

**ISEBE LEMFUNDO LEMPUMA KOLONI  
EASTERN CAPE EDUCATION DEPARTMENT  
OOS-KAAP ONDERWYSDEPARTEMENT**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**ENGINEERING GRAPHICS AND DESIGN P2  
NOVEMBER 2014**

**MARKS: 200**

**TIME: 3 hours**

**This question paper consists of 6 pages.**

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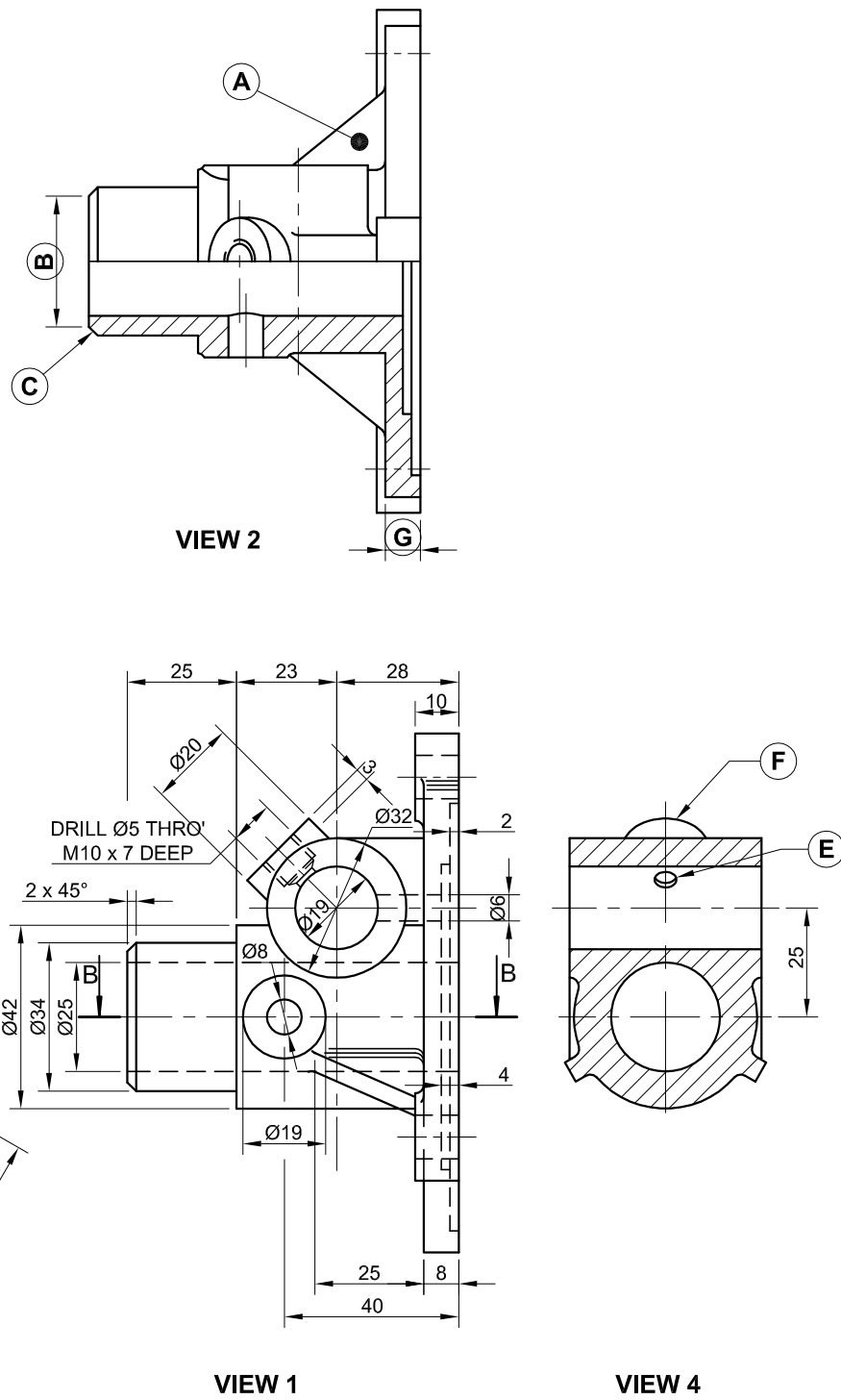
**INSTRUCTIONS AND INFORMATION**

