STAPEL

education

Department of Education
FREE STATE PROVINCE

# ENGINEERING GRAPHICS AND DESIGN

## GRADE 12

## PAPER 2

## SEPTEMBER 2017

## TIME: 3 HOURS

## TOTAL: 100

This question paper consists of 6 pages

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. ALL drawings are in third-angle orthographic projection, unless stated otherwise.
3. ALL drawings must be drawn to scale 1:1, unless stated otherwise.
4. ALL questions must be answered on the DIAGRAM SHEET as instructed.
5. ALL the pages must be stapled in numeric sequence, irrespective whether the question was attempted or not.
6. Time management is essential in order to complete all the questions.
7. Print your name and surname as well as the grade in the space provided on each title block.
8. ALL answers must be drawn accurate and neat.
9. ALL necessary construction and projection lines must be shown.
10. Plan each drawing carefully from the given position, which is indicated on each diagram sheet.
11. Any details or dimensions not given must be assumed in good proportion.

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

| FINAL CONVERTED MARK | CHECKED BY |
|---|---|
| 100 | |

NAME & SURNAME | GRADE | 1

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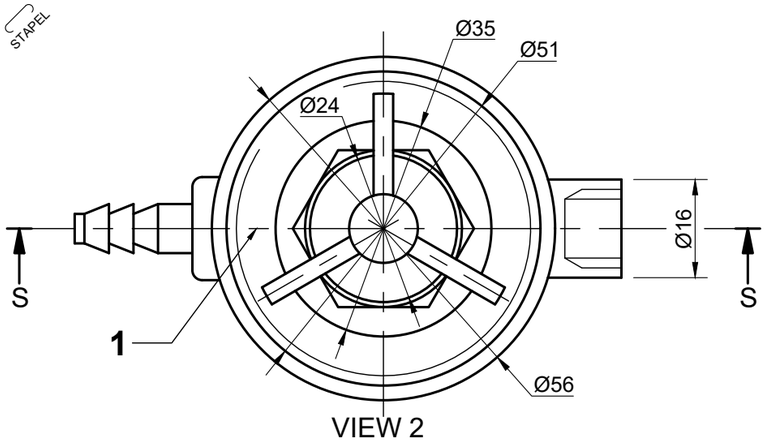
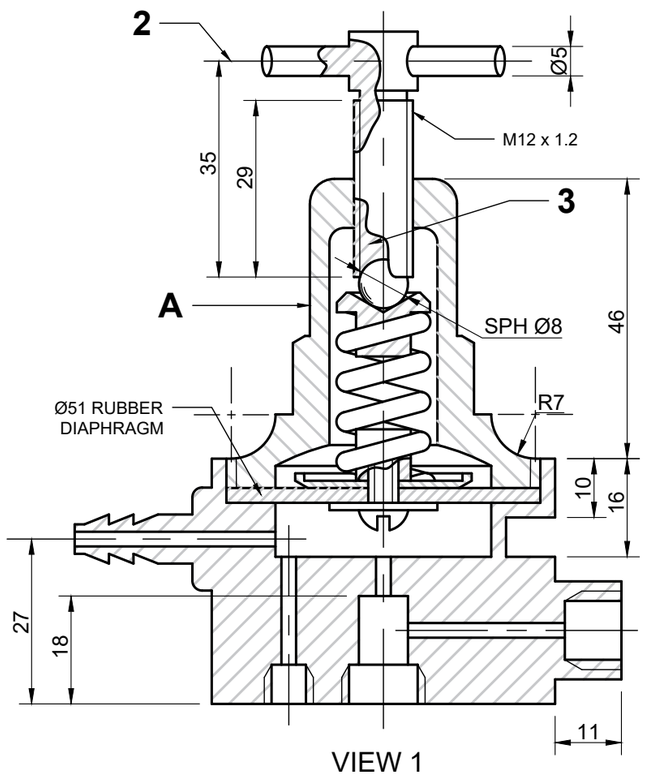
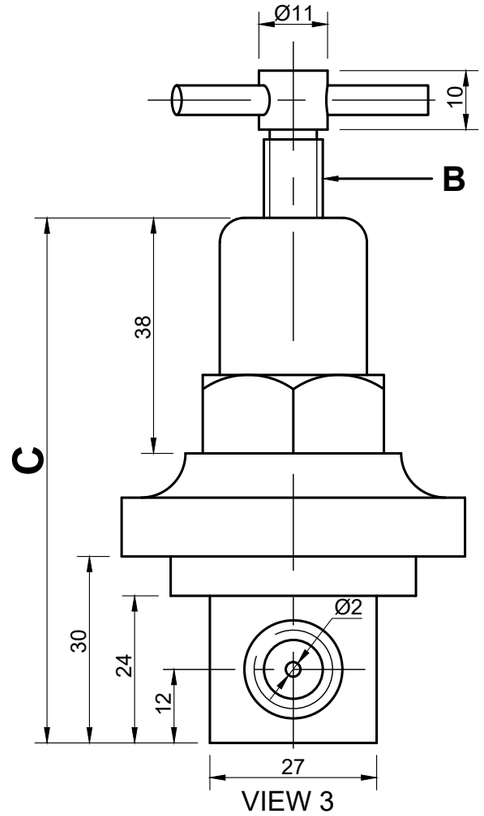



