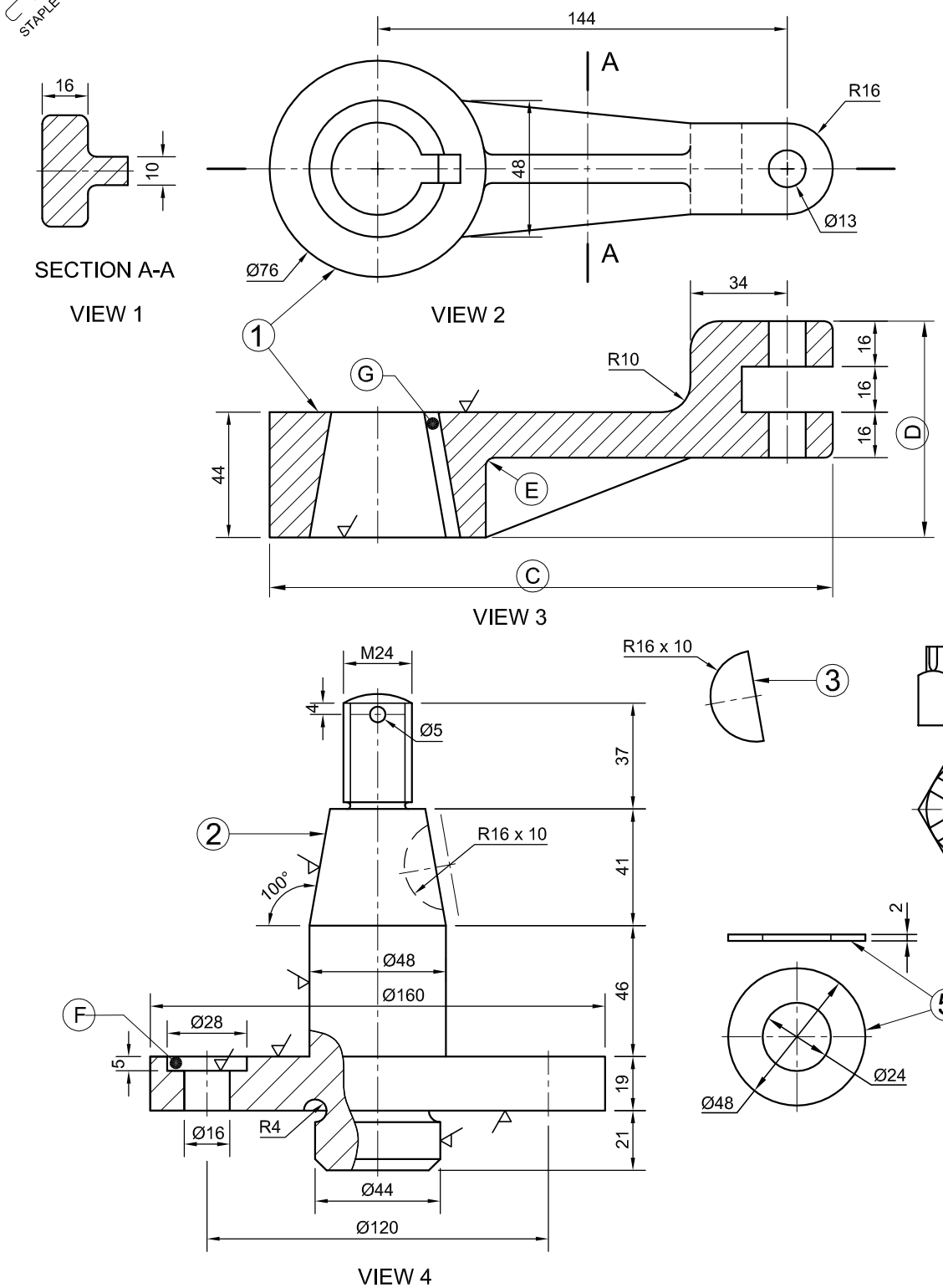


ASSESSMENT CRITERIA				
1. CONSTRUCTION	$8\frac{1}{2}$			
2. OUTSIDE CURVES + LINES	$15\frac{1}{2}$			
3. INSIDE CURVES	6			
4. QUALITY OF CURVES	4			
5. SHAFT	5			
TOTAL	**39**			

EXAMINATION NUMBER

EXAMINATION NUMBER 3

STAPLE



PARTS LIST		
PART	QUANTITY	MATERIAL
1. HANDLE	1	MILD STEEL
2. SPINDLE	1	MILD STEEL
3. WOODRUFF KEY	1	HARDENED STEEL
4. CASTLE NUT	1	HARDENED STEEL
5. WASHER	1	MILD STEEL
6. SPLIT PIN	1	SPRING STEEL

QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
Six parts of a crank handle with a title block and a table of questions.

