basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2010

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

INSTRUCTIONS AND INFORMATION

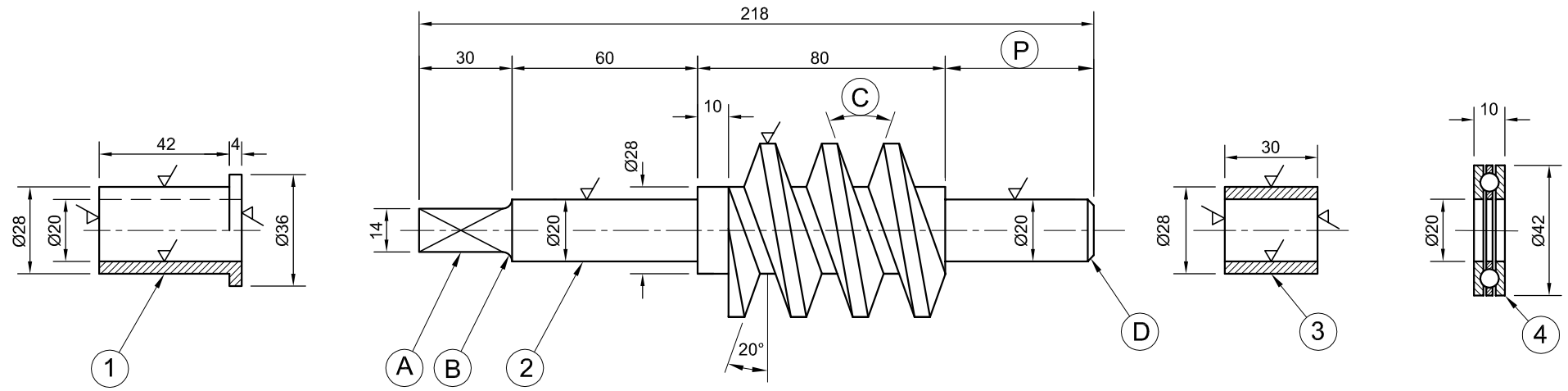
1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in third-angle orthographic projection, unless stated otherwise.
4. ALL drawings must be drawn to scale 1:1, unless stated otherwise.
5. ALL the questions must be answered on the QUESTION PAPER as instructed.
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.

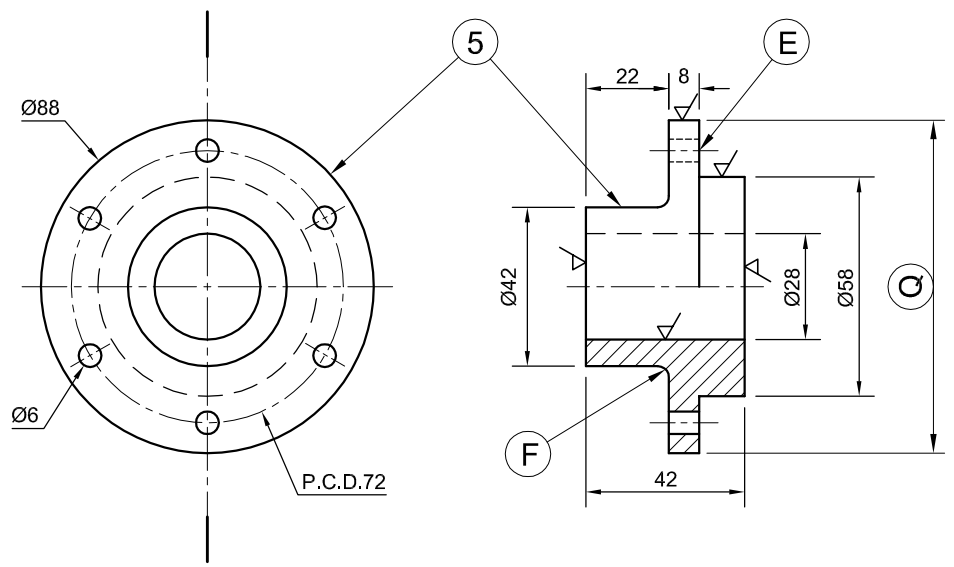
FOR OFFICIAL USE ONLY										
QUESTION	MARKS OBTAINED			½	SIGN	MODERATED			½	SIGN	
1											
2											
3											
4											
TOTAL											
	2	0	0			2	0	0			