VIEW 2




VIEW 1




VIEW 3

**QUESTION 1: ANALYTICAL (MECHANICAL)**

**Given:**
The working drawings of a diaphragm regulator with a title block and a table of questions.

**Instructions:**
With a pencil, complete the table by neatly printing the correct answers in the corresponding answer column. All the questions refer to the accompanying drawings and the title block on diagram sheet A. **[26]**

| | QUESTIONS | ANSWERS | |
|---|---|---|---|
| 1 | On what date was the revision completed? | | 1 |
| 2 | Who checked the drawing? | | 1 |
| 3 | What is the title of the drawing? | | 1 |
| 4 | What scale is indicated for the drawing? | | 1 |
| 5 | How many internal screw threads are there in the assembly? | | 1 |
| 6 | From what material are the metal components of the regulator made? | | 1 |
| 7 | How many parts make up the assembly? | | 1 |
| 8 | What orthographic projection system has been used? | | 1 |
| 9 | What would VIEW 3 be called? | | 1 |
| 10 | What would VIEW 2 be called? | | 1 |
| 11 | What is the outer diameter of the rubber diaphragm? | | 1 |
| 12 | What is the Diameter of the sphere? | | 1 |
| 13 | Determine the dimensions at: A B C D E | | 5 |
| 14 | What drawing feature is shown at 1? | | 1 |
| 15 | What drawing feature is shown at 2? | | 1 |
| 16 | What type of section is shown at 3? | | 1 |
| 17 | What does the machining symbol ✓ mean? | | 1 |
| 18 | In the block below, draw, in neat freehand, the simplified SABS 0111 convention for diamond knurling. | | 4 |
| 19 | What is the permissible tolerance on the components of the regulator? | | 1 |
| TOTAL | | | 26 |

| DATE | CHANGED BY | REVISION DESCRIPTION | No |
|---|---|---|---|
| 2017/05/06 | E. POTGIETER | DIAMOND KNURLING ON HANDLES | A |

# DIAPHRAGM REGULATOR

**EXCELLED ENGINEERING**
(SA) (PTY) LTD

141 OXFORD STREET
PRETORIA 0001
www.exengineering.co.za Tel.No: 012 211 2345

DRAWING METHOD: AutoCAD 2018
DRAWING No: LFN/304/2017
FILE NAME: D5-Y2

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MILLIMETERS WITH A TOLERANCE OF ±0.25

UNLESS OTHERWISE SPECIFIED, ALL SURFACE TEXTURE FINISHERS ARE ✓

| | |
|---|---|
| DRAWN: M.A. HALA | 2017/08/20 |
| CHECKED: A.C. NEL | 2017/09/01 |
| APPROVED: R. SMITH | 2017/09/09 |
| MATERIAL: BRASS | |
| RUBBER | |
| HEAT TREATMENT: NORMAL | |
| SCALE 1:2 | |
| DRAWN TO SCALE | |

