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EASTERN CAPE EDUCATION DEPARTMENT  
OOS-KAAP ONDERWYSDEPARTEMENT

NATIONAL  
SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

SEPTEMBER 2016

PREPARATORY EXAMINATION

MARKS: 200

TIME: 3 hours

This question paper consists of 6 pages.

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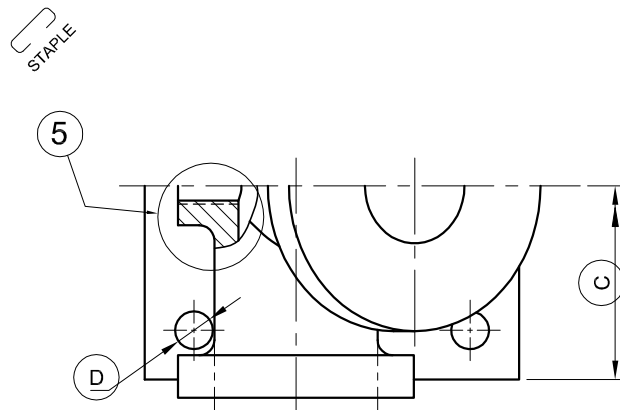
## INSTRUCTIONS AND INFORMATION

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.

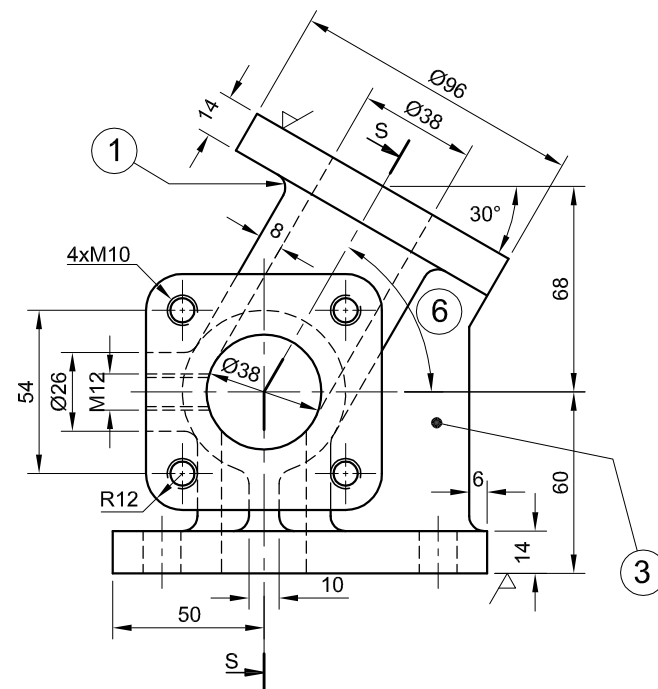
| FOR OFFICIAL USE ONLY |   |   |   |  |  |  |  |                |  |
|-----------------------|---|---|---|--|--|--|--|----------------|--|
|                       |   |   |   |  |  |  |  | MODERATED MARK |  |
| 1                     |   |   |   |  |  |  |  |                |  |
| 2                     |   |   |   |  |  |  |  |                |  |
| 3                     |   |   |   |  |  |  |  |                |  |
| 4                     |   |   |   |  |  |  |  |                |  |
| TOTAL                 |   |   |   |  |  |  |  |                |  |
|                       | 2 | 0 | 0 |  |  |  |  |                |  |