FINAL CONVERTED MARK	CHECKED BY
100	

COMPLETE THE FOLLOWING:
CENTRE NUMBER
CENTRE NUMBER
EXAMINATION NUMBER
EXAMINATION NUMBER

STAPLE





PARTS LIST		
PART	QUANTITY	MATERIAL
1. BUSH	1	BRASS
2. WORM	1	CASE-HARDENED STEEL
3. BUSH	1	BRASS
4. BEARING	1	CASE-HARDENED STEEL
5. END PLATE	1	MILD STEEL

QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
Five parts of a worm gear assembly 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. **[30]**

	QUESTIONS	ANSWERS	
1	On what date was the drawing first checked?		1
2	From what material are the bushes manufactured?		1
3	Which drawing method was used to create these drawings?		1
4	How many end plates are there on this assembly?		1
5	How many sets of drawings are there?		1
6	What is the tolerance allowed on the dimensions?		1
7	How many surfaces must be machined?		1
8	What does the cross at A indicate?		1
9	What is feature B called?		1
10	What is the size of angle C?		1
11	What is feature D called?		1
12	What is the size of the hole marked E?		1
13	What is the size of the arc marked F?		1
14	What type of section is shown on part 1?		1
15	Determine the dimensions at:	**P** **Q**	2
16	What do the letters P.C.D. stand for?		1
17	How many bolts will be used to secure the end plate?		1
18	Draw the arrows for the cutting plane located on part 5 and label it A-A.		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), draw, in neat freehand, the *SABS 0111* convention for part 4.		6
	TOTAL		**30**

	15/05/2010	MICHELLE	ANGLE OF GEARS	A
ALL DIMENSIONS ARE IN MILLIMETRES.	DATE	CHANGED BY	REVISION DESCRIPTION	№
UNLESS OTHERWISE SPECIFIED, TOLERANCES ON DIMENSIONS ARE ± 0,25.	DRAWN BY: JOSHUA	DRAWING SET NO. 3 OF 4	MATERIAL: VARIOUS	
	DATE: 20/04/2010	FILE NAME: P-S2-B4	HEAT TREATMENT: NONE	
ALL UNSPECIFIED RADII ARE R3.	CHECKED BY: KRISTY	LONGSTEEL MANUFACTURING	RIVER DRIVE EAST LONDON 5247 www.longsteel.co.za	
	DATE: 26/04/2010			
DRAWING PROGRAM: AUTOCAD 2008	APPROVED BY: HOLLY	WORM-GEAR ASSEMBLY		
	DATE: 01/05/2010			
	SCALE: 1 : 2			

ANSWER 19

SYMBOL

ANSWER 20

Convention for part 4

EXAMINATION NUMBER

EXAMINATION NUMBER 2

STAPLE

QUESTION 2: LOCI (CAM)

Given:

- The shaft and follower detail of an industrial cam with the follower shown at its furthest position to the left
- The vertical centre line of the camshaft as a reference on the drawing sheet

The specifications for the movement are as follows:

- The cam rotates clockwise at constant velocity and imparts uniform motion to the follower.
- Over the first 60° the follower moves 20 mm to the right.
- There is a dwell period for the next 30°.
- Over the next 30° the follower moves a further 20 mm to the right.
- Over the next 60° the follower moves a further 20 mm to the right.
- There is a dwell period for the next 45°.
- Over the next 45° the follower moves 50% of the displacement to the left.
- There is a dwell period for the next 30°.
- Over the final 60° the follower returns to its original position.

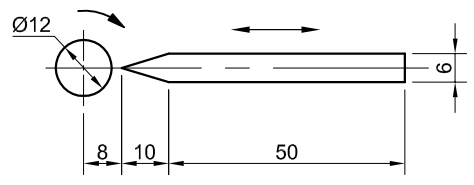
Instructions:

2.1 Draw, to scale 1 : 1, the given view of the camshaft and the follower using the given vertical centre line as reference. The arrow indicating the direction of rotation must be shown.

2.2 Draw the displacement graph with a rotational scale of 30° equal to 8 mm and a displacement scale of 1 : 1 for the given motion. Label the graph.

