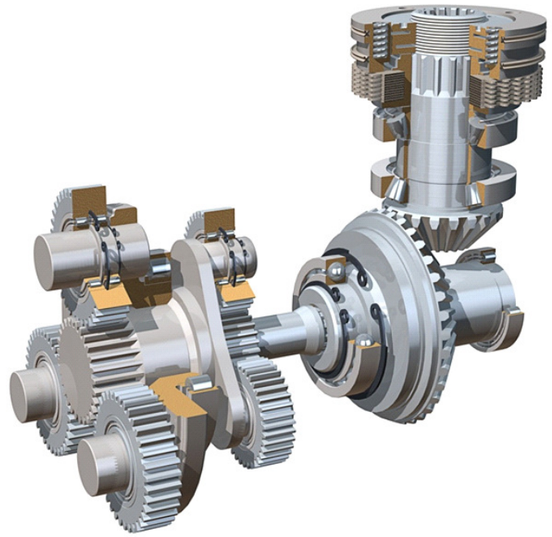
NATIONAL SENIOR CERTIFICATE EXAMINATION

2017

ENGINEERING GRAPHICS AND DESIGN

PAPER 2



FOR OFFICIAL USE ONLY																	
QUESTION	SECTION	MARK						MODERATED						MAXIMUM	CODE		
1	MECHANICAL ANALYTICAL																
2.1	LOCUS CAM																
2.2	LOCUS MECHANISM																
3	ISOMETRIC DRAWING																
4	MECHANICAL ASSEMBLY																
SYMBOL	TOTAL													200			
	TOTAL													100			

FINAL CONVERTED MARK	CHECKED BY
100	

MARKS:	200
TIME:	3 HOURS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of **7 pages** including the cover page and **4 questions.**
2. **All** the 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 **stapled** in **numerical** order and handed in, even unattempted/blank questions**.**
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 **answer sheets** provided**.**
9. Your drawings should be **well presented** and reflect **neatness** and **accuracy.** Marks will be **deducted** for untidy and inaccurate work**.**
10. Any dimensions or detail not given may be **assumed** in **good proportion.**
11. **Stencils** and **calculators** may be used**.**
12. **All** drawings must adhere to the SANS 10111-1**.**
13. In order to save time, **detailed assembly parts** must be drawn to **convention.**

