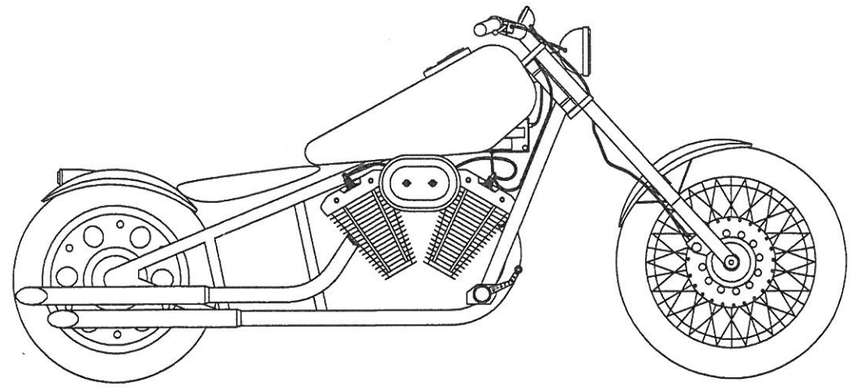
NATIONAL SENIOR CERTIFICATE EXAMINATION

2011

ENGINEERING GRAPHICS AND DESIGN

PAPER 2

MARKS: 200
TIME: 3 HOURS



FOR OFFICIAL USE ONLY					
QUESTION	SECTION	MARK	MODERATED	MAXIMUM	CODE
1	MECHANICAL ASSEMBLY			100	
2	MECHANICAL ANALYTICAL			15	
3	ISOMETRIC PROJECTION			40	
4a	CAM PROFILE			30	
4b	MECHANISM			15	
SYMBOL	TOTAL			200	
	TOTAL			100	

