



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

FEBRUARY/MARCH 2012

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 must be re-stapled in numerical sequence, irrespective of whether the question was attempted.
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			½	SIGN	MODERATED			½	SIGN	
1											
2											
3											
4											
TOTAL											
	2	0	0			2	0	0			

FINAL CONVERTED MARK

100

CHECKED BY

COMPLETE THE FOLLOWING:

CENTRE NUMBER

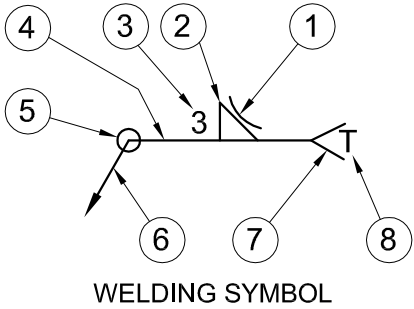
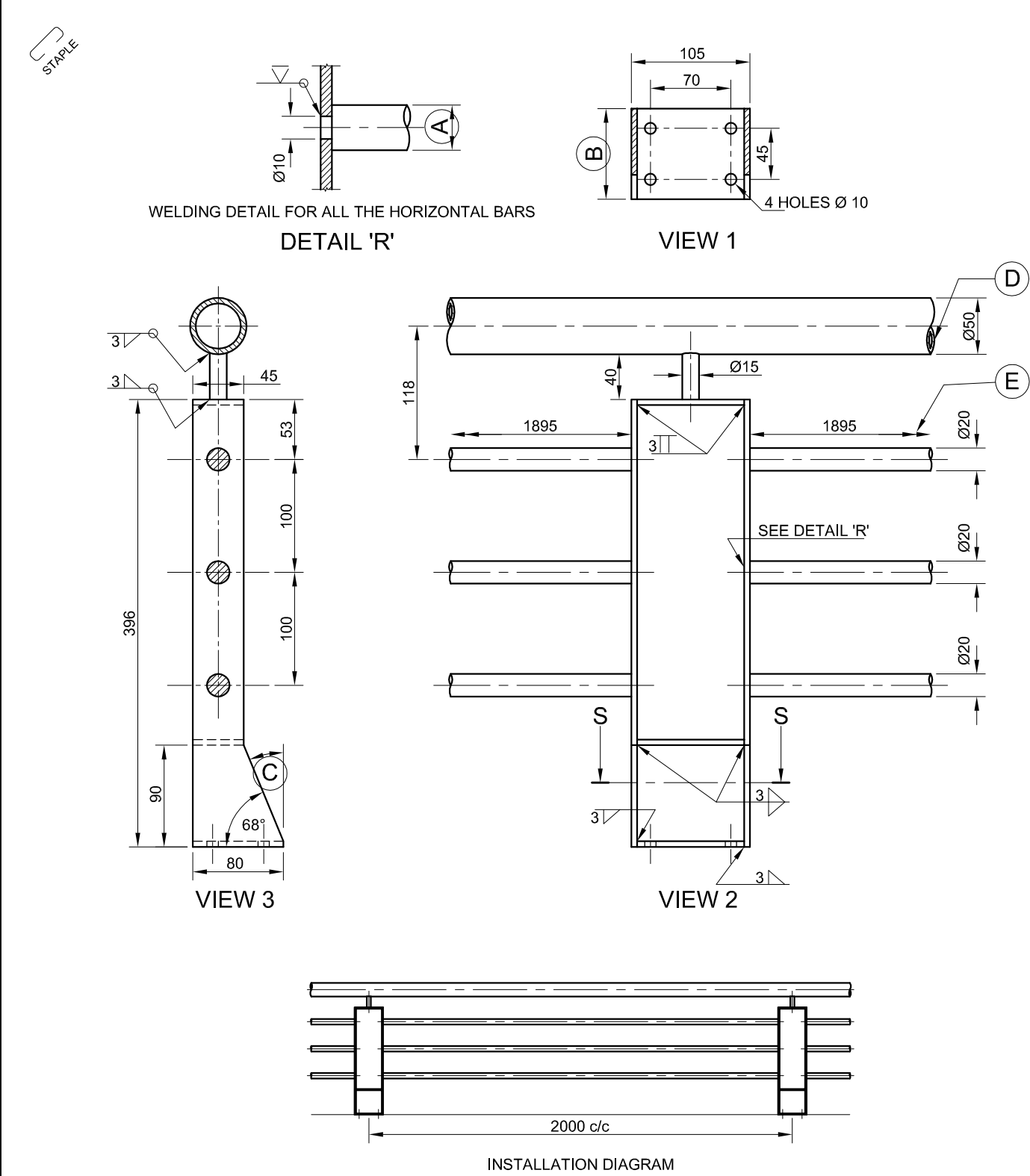
CENTRE NUMBER

EXAMINATION NUMBER

EXAMINATION NUMBER



Please turn over



QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
A selection of views of a balustrade bracket, a welding symbol, 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]**