2.3 Project and draw the cam profile that would generate the given motion.

- Show ALL necessary construction. **[33]**



CAMSHAFT AND FOLLOWER DETAIL

ASSESSMENT CRITERIA				
1. GRAPH	11			
2. FOLLOWER + SHAFT + ARROW	5			
3. CONSTRUCTION	4			
4. CAM POINTS	7			
5. CURVE + QUALITY	6			
TOTAL	**33**			
EXAMINATION NUMBER				
EXAMINATION NUMBER				3

STAPLE

QUESTION 3: ISOMETRIC DRAWING

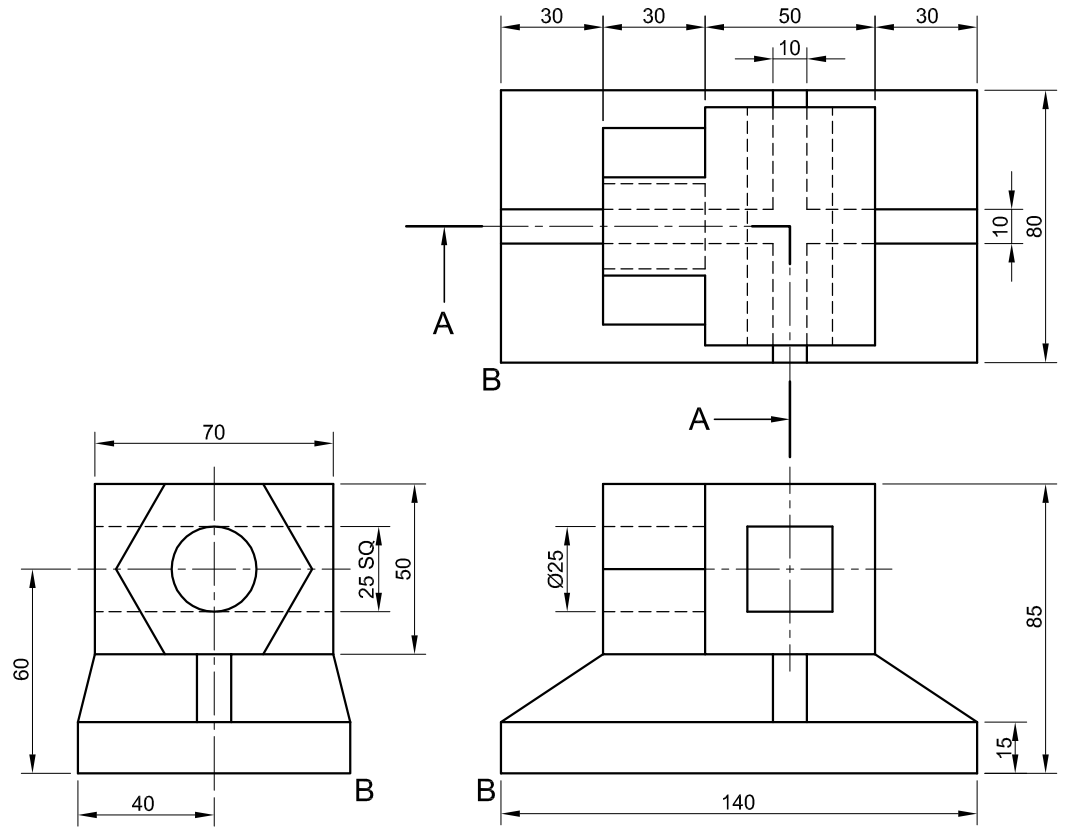
Given:

- The front view, top view and left view of a channel drilling jig with cutting plane A-A
- The position of point B on the drawing sheet

Instructions:

Convert the orthographic views of the channel drilling jig into a scale 1 : 1 sectional isometric drawing on cutting plane A-A.

- Make corner B the lowest point of the drawing.
- Show ALL necessary circle and other construction.
- NO hidden detail is required. **[40]**