FINAL CONVERTED MARK	CHECKED BY
100	

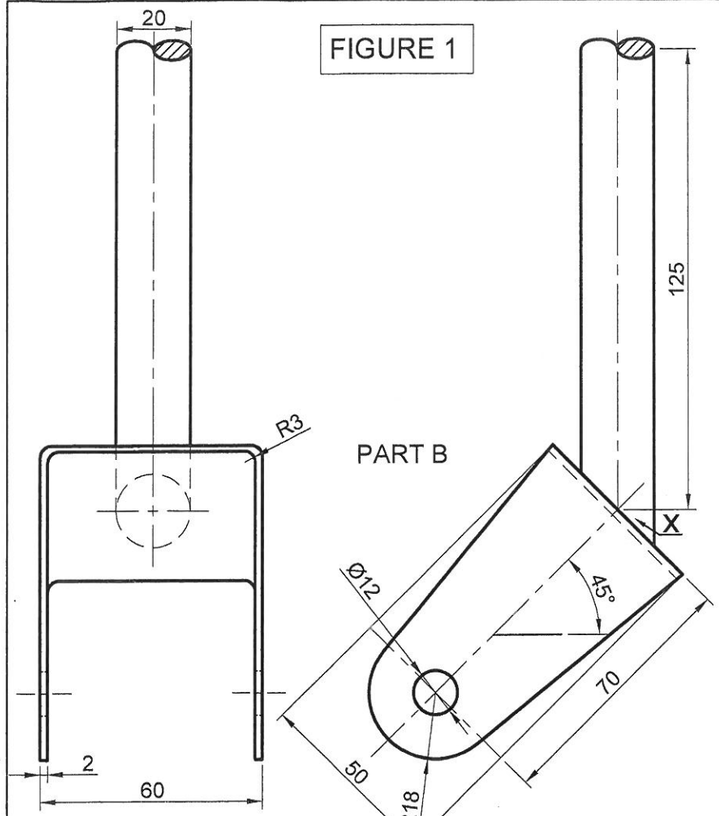
EXAMINATION CENTRE

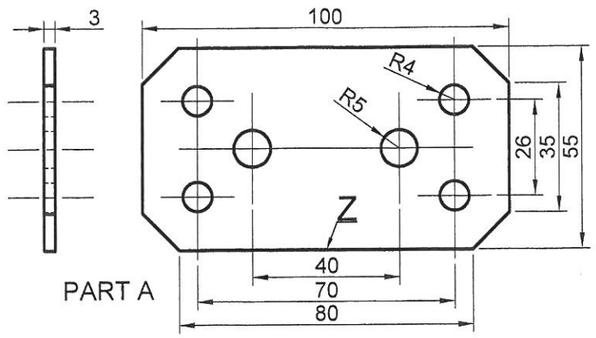
EXAMINATION NUMBER

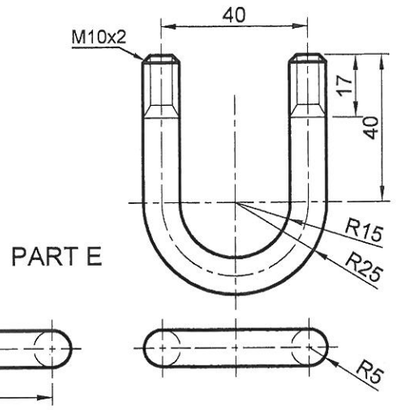
PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

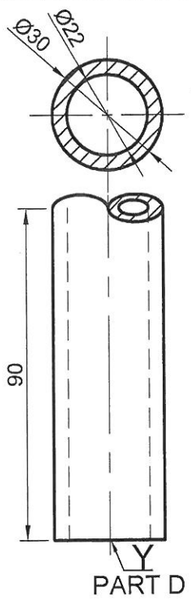
1. This question paper consists of **7 pages** including the cover page and **4 questions**.
2. **All** questions must be answered.
3. Unless specified otherwise, all questions are in **Third Angle Orthographic Projection**.
4. Unless specified otherwise, all questions are to be completed to a **scale of 1:1**.
5. **All** answer sheets must be re-stapled in numerical order, even questions that are not attempted/blank.
6. All **construction work** must be shown, even if a stencil was used.
7. Print your **examination number** neatly on each page.
8. Use only the **drawing sheets** provided.
9. Your drawings should reflect **neatness** and **accuracy**.
10. All dimensions or detail not given may be **assumed** in **good proportion**.
11. **Stencils** may be used.