1. The paper consists of FOUR questions.
2. Answer ALL the questions.
3. All drawings must be drawn to scale 1:1, unless otherwise stated.
4. The questions must be answered on the answer sheets provided.
5. All the answers sheets must be re-stapled in numerical sequence and handed in irrespective of whether the question was attempted or not.
6. Careful time management is essential in order to complete all the questions.
7. Print your name in the block provided on every answer sheet.
8. All answers must be drawn accurately and neatly.
9. Any details or dimensions not given must be estimated in good proportion.

| FOR OFFICIAL USE ONLY |          |          |          |                |
|-----------------------|----------|----------|----------|----------------|
|                       |          |          |          | MODERATED MARK |
| 1                     |          |          |          |                |
| 2                     |          |          |          |                |
| 3                     |          |          |          |                |
| 4                     |          |          |          |                |
| <b>TOTAL</b>          |          |          |          |                |
|                       | <b>2</b> | <b>0</b> | <b>0</b> |                |

| FINAL CONVERTED MARK | CHECKED BY |
|----------------------|------------|
| <b>100</b>           |            |

| COMPLETE THE FOLLOWING: |
|-------------------------|
| NAME                    |
|                         |
| NAME                    |
| EXAMINATION CENTRE      |
|                         |
| EXAMINATION CENTRE      |



**QUESTION 1: ANALYTICAL (MECHANICAL)**

**Given:**

Four views of a steering bracket 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 title block.

Show all calculations.

[29]

| QUESTIONS    |  | ANSWERS |           |
|--------------|--|---------|-----------|
| 1            | On what date was the drawing first checked?  |         | 1         |
| 2            | From what material is the steering bracket manufactured?   |         | 1         |
| 3            | Which drawing method was used to create these drawings?  |         | 1         |
| 4            | How many threaded holes are there in this drawing?   |         | 1         |
| 5            | How many sets of drawings are there?   |         | 1         |
| 6            | What is the tolerance allowed on the dimensions?   |         | 1         |
| 7            | How deep must the M10 thread be?   |         | 1         |
| 8            | What is feature A called?  |         | 1         |
| 9            | Determine the dimension at B?  |         | 2         |
| 10           | What is feature C called?  |         | 1         |
| 11           | What is the size of angle D?   |         | 1         |
| 12           | What is the size of the hole marked E?   |         | 2         |
| 13           | What is the size of the arc marked F?  |         | 2         |
| 14           | Determine the dimension at G?  |         | 1         |
| 15           | What type of section is shown on VIEW 2?   |         | 1         |
| 16           | What type of section is shown on VIEW 4?   |         | 1         |
| 17           | What do the letters P.C.D. stand for?  |         | 1         |
| 18           | How many Ø10 holes need to be drilled in the bracket?  |         | 1         |
| 19           | What would VIEW 3 be called?   |         | 1         |
| 20           | Draw the cutting plane located on VIEW 1, for the sectional VIEW 4, and label it A-A.            |         | 3         |
| 21           | In the box below (ANSWER 21), draw, in neat freehand, the symbol for the projection system used. |         | 4         |
| <b>TOTAL</b> |  |         | <b>29</b> |