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

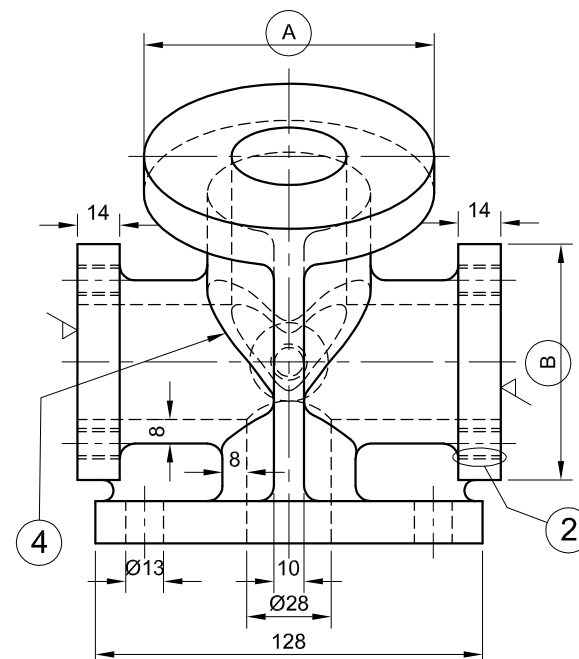
| COMPLETE THE FOLLOWING: |  |
|-------------------------|--|
| NAME                    |  |
|                         |  |
| NAME                    |  |
|                         |  |
| EXAMINATION CENTRE      |  |
|                         |  |
| EXAMINATION CENTRE      |  |
|                    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



VIEW 1



FRONT VIEW



VIEW 2

ALL UNDIMENSIONED RADII R 5.

ALL DIMENSIONS ARE IN MILLIMETRES.

SCALE: 1 : 2

PROGRAMME: AUTOCAD 2015

MATERIAL: CAST IRON

FILE NAME: pipe con1.dwg

QUANTITY: 1 500 UNITS

DRAWING No. PC3-25

TREATMENT: HARDEN

FINISH: REMOVE ALL BURRS  
AND SHARP EDGES

0,25 MILLING

|                   |
|-------------------|
| 2. BASE HOLES Ø13 |
|-------------------|

2015/09/20

1. ANGLE OF BASE

2015/09/15

## REVISIONS

DATE \_\_\_\_\_

DRAWN: JOHN

2015/09/10

CHECKED: WEST

2015/09/12

APPROVED: KEN

2015/09/22

|       |
|-------|
| TITLE |
|-------|

## PIPE CONNECTING PIECE

54 PEARL ROAD  
PERSEVERANCE  
PORT ELIZABETH  
6000  
 041 335 1600

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**QUESTION 1: ANALYTICAL (MECHANICAL)**

**Given:**

A detailed drawing of a pipe connecting piece, 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         | On what date was the drawing checked?  |         | 1  |  |
| 2         | What is the name of the engineering firm?  |         | 1  |  |
| 3         | Which indicated scale has been used?   |         | 1  |  |
| 4         | What treatment must the pipe connector undergo?                                      |         | 1  |  |
| 5         | On what date was the base angle revised?   |         | 1  |  |
| 6         | What is the drawing number?  |         | 1  |  |
| 7         | What would view 1 be called?   |         | 1  |  |
| 8         | How many surfaces need to be machined?   |         | 1  |  |
| 9         | What roughness value is required on the machined surfaces?                           |         | 1  |  |
| 10        | What is the depth of the thread on a standard M12 nut?                               |         | 1  |  |
| 11        | How many threaded holes are there on the pipe connector?                             |         | 1  |  |
| 12        | What type of Section would cutting plane S-S produce?                                |         | 1  |  |
| 13        | What type of curve is shown at 1?  |         | 1  |  |
| 14        | Name the encircled feature at 2.   |         | 1  |  |
| 15        | What is the thickness of the feature at 3?   |         | 2  |  |
| 16        | Name the feature at 4.   |         | 2  |  |
| 17        | Name the type of sectioning at 5.  |         | 2  |  |
| 18        | Determine the angle between centrelines at 6.  |         | 2  |  |
| 19        | Determine the complete dimensions: A B C D   |         | 4  |  |
| 20        | In the box below, draw, in neat freehand, the symbol for the projection system used. |         | 4  |  |
| TOTAL     |  |         | 30 |  |

ANSWER 20

\_\_\_\_\_ - \_\_\_\_\_

SYMBOL

NAME

NAME

2

Please turn over



QUESTION 2: LOCI (CAM)

Given:

- An incomplete displacement diagram of a cam.
- The centre point for the cam profile and a reference point on the answer sheet.