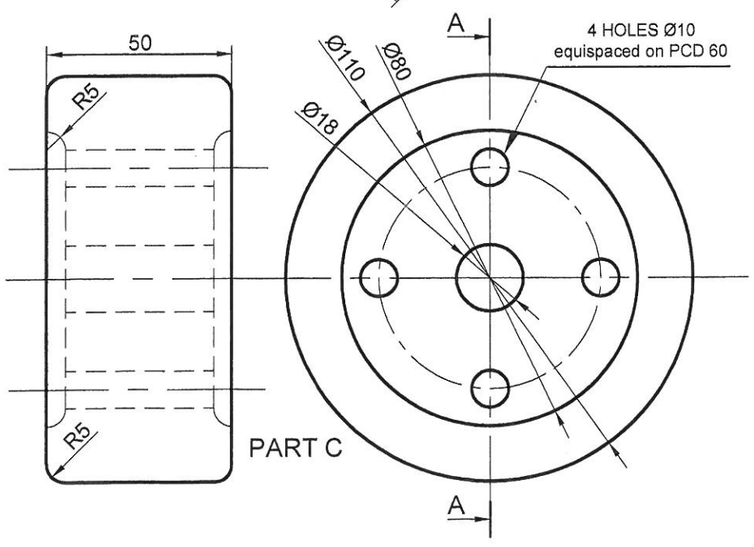
FIGURE 1

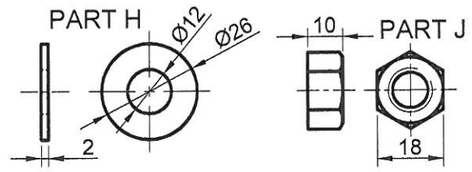


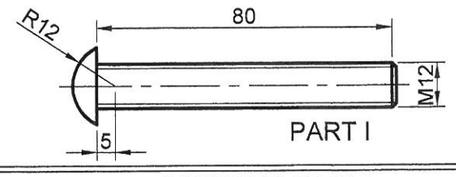


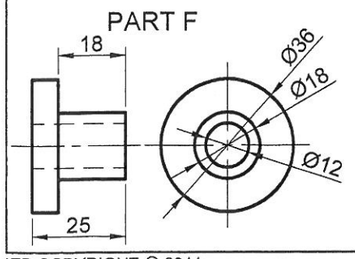


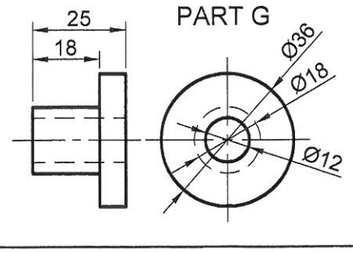












COMPONENT LIST			
NO.	PART	QUANTITY	MATERIAL
A	BRACKET	1	GALVANISED STEEL
B	FORK	1	GALVANISED STEEL
C	WHEEL	1	PLASTIC COMPOUND
D	CASING	1	GALVANISED STEEL
E	U-BOLT	1	GALVANISED STEEL
F	LEFT BUSH	1	PLASTIC COMPOUND
G	RIGHT BUSH	1	PLASTIC COMPOUND
H	WASHER	2	GALVANISED STEEL
I	BOLT	1	GALVANISED STEEL
J	M12 NUT	1	GALVANISED STEEL

QUESTION 1

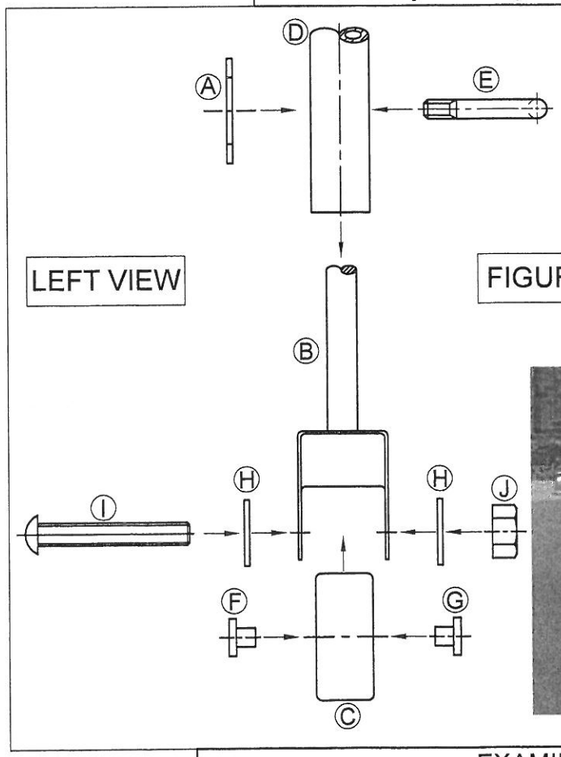
MECHANICAL ASSEMBLY

Figure 2 shows a photograph of a ***JOCKEY WHEEL***, as well as an exploded view of how the components of a similar, simplified system are assembled. Figure 1 shows the different components that need to be assembled.

Complete the following to a ***SCALE*** of ***1:1***:

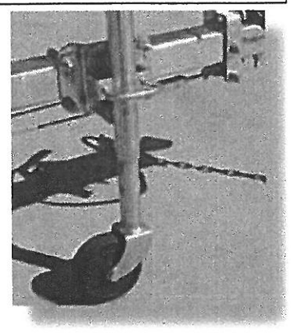
1.1 A ***Front View*** of the assembled ***JOCKEY WHEEL.***
1.2 A ***Sectioned Left View*** of the assembled ***JOCKEY WHEEL.*** (The nut must show three faces)
1.3 Show ***Hidden Detail*** on the ***Front View*** only.
1.4 Show your ***Section Line*** and the omitted ***Centre Lines.***
1.5 Insert 5 important, functional ***Dimensions.***
1.6 Draw the ***Projection Symbol.***
1.7 Add a suitable ***Title*** and indicate the ***Scale*** used.
1.8 Label the ***Sectioned View.***

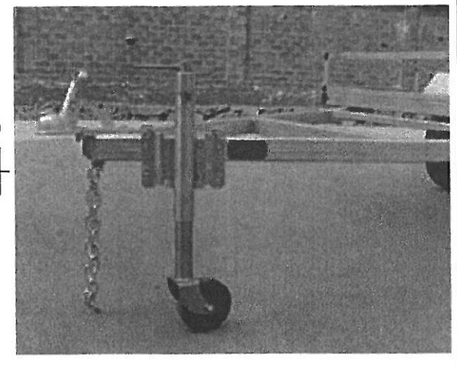
NB: 1) The ***centre lines*** for the ***two views*** are given on the answer sheet on the next page.
2) Point Y (on the casing) must be assembled 30 mm above ***point X*** (on the fork).
3) Point Z (on the bracket) must be assembled 60 mm above ***point X*** (on the fork).