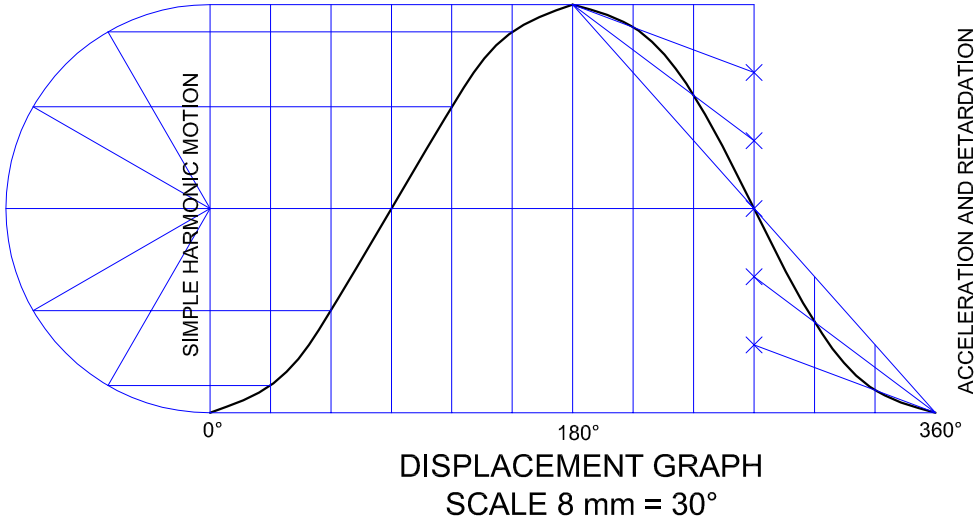
QUESTIONS		ANSWERS			
1	With reference to the welding symbol, link the number on the drawing with the correct element in the column to the right of this question.	ARROW LINE		7	
		TAIL			
		REFERENCE LINE			
		WELDING PROCESS			
		CONCAVE FINISH			
		WELD ALL AROUND			
		SIZE OF WELD			
2	When was the drawing approved?			1	
3	What is the manufacturing company's web address?			1	
4	What finish is required for the balustrade?			1	
5	What is the file name?			1	
6	What is the thickness of the plate used on the bracket?			1	
7	How many brackets must be manufactured?			1	
8	What would view 1 be called?			1	
9	What would view 3 be called?			1	
10	What size bolt is needed to secure the bracket?			1	
11	Determine the dimensions: A B C			3	
12	What is the centre-to-centre distance between two brackets?			1	
13	How many surfaces need to be welded on each bracket?			2	
14	What is feature D called on view 2?			1	
15	What is the meaning of the double arrow at E?			1	
16	If the permissible tolerance on a dimension is ± 0,5, determine the upper and lower tolerance on a dimension of 30 mm.			2	
17	In the box below, draw, in neat freehand, the symbol for the projection system used.			4	
		TOTAL		30	

FILE NAME: PM 12-PSC-347	MATERIAL: 5 mm MILD STEEL PLATE		
DRAWING No. 7	FINISH: CHROME PLATED	ALL DIMENSIONS ARE IN MILLIMETRES.	
BALUSTRADE FOR PIET AND SONS CONTRACTORS 17 WALDO STREET DURBAN	DRAWING PROGRAMME: AUTOCAD 2008	DRAWN BY: HAROLD	2011/05/15
	ALL UNSPECIFIED RADII ARE R3.	CHECKED BY: SALLY	2011/05/25
WELDTECH ENGINEERING 51 PARK AVENUE NEWLANDS 4070 www.weldtech.co.za 031 645 7820		APPROVED BY: GEORGE	2011/06/01
		SCALE: 1 : 10	
		QUANTITY: 26 BRACKETS	
TITLE BALUSTRADE BRACKET			



SYMBOL

EXAMINATION NUMBER	
EXAMINATION NUMBER	2



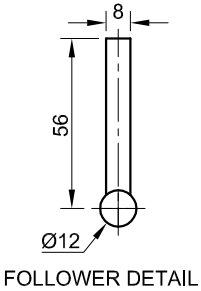
QUESTION 2: LOCI
NOTE: Answer QUESTIONS 2.1 AND 2.2.

2.1 CAM

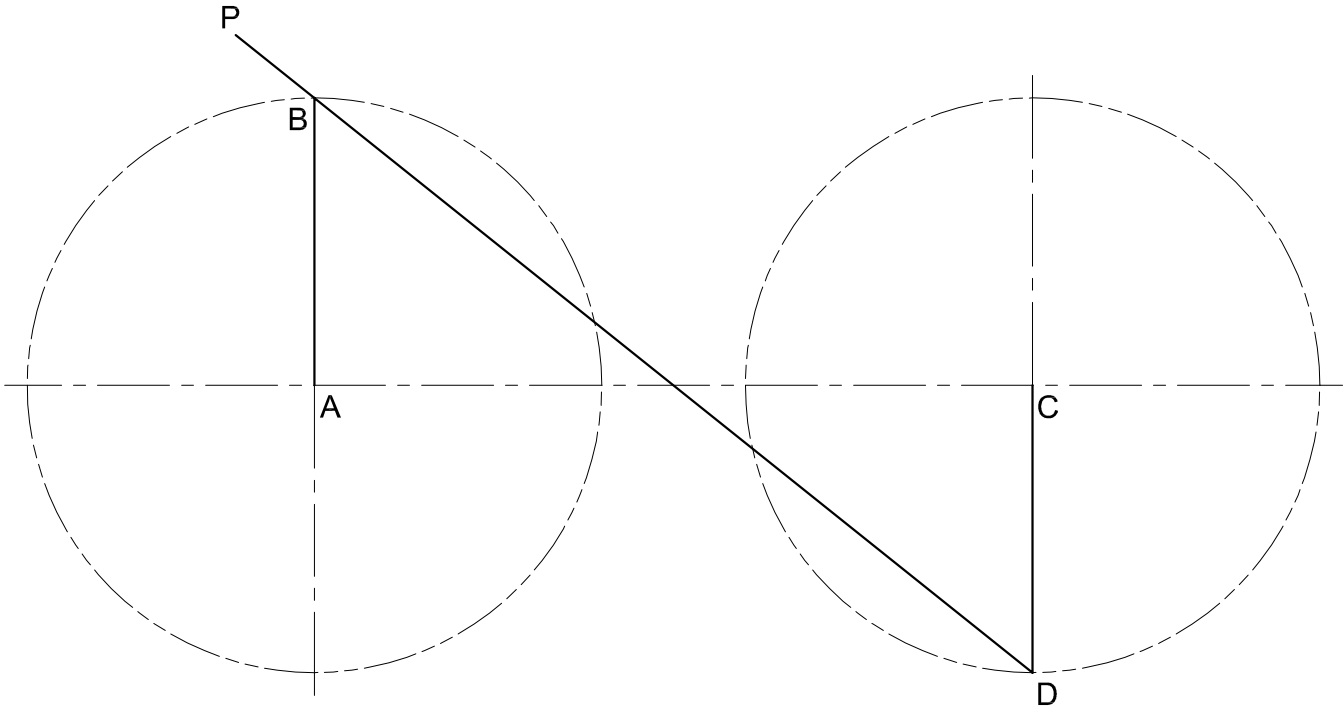
- Given:**
- The detail of a roller-ended follower and a displacement graph showing simple harmonic motion and uniform acceleration and retardation
 - The vertical centre line of the cam profile