EXAMINATION NUMBER

QUESTION 1

MECHANICAL ANALYTICAL

Figure A

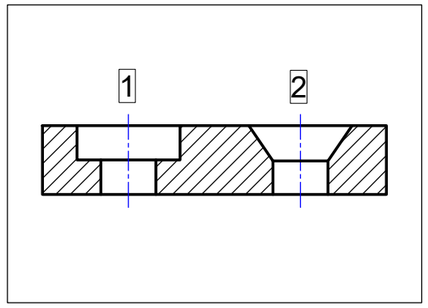


Figure B

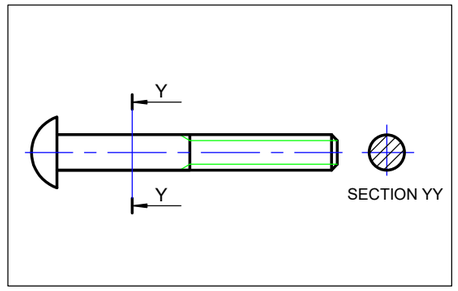


Figure C

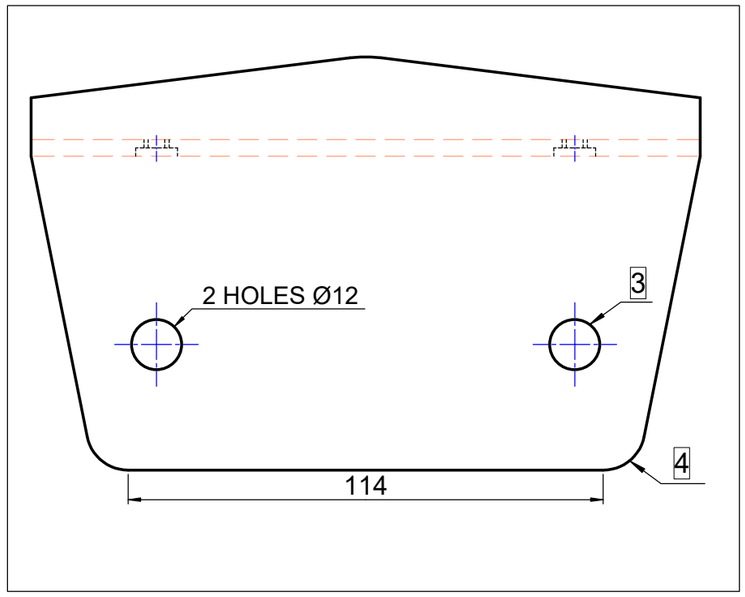


Figure D

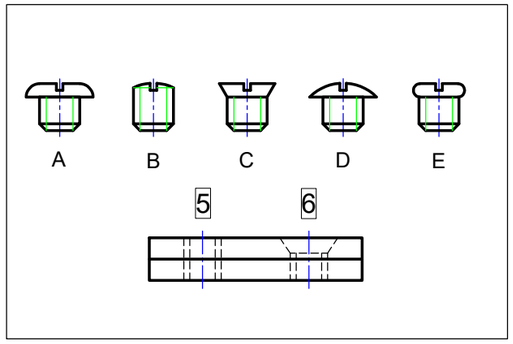


Figure E

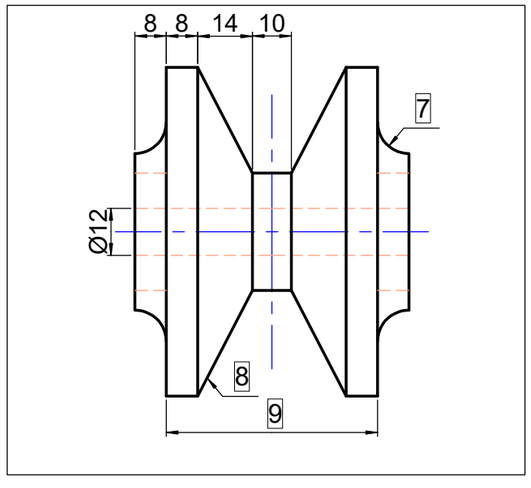


Figure F

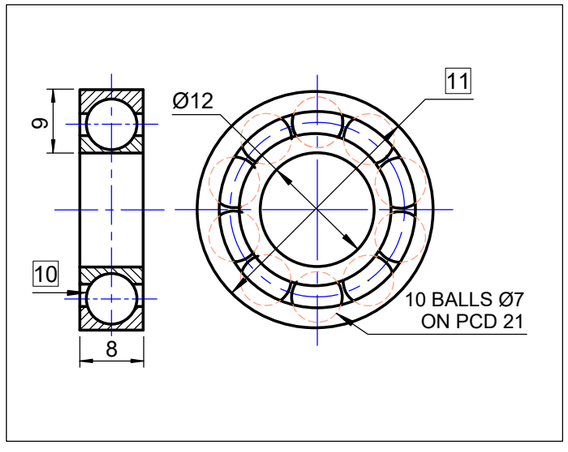


Figure G

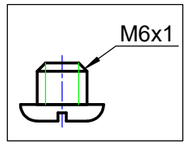
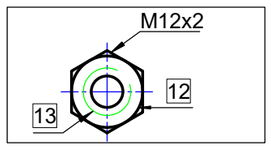


Figure H



Answer the following questions neatly and legibly in the space provided:

1.1	Name the type of hole shown at 1 in Figure A.	Counter bore	(1)
1.2	Name the type of hole shown at 2 in Figure A.	Countersunk	(1)
1.3	What type of sectioning is shown in Figure B?	Removed	(1)
1.4	Calculate the radius 3 in Figure C.	R6	(1)
1.5	What is feature 4 in Figure C called?	Round	(1)
1.6	Which screw in Figure D would fit completely into hole 5 and produce a near flush top surface?	B	(1)
1.7	Which screw in Figure D would fit completely into hole 6 and produce a near flush top surface?	C	(1)
1.8	What is feature 7 in Figure E called?	Fillet	(1)
1.9	What is feature 8 in Figure E called?	Taper/chamfer	(1)
1.10	Calculate the dimension 9 in Figure E.	54 mm	(1)
1.11	Calculate the diameter 10 of the ball in Figure F.	Ø7	(1)
1.12	Calculate the diameter 11 in Figure F.	Ø30	(1)
1.13	What is the thickness of the thread in Figure G?	1 mm/0.6 mm	(1)
1.14	Is the thread in Figure G external or internal?	External	(1)
1.15	Calculate the diameter 12 of the circle in Figure H.	Ø18	(1)
1.16	Calculate the diameter 13 of the circle in Figure H.	Ø12	(1)

1.17 The ***machining symbol*** in Figure I shows the following information: (2)

Select and circle the correct option.

Option	Machine allowance	Roughness value	Direction of lay	Finish
A	0.2	0.5	Circular	Plating
B	0.5	0.2	=	Plating
C	0.2	0.5	Parallel	Plating
D	=	0.2	Perpendicular	Plating

1.18 The ***welding symbol*** in Figure J shows the following information: (2)

Select and circle the correct option.

Option	Weld type	Site weld	Weld all around	Process
A	Bead	No	Yes	Flame
B	Fillet	Yes	No	Arc
C	Bevel	No	No	Flame
D	Fillet	Yes	Yes	Arc

Figure I

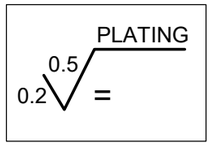
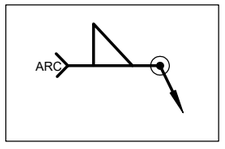


Figure J



ANSWER SHEET 1

EXAMINATION NUMBER

QUESTION 2.1

LOCUS CAM

Given is the incomplete ***graph*** of ***displacement*** of a ***wedge-ended*** follower as well as the centre of the camshaft as shown by the given centre lines.