LEFT VIEW

FIGURE 2





100 MARKS

EXAMINATION NUMBER

QUESTION 1

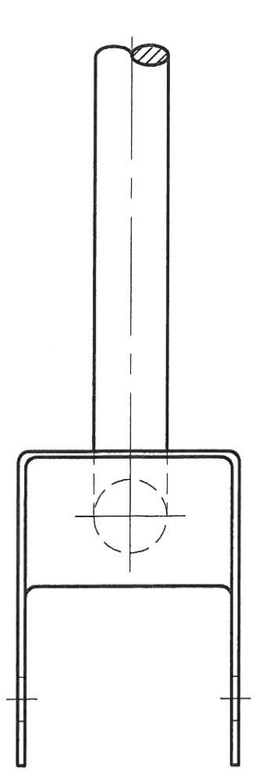
MECHANICAL ASSEMBLY

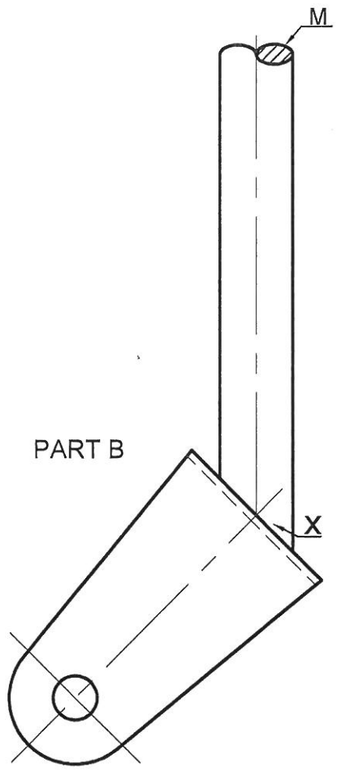
ASSESSMENT CRITERIA			
FRONT VIEW			
A	BRACKET	12	
B	FORK	10	
C	WHEEL	8	
D	PIPE	5	
E	U-BOLT	4	
H	WASHER	2	
I	BOLT	2	
J	NUT	6	
HIDDEN DETAIL		9	
TOTAL	58		
LEFT VIEW			
A	BRACKET	3	
B	FORK	10	
C	WHEEL	20	
D	PIPE	5	
E	U-BOLT	6	
F/G	BUSHES	8	
H	WASHERS	4	
I	BOLT	6	
J	NUT	6	
TOTAL	68		
ADDITIONAL			
CORR. ASSEMBLY		8	
HATCHING		12	
CENTRE LINES		17	
DIMENSIONS		5	
SECTION LINE		4	
SYMBOL		4	
TITLE		4	
SCALE		4	
LABEL		4	
NO-HATCHING		12	
LW / ACC / PRE		-3	
TOTAL	74		
TOTAL	200		
TOTAL	100		