- Specifications:**
- Camshaft = Ø14 mm
 - Minimum distance from the cam profile to the centre of the camshaft = 10 mm
 - Rotation = clockwise

- Instructions:**
- Draw, to scale 1 : 1, the given follower detail so that it will reciprocate along the given centre line.
 - From the given displacement graph, project and draw the cam profile.
 - Show the centre line and the direction of rotation on the cam profile.
 - Show ALL necessary construction. [19]



ASSESSMENT CRITERIA				
1. FOLLOWER + MIN. DIST' + CENTRE LINE + CAMSHAFT	6			
2. CONSTRUCTION	3			
3. PLOTTING + DIRECTION	6			
4. CURVE	4			
SUBTOTAL	19			



- 2.2 MECHANISM**
- Given:**
A schematic diagram of a linked crank mechanism consisting of two cranks, AB and CD, joined by a rod, DP, which is fixed at D and slides through B.
- Motion:**
As crank AB rotates in an anticlockwise direction, crank CD rotates in a clockwise direction at the same velocity.

- Instructions:**
- Using the given diagram, trace the locus generated by point P for ONE complete revolution of the mechanism.
 - Show ALL necessary construction. [19]

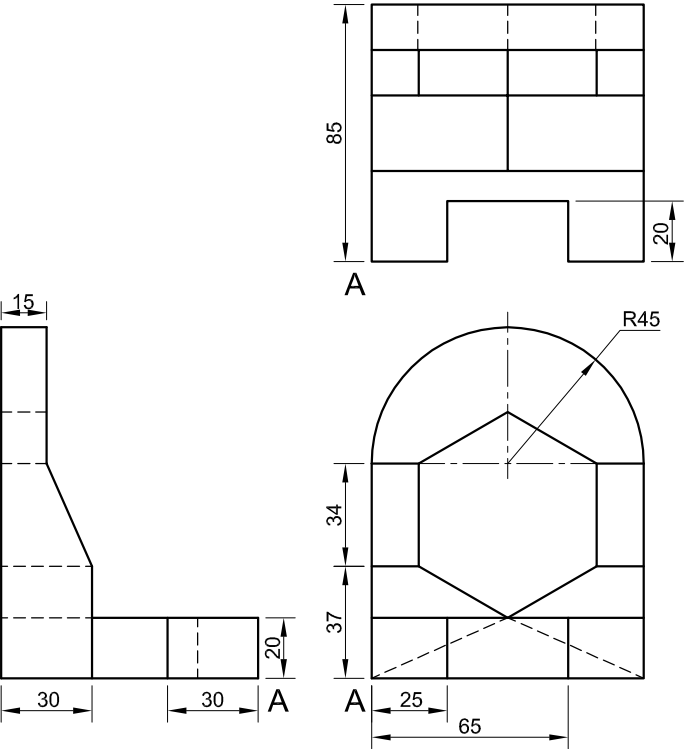
ASSESSMENT CRITERIA				
1. CONSTRUCTION	5			
2. LOCUS OF P	14			
SUBTOTAL	19			
TOTAL	38			
EXAMINATION NUMBER				
EXAMINATION NUMBER				3