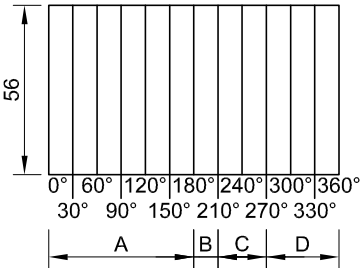
Motion:

- The follower rises, with uniform acceleration and retardation over the first 180°(A), to a maximum height of 56 mm.
- There is a dwell period for the next 30°(B).
- The follower descends with uniform motion over the next 60°(C), for 22 mm.
- The follower descends, with simple harmonic motion, to the original position over the rest of the rotation(D).

Instructions:

- Draw, to a horizontal scale of 96 mm = 360° and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
- Using the cam displacement diagram, determine the cam profile of a wedge shaped follower. Complete the cam profile by using the following specifications:
- The cam rotates clockwise.
- Minimum displacement radius = R15.
- Camshaft diameter = Ø20.
- Show ALL necessary construction.
- Show the direction of the cam rotation.
- Label the displacement diagram and insert the scale.

[34]



| ASSESSMENT CRITERIA |                                     |    |  |  |   |
|---------------------|-------------------------------------|----|--|--|---|
| 1                   | GRAPH DIVISIONS + CONSTR GRAPH      | 15 |  |  |   |
| 2                   | MIN. DIST, C'LINES + 12 DIV + ARROW | 8  |  |  |   |
| 3                   | PLOTTING POINTS & CURVE             | 9  |  |  |   |
| 4                   | LABEL                               | 2  |  |  |   |
|                     | TOTAL                               | 34 |  |  |   |
| NAME                |                                     |    |  |  |   |
|                     |                                     |    |  |  |   |
| NAME                |                                     |    |  |  | 3 |



QUESTION 3: ISOMETRIC DRAWING

Given:

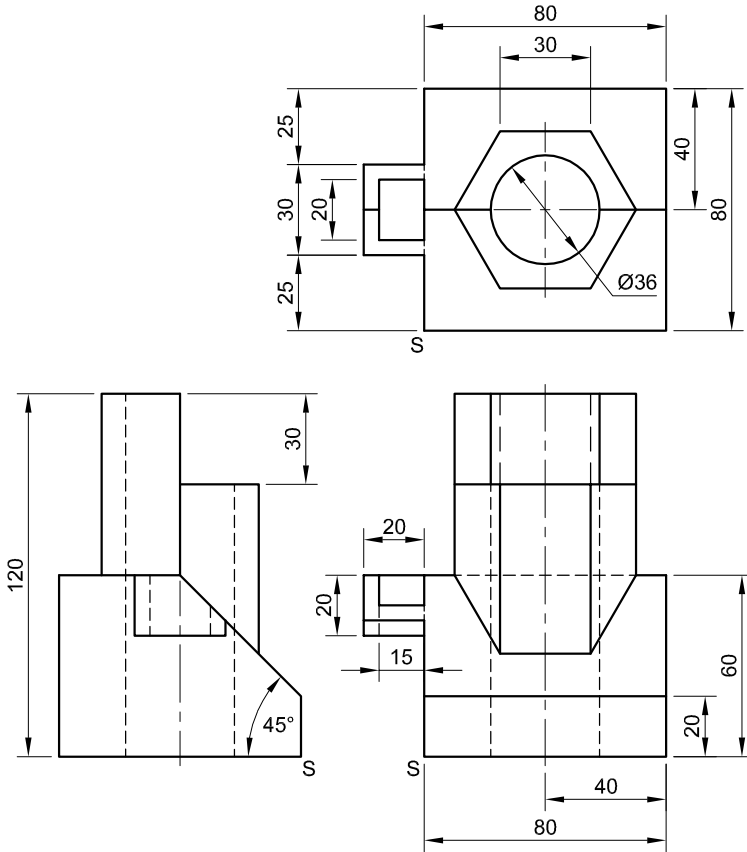
- The front view, top view and left view of a bracket
- The position of point S on the drawing sheet

Instructions:

Using scale 1 : 1, convert the orthographic views of the bracket to a isometric drawing.