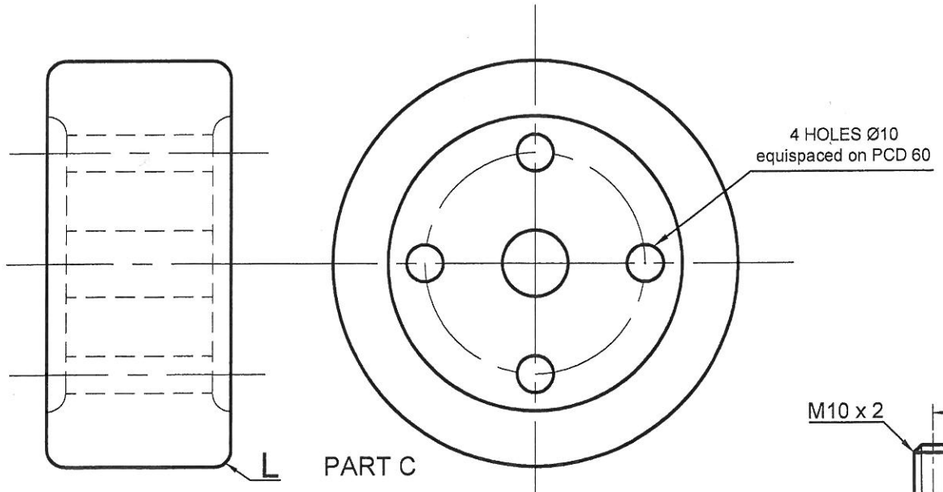
ANSWER SHEET 1

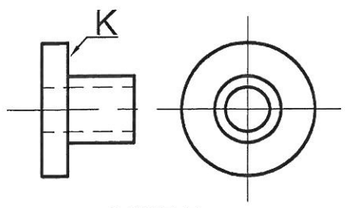
100 MARKS

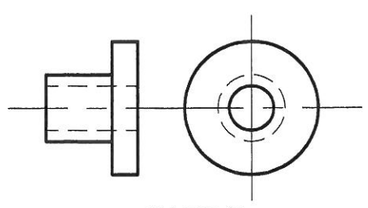
EXAMINATION NUMBER

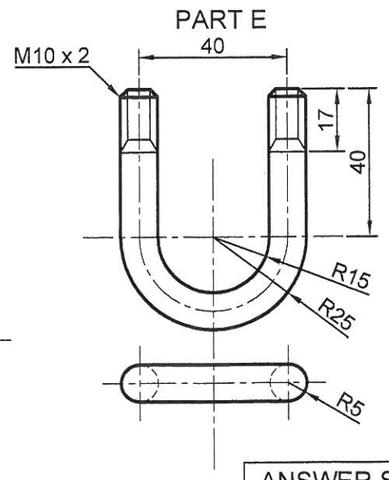












ANSWER SHEET 2

QUESTION 2

MECHANICAL ANALYTICAL

Choose the correct alternative and write down the correct LETTER in the space provided.	Answer	OFFICIAL USE Only
2.1 How many components did you need to assemble? (1) A. Five B. Six C. Seven D. Eight		
2.2 The feature 'K' on the left bush (Part F) represents a: (1) A. Shoulder B. Fillet C. Round D. Chamfer		
2.3 The feature 'L' on the wheel (Part C) represents a: (1) A. Shoulder B. Fillet C. Round D. Chamfer		
2.4 The feature 'M' on the fork (Part B) represents a: (1) A. Welding symbol B. Machining symbol C. Chamfer D. Interrupted View		
2.5 The thread on the U-Bolt (Part E) is: (1) A. 2 mm thick, 17 mm long and external B. 2 mm thick, 17 mm long and internal C. 2 mm thick, 40 mm long and external D. 2 mm thick, 40 mm long and internal		
2.6 What does the abbreviation PCD (Part C) stand for? (1) A. Perfect Circle Drawing B. Perfect Circumference Drawing C. Pitch Circumference Drawing D. Pitch Circle Diameter		
2.7 Most of these parts are galvanised similar to that of a roof on a house. Why is metal galvanised? (1)		
2.8 Explain the function of a U-Bolt (Part E): (1)		
2.9 Explain the function of a Bush (Part F/G): (1)		
2.10 Part B consists of a solid rod that had been welded to the forked part around the point marked with an 'X'. Draw the welding symbol that would represent this particular weld. (3)		
2.11 You need to finish the welding neatly around the part 'X' in the above question. Draw a machining symbol that would fit the following requirements in the space below: (3) 'Machine by grinding, roughness value of 0.9 mm, machine allowance of 0.7 mm, direction of lay is circular.'		