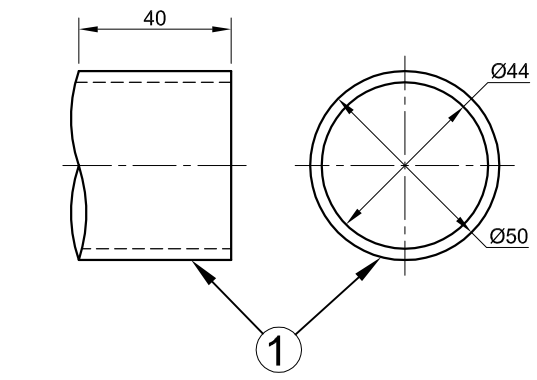


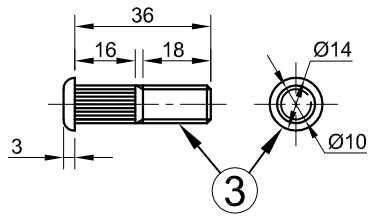
B

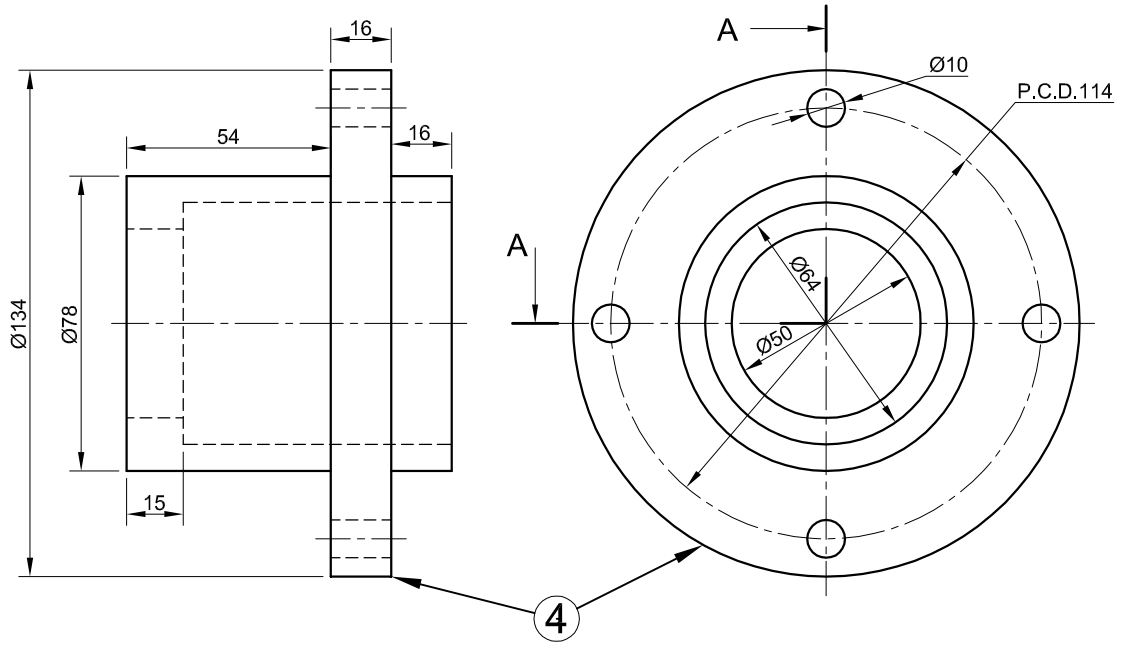
ASSESSMENT CRITERIA				
1. AUX. VIEW + PLACING	3			
2. ISOMETRIC LINES	11			
3. NON-ISOMETRIC LINES	3			
4. ISOMETRIC CIRCLES	3			
5. CIRCLE CONSTRUCTION	1½			
6. CENTRE LINES	1½			
7. SECTIONED SURFACES	13			
8. HATCHING	4			
TOTAL	**40**			