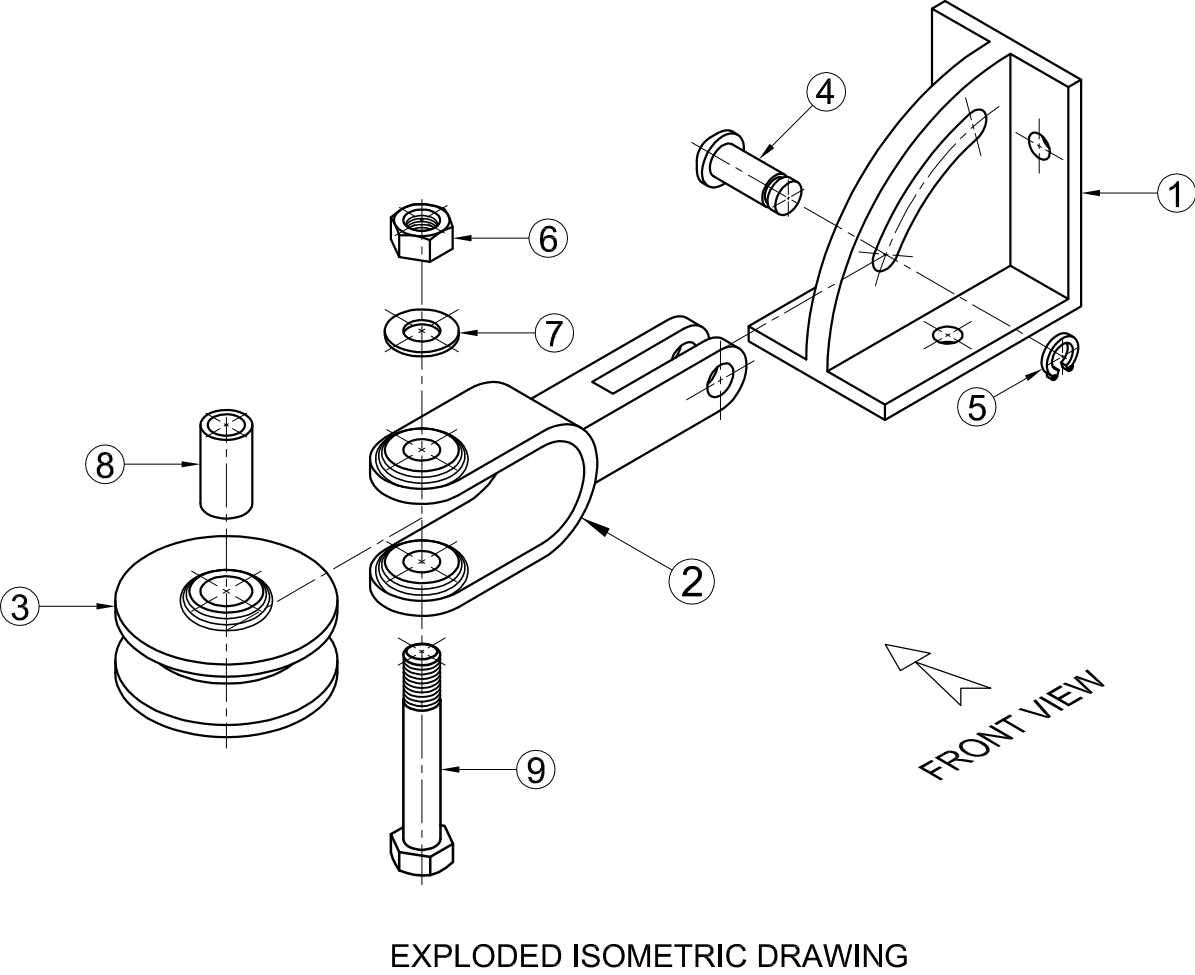
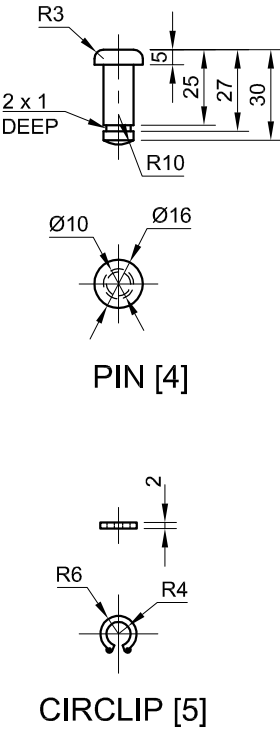
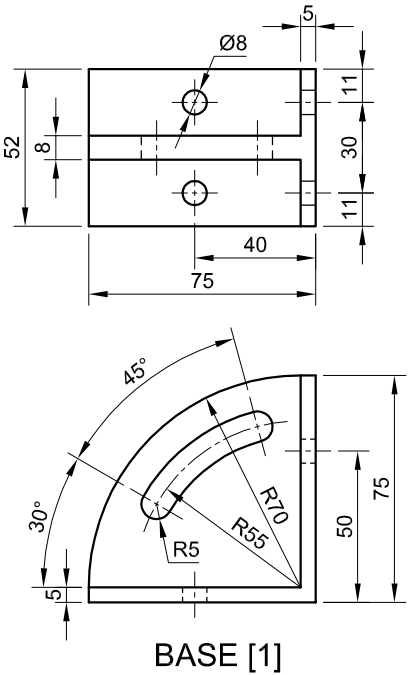
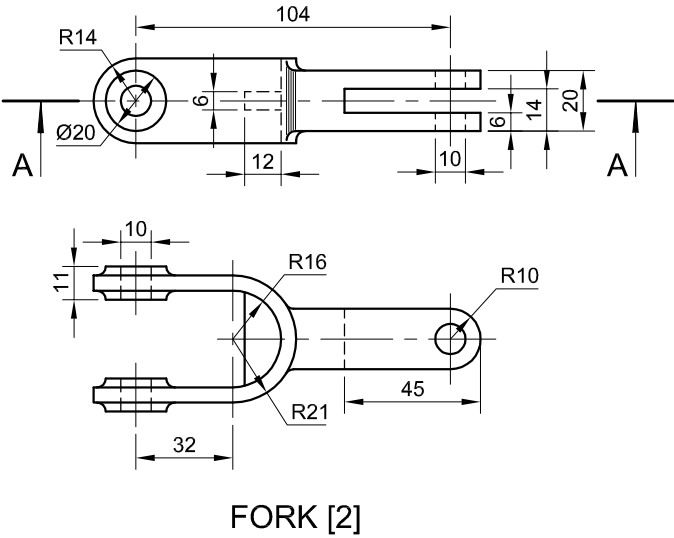