The graph of displacement has the following motion:

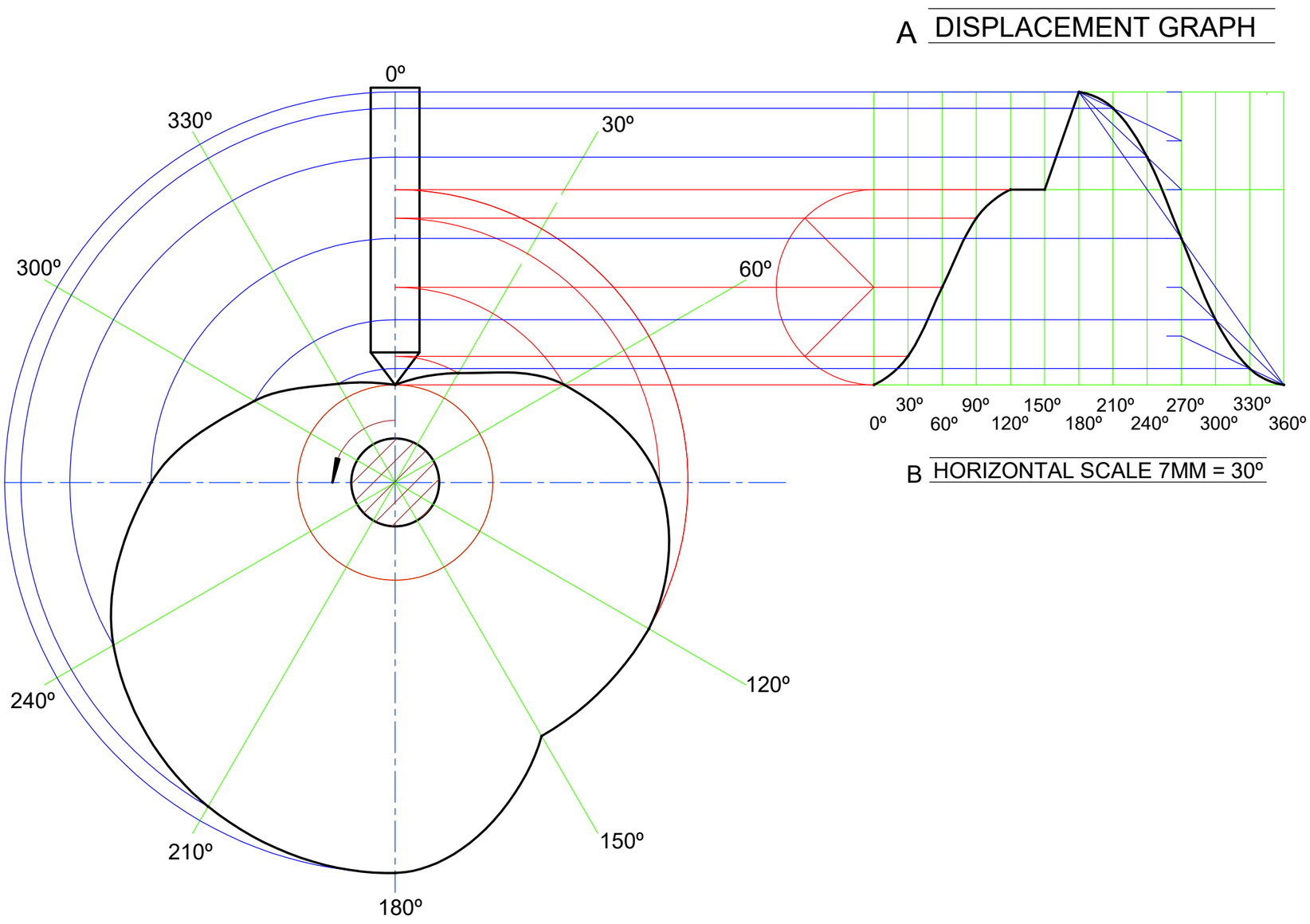
- ✓ 0°—120° the follower ***rises*** 40 mm with **simple harmonic motion**. (Given)
- ✓ 120°—150° the follower is at ***rest***. (**Uniform motion**)
- ✓ 150°—180° the follower ***rises 20 mm***. (**Uniform motion**)
- ✓ 180°—360° the follower ***returns to its original position*** with ***uniform*** **acceleration and retardation**.

The cam profile has the following specifications:

- ➢ The direction of turn is ***anti-clockwise***.
- ➢ The ***camshaft*** has a radius of 9 mm.

<u>Draw the following</u>:

2.1.1 the complete graph of displacement.
2.1.2 the cam profile.
2.1.3 the camshaft with hatching.
2.1.4 the wedge-ended follower (to your own appropriate size and measurements).
2.1.5 the direction of rotation.
2.1.6 print, in capitals, the required ***label*** at A and the applicable ***scale*** at B.
2.1.7 show all constructions.



