basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

INGENIEURSGRAFIKA EN -ONTWERP V2

NOVEMBER 2011

PUNTE: 100

TYD: 3 uur

Hierdie vraestel bestaan uit 6 bladsye.

INSTRUKSIES EN INLIGTING

1. Hierdie vraestel bestaan uit VIER vrae.
2. Beantwoord AL die vrae.
3. ALLE tekene is in derdehoekse ortografiese projeksie, tensy anders aangedui.
4. ALLE tekene moet volgens skaal 1 : 1 geteken word, tensy anders aangedui.
5. AL die vrae moet, soos voorgeskryf, op die VRAESTEL beantwoord word.
6. AL die bladsye moet weer in nommervolgorde vasgekram word, ongeag of die vraag beantwoord is.
7. Tydsbeplanning is noodsaaklik om al die vrae te voltooi.
8. Drukskryf jou eksamennommer in die blokkie voorsien op elke bladsy.
9. Enige besonderhede of afmetings wat nie gegee is nie, moet in goeie verhouding veronderstel word.
10. ALLE antwoorde moet akkuraat en netjies geteken word.

SLEGS VIR AMPTELIKE GEBRUIK

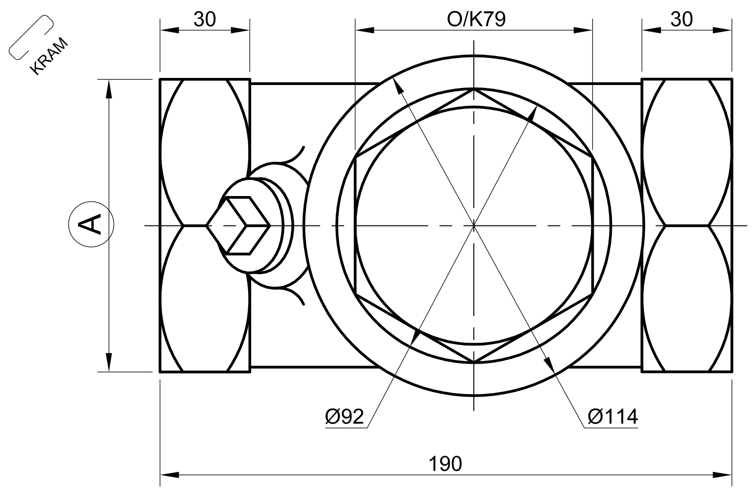
VRAAG	PUNTE BEHAAL			½	TEKEN	GEMODEREER			½	TEKEN	
1											
2											
3											
4											
TOTAAL											
	2	0	0			2	0	0			

FINALE VERWERKTE PUNT	NAGESIEN DEUR
100	

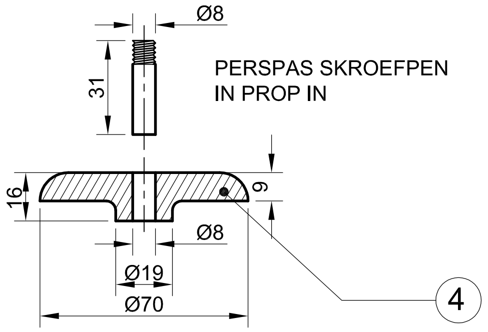
VOLTOOI DIE VOLGENDE:

SENTRUMNOMMER
SENTRUMNOMMER
EKSAMENNOMMER
EKSAMENNOMMER

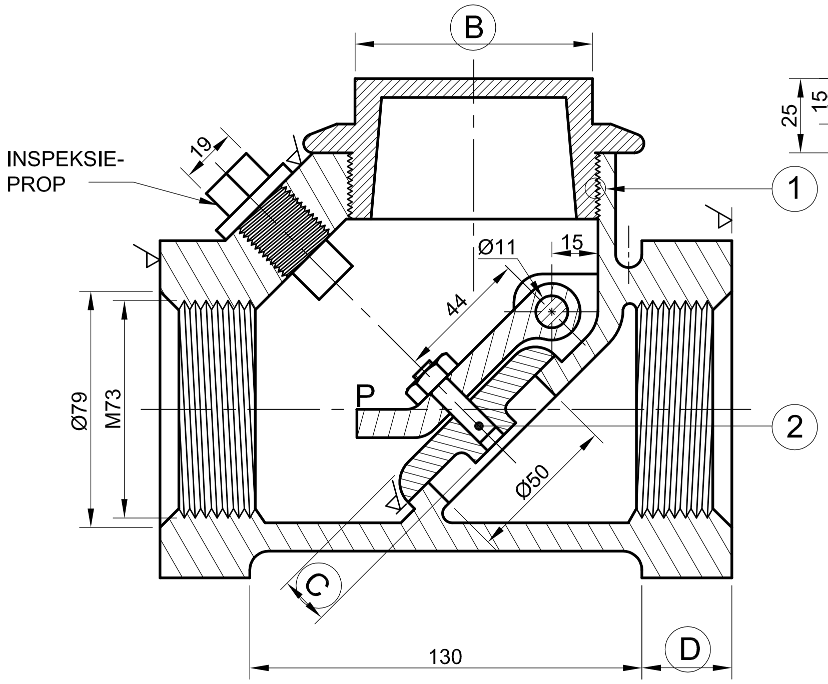
Kopiereg voorbehou



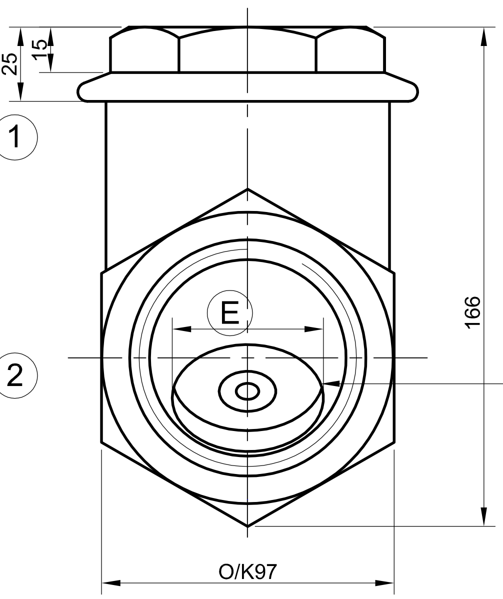
AANSIG 2



BESONDERHEDE VAN SKROEFPEN EN PROP



AANSIG 1



AANSIG 3

VRAAG 1: ANALITIES (MEGANIES)

Gegee:
DRIE gedetailleerde aansigte van 'n swaaikontroleklep, 'n gedetailleerde tekening van die skroefpen en prop, 'n titelblok en 'n tabel met vrae. Die tekene is nie volgens die aangetoonde skaal voorberei nie.