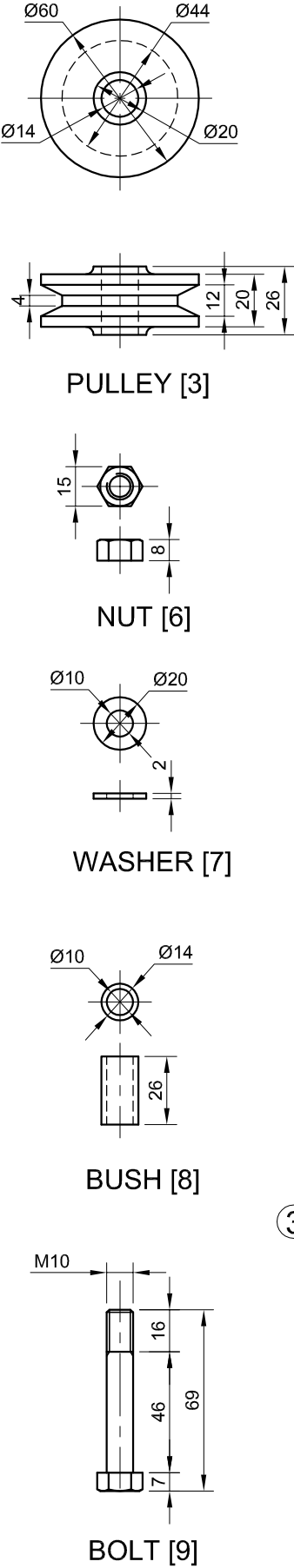
- Make S the lowest point of the drawing.
- Show ALL necessary construction.
- NO hidden detail is required.