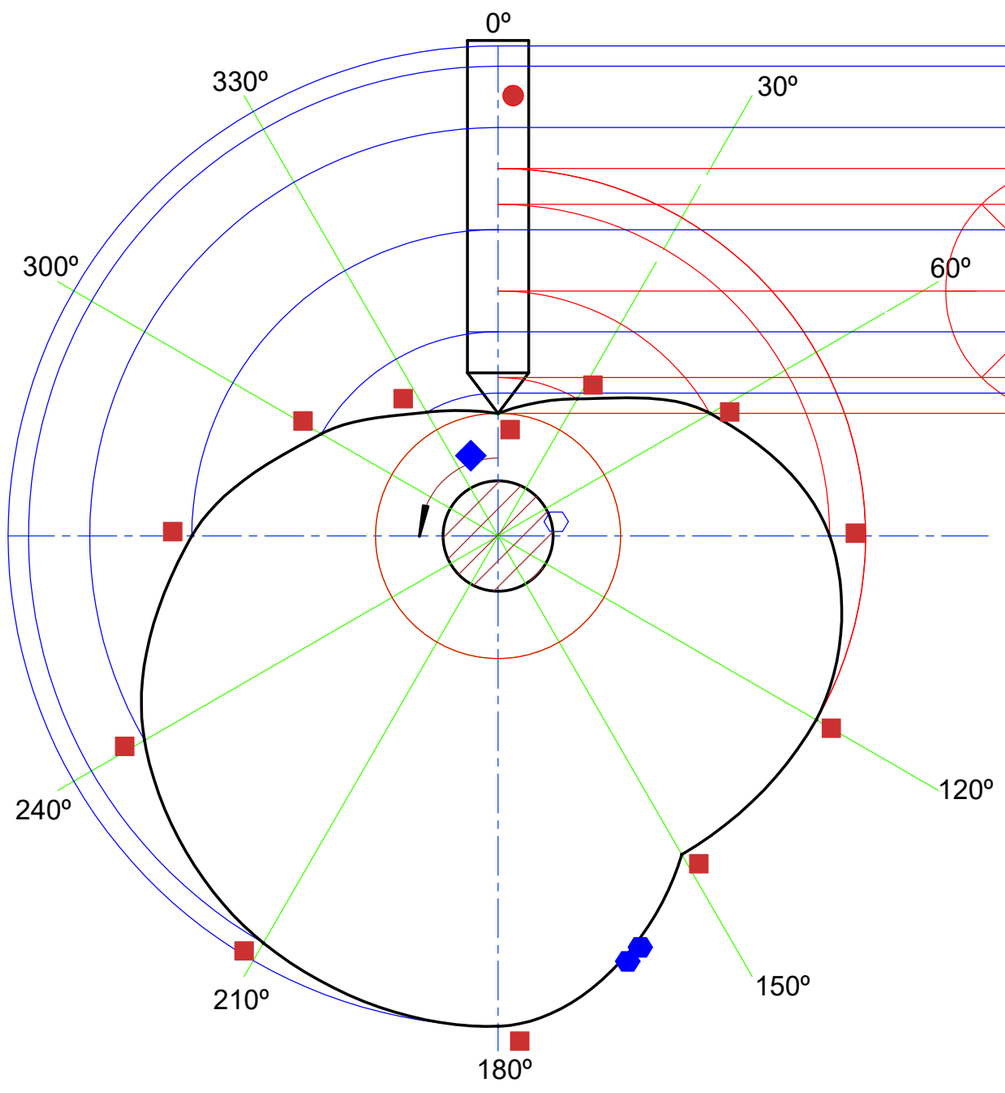
ASSESSMENT CRITERIA

☑	Graph 12/2	6
☑	Setup/Plot Points	12
☑	Locus	2
☑	Shaft and hatch	1
☑	Follower	1
☑	Direction	1
☑	Label/Scale	2

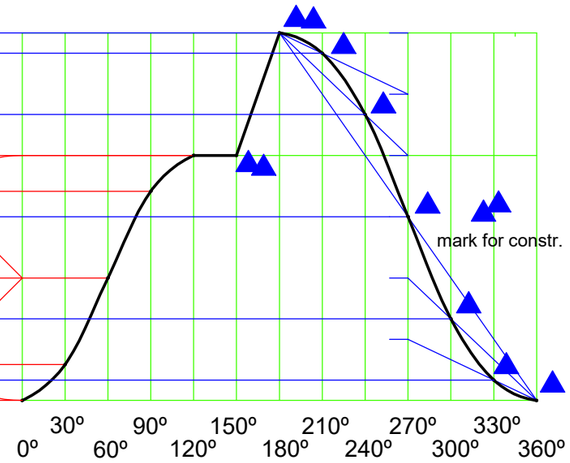
GRPH 6	
PLOT 12	
LOC 2	
SHFT 1	
FOL 1	
DIR 1	
LBL 2	