QUESTION 3: ISOMETRIC DRAWING

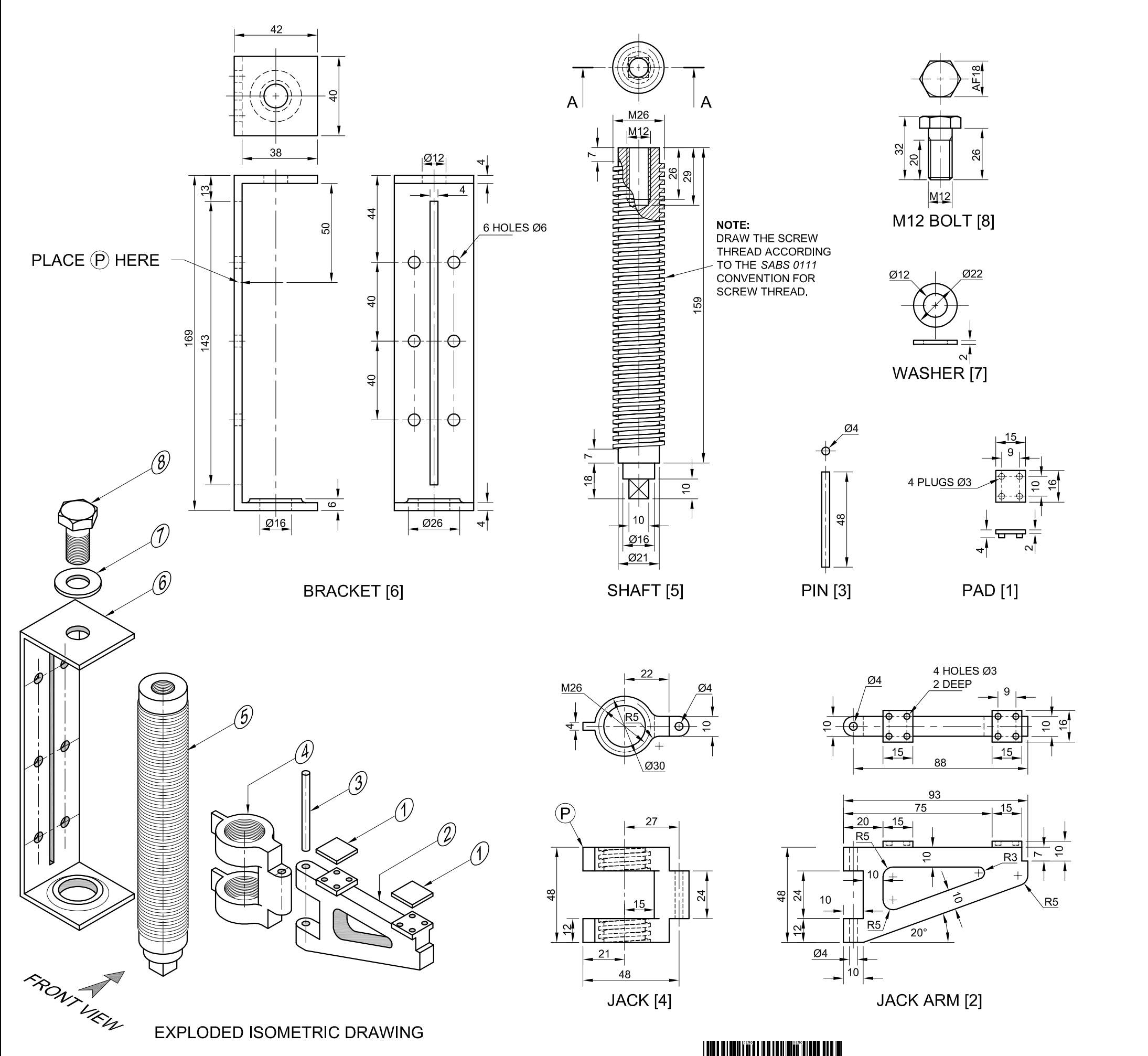
- Given:**
- The front view, top view and left view of a jig with a regular hexagonal hole
 - The position of point A on the drawing sheet

- Instructions:**
- Using scale 1 : 1, convert the orthographic views of the jig into an isometric drawing.
- Make A the lowest point of the drawing.
 - Show ALL necessary construction.
 - NO stencils may be used.
 - NO hidden detail is required.
- [39]



↓
A

ASSESSMENT CRITERIA				
1. AUXILIARY VIEW + PLACEMENT + CIRCLE CONSTRUCTION	5			
2. ISO' CIRCLES + CENTRE LINES	5			
3. ISO + NON-ISO' LINES	18			
4. HEXAGON	11			
TOTAL	39			
EXAMINATION NUMBER				
EXAMINATION NUMBER				4



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- The exploded isometric drawing of the parts of a jack assembly, showing the position of each part relative to all the others
 - Orthographic views of each of the parts of the jack 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 jack assembly:
- 4.1 A sectional front view** on cutting plane A-A, as seen from the direction of the arrow shown on the exploded isometric drawing. The cutting plane, which passes through the vertical centre line of the assembly, is shown on the top view of the shaft (part 5).
- 4.2 The top view**
- ALL drawings must comply with the guidelines contained in the SABS 0111.

- NOTE:**
- As indicated, place point P on the jack at point P on the bracket.
 - Show THREE faces of the M12 bolt and ALL necessary construction.
 - NO hidden detail is required.

- Add the following features to the drawing:**
- The cutting plane A-A
 - Label the sectional view SECTION A-A.
- [93]

PARTS LIST		
PART	QUANTITY	MATERIAL
1. PAD	2	BRONZE
2. JACK ARM	1	CAST IRON
3. PIN	1	MILD STEEL
4. JACK	1	CAST IRON
5. SHAFT	1	MILD STEEL
6. BRACKET	1	MILD STEEL
7. WASHER	1	MILD STEEL
8. M12 BOLT	1	MILD STEEL

MECHTECH
ENGINEERING

17 LONG STREET
NEW PARK
KIMBERLEY 8300
www.mtech.co.za
053 645 7820

JACK ASSEMBLY	
ALL DIMENSIONS ARE IN MILLIMETRES.	ALL UNSPECIFIED RADII ARE R2.