CONVENTION FOR DIAMOND KNURLING

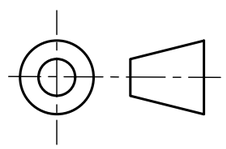


DIAGRAM SHEET 1 ENGINEERING GRAPHICS AND DESIGN SEPTEMBER 2017 PAPER 2 | NAME & SURNAME | GRADE | 2

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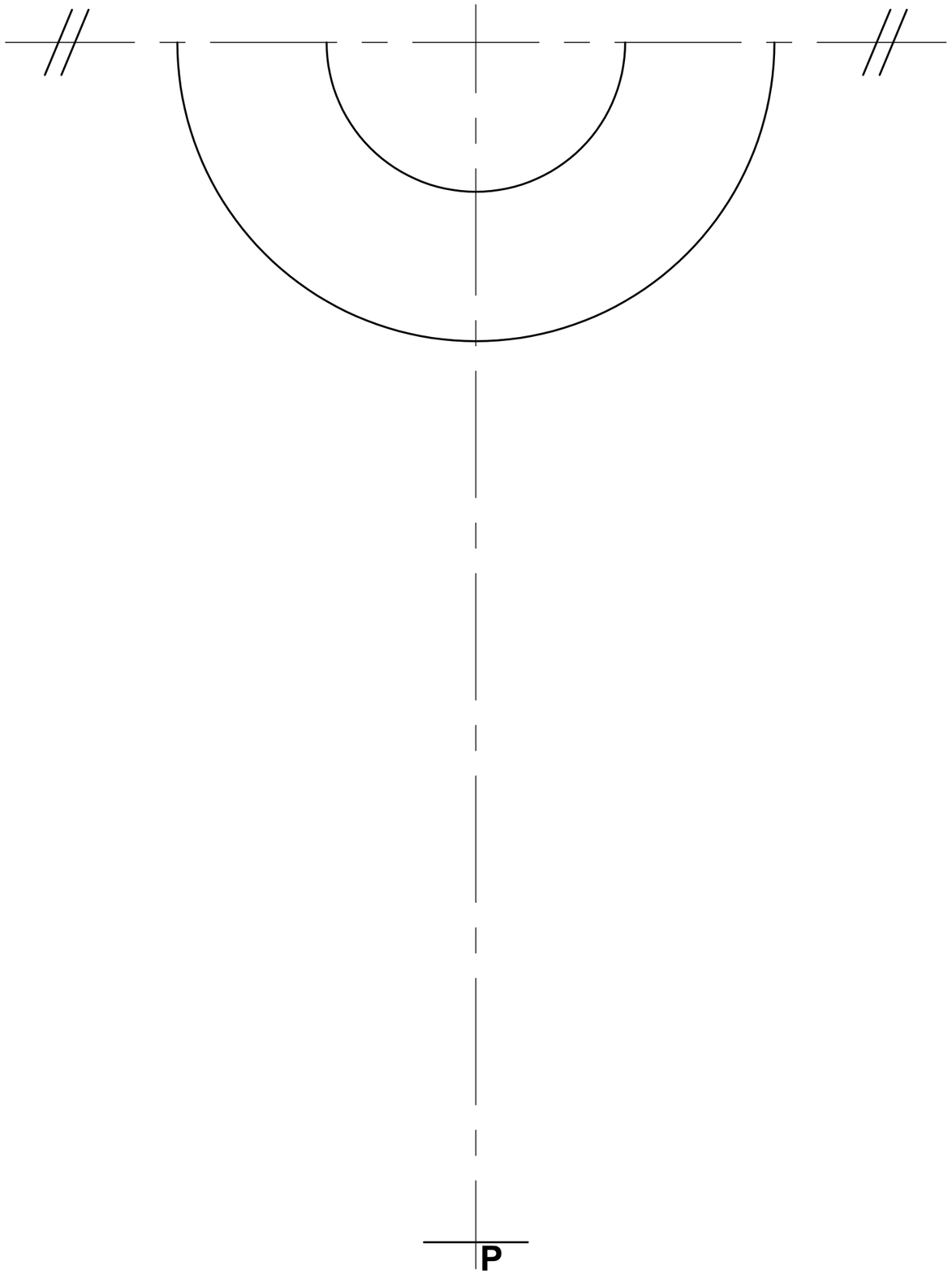
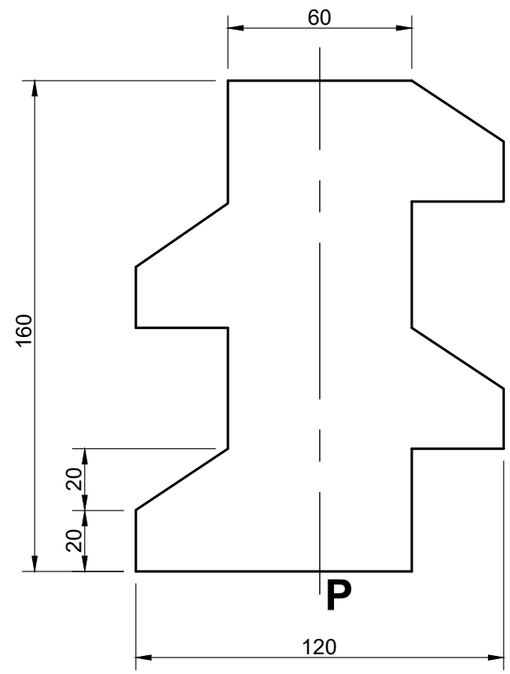