EXAMINATION NUMBER

ANSWER SHEET 2.1



A DISPLACEMENT GRAPH



B HORIZONTAL SCALE 7MM = 30º

-1 mark for not PRINTING/CAPS

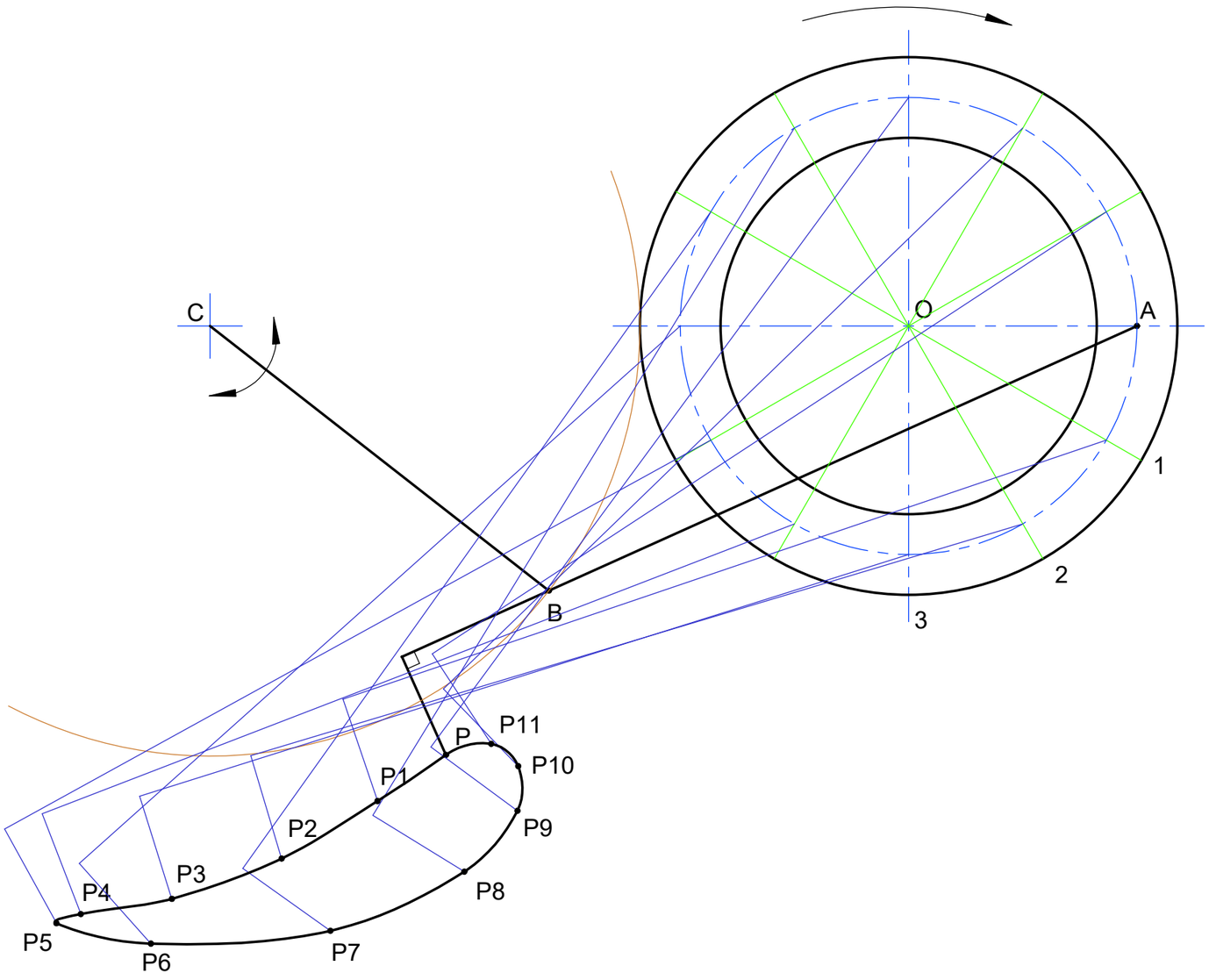
Graph	6	12/2
Setup/Plot	12	
Locus	2	
Shaft/hatch	1	
Follower	1	
Direction	1	
Label/Scale	2	
	25	

QUESTION 2.2

LOCUS MECHANISM

The given figure shows a wheel, rotating around the centre O, with a ***rod AD*** attached to it at point A. ***Rod BC*** is pin-jointed at point B and free to move about its anchor point C. ***Rods AD*** and ***DP*** are fixed at 90°. ***Rod BC*** rocks back and forth as the wheel rotates. Construct and draw the locus of ***point P*** if the direction of rotation is ***clockwise***.

Show all ***constructions*** and indicate the ***direction*** correctly.