|  |                  |  |                      |   |
|--|------------------|--|----------------------|---|
| ALL DIMENSIONS ARE IN MILLIMETRES.                               |                  |  |                      | 1 |
|  | DATE             | CHANGED BY   | REVISION DESCRIPTION | № |
| UNLESS OTHERWISE SPECIFIED, TOLERANCES ON DIMENSIONS ARE ± 0,25. | DRAWN BY: JP     | DRAWING SET NO. 2 OF 6   | MATERIAL: CAST IRON  |   |
|  | DATE: 20/12/2013 | FILE NAME: SB-48-2013  | HEAT TREATMENT: NONE |   |
| ALL UNSPECIFIED RADII ARE R2.                                    | CHECKED BY: SvR  | <b>PROCAST</b><br>MANUFACTURING<br>WEST STREET<br>MATATIELE<br>4730<br>www.procast.co.za |                      |   |
|  | DATE: 15/01/2014 |  |                      |   |
| DRAWING PROGRAM: AUTOCAD 2014                                    | APPROVED BY: DE  | <b>STEERING BRACKET</b>  |                      |   |
|  | DATE: 17/02/2014 |  |                      |   |
|  | SCALE: 1 : 2     |  |                      |   |

ANSWER 21

---

SYMBOL

|                    |          |
|--------------------|----------|
| EXAMINATION NUMBER |          |
| EXAMINATION NUMBER | <b>2</b> |



**QUESTION 2: LOCI (CAMS)**

**Given:**

- The shaft and follower detail of an industrial cam with follower shown at its lowest position. The minimum cam radius is 15 mm.

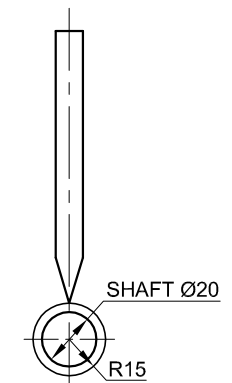
**The specifications for the movement is as follows:**

- The cam shaft rotates clockwise at uniform velocity.
- Over the first 60°, the follower rises 14 mm.
- Over the next 30°, the follower rises a further 14 mm.
- There is a dwell period for the next 60°.
- Over the next 60°, the follower rises 26 mm.
- Over the next 30°, the follower falls 18 mm.
- There is a dwell period for the next 30°.
- Over the next 30°, the follower falls a further 18 mm.
- There is a dwell period for the next 30°.
- Over the final 30°, the follower returns to its original position.

**Instructions:**

- Draw, to scale 1:1, a displacement graph with a scale of 30° equal to 8 mm and a follower displacement scale of 1:1 for the given motion. Also, determine the displacement at the following degrees: 75°, 225°, 285° and 345°. Indicate the degrees at the bottom of the graph. Label the graph.
- Project and draw the cam profile that would generate the given motion. Use the extra degrees (75°, 225°, 285° and 345°) plotted on the graph to obtain a more accurate curve. Indicate the degrees on the cam profile. The arrow indicating the direction of rotation must be shown.

- Show ALL necessary construction. **[38]**



| ASSESSMENT CRITERIA                         |           |  |          |
|---|-----------|--|----------|
| 1 GRAPH + LABEL                             | 12        |  |          |
| 2 ARROW + SHAFT + MIN RADIUS + DEGREE + C L | 6         |  |          |
| 3 CONSTRUCTION                              | 6         |  |          |
| 4 CAM POINTS                                | 9½        |  |          |
| 5 CURVE + QUALITY                           | 4½        |  |          |
| <b>TOTAL</b>                                | <b>38</b> |  |          |
| EXAMINATION NUMBER                          |           |  |          |
| EXAMINATION NUMBER                          |           |  |          |
| EXAMINATION NUMBER                          |           |  | <b>3</b> |