Instruksies:
Voltooi die tabel hieronder deur die vrae, wat almal na die bygaande tekene en titelblok verwys, netjies te beantwoord. **[30]**

	VRAE	ANTWOORDE		
1	Wanneer is die tekening nagesien?		½	
2	Wie het die tekening goedgekeur?		½	
3	Watter skaal word vir die tekening aangedui?		½	
4	Wie is verantwoordelik vir die hersienings?		½	
5	Hoeveel hersienings is daar aan die tekening aangebring?		½	
6	Wat was die aard van die eerste hersiening?		½	
7	Hoeveel oppervlakke moet gemasjineer word?		1	
8	Wat is die grofheidswaarde van die gemasjineerde oppervlakke?		1	
9	Benoem die omsirkelde kenmerk by 1.		1	
10	Benoem die onderdeel by 2.		1	
11	Beskryf, in EEN woord, die ware vorm van die kenmerk by 3.		1	
12	Watter tipe snit word by 4 getoon?		1	
13	Wat moet die skroefdraadgrootte van 'n onderdeel wees sodat dit aan die swaaikontroleklep gekoppel kan word?		1	
14	Uit hoeveel onderdele bestaan die swaaikontroleklep?		1	
15	Wat sal aansig 3 genoem word?		1	
16	Bepaal die afmetings by: A B C D E		5	
17	Teken die snyvlak A-A op aansig 2.		3	
18	In aansig 1, teken die lokus wat deur punt P gegenereer sal word soos wat die hek tot sy maksimum oopgemaak word.		2	
19	In die blok hieronder (ANTWOORD 19), teken, in netjiese vryhand, die simbool vir die projeksiesisteem wat gebruik word.		4	
20	In die blok hieronder (ANTWOORD 20), voltooi, in netjiese vryhand en volgens die *SABS 0111*-konvensies, die tekening van die inspeksieprop aan die regterkant.		4	
		TOTAAL	**30**	

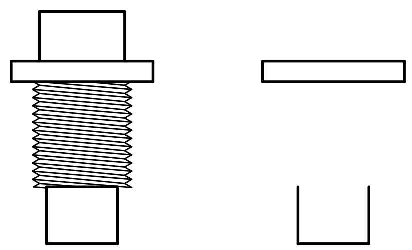
2011-08-12	N BOOTH	VERLENG INSPEKSIEPROP	3
2011-08-09	N BOOTH	TOON GEMASJINEERDE OPPERVLAKKE	2
2011-08-05	N BOOTH	VERWYDER WASTER	1
DATUM	HERSIEN DEUR	BESKRYWING VAN HERSIENING	Nr.

TEKENING NR. 60305	MATERIAAL: BRONS		
LÊERNAAM: SCV 15-10	HITTEBEHANDELING: NORMALISEER	ALLE AFMETINGS IS IN MILLIMETER.	
TENSY ANDERS VERMELD, IS ALLE TOLERANSIES OP AFMETINGS ± 0,25.	TEKENPROGRAM: AUTOCAD 2011	TEKENAAR: S SHABALALA	2011-07-22
	ALLE ONGESPESIFISEERDE RADIUSSE IS R2.	NASIENER: S PIENAAR	2011-07-24
MECHTECH INGENIEURSWERKE	LONGSTRAAT 17 NEW PARK KIMBERLEY 8300 www.mtech.co.za ☏ 053 645 7820	GOEDGEKEUR: A MOKOENA	2011-08-03
		SKAAL: 1 : 2	
TITEL SWAAIKONTROLEKLEP		0,8	

ANTWOORD 19

SIMBOOL

ANTWOORD 20



EKSAMENNOMMER
EKSAMENNOMMER

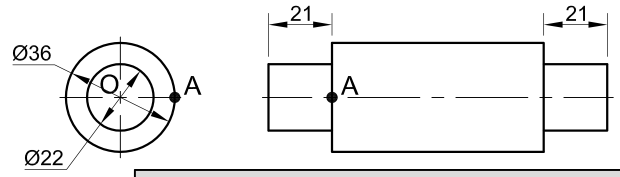
2

VRAAG 2: LOKUSSE
LET WEL: Beantwoord VRAAG 2.1 EN 2.2.

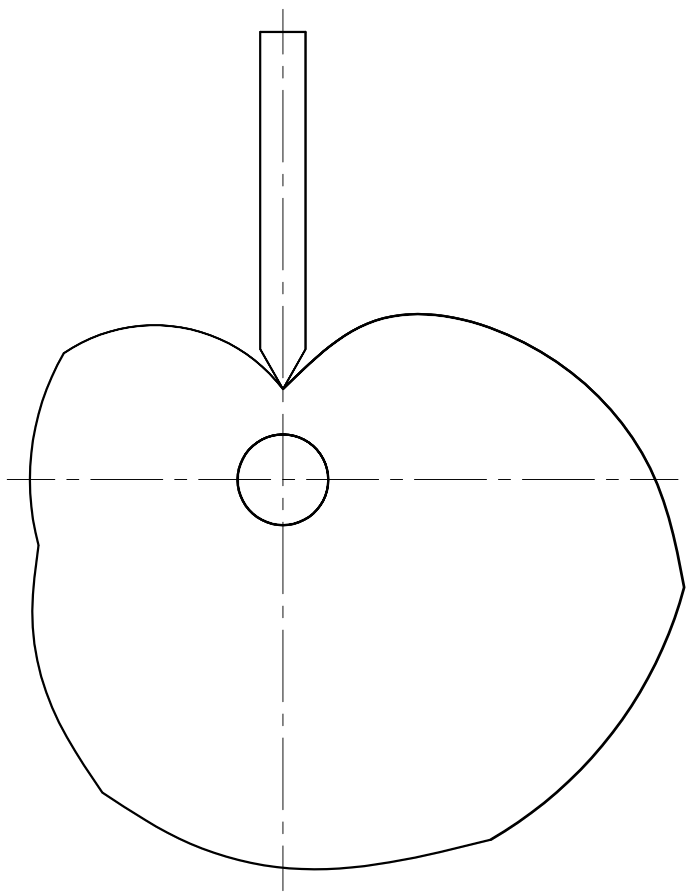
2.1 AWEGAAR
Gegee:
- Die vooraansig en linkeraansig van die as van 'n awegaar
- 'n Verwysingspunt, gemerk O, om te help met die plasing van die antwoord

Spesifikasies:
- Die steek (EEN volle draai) is 35 mm.
- Die buitediameter van die awegaar is Ø80.