5

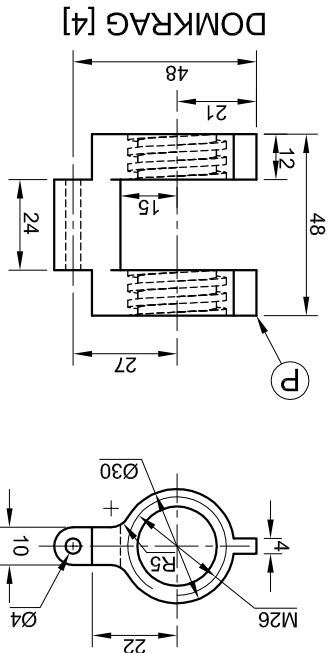


ASSESSMENT CRITERIA					
SECTIONAL FRONT VIEW					
1	PAD	3			
2	JACK ARM	11			
3	PIN	1			
4	JACK	7½			
5	SHAFT	14½			
6	BRACKET	7			
7	WASHER	1			
8	M12 BOLT	11			
9	HATCHING	13			
SUBTOTAL		69			
TOP VIEW					
1	OUTLINE	10			
2	M12 BOLT + WASHER	3			
SUBTOTAL		13			
GENERAL					
1	CENTRE LINES	2			
2	CUTTING PLANE + TITLE	4			
3	ASSEMBLY	5			
SUBTOTAL		11			
TOTAL		93			
EXAMINATION NUMBER					
EXAMINATION NUMBER					6

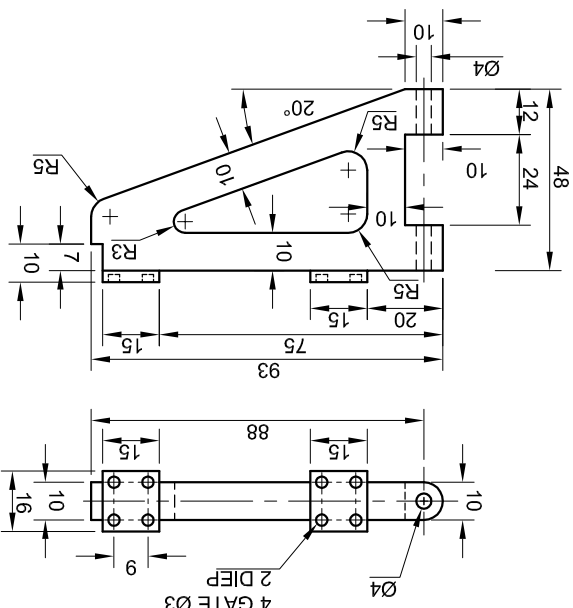




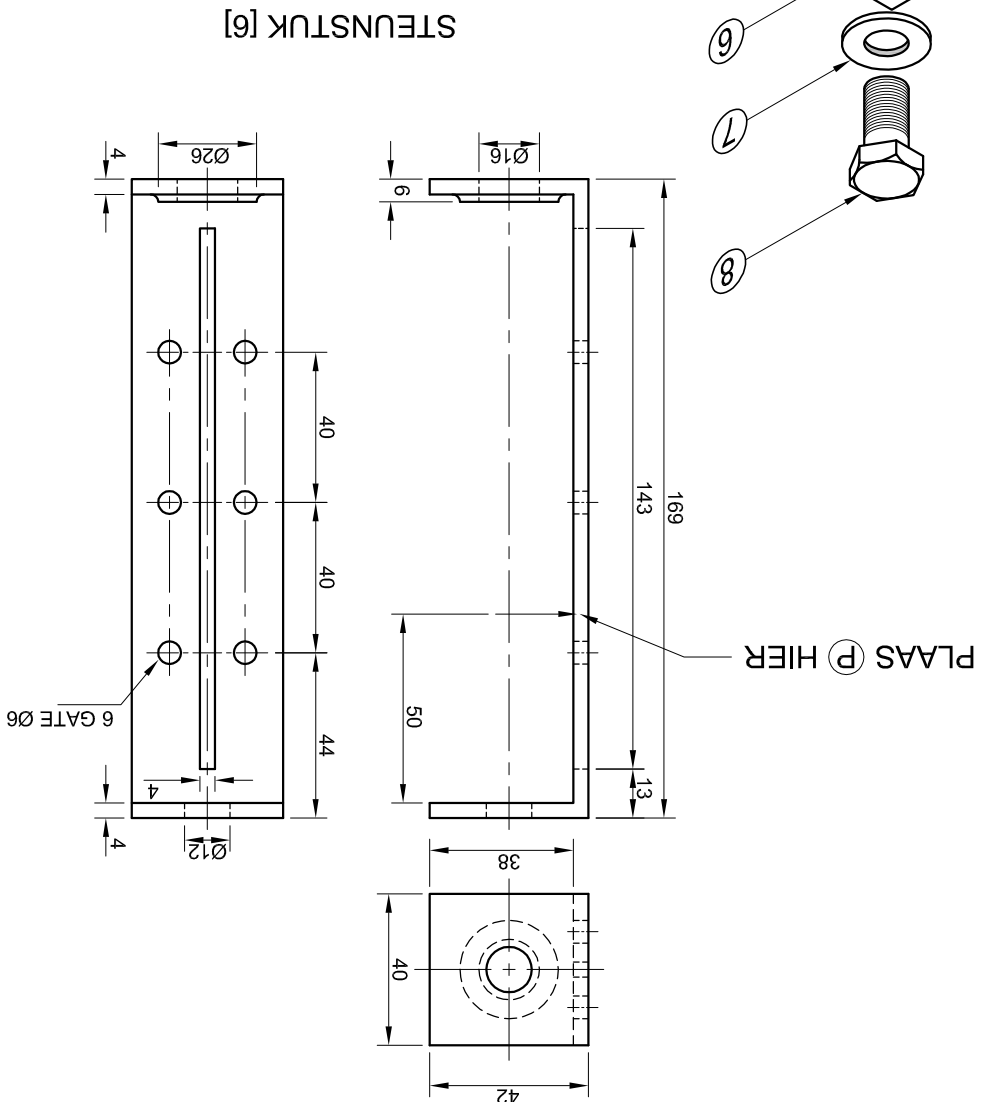
ASSESSERINGSKRITERIA				
DEURSNEE-VOORAANSIG				
1	KUSSING	3		
2	DOMKRAAGARM	11		
3	PEN	1		
4	DOMKRAAG	7½		
5	AS	14½		
6	STEUNSTUK	7		
7	WASTER	1		
8	M12-BOU	11		
9	ARSERING	13		
SUBTOTAAL		69		
BOAANSIG				
1	BUITELYN	10		
2	M12-BOU + WASTER	3		
SUBTOTAAL		13		
ALGEMEEN				
1	SENTERLYNE	2		
2	SNYVLAK + TTIEL	4		
3	SAMESTELLING	5		
SUBTOTAAL		11		
TOTAAL		93		
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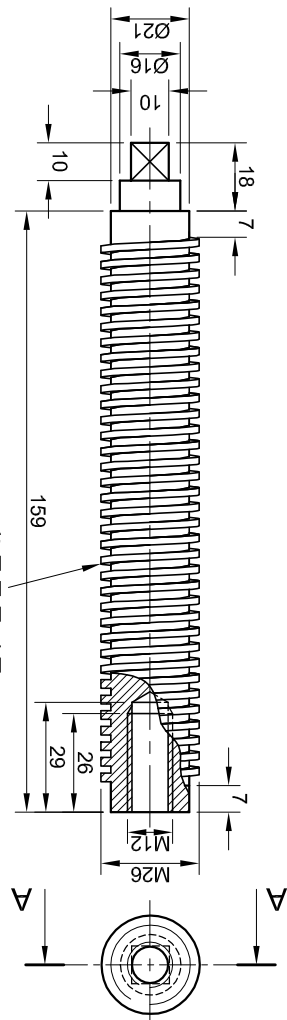
DOMKRAG [4]