ASSESSMENT CRITERIA		
☑	Setup	2
☑	Plot Points	11
☑	Direction	1
☑	Locus	1

SET 2

PTS 11

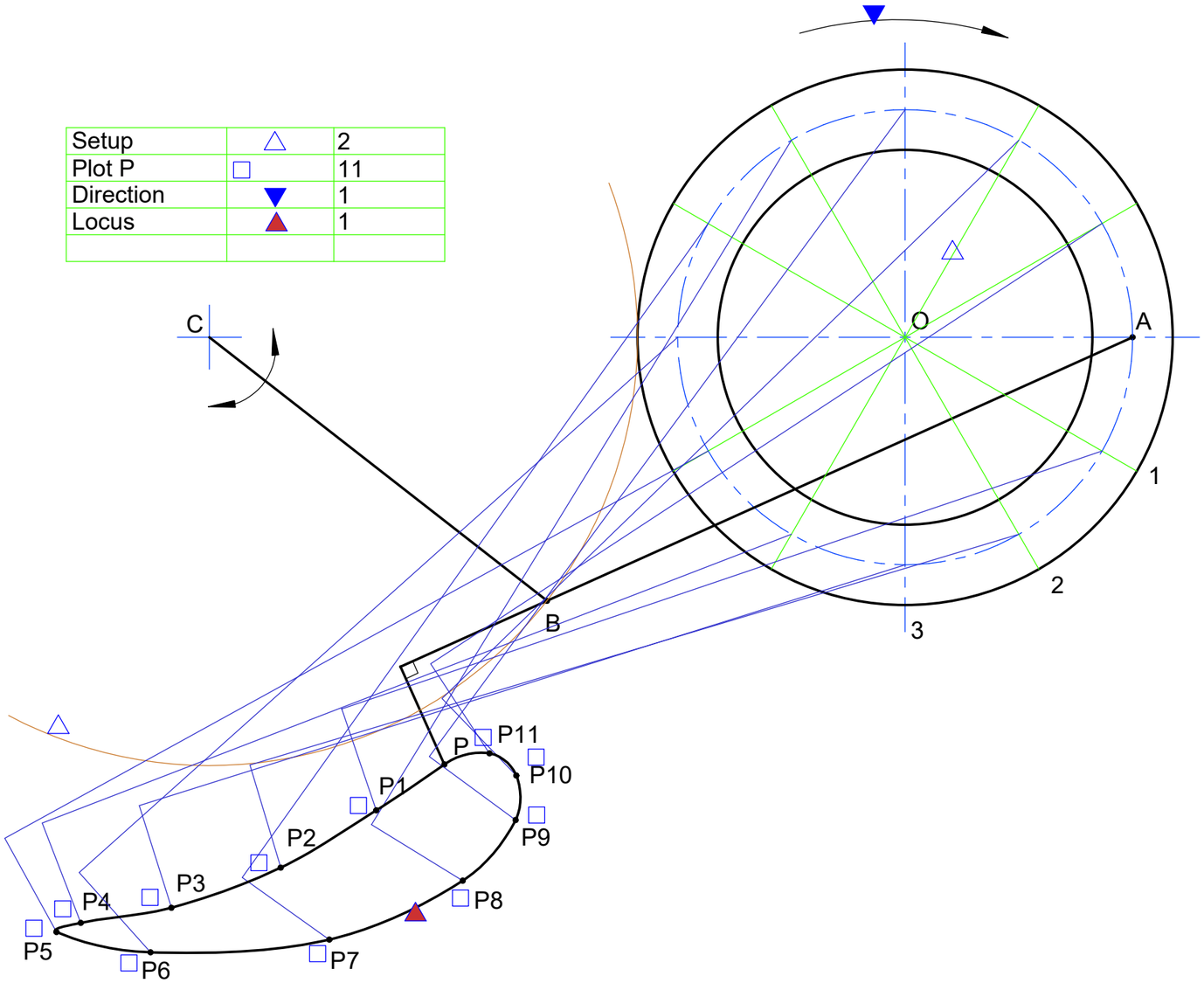
DIR 1

LOC 1

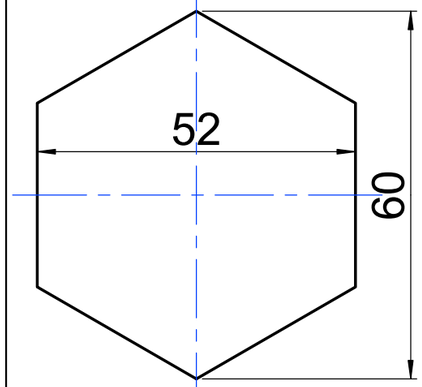
EXAMINATION NUMBER

ANSWER SHEET 2.2

Setup	△	2
Plot P	□	11
Direction	▼	1
Locus	▲	1



CONSTRUCTION AREA



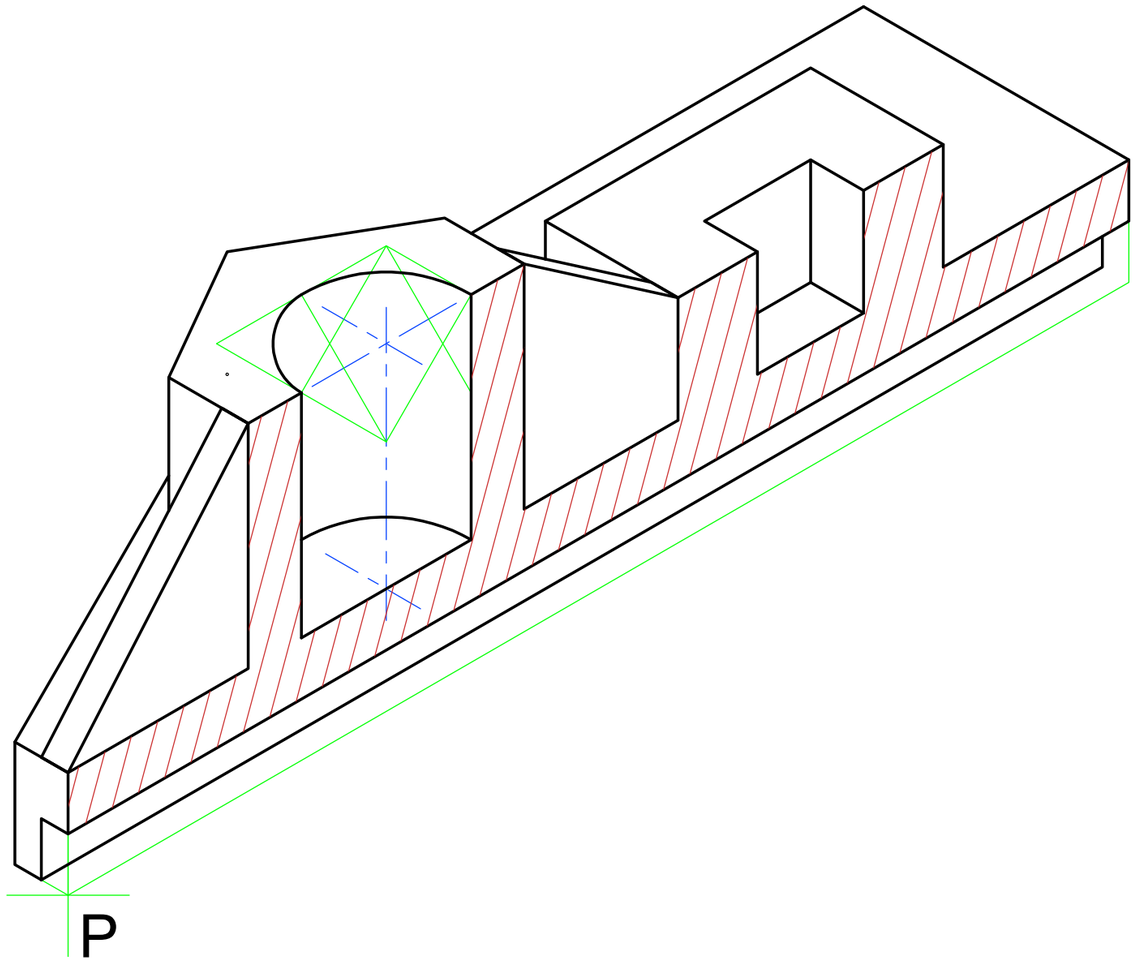
QUESTION 3

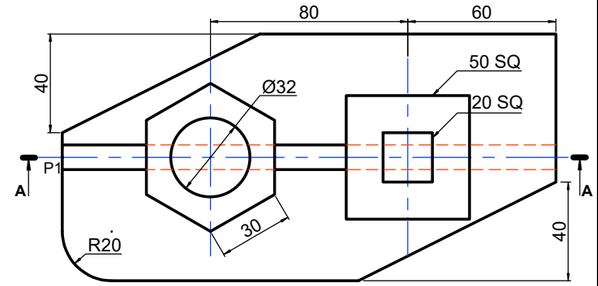
ISOMETRIC DRAWING

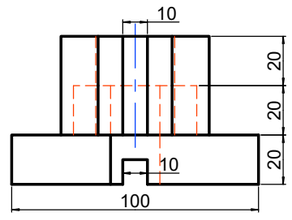
The figure below shows the top view, front view and left view of a heavy duty **CASTING**. The **CASTING** has been cut by a ***cutting plane A-A.***