Instruksies:
- Deur te begin by punt A, teken, volgens skaal 1 : 1, TWEE draaie van 'n regterhandse awegaar op die gegewe aansigte van die as.
- Toon ALLE nodige konstruksies.
- GEEN verborge besonderhede word verlang nie. **[27]**



ASSESSERINGSKRITERIA				
GEGEE	5			
SENTERLYNE + KONSTR	5			
HELIKS/AWEGAAR	17			
SUBTOTAAL	**27**			



2.2 NOK
Gegee:
'n Nokprofiel met 'n wigvormige volger

Spesifikasies:
Die nok roteer teen konstante snelheid in 'n kloksgewyse rigting en verleen eenvormige beweging aan die volger.

Instruksies:
- Teken die verplasingsgrafiek vir die nok deur 'n horisontale skaal van 8 mm gelyk aan 30° te gebruik.
- Toon die rigting van rotasie op die nokprofiel aan.
- Benoem die verplasingsgrafiek en toon die skaal wat gebruik word, aan.
- Toon AL die nodige konstruksies. **[12]**

ASSESSERINGSKRITERIA				
VERPLASINGSGRAFIEK	7			
KONSTRUKSIE	3			
BYSKRIFTE + PYL	2			
SUBTOTAAL	**12**			
TOTAAL	**39**			

EKSAMENNOMMER

EKSAMENNOMMER 3

KRAM

VRAAG 3: ISOMETRIESE TEKENING

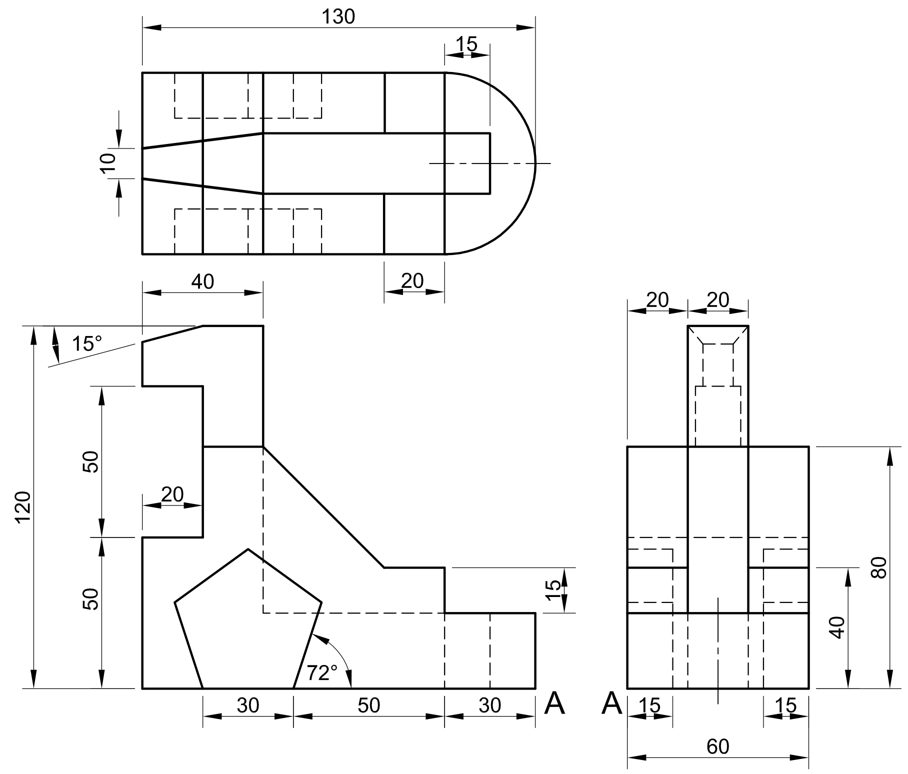
Gegee:

- Die vooraansig, boaansig en regteraansig van 'n veiligheidsknip met TWEE reëlmatige vyfkantige gleufgate
- Die posisie van punt A op die tekenvel

Instruksies:

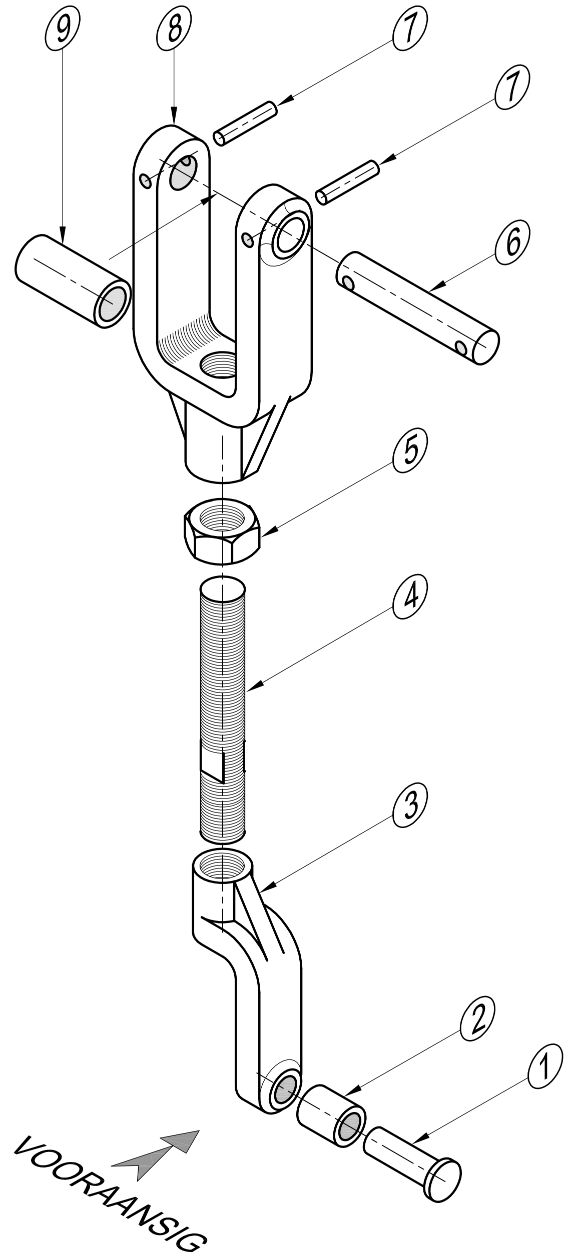
Deur skaal 1 : 1 te gebruik, omskep die ortografiese aansigte van die veiligheidsknip in 'n isometriese tekening.