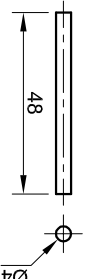
DOMKRAARM [2]



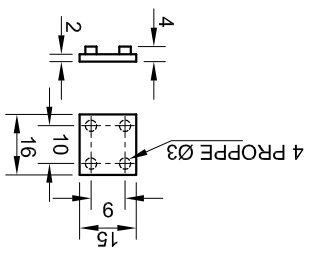
STEUERNSTUK [6]



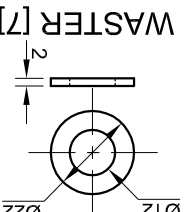
AS [5]



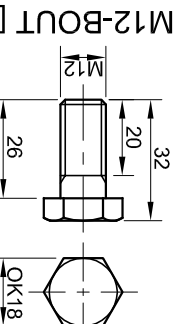
PEN [3]



[1] KUSSING



MASTER [7]



M12-BOUT [8]

NOTA:
TEKEN DIE SKROEF-
DRAAD VOLGENS
DIE SABS 0111-
KONVENSIË VIR
SKROEFDRAAD.

Gege:

- Die uitsluit- isometrische tekening van die onderdele van 'n domptegasmestelling, wat die posisie van elke onderdeel relatief tot al die ander toon
- Orthografiese aansigte van elke onderdeel van die domptegasmestelling

- Beantwoord hierdie vraag op bladsy 6.
- Teken, volgens skaal 1 : 1 en in derde

- onderdele van die domkragasamstelling:
- 4.1 'n Deursnee-vooraansig** volgens snylak A-A, soos gestien vanuit die rigting van die pyl wat in die uitskui-fisometrie se tekening getoon word. Die snylak, wat deur die vertikale sentrelyn van die samestelling gaan, word op die boaansig van die as (onderdeel 5) getoon.
- 4.2 Die boaansig**
- **ALLE** tekene moet voldoen aan die riglyne vervat in die **SABS 0111**.

LET ME:

- Soos aangedui, plaas punt P op die domkrag by punt P op die steunstuk.
- Toon DRIE vlakke van die M12-bout en ALLE nodige konstruksies.
- GEEN verborge besonderhede word verlang nie.

Voeg die volgende kenmerke by die tekening:

- Die snylak A-A
- Benoem die deursneeansig SNIT A-A.

ONDERDEELTS

MECHTECH

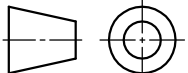
INGENIEURSWERKE

KIMBERLEY 8300
www.mtech.co.za 053 645 7820

DOMKRAGSAMESTELLING

ALLE AFMETINGS IS IN MILLIMETER.

ALLE
ONGESPESIFISEERDE
RADIUSSE IS R2.