[37]



↙  
S

| ASSESSMENT CRITERIA |                      |                                |  |  |   |
|---------------------|----------------------|--------------------------------|--|--|---|
| 1                   | AUX' VIEWS + PLACING | 3                              |  |  |   |
| 2                   | ISO' LINES - BASE    | 14 <sup>1</sup> / <sub>2</sub> |  |  |   |
| 3                   | HEXAGONAL PRISM      | 11 <sup>1</sup> / <sub>2</sub> |  |  |   |
| 4                   | CIRCLE + CONSTR      | 8                              |  |  |   |
| TOTAL               |                      | 37                             |  |  |   |
| NAME                |                      |                                |  |  |   |
|                     |                      |                                |  |  |   |
| NAME                |                      |                                |  |  | 4 |



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- The exploded isometric drawing of the parts of a pulley assembly, showing the position of each part relative to all the others
  - Orthographic views of each of the parts of the pulley 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 pulley assembly:
    - 4.1 The sectional front view** of the pulley assembly, on cutting plane A-A as seen from the direction of the arrow shown on the exploded isometric drawing. The cutting plane, that runs vertically through the centre of the assembly, is shown on the top view of the fork (part 2).
    - 4.2 A top view** without any hidden detail.
  - ALL drawings must comply with the guidelines contained in the SANS 10111.

- NOTE:**
- Place the fork in a horizontal position in the sectional front view.
  - Show, in the sectional front view, THREE faces of the M10 bolt and two faces of the M10 nut and ALL necessary construction.
  - NO hidden detail is required.

- Add the following features to the drawing:**
- The cutting plane A-A [99]

| PARTS LIST |          |              |
|------------|----------|--------------|
| PART       | QUANTITY | MATERIAL     |
| 1. BASE    | 1        | MILD STEEL   |
| 2. FORK    | 1        | CAST IRON    |
| 3. PULLEY  | 1        | CAST IRON    |
| 4. PIN     | 1        | MILD STEEL   |
| 5. CIRCLIP | 1        | SPRING STEEL |
| 6. M10 NUT | 1        | MILD STEEL   |
| 7. WASHER  | 1        | MILD STEEL   |
| 8. BUSH    | 1        | BRONZ        |
| 9. BOLT    | 1        | MILD STEEL   |

|   |  |                  |  |
|---|--|------------------|--|
| TITLE   |  | PULLEY TENSIONER |  |
| GENERAL   |  | ENGINEERING      |  |
| 54 PEARL ROAD<br>PERSEVERANCE<br>PORT ELIZABETH<br>6000<br>041 335 1600 |  | 5                |  |

|                                       |                                  |  |
|---------------------------------------|----------------------------------|--|
| ALL DIMENSIONS ARE<br>IN MILLIMETRES. | ALL UNSPECIFIED<br>RADII ARE R3. |  |
|---------------------------------------|----------------------------------|--|



| ASSESSMENT CRITERIA  |                        |    |  |  |   |
|----------------------|------------------------|----|--|--|---|
| TOP VIEW             |                        |    |  |  |   |
| 1                    | BASE                   | 7  |  |  |   |
| 2                    | PIN                    | 4½ |  |  |   |
| 3                    | CIRCLIP                | 1½ |  |  |   |
| 4                    | FORK                   | 5½ |  |  |   |
| 5                    | PULLEY                 | 1½ |  |  |   |
| 6                    | WASHER + NUT<br>+ BOLT | 5  |  |  |   |
| 7                    | CENTRE LINES           | 6  |  |  |   |
| 8                    | CUTTING PLANE          | 3  |  |  |   |
| 9                    | ASSEMBLY               | 8  |  |  |   |
| SUB-TOTAL            |                        | 42 |  |  |   |
| ASSESSMENT CRITERIA  |                        |    |  |  |   |
| SECTIONAL FRONT VIEW |                        |    |  |  |   |
| 1                    | BASE                   | 6½ |  |  |   |
| 2                    | PIN                    | 1½ |  |  |   |
| 3                    | FORK                   | 19 |  |  |   |
| 4                    | BUSH                   | 2  |  |  |   |
| 5                    | PULLEY                 | 10 |  |  |   |
| 6                    | WASHER + NUT<br>+ BOLT | 18 |  |  |   |
| SUB-TOTAL            |                        | 57 |  |  |   |
| TOTAL                |                        | 99 |  |  |   |
| NAME                 |                        |    |  |  |   |
|                      |                        |    |  |  |   |
| NAME                 |                        |    |  |  | 6 |