- Maak A die laagste punt van die tekening.
- Toon ALLE nodige konstruksies.
- GEEN stensils mag gebruik word nie.
- GEEN verborge besonderhede word verlang nie. **[40]**

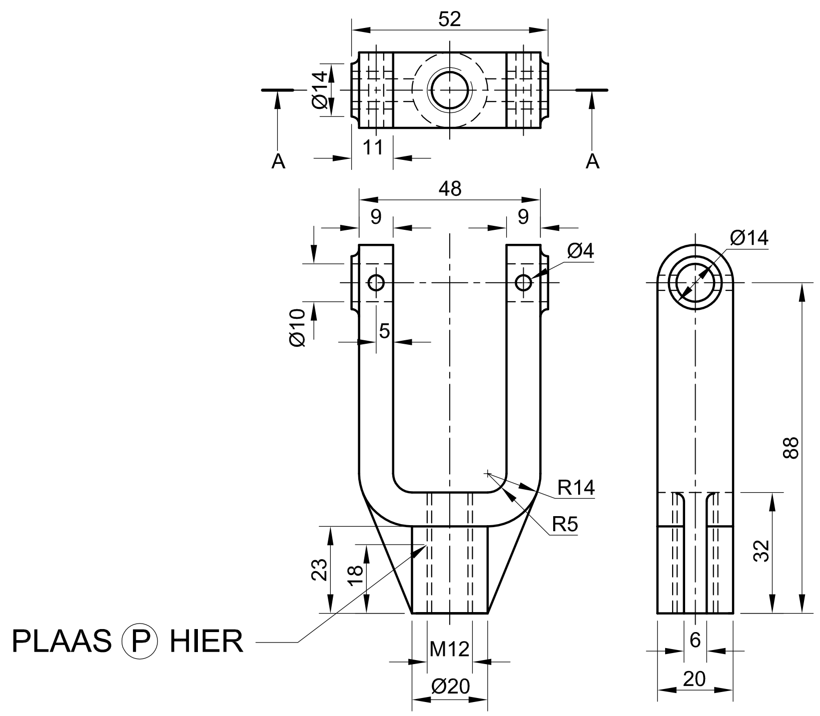


A

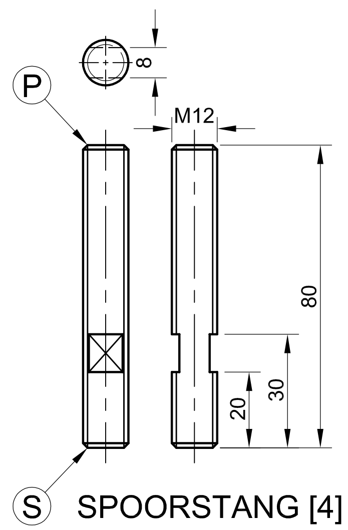
ASSESSERINGSKRITERIA				
HULPAANSIGTE + SIRKEL-KONSTRUKSIES + PLASING	6			
ISO-KURWES + VYFKANTIGE GAT	11			
ISO- + NIE-ISO-LYNE	23			
TOTAAL	**40**			
EKSAMENNOMMER				
EKSAMENNOMMER				4



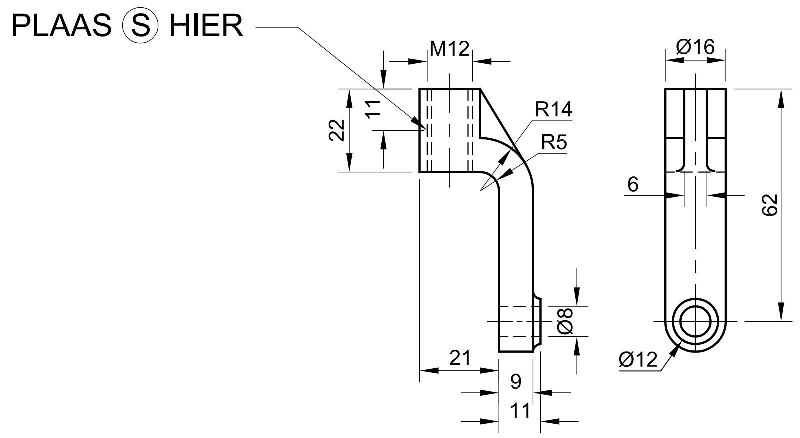
UITSKUIF- ISOMETRIESE TEKENING



VURK [8]



SPOORSTANG [4]



WEGSTAANARM [3]

VRAAG 4: MEGANIESE SAMESTELLING

Gegee:

- Die uitskuif- isometriese tekening van die onderdele van 'n wegstaanverbindingstaaf, wat die posisie van elke onderdeel relatief tot al die ander toon
- Ortografiese aansigte van elke onderdeel van die wegstaanverbindingstaaf-samestelling

Instruksies:

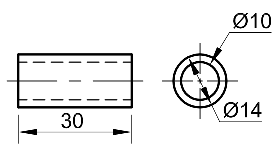
- Beantwoord hierdie vraag op bladsy 6.
- Teken, volgens skaal 1 : 1 en in derdehoekse ortografiese projeksie, die volgende aansigte van die saamgestelde onderdele van die wegstaanverbindingstaaf-samestelling:
  - **4.1 'n Deursnee-vooraansig** volgens snyvlak A-A, soos gesien vanuit die rigting van die pyl wat in die uitskuif-isometriese tekening getoon word. Die snyvlak, wat vertikaal deur die middel van die samestelling gaan, word op die boaansig van die vurk (onderdeel 8) getoon.
  - **4.2 Die regteraansig**
- ALLE tekene moet voldoen aan die riglyne vervat in die *SABS 0111*.

LET WEL:

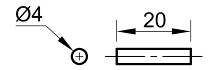
- Soos aangedui, plaas punt P aan die bokant van die spoorstang met punt P op die vurk en punt S aan die onderkant van die spoorstang met punt S op die wegstaanarm.
- Toon DRIE vlakke van die moer in die vooraansig en ALLE nodige konstruksies.
- GEEN verborge besonderhede word verlang nie.