**QUESTION 3: ISOMETRIC DRAWING**

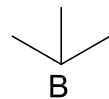
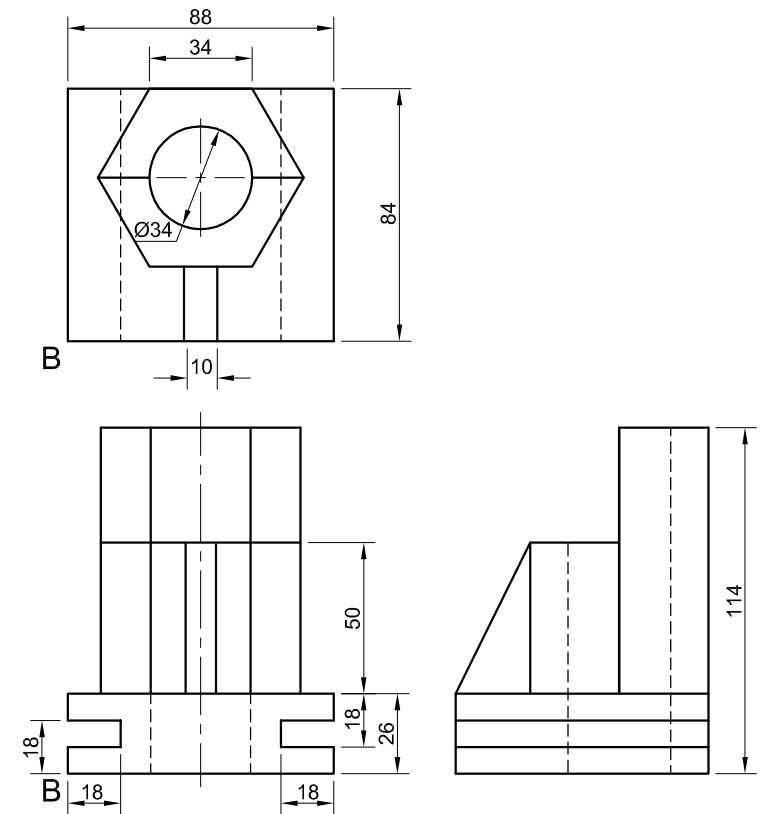
**Given:**

- The front view, top view and right view of a model.
- The position of point B on the drawing sheet.

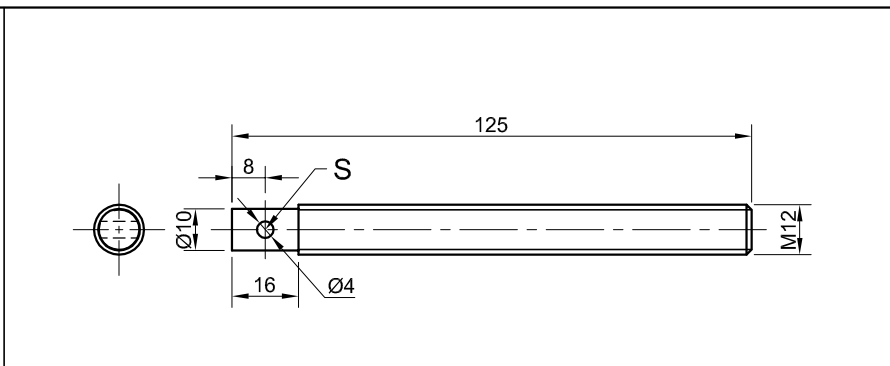
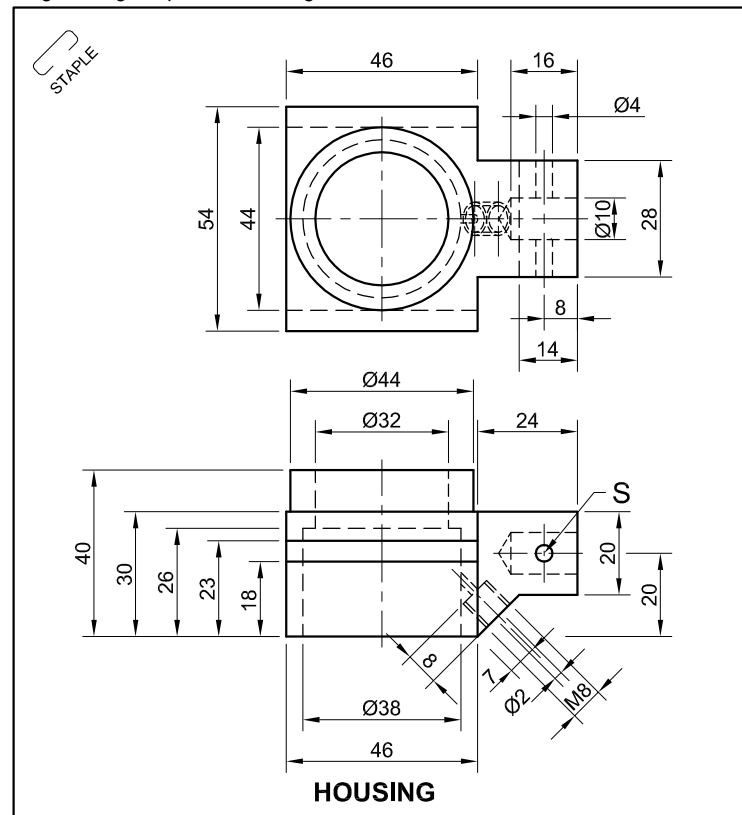
**Instructions:**