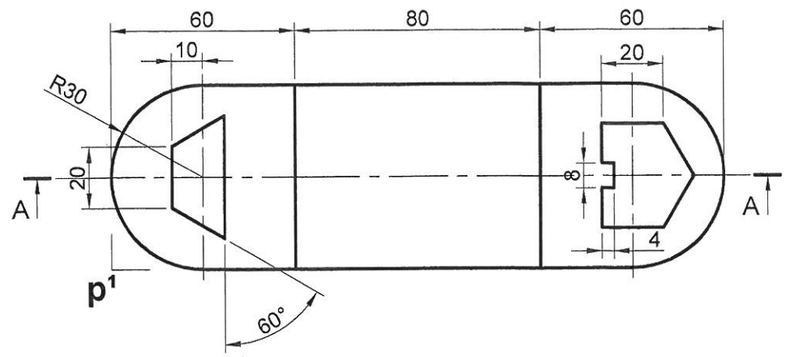
15 MARKS

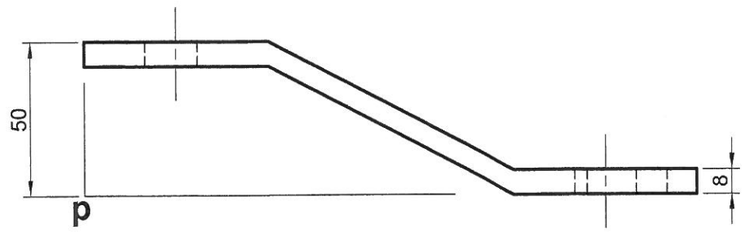
EXAMINATION NUMBER

QUESTION 3

ISOMETRIC DRAWING

Shown are two orthographic views of a ***BOTTLE OPENER***.
Complete a neat, sectioned ***Isometric*** drawing using the cutting plane A-A. The two holes are based on the construction of a ***hexagon***. Show all ***constructions*** and ***centre lines***. Make point ***P*** the lowest point on your drawing and start your drawing on the given crosshairs.