Voeg die volgende kenmerke by die tekening:

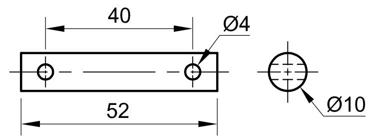
- Die snyvlak A-A
- Benoem die deursneeaansig SNIT A-A. **[91]**



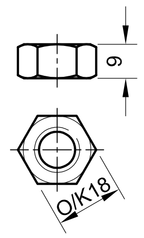
BUS B [9]



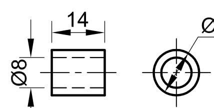
TAPPEN [7]



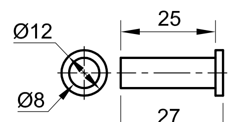
AS B [6]



M12-SLUITMOER [5]



BUS A [2]



AS A [1]

LYS VAN ONDERDELE		
ONDERDEEL	HOEVEELHEID	MATERIAAL
1. AS A	1	SAGTE STAAL
2. BUS A	1	BRONS
3. WEGSTAANARM	1	GIETYSTER
4. SPOORSTANG	1	SAGTE STAAL
5. M12-SLUITMOER	1	SAGTE STAAL
6. AS B	1	SAGTE STAAL
7. TAPPEN	2	SAGTE STAAL
8. VURK	1	GIETYSTER
9. BUS B	1	BRONS

MECHTECH
INGENIEURSWERKE

LANGSTRAAT 17
NEW PARK
KIMBERLEY 8300
www.mtech.co.za
☎ 053 645 7820

WEGSTAANVERBINDINGSTAAF

ALLE AFMETINGS IS IN MILLIMETER.	ALLE ONGESPESIFISEERDE RADIUSSE IS R2.	5

KRAM

ASSESSERINGSKRITERIA					
DEURSNEE-VOORAANSIG					
1	AS A	2			
2	BUS A	1			
3	WEGSTAAN-ARM	7½			
4	SPOORSTANG	9			
5	M12-MOER	8			
6	AS B	2			
7	TAPPEN	1			
8	VURK	10½			
9	BUS B	1			
H	ARSERING	12			
SUBTOTAAL		**54**			
REGTERAANSIG					
3	WEGSTAAN-ARM	5½			
4	SPOORSTANG	5			
5	M12-MOER	4½			
8	VURK	6			
SUBTOTAAL		**21**			
ALGEMEEN					
1	SENTERLYNE	4			
2	SNYVLAK + TITEL	5			
3	SAMESTELLING	7			
SUBTOTAAL		**16**			
TOTAAL		**91**			
EKSAMENNOMMER					
EKSAMENNOMMER					6

Kopiereg voorbehou

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 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

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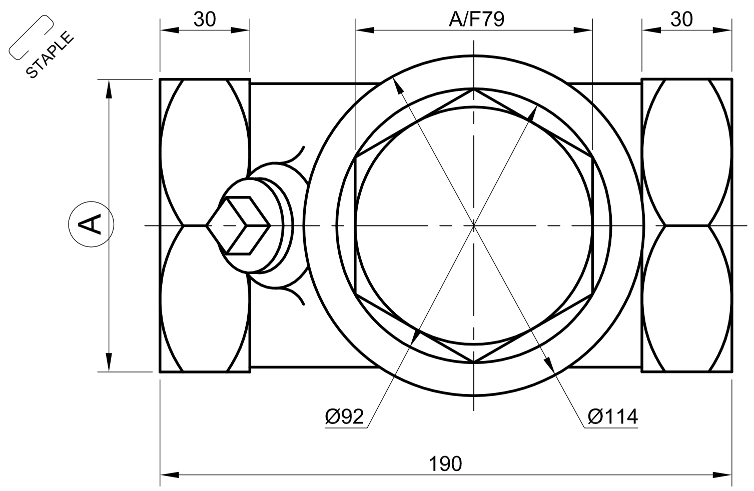
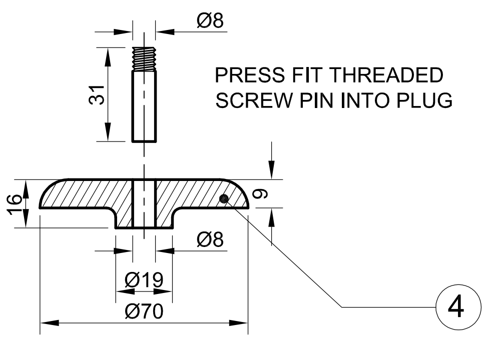
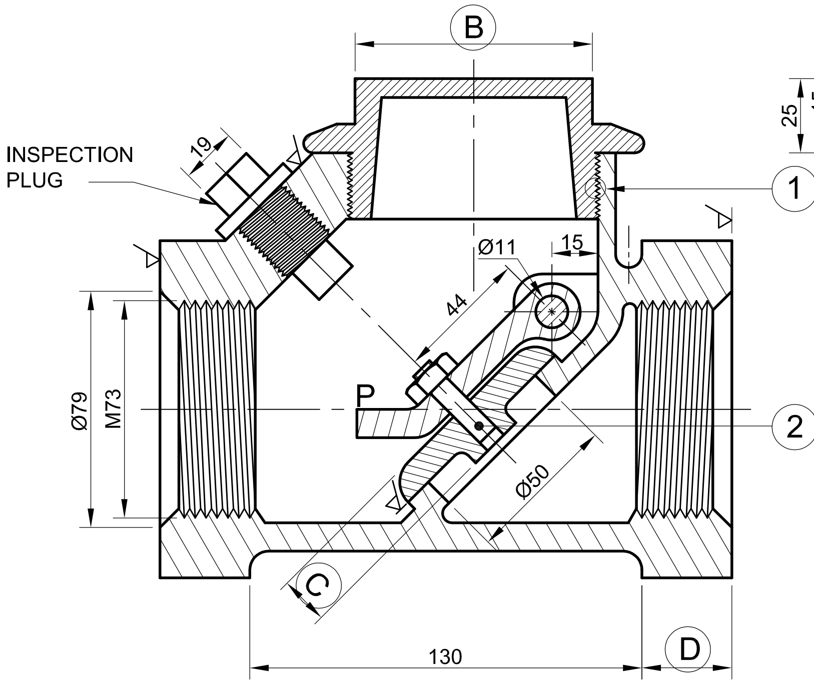