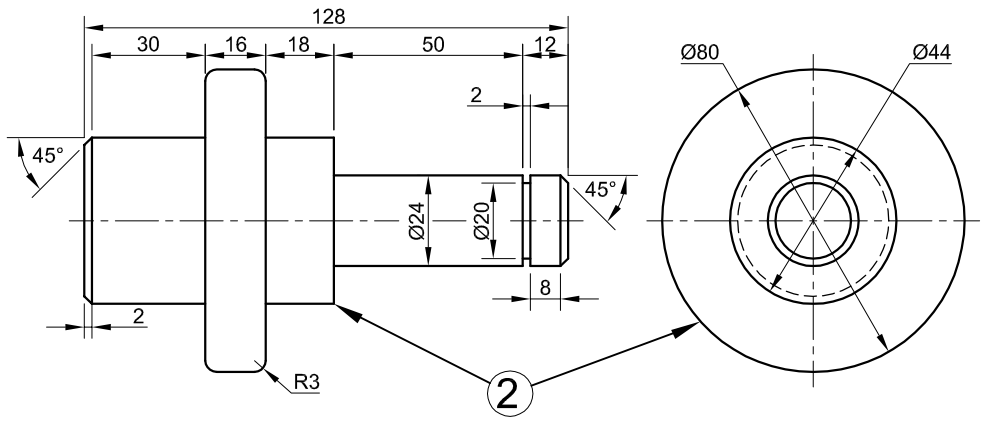
EXAMINATION NUMBER

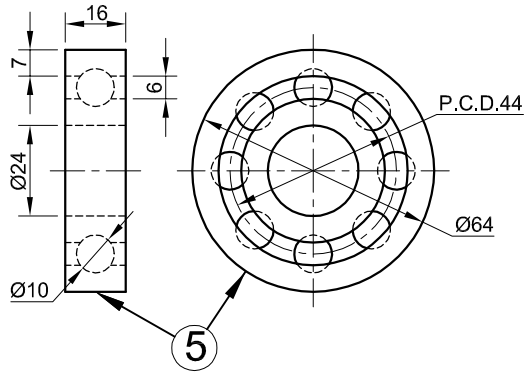
EXAMINATION NUMBER 4

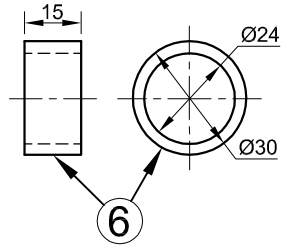












QUESTION 4: MECHANICAL ASSEMBLY

Given:

- The exploded isometric drawing of the parts of a wheel-hub assembly for a trailer, showing the position of each part relative to all the others
- Orthographic views of each of the parts of the wheel-hub assembly for a trailer

Instructions:

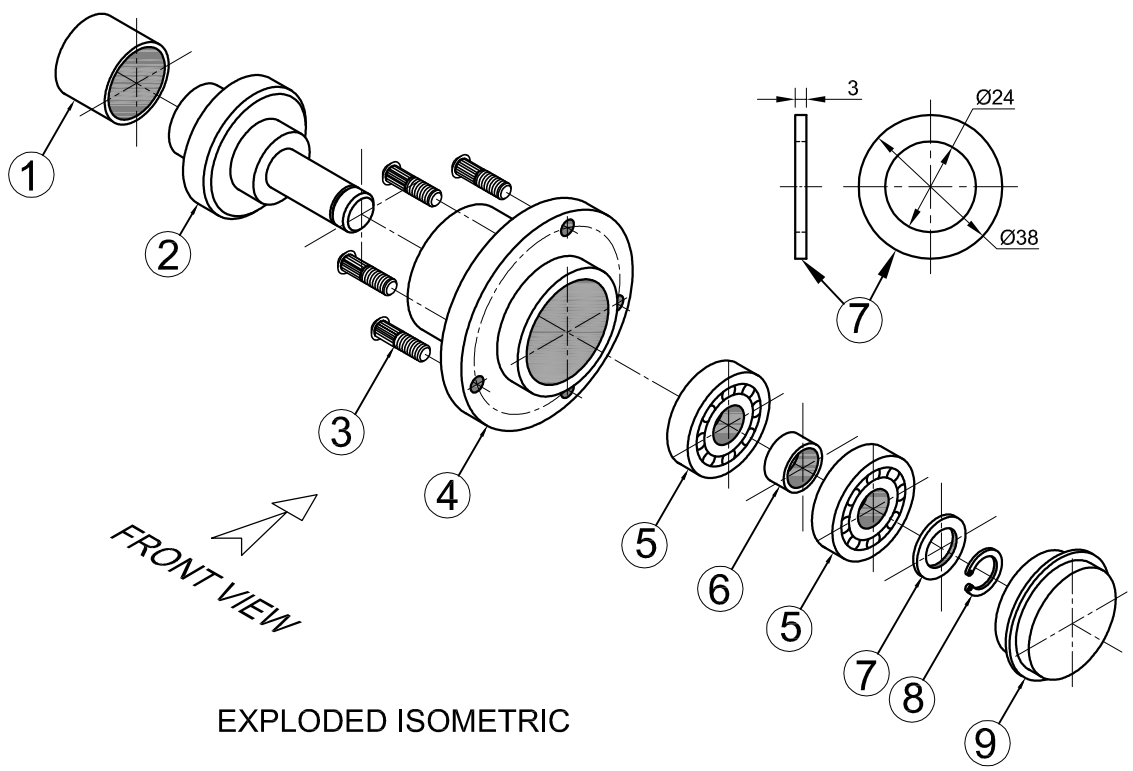
- Answer this question on page 6.
- Draw, to scale 1 : 1 and in third-angle orthographic projection, the following views of the assembled parts of the wheel-hub assembly for a trailer:
  - **4.1 A half-sectional front view**, with the top half in section, on cutting plane A-A, as seen from the direction of the arrow shown on the exploded isometric drawing. The cutting plane is shown on the right view of the wheel hub (part 4).
  - **4.2 The right view** with the **hub cap removed**.
- ALL drawings must comply with the guidelines contained in the *SABS 0111.*