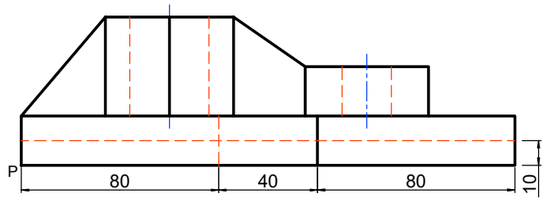
Draw the following:

3.1 draw a neat **Sectioned Isometric** on the cutting plane A-A.
3.2 show the constructions for the hexagon.
3.3 draw the centre lines for the circle.
3.4 make point P the lowest part of your drawing.
3.5 start your drawing on the given crosshairs.









ASSESSMENT CRITERIA

☑	Construction	2
☑	Iso points 44/2	22
☑	Iso circles	4
☑	Centre lines	3
☑	Hatching	5
☑	Non-hatching	2
☑	Positioning	2

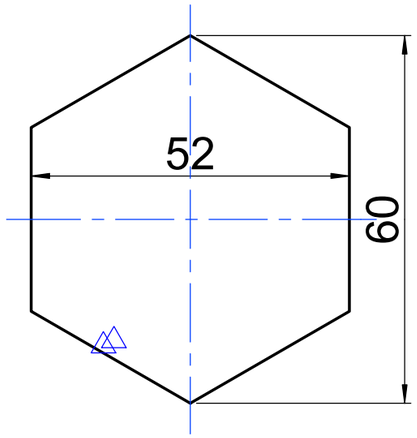
CON 2	
ISOM 22	
CIRC 4	
CLS 3	
HAT 5	
NON 2	
POS 2	