**QUESTION 2: LOCI**

**Given:**
An incomplete profile of a right hand worm gear with a pitch of 80 mm.
The bottom half of the top view, the center lines and the starting position P is also shown as reference lines on diagram sheet 2 (page 3).

**Instructions:**
Complete, according to scale 1:1, the loci of the worm gear for one and a half rotation in a clockwise direction.

* Show all construction lines.
* NO hidden detail is required. [32]




| ASSESSMENT CRITERIA | | | | |
|---|---|---|---|---|
| 1 | PROJ + CONTRUCTIONS ($\frac{6}{2}$) | 3 | | |
| 2 | LOCI 1 - OUTER BOTTOM ($\frac{13}{2}$) | 6.5 | | |
| 3 | LOCI 2 - OUTER TOP ($\frac{12}{2}$) | 6 | | |
| 4 | LOCI 3 - INNER ($\frac{18}{2}$) | 9 | | |
| 5 | SHAFT & SIDES ($\frac{15}{2}$) | 7.5 | | |
| | TOTAL | 32 | | |

| DIAGRAM SHEET 2 | ENGINEERING GRAPHICS AND DESIGN | SEPTEMBER 2017 PAPER 2 | NAME & SURNAME | | GRADE | | 3 |
|---|---|---|---|---|---|---|---|

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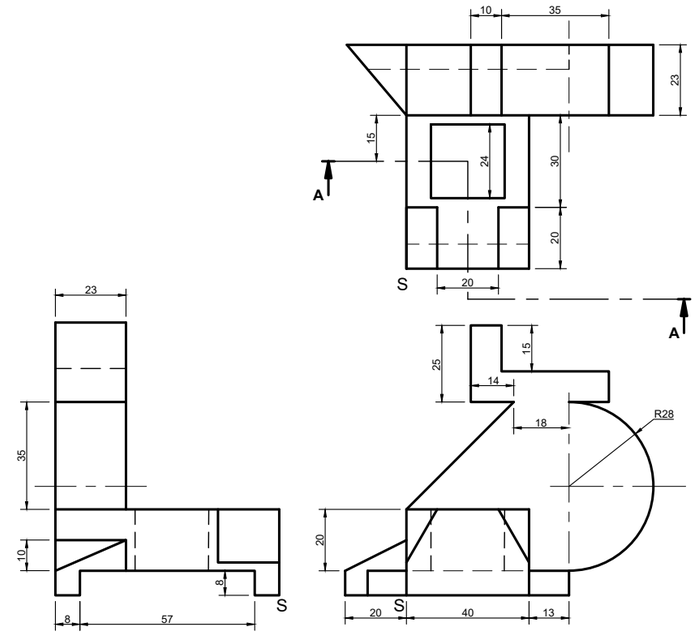
**QUESTION 3: ISOMETRIC DRAWING**

**Given:**
The front view, top view and left view of a casting.
The position of point S on the diagram sheet 3 (page 4).

**Instructions:**
Use a scale of 1:1 to convert the orthographic view of the casting into a sectional isometric drawing on cutting plane A-A.