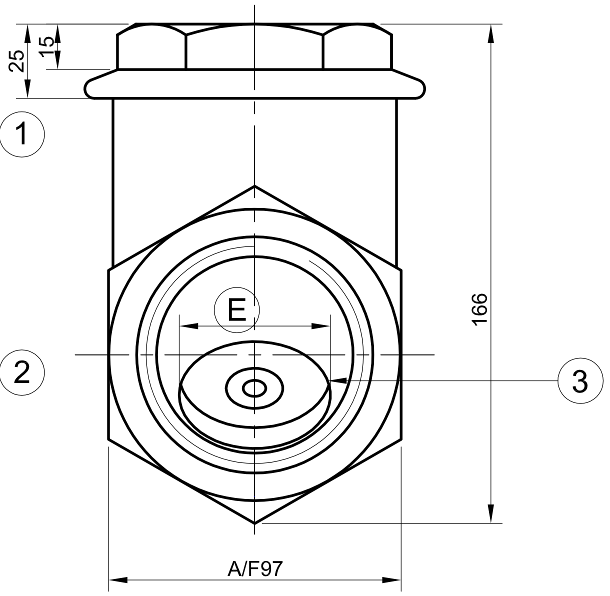
VIEW 2



DETAIL OF THREADED SCREW PIN AND PLUG



VIEW 1



VIEW 3

QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
THREE detailed views of a swing check valve, a detailed drawing of the screw pin and plug, 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	When was the drawing checked?		½	
2	Who approved the drawing?		½	
3	What scale is indicated for the drawing?		½	
4	Who was responsible for the revisions?		½	
5	How many revisions have there been to the drawing?		½	
6	What was the nature of the first revision?		½	
7	How many surfaces require machining?		1	
8	What is the roughness value of the machined surfaces?		1	
9	Name the circled feature at 1.		1	
10	Name the component at 2.		1	
11	In ONE word, describe the true shape of the feature at 3.		1	
12	What type of section is shown at 4?		1	
13	What thread size must a component have in order to be coupled to the swing check valve?		1	
14	How many components make up the swing check valve?		1	
15	What would view 3 be called?		1	
16	Determine the dimensions at: A B C D E		5	
17	Draw the cutting plane A-A on view 2.		3	
18	In view 1, trace the locus that will be generated by point P as the gate opens to its maximum.		2	
19	In the box below (ANSWER 19), draw, in neat freehand, the symbol for the projection system used.		4	
20	In the box below (ANSWER 20), complete, in neat freehand and according to the *SABS 0111* conventions, the drawing of the inspection plug on the right.		4	
	TOTAL		30	

DATE	REVISED BY	REVISION DESCRIPTION	№
2011-08-12	N BOOTH	LENGTHEN INSPECTION PLUG	3
2011-08-09	N BOOTH	SHOW MACHINED SURFACES	2
2011-08-05	N BOOTH	REMOVE WASHER	1

DRAWING No. 60305	MATERIAL: BRONZE
FILE NAME: SCV 15-10	HEAT TREATMENT: NORMALISE
UNLESS OTHERWISE SPECIFIED, TOLERANCES ON DIMENSIONS ARE ± 0,25.	DRAWING PROGRAMME: AUTOCAD 2011
	ALL UNSPECIFIED RADII ARE R2.

MECHTECH ENGINEERING
17 LONG STREET
NEW PARK
KIMBERLEY 8300
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TITLE
SWING CHECK VALVE

ALL DIMENSIONS ARE IN MILLIMETRES.

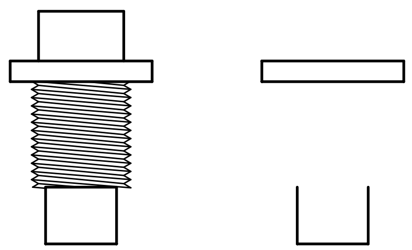
DRAWN BY: S SHABALALA	2011-07-22
CHECKED BY: S PIENAAR	2011-07-24
APPROVED BY: A MOKOENA	2011-08-03
SCALE: 1 : 2	

0,8

ANSWER 19

SYMBOL

ANSWER 20



EXAMINATION NUMBER

EXAMINATION NUMBER

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QUESTION 2: LOCI

NOTE: Answer QUESTIONS 2.1 AND 2.2.

2.1 AUGER

Given:

- The front view and left view of the shaft of an auger
- A reference point, labelled O, to help with the placement of the answer

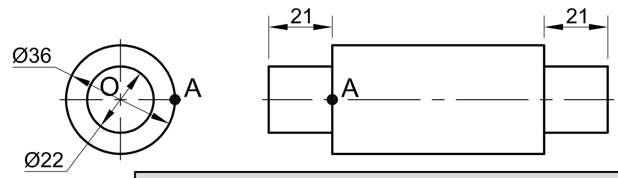
Specifications:

- The pitch (ONE full turn) is 35 mm.
- The outer diameter of the auger is Ø80.

Instructions:

- Starting at point A, draw, to scale 1 : 1, TWO turns of a right-hand auger on the given views of the shaft.
- Show ALL necessary construction.
- NO hidden detail is required. **[27]**

O



ASSESSMENT CRITERIA				
GIVEN	5			
CENTRE LINES + CONSTR'	5			
HELIX/AUGER	17			
SUBTOTAL	**27**			

2.2 CAM

Given:

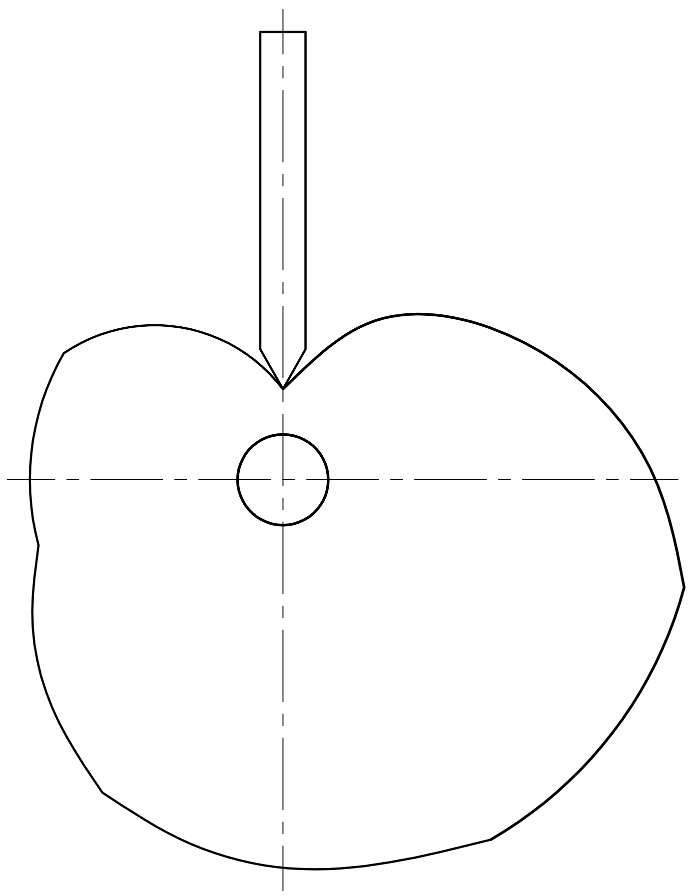
A cam profile with a wedge-ended follower