P

ANSWER SHEET 3

CON	
ISOM	
N/ISO	
CIRC	
CLS	
HAT	
N/HT	
L/N/P	
40 MARKS	

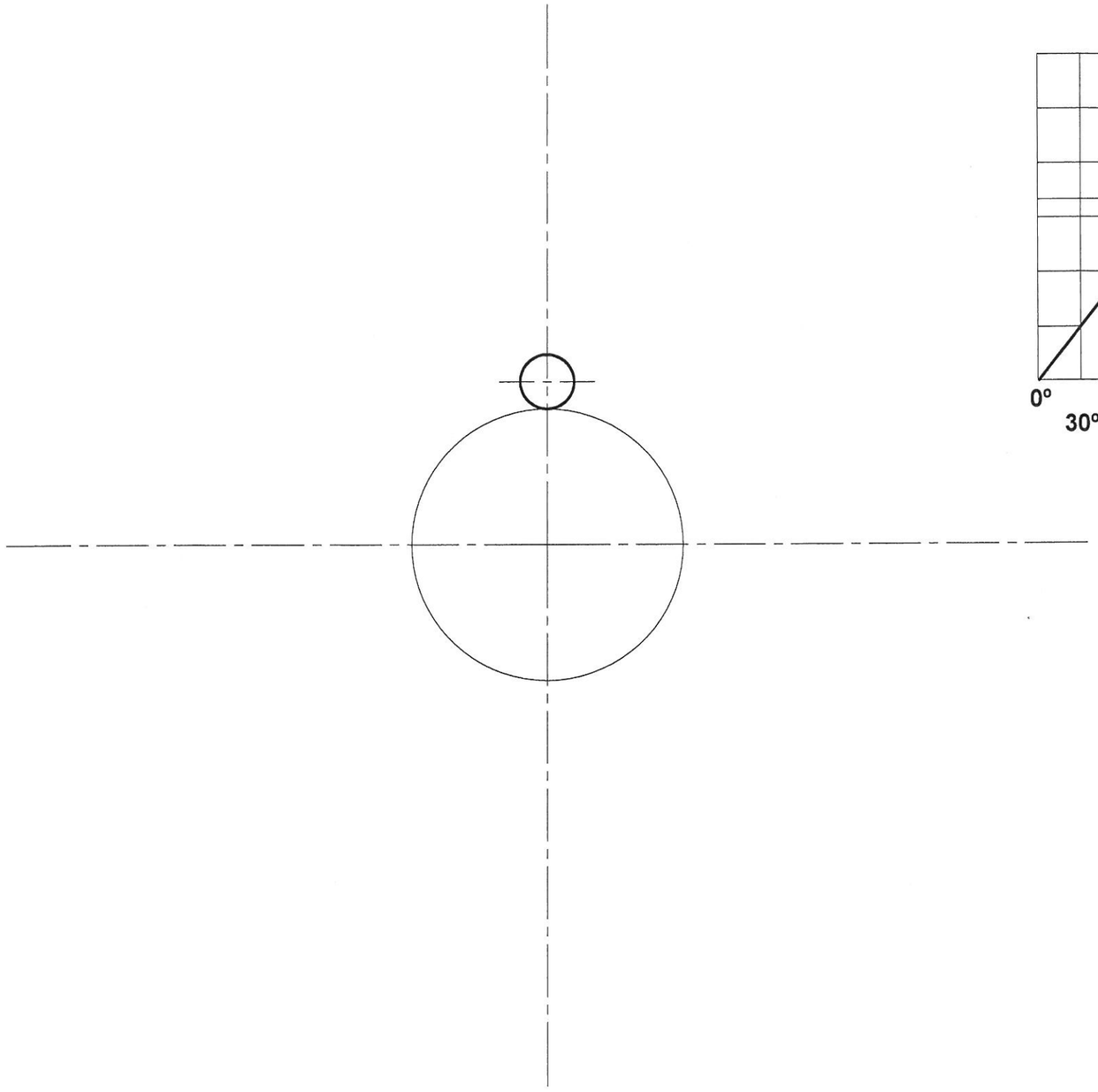
ASSESSMENT CRITERIA

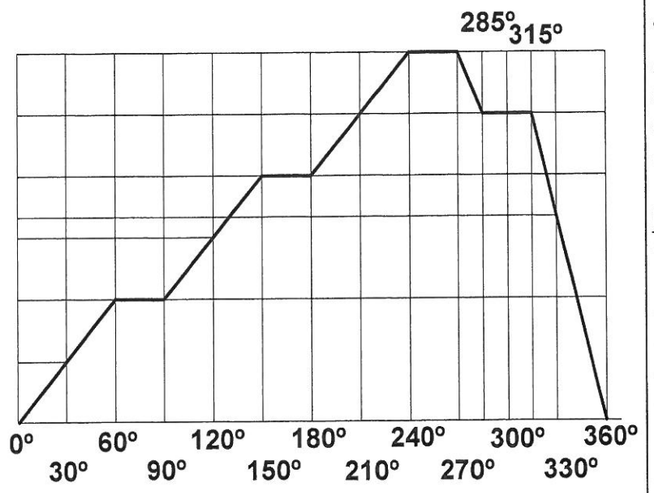
• Constructions	2
• Isometric Lines	18
• Non-Isometric Lines	7
• Isometric Circles	6
• Centre Lines	2
• Hatching	3
• Non Hatching	2
• LW / ACC / PRE	-2

EXAMINATION NUMBER

QUESTION 4a

CAM PROFILE





A machine needs a special ***Cam Profile*** to produce a specific action on an assembly line.

The displacement diagram is given in position.

The following specifications are applicable to the ***roller-ended*** follower:

- The direction of rotation is ***anti-clockwise***.
- The ***diameter*** of the ***Camshaft*** is 20 mm.
- The ***roller diameter*** is 10 mm.

Instructions:

- Draw the ***Cam Profile*** that is generated by the follower.
- ***Label*** the ***Displacement Graph*** and ***Scale***.
- ***Label*** the ***Cam Profile*** and ***Cam Shaft.***
- Indicate the *Direction*.
- Show all ***constructions***.

Answer the following related questions:

4.1.1 What is the ***travel*** after 360°?
4.1.2 What is the ***maximum displacement***?
4.1.3 What is the ***angular displacement*** after the follower has travelled ***40 mm***?