- Make S the lowest point of the drawing.
- Show ALL necessary constructions.
- NO hidden detail is required. **[39]**




S

| ASSESSERINGSKRITERA | | | | |
|---|---|---|---|---|
| 1 | HULPAANSIG | 3 | | |
| 2 | VOOR (SES- & VIERKANT( $(\frac{31}{2})$ | 15.5 | | |
| 3 | AGTER $(\frac{30}{2})$ | 15 | | |
| 4 | SIRKEL $(\frac{11}{2})$ | 5.5 | | |
| | TOTAAL | 39 | | |

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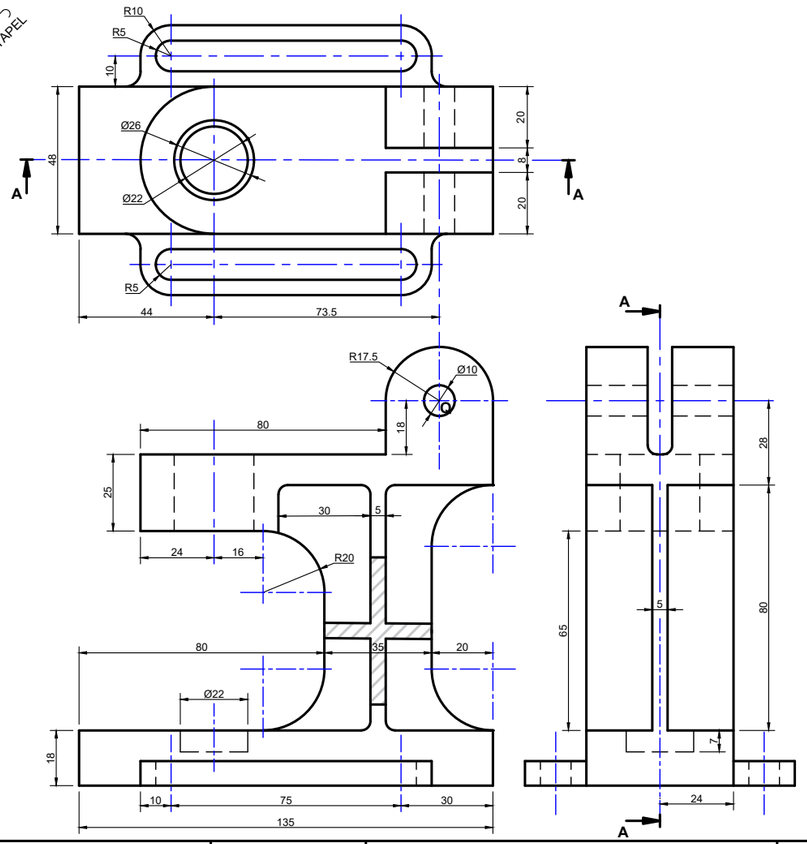
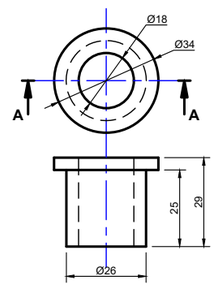
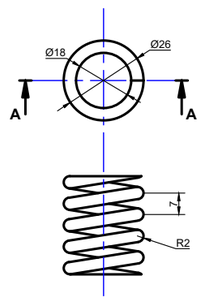



1




2

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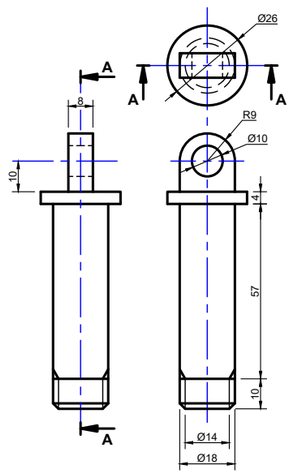