Specifications:

The cam rotates with constant velocity in a clockwise direction, imparting uniform motion to the follower.

Instructions:

- Draw the displacement graph for the cam, using a horizontal scale of 8 mm equal to 30°.
- Indicate the direction of rotation on the cam profile.
- Label the displacement graph and indicate the scale used.
- Show ALL necessary construction. **[12]**



ASSESSMENT CRITERIA				
DISPLACEMENT GRAPH	7			
CONSTRUCTION	3			
LABELS + ARROW	2			
SUBTOTAL	**12**			
TOTAL	**39**			

EXAMINATION NUMBER

EXAMINATION NUMBER 3

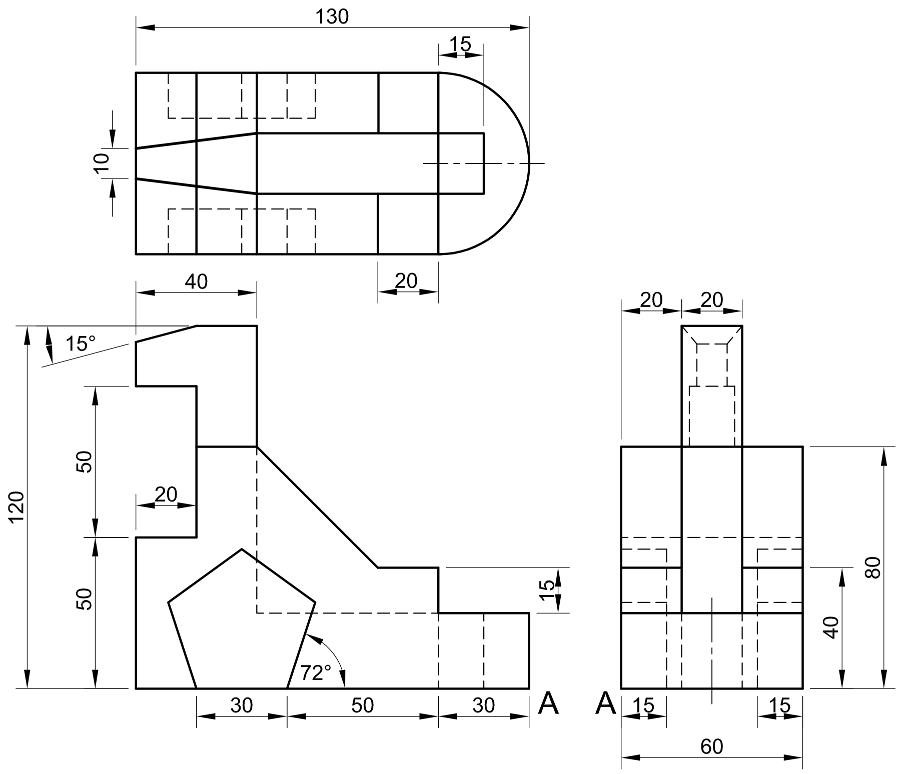
STAPLE

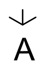
QUESTION 3: ISOMETRIC DRAWING

Given:
- The front view, top view and right view of a safety clip with TWO regular pentagonal slot holes
- The position of point A on the drawing sheet

Instructions:
Using scale 1 : 1, convert the orthographic views of the safety clip 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. **[40]**





ASSESSMENT CRITERIA				
AUXILIARY VIEWS + CIRCLE CONSTRUCTION + PLACE	6			
ISO' ARCS + PENTAGONAL HOLE	11			
ISO' + NON-ISO' LINES	23			
TOTAL	**40**			
EXAMINATION NUMBER				
EXAMINATION NUMBER				4