NOTE:

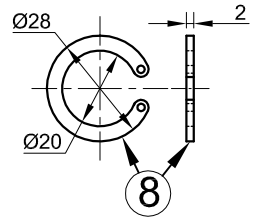
- Only the top wheel stud must be shown in the assembly.
- The ball bearings must be drawn in detail.
- No hidden detail is required.

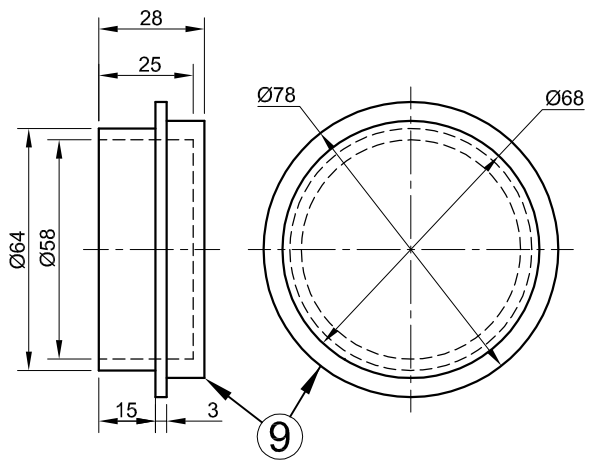
Add the following features to the drawing:

- The cutting plane A-A
- Label the half-sectional view: SECTION A-A **[97]**



EXPLODED ISOMETRIC





PARTS LIST		
PART	QUANTITY	MATERIAL
1. AXLE PIPE	1	MILD STEEL
2. STUB AXLE	1	MILD STEEL
3. WHEEL STUD	4	HARDENED STEEL
4. WHEEL HUB	1	CAST IRON
5. BALL BEARING	2	HARDENED STEEL
6. SPACER	1	MILD STEEL
7. WASHER	1	MILD STEEL
8. CIRCLIP	1	SPRING STEEL
9. HUB CAP	1	MILD STEEL

ALL DIMENSIONS ARE IN MILLIMETRES.	DRAWN BY: SHAUN	RHINO STEEL MANUFACTURING	FOREST DRIVE AMALINDA 5247 www.rhinosteel.co.za
	DATE: 28/03/2010		
	CHECKED BY: STEVEN		
ALL UNSPECIFIED RADII ARE R3.	DATE: 30/03/2010	TITLE: TRAILER-WHEEL HUB ASSEMBLY	
	APPROVED BY: JOHAN		
DRAWING PROGRAM: AUTOCAD 2008	DATE: 02/04/2010	NATIONAL SENIOR CERTIFICATE GRADE 12 NOVEMBER 2010	5
	SCALE: 1 : 1		

STAPLE

ASSESSMENT CRITERIA				
HALF-SECTIONAL FRONT VIEW				
	POSSIBLE	OBTAINED	SIGN	MODERATE
THIRD ANGLE	2			
1. AXLE PIPE	3			
2. STUB AXLE	$9\frac{1}{2}$			
3. WHEEL STUD	$8\frac{1}{2}$			
4. WHEEL HUB	8			
5. BEARINGS	7			
6. SPACER	1			
7. WASHER	$1\frac{1}{2}$			
8. CIRCLIP	$1\frac{1}{2}$			
9. HUB CAP	5			
SUBTOTAL	**47**			
RIGHT VIEW + GENERAL				
1. WHEEL HUB	$4\frac{1}{2}$			
2. WHEEL STUD	2			
3. BEARING	9			
4. WASHER	1			
5. CIRCLIP	3			
6. STUB AXLE	2			
7. ASSEMBLY	9			
8. SECTION A-A	4			
9. CENTRE LINES	4			
10. HATCHING	$11\frac{1}{2}$			
SUBTOTAL	**50**			
TOTAL	**97**			

EXAMINATION NUMBER	
EXAMINATION NUMBER	6