5

Blaai om asseblief



VRAAG 3: ISOMETRIESE TEKENING

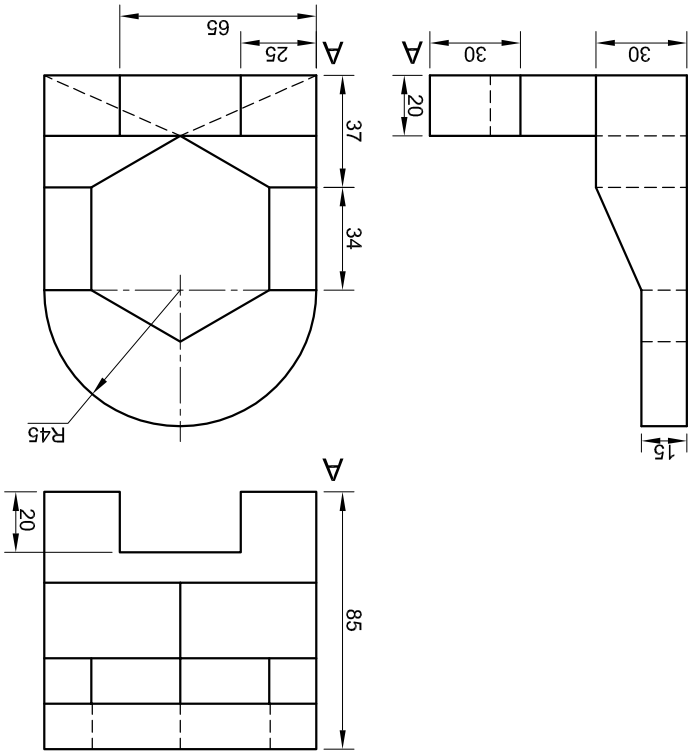
Gegee:

- Die vooraansig, boaansig en linkeraansig van 'n setmaat met 'n reëlmatige seshoekige gat
- Die posisie van punt A op die tekenvel

Instruksie:

Deur skaal 1 : 1 te gebruik, omskep die ortografiese aansigte van die setmaat in 'n isometriese tekening.

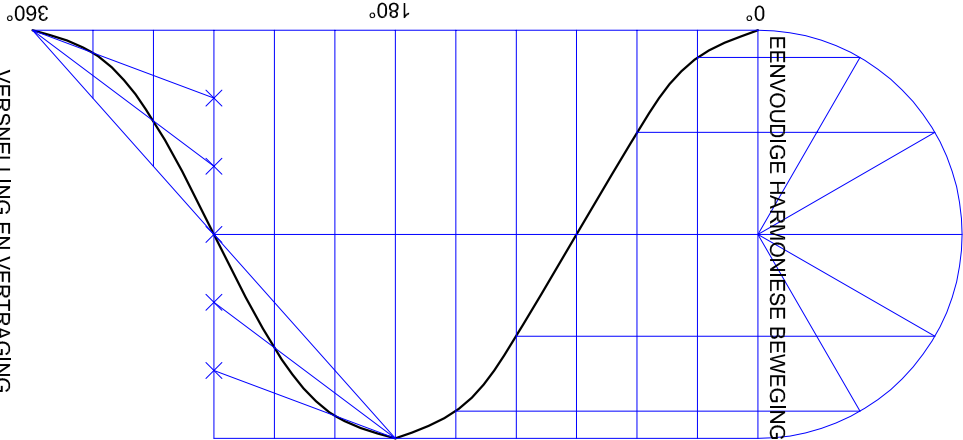
- Maak A die laagste punt van die tekening.
- Toon ALLE nodige konstruksies.
- GEEN stensils mag gebruik word nie.
- GEEN verborge besonderhede word verlang nie. [39]



A



ASSESSERINGSKRITERIA				
1. HULPAANSIG + PLASING + SIRKEL-KONSTRUKSIE	5			
2. ISO-SIRKELS + SENTERLYNE	5			
3. ISO + NIE-ISO-LYNE	18			
4. SESKANT	11			
TOTAAL	39			
EKSAMENNOMMER				
EKSAMENNOMMER				
EKSAMENNOMMER				
4				



VERPLASINGSGRAFIËK
SKAAL 8 mm = 30°

2.1 NOK

Gege:

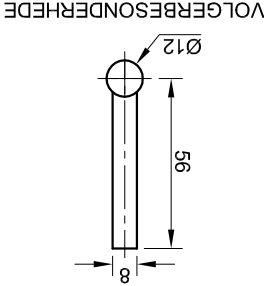
- Die besonderhede van 'n rolleervormige volger en 'n verplasingsgrafiek wat eenvoudige harmoniese beweging en eenvormige versnelling en vertraging toon
- Die vertikale sentryn van die nokprofiel

Spezialkassen:

- Minimum afstand vanaf de nokprofiel na die senter van die nokas = 10 mm
- Rotasie = kloksgewys

Instrukcijas:

- Teken, volgens skaal 1 : 1, die gegewe volger-
besonderheide sodat dit heen en weer op die gegewe
sentriem sal beweeg.
 - Vanaf die gegewe verplasingstraak, projekteer en
teken die nokprofiel.
 - Toon die sentriem en die rigting van rotasie op die
nokprofiel.
 - Toon AL die nodige konstruksies.
- [19]**



ASSESSERINGSKRITERIA			
1. VOLGER + MIN. AFSTAND + SENTERLYN + NOKAS	6		
2. KONSTRUKSIE	3		
3. UITSTIPPING + RIGTING	6		
4. KURWE	4		
SUBTOTAL	19		

2.2 MEGANISME

Gedee:

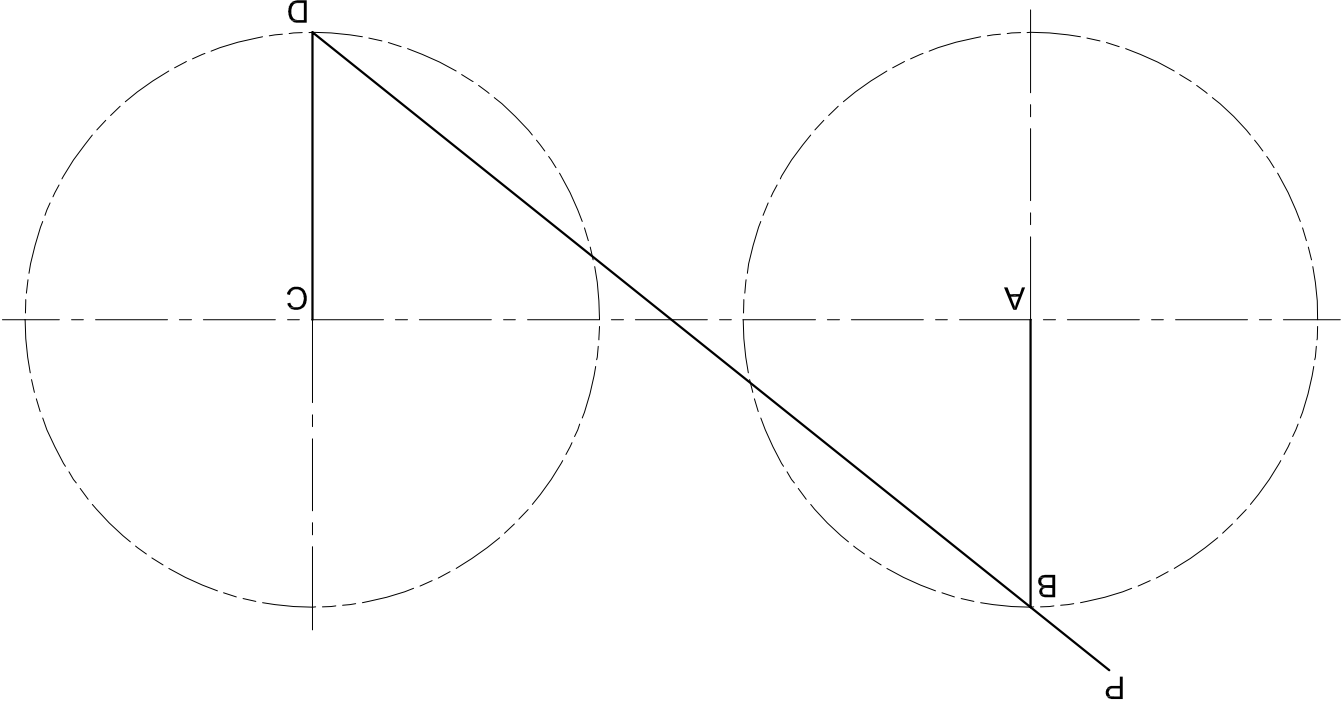
'n Skematiese diagram van 'n verbindende kruismeganisme wat bestaan uit twee krukke, AB en CD, wat met 'n stang, DP, wat by D geheg is en deur B gly, verbind is.

Beweging:

kruk CD in 'n kloksgewyse rigting teen dieselfde snelheid.

Instrukcijas:

- Deur die gegewe diagram te gebruik, bepaal die lokus wat deur punt P gegenereer word vir EEN volledige omwenteling van die meganisme.
 - Toon AL die nodige konstruksies.
- [19]



ASSESSERINGSKRITERIA				
1. KONSTRUKSIES	5			
2. LOKUS VAN P	14			
SUBTOTAAL	19			
TOTAAL	38			
EKSAAMENNOMMER				
EKSAAMENNOMMER				
3				





NASIONALE
SENIOR SERTIFIKAAT

GRAAD 12

INGENIEURSGRAFIKA EN -ONTWERP V2
FEBRUARIE/MAART 2012

PUNTE: 100
TYD: 3 uur



Hierdie vraestel bestaan uit 6 bladsye.



INSTRUKSIES EN INLICHTING

- Hierdie vraestel bestaan uit VIER vrae.
- Beantwoord AL die vrae.
- ALLE tekene is in derdehoekse ortografiese projeksie, tensy anders aangedui.
- ALLE tekene moet voltooi word met instrumente, tensy anders aangedui.
- ALLE antwoorde moet akkuraat en netjies geteken word.
- AL die vrae moet, soos voorgeskryf, op die VRAESTEL beantwoord word.
- AL die bladsye moet weer in nommervolgorde vasgeklam word, ongeag of die vraag beantwoord is.
- Tydsbeplanning is noodsaaklik om al die vrae te voltooi.
- Drukskryf jou eksamennummer in die blokkie voorsien op elke bladsy.
- Enige besonderhede of afmetings wat nie gegee is nie, moet in goeie verhouding veronderstel word.

SLEGS VIR AMPTELIKE GEBRUIK											
VRAAG			PUNTE BEHAL			GEMODEREER			TEKEN		
1	2	3	4								
TOTAAL											
2	0	0				2	0	0			

FINALE VERWERKTE PUNT	100
NAGESIEN DEUR	

VOLTOOI DIE VOLGENDE:
SENTRUMNUMMER
SENTRUMNUMMER
EKSAMENNUMMER
EKSAMENNUMMER