MPUMALANGA

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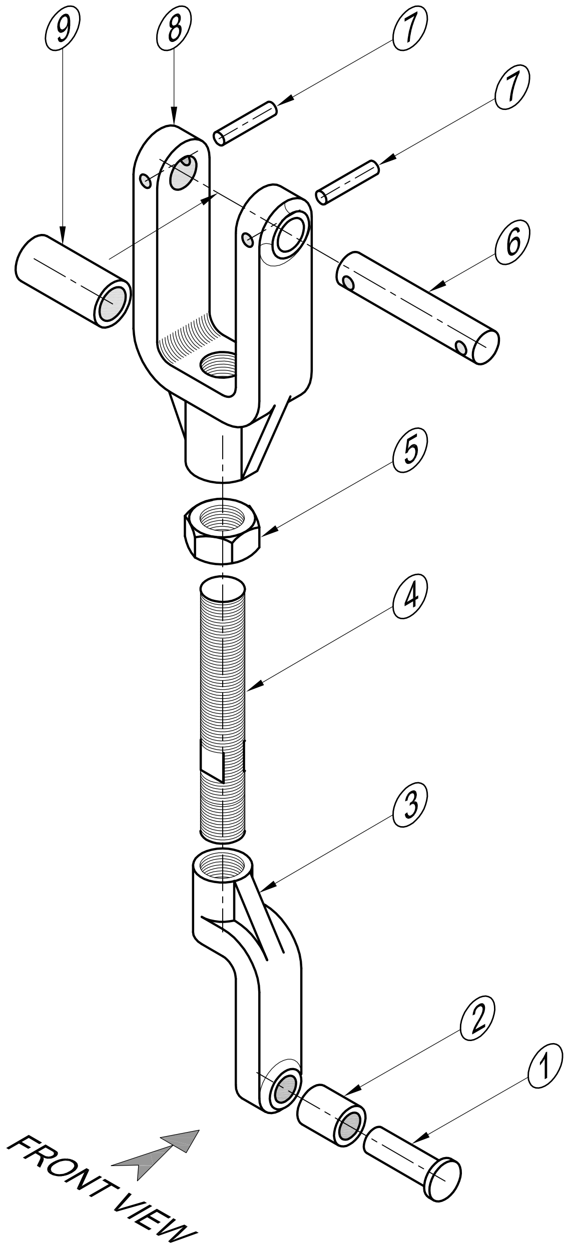
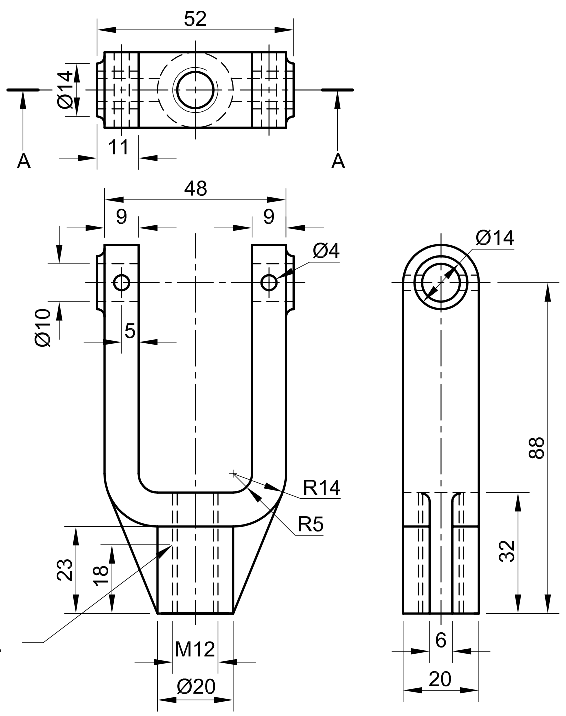
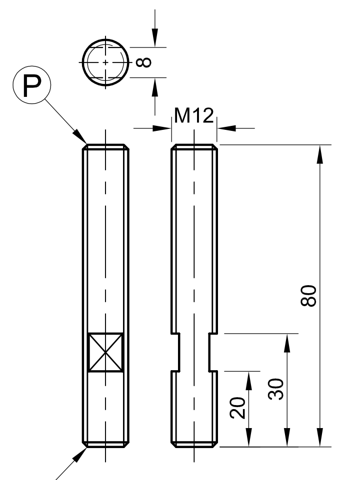


EXPLODED ISOMETRIC DRAWING

PLACE (P) HERE

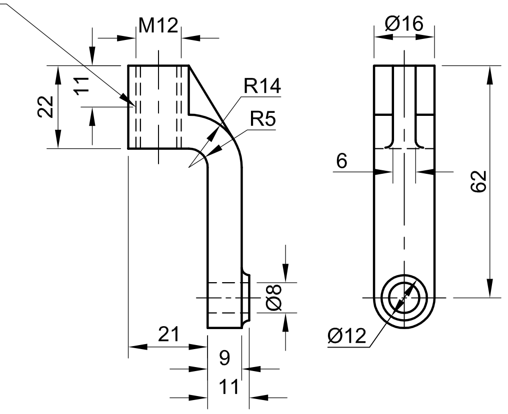


FORK [8]

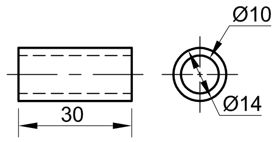


TIE ROD [4]

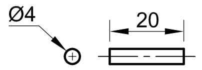
PLACE (S) HERE



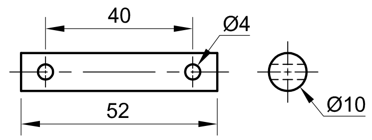
OFFSET ARM [3]



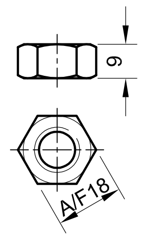
BUSH B [9]



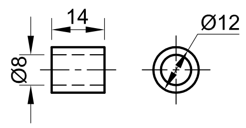
DOWEL [7]



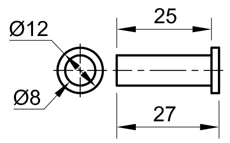
SHAFT B [6]



M12 LOCK NUT [5]



BUSH A [2]



SHAFT A [1]

QUESTION 4: MECHANICAL ASSEMBLY

Given:
- The exploded isometric drawing of the parts of an offset connecting bar, showing the position of each part relative to all the others
- Orthographic views of each of the parts of the offset connecting bar 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 offset connecting bar 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 vertically through the centre of the assembly, is shown on the top view of the fork (part 8).
  - **4.2** **The right view**
- ALL drawing must comply with the guidelines contained in the *SABS 0111.*

NOTE:
- As indicated, place point P on the upper end of the tie rod with point P on the fork and point S on the lower end of the tie rod, with point S on the offset arm.
- Show THREE faces of the nut in the front view 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. **[91]**

PARTS LIST		
PART	QUANTITY	MATERIAL
1. SHAFT A	1	MILD STEEL
2. BUSH A	1	BRONZE
3. OFFSET ARM	1	CAST IRON
4. TIE ROD	1	MILD STEEL
5. M12 LOCK NUT	1	MILD STEEL
6. SHAFT B	1	MILD STEEL
7. DOWEL	2	MILD STEEL
8. FORK	1	CAST IRON
9. BUSH B	1	BRONZE

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OFFSET CONNECTING BAR

ALL DIMENSIONS ARE IN MILLIMETRES.

ALL UNSPECIFIED RADII ARE R2.

5

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STAPLE

ASSESSMENT CRITERIA					
SECTIONAL FRONT VIEW					
1	SHAFT A	2			
2	BUSH A	1			
3	OFFSET ARM	7½			
4	TIE ROD	9			
5	M12 NUT	8			
6	SHAFT B	2			
7	DOWEL	1			
8	FORK	10½			
9	BUSH B	1			
H	HATCHING	12			
SUBTOTAL		**54**			
RIGHT VIEW					
3	OFFSET ARM	5½			
4	TIE ROD	5			
5	M12 NUT	4½			
8	FORK	6			
SUBTOTAL		**21**			
GENERAL					
1	CENTRE LINES	4			
2	CUTTING PLANE + TITLE	5			
3	ASSEMBLY	7			
SUBTOTAL		**16**			
TOTAL		**91**			
EXAMINATION NUMBER					
EXAMINATION NUMBER					6

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