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

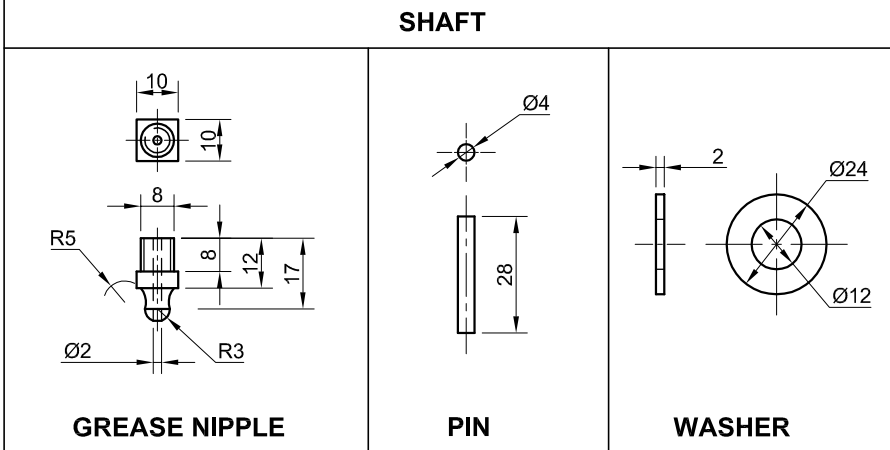
- Make corner B the lowest point of the drawing.
- Show ALL necessary circle and other construction.
- NO hidden detail is required. **[39]**



| ASSESSMENT CRITERIA    |           |  |   |
|------------------------|-----------|--|---|
| 1. AUX. VIEW + PLACING | 3         |  |   |
| 2. BASE                | 11½       |  |   |
| 3. HEXAGON             | 13½       |  |   |
| 4. WEB                 | 2         |  |   |
| 5. ISOMETRIC CIRCLES   | 4         |  |   |
| 6. CIRCLE CONSTRUCTION | 2½        |  |   |
| 7. CENTRE LINES        | 2½        |  |   |
| <b>TOTAL</b>           | <b>39</b> |  |   |
| EXAMINATION NUMBER     |           |  |   |
| EXAMINATION NUMBER     |           |  |   |
| EXAMINATION NUMBER     |           |  | 4 |



| PARTS LIST       |          |            |
|------------------|----------|------------|
| PART             | QUANTITY | MATERIAL   |
| 1. BASE          | 1        | CAST IRON  |
| 2. SHAFT         | 1        | MILD STEEL |
| 3. HOUSING       | 1        | CAST IRON  |
| 4. BUSH          | 1        | BRONZE     |
| 5. GREASE NIPPLE | 1        | CAST IRON  |
| 6. PIN           | 1        | MILD STEEL |
| 7. WASHER        | 1        | MILD STEEL |
| 8. NUT           | 1        | MILD STEEL |