ASSESSMENT CRITERIA

• Plot Points	14
• Locus	4
• Hatch Shaft	2
• Direction	1
• Roller Centres	2
• Labels	4
• Answers	3
• LW / ACC / PRE	-2

4.1.1 TRAVEL AFTER 360°	=	
4.1.2 MAX DISPLACEMENT	=	
4.1.3 ANGULAR DISPLACEMENT	=	

PTS	
LOC	
HAT	
DIRE	
ROL	
LAB	
ANS	
L/N/P	
30 MARKS	

EXAMINATION NUMBER

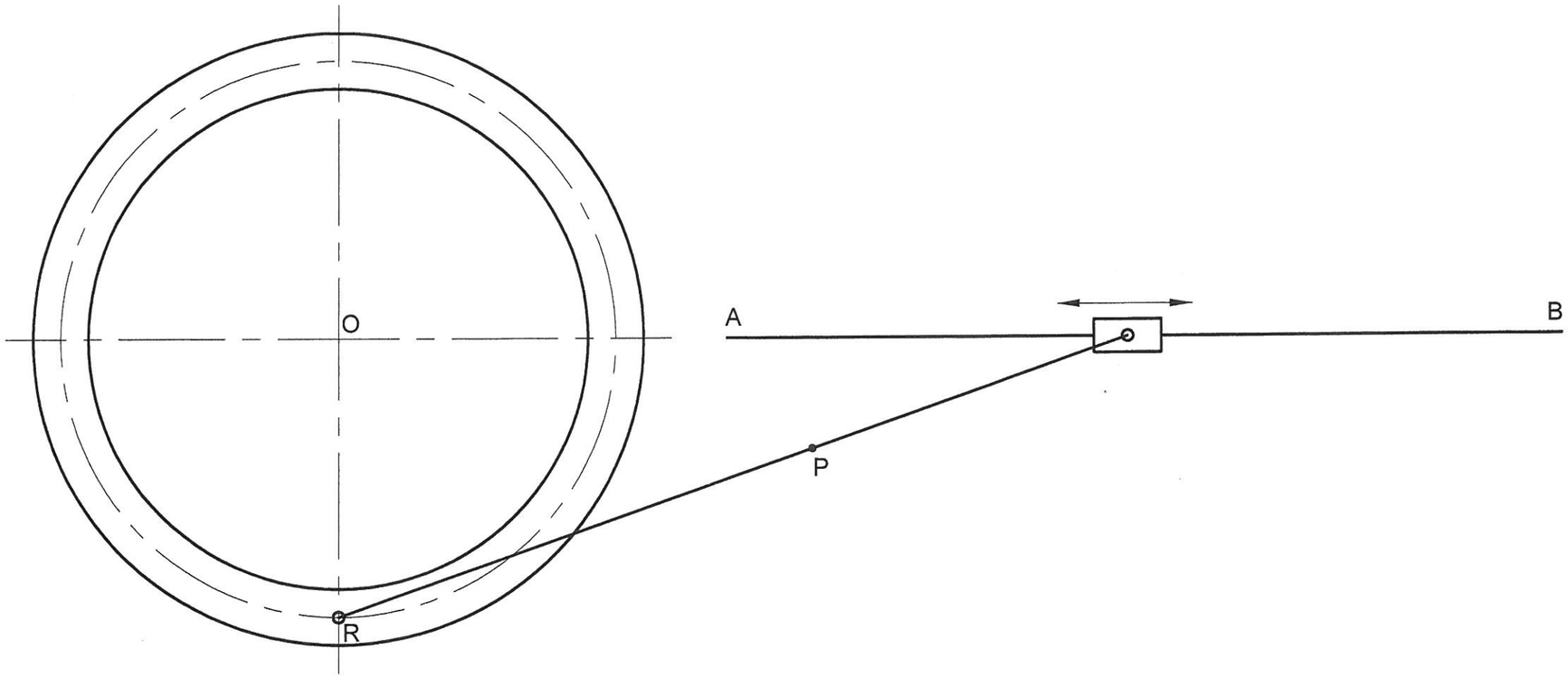
ANSWER SHEET 4

QUESTION 4b

MECHANISM

The given figure shows a wheel, rotating around the centre O, with a ***rod*** attached to it at point R. The other end of the rod is attached to a ***sliding mechanism*** that can only move in the horizontal plane between point A and B. Construct and draw the locus of ***point P*** for one full rotation.

- The direction of rotation is ***clockwise***.
- Show all ***constructions***.



ASSESSMENT CRITERIA	
• Set Up	2
• Plot Points	10
• Locus	3
• LW / ACC / PRE	-2

SET	
PTS	
LOC	
L/N/P	
15 MARKS	

EXAMINATION NUMBER

ANSWER SHEET 4