Instructions:
Complete the table below by neatly answering the questions, which all refer to the accompanying drawings and the title block. **[25]**

	QUESTIONS	ANSWERS	
1	On what date was the drawing drawn?		1
2	What is the file name of the drawing?		1
3	In which street is the manufacturing company situated?		1
4	Who made changes to the drawing?		1
5	What scale is indicated for the drawing?		1
6	What is the tolerance allowed on the dimensions?		1
7	What type of section is indicated with view 1?		1
8	What would VIEW 3 be called?		1
9	How many surfaces must be machined on VIEW 4?		1
10	What is the thickness of the Woodruff key?		1
11	Determine the dimensions at C and D.	**C** **D**	2
12	What is the size of the arc at E?		1
13	What is the feature at F called?		1
14	What is the feature at G called?		1
15	What is the purpose of the castle nut?		1
16	What is the purpose of the split pin?		1
17	What type of section is indicated on VIEW 4?		1
18	What is the purpose of the Woodruff key in the crank-handle assembly?		1
19	Draw the arrows for the cutting plane located on VIEW 2 and label it B-B.		2
20	In the box below (ANSWER 20), draw, in neat freehand, the symbol for the projection system used.		4
	TOTAL		**25**

	13/12/2010	STEVEN	INSERT KEY AND KEYWAY	A
ALL DIMENSIONS ARE IN MILLIMETRES.	DATE	CHANGED BY	REVISION DESCRIPTION	№

UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS ARE ± 0,15.	DRAWN BY: JOHAN	DRAWING NO. 2	MATERIAL: MILD AND HARDENED STEEL
	DATE: 05/11/2010	FILE NAME: CRANK_003	HEAT TREATMENT: NORMALISE
ALL UNSPECIFIED RADII ARE R3.	CHECKED BY: DE WET	MAXSTEEL MANUFACTURING	GOVAN MBEKI DRIVE PORT ELIZABETH 6001 www.maxsteel.co.za
	DATE: 10/11/2010		
DRAWING PROGRAM: AUTOCAD 2008	APPROVED BY: ALIDA	CRANK HANDLE	
	DATE: 20/11/2010		
	SCALE: 1 : 2		

ANSWER 20

SYMBOL

EXAMINATION NUMBER

EXAMINATION NUMBER 2

STAPLE

ASSESSMENT CRITERIA				
TOP VIEW				
	POSSIBLE	OBTAINED	SIGN	MODERATE
1. M14 BOLT	3			
2. BUSH	1			
3. SWIVEL	3			
4. FIXED ARM	$2\frac{1}{2}$			
5. PIN	4			
6. BUSH	2			
7. LOCKING PIN	1			
8. YOKE	10			
9. MOUNTING BRACKET	$4\frac{1}{2}$			
SUBTOTAL	**31**			
SECTIONAL FRONT VIEW				
1. M14 BOLT	$10\frac{1}{2}$			
2. BUSH	$3\frac{1}{2}$			
3. SWIVEL	$3\frac{1}{2}$			
4. FIXED ARM	4			
5. SPRING WASHER	$2\frac{1}{2}$			
6. M14 NUT	5			
7. PIN	1			
8. YOKE	9			
9. MOUNTING BRACKET	4			
SUBTOTAL	**43**			
GENERAL				
THIRD ANGLE	2			
⊹ CENTRE LINES	3			
⊗ SECTION A-A	4			
▲ HATCHING	9			
ASSEMBLY $\frac{1}{2}$ MARK OF EVERY PART CORRECTLY ASSEMBLED	5			
SUBTOTAL	**23**			
TOTAL	**97**			

EXAMINATION NUMBER	
EXAMINATION NUMBER	6