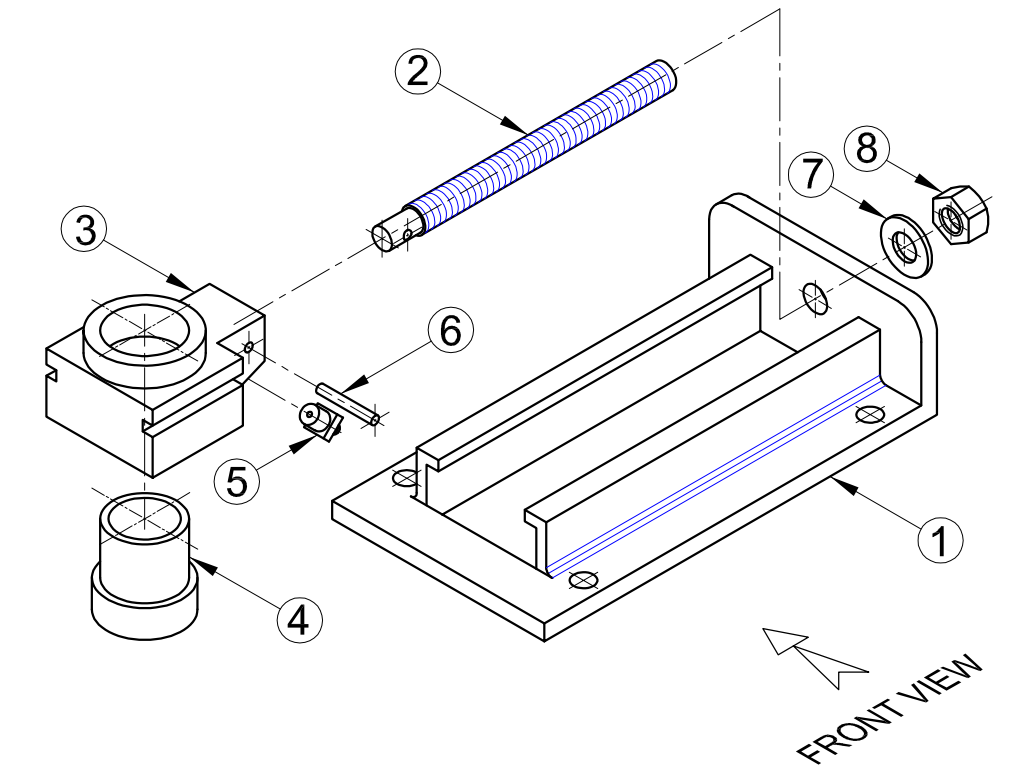
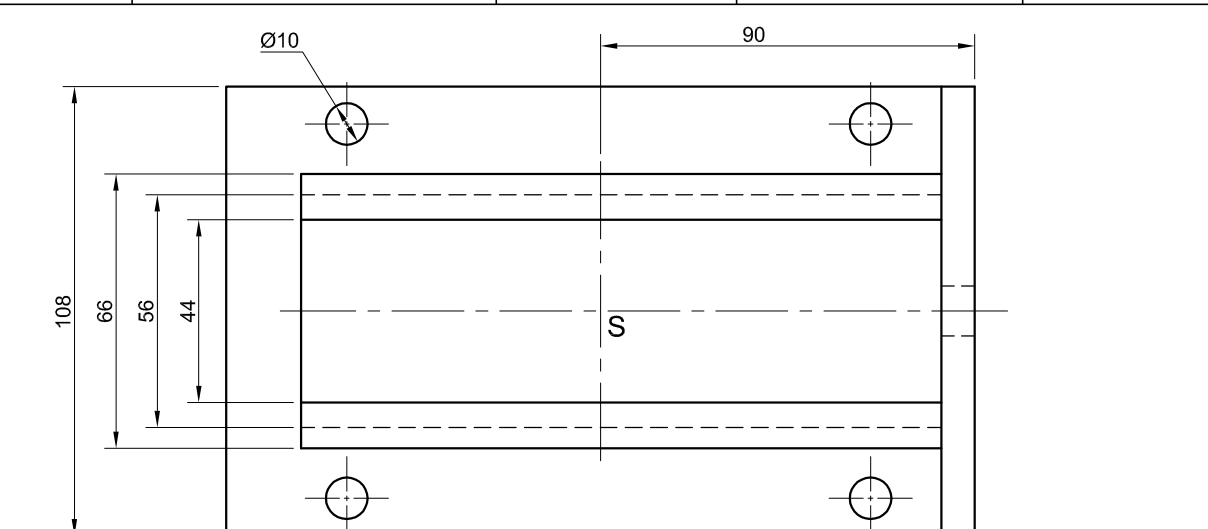
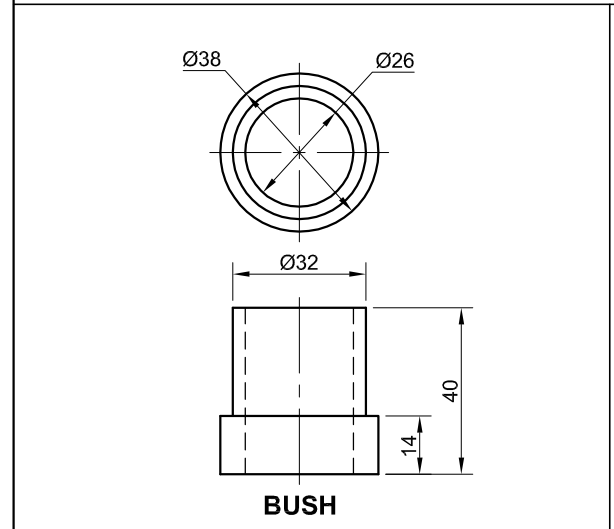
**QUESTION 4: MECHANICAL ASSEMBLY**