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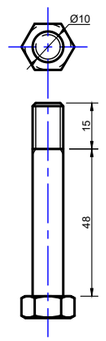


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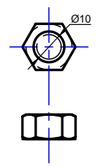


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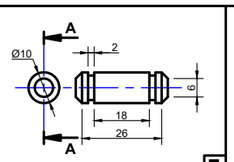


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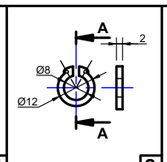


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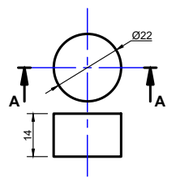


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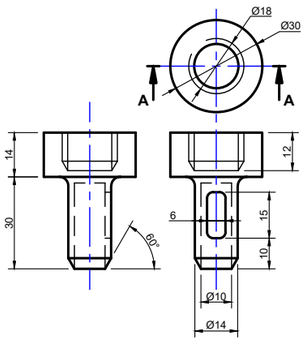
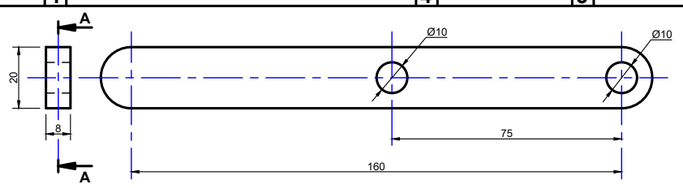



10

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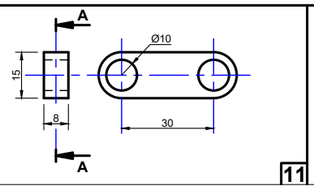
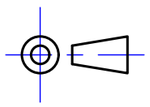



11



## QUESTION 4: MECHANICAL ASSEMBLY

**GIVEN:**

The exploded isometric drawing of the parts of a pulley, showing the position of each part relative to all the others.
Orthographic views of each of the parts of the pulley assembly.
Point Q as the starting position of the front view and the centerlines of the left view on diagram sheet 5 (page 6).

**INSTRUCTIONS:**

Answer this question on diagram sheet 5 (page 6).
Draw, to scale 1:1 and in third-angle orthographic projection, the following view of the assembled parts of the punch assembly.

- A sectional front view, on cutting plane AA, as seen from the direction of the arrow shown on the exploded isometric drawing.
- A left view.

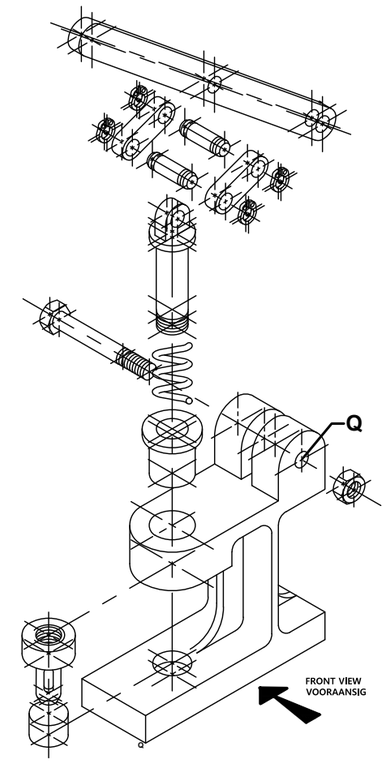
All drawings must comply with the guidelines contained in the SABS 0111.

**NOTE:**

Show three sides of the bolt and nut in the sectional front view.
No hidden detail is required.
Show a partly section on the thickened part of the shaft to indicate the internal detail of the part in the front view.
Show a revolved section on only the arm mechanism to indicate the profile clearly.
Add the following to the drawing:
The cutting plane AA on the answer sheet.
The projection system symbol of the system of the projection used.
Between 5 mm guidelines, neatly supply the drawing with a title and scale in the title block provided:

PUNCH ASSEMBLY
SCALE 1:1

**[103]**




**PART LIST**

| No | PART | QUANTITY | MATERIAL | No | PART | QUANTITY | MATERIAL |
|---|---|---|---|---|---|---|---|
| 1 | BASE | 1 | CAST IRON | 7 | SHAFT COUPLING | 2 | STEEL |
| 2 | BUSH | 1 | BRASS | 8 | CIRCLIP | 4 | STEEL |
| 3 | HELICAL SPRING | 1 | STEEL | 9 | PUNCH BED | 1 | YELLOW COPPER |
| 4 | SHAFT | 1 | STEEL | 10 | PUNCH | 1 | STEEL |
| 5 | M10 BOLT | 1 | STEEL | 11 | BAR COUPLING | 2 | STEEL |
| 6 | M10 NUT | 1 | STEEL | 12 | ARM MECHANISM | 1 | STEEL |

DIAGRAM SHEET 4 ENGINEERING GRAPHICS AND DESIGN SEPTEMBER 2017 PAPER 2 | NAME & SURNAME | GRADE | 5

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# TITLE BLOCK

## PROJECTION SYMBOL


| ASSESSMENT CRITERIA | | | | |
|---|---|---|---|---|
| FRONT VIEW | | | Mark | Mod. |
| 1 | BASE ($\frac{30}{2}$) | 15 | | |
| 2 | BUSCH ($\frac{12}{2}$) | 6 | | |
| 3 | HELICAL SPRING ($\frac{4}{2}$) | 2 | | |
| 4 | SHAFT ($\frac{10}{2}$) | 5 | | |
| 5 | BOLT ($\frac{2}{2}$) | 1 | | |
| 6 | NUT | | | |
| 7 | SHAFT COUPLING ($\frac{4}{2}$) | 2 | | |
| 8 | CIRCLIP | | | |
| 9 | PUNCH BED ($\frac{5}{2}$) | 2.5 | | |
| 10 | PUNCH ($\frac{14}{2}$) | 7 | | |
| 11 | BAR COUPLINIG ($\frac{2}{2}$) | 1 | | |
| 12 | ARM MECHANISM ($\frac{5}{2}$) | 2.5 | | |
| | SUB TOTAL 1 | 44 | | |
| LEFT VIEW | | | Mark | Mod. |
| 1 | BASE ($\frac{10}{2}$) | 5 | | |
| 2 | BUSCH ($\frac{4}{2}$) | 2 | | |
| 3 | HELICAL SPRING ($\frac{4}{2}$) | 2 | | |
| 4 | SHAFT ($\frac{8}{2}$) | 4 | | |
| 5 | BOLT ($\frac{18}{2}$) | 9 | | |
| 6 | NUT ($\frac{12}{2}$) | 6 | | |
| 7 | SHAFT COUPLING ($\frac{12}{2}$) | 6 | | |
| 8 | CIRCLIP ($\frac{8}{2}$) | 4 | | |
| 9 | PUNCH BED ($\frac{3}{2}$) | 1.5 | | |
| 10 | PUNCH ($\frac{10}{2}$) | 5 | | |
| 11 | BAR COUPLING ($\frac{6}{2}$) | 3 | | |
| 12 | ARM MECHANISM ($\frac{3}{2}$) | 1.5 | | |
| | SUB TOTAL 2 | 49 | | |
| GENRAL | | | Mark | Mod. |
| 1 | CENTER LINES ($\frac{11}{2}$) | 5.5 | | |
| 2 | SECTION LINE ($\frac{2}{2}$) | 1 | | |
| 3 | TITLE & SCALE ($\frac{2}{2}$) | 1 | | |
| 4 | PROJECTION SYMBOL ($\frac{2}{2}$) | 1 | | |
| 5 | AUXILIARY VIEW ($\frac{3}{2}$) | 1.5 | | |
| | SUB TOTAL 3 | 10 | | |
| | TOTAL | 103 | | |

| DIAGRAM SHEET 5 | ENGINEERING GRAPHICS AND DESIGN | SEPTEMBER 2017 PAPER 2 | NAME & SURNAME | | GRADE | | 6 |
|---|---|---|---|---|---|---|---|