- Given:**
- The exploded isometric drawing of the parts of a shaft support assembly, showing the position of each part relative to all the others.
  - Orthographic views of each of the parts of the shaft support assembly.
  - Point S as a reference point on page 6.

- 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 shaft support assembly:
    - 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 is shown on the left view of the base (part 1).
    - The left view.**
  - ALL drawings must comply with the guidelines contained in the SABS 0111.

- NOTE:**
- Show three sides of the nut in the sectional front view.
  - Show all the constructions for the nut.
  - No hidden detail is required.

- Insert the following detail to the drawing**
- The cutting plane A-A
  - Label the sectional view: SECTION A-A SCALE 1:1



|                                    |                  |
|------------------------------------|------------------|
| ALL DIMENSIONS ARE IN MILLIMETRES. | DRAWN BY: JS     |
|                                    | DATE: 18/12/2013 |
| ALL UNSPECIFIED RADII ARE R3.      | CHECKED BY: AC   |
|                                    | DATE: 30/01/2014 |
| DRAWING PROGRAM: CAD 2014          | APPROVED BY: GW  |
|                                    | DATE: 25/03/2014 |

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GRADE 11  
NOVEMBER 2014



| ASSESSMENT CRITERIA |            |          |      |          |
|---------------------|------------|----------|------|----------|
| LEFT VIEW + GENERAL |            |          |      |          |
|                     | POSSIBLE   | OBTAINED | SIGN | MODERATE |
| 1. BASE             | 12         |          |      |          |
| 2. HOUSING          | 4½         |          |      |          |
| 3. SECTION AA       | 3          |          |      |          |
| ▲ CENTERLINES       | 5          |          |      |          |
| LABEL               | 3          |          |      |          |
| HATCHING            | 12         |          |      |          |
| ASSEMBLY            | 7          |          |      |          |
| <b>SUBTOTAL</b>     | <b>46½</b> |          |      |          |

+s

| SECTIONAL FRONT VIEW |            |  |  |  |
|----------------------|------------|--|--|--|
| 1. BASE              | 6          |  |  |  |
| 2. HOUSING           | 14         |  |  |  |
| 3. BUSH              | 3          |  |  |  |
| 4. GREASE NIPPLE     | 6          |  |  |  |
| 5. SHAFT             | 7          |  |  |  |
| 6. PIN               | 1          |  |  |  |
| 7. WASHER            | 2          |  |  |  |
| 8. NUT               | 8½         |  |  |  |
| <b>SUBTOTAL</b>      | <b>47½</b> |  |  |  |
| <b>SUBTOTAL</b>      | <b>46½</b> |  |  |  |
| <b>TOTAL</b>         | <b>94</b>  |  |  |  |

|                    |   |
|--------------------|---|
| EXAMINATION NUMBER |   |
| EXAMINATION NUMBER | 6 |