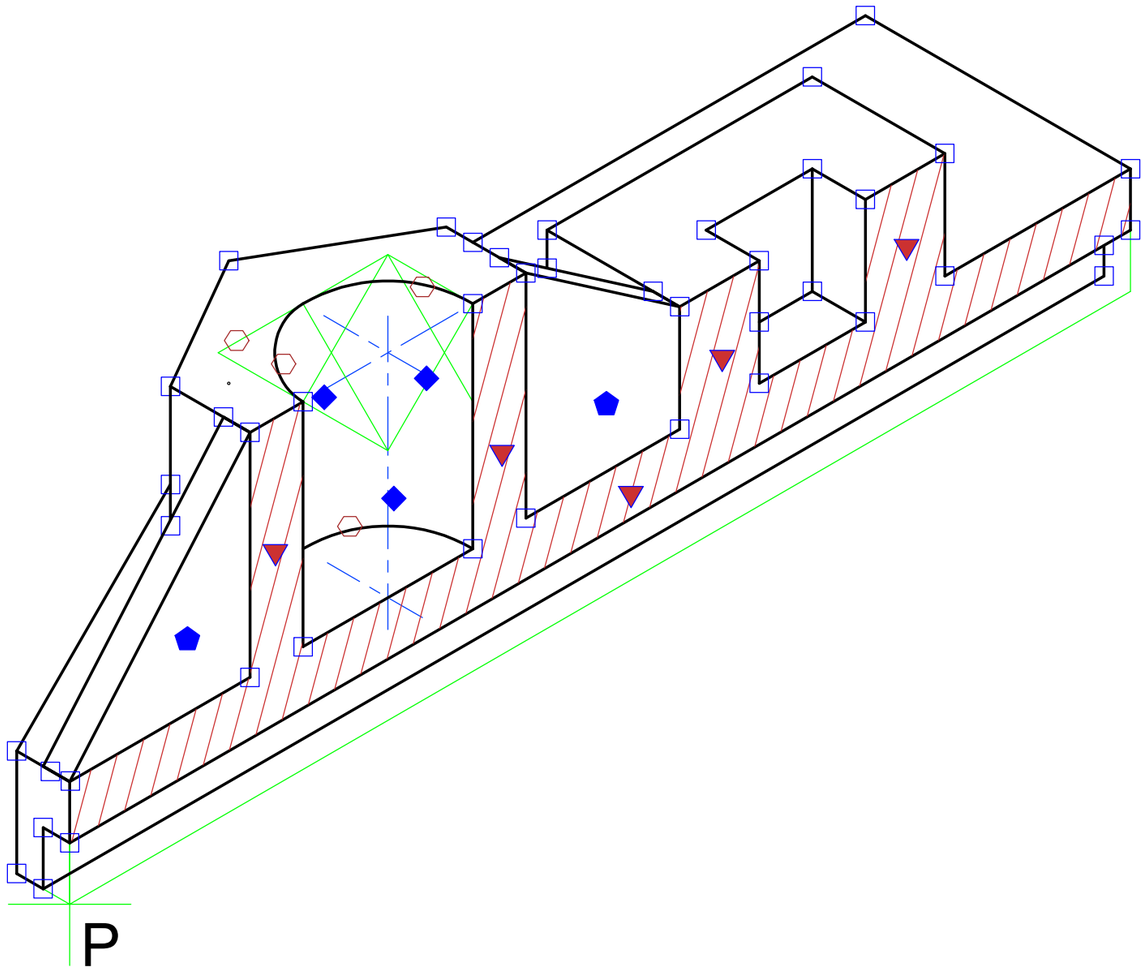
EXAMINATION NUMBER

ANSWER SHEET 3

Construction	△	2
Iso points	□	22
Iso circles	⬡	4
Centre lines	◆	3
Hatching	▼	5
Non-hatch	⬟	2
Positioning		2

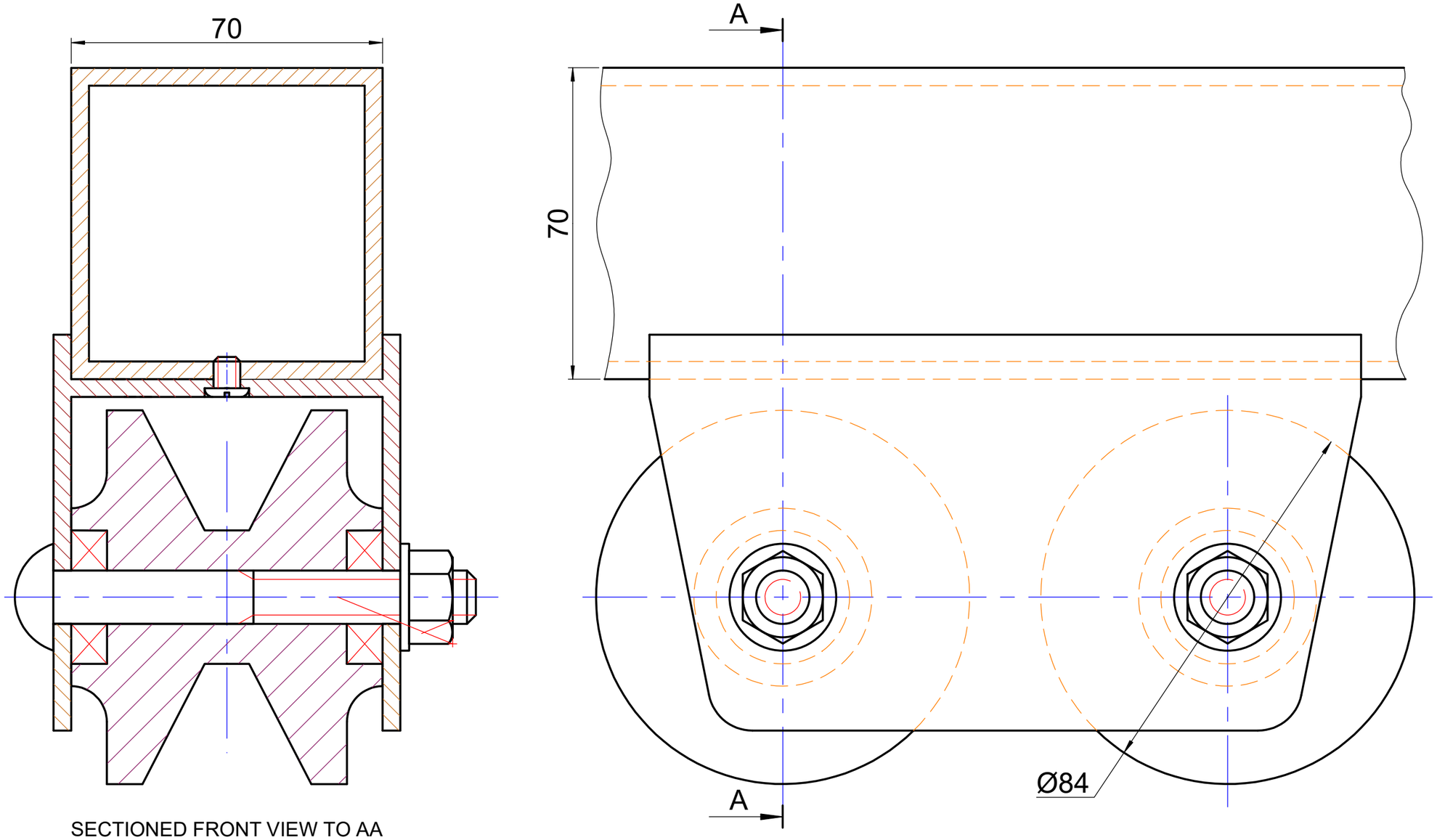
44/2





QUESTION 4

MECHANICAL ASSEMBLY



SECTIONED FRONT VIEW TO AA
SECTION AA

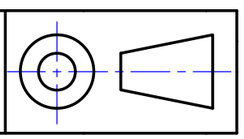
ASSESSMENT CRITERIA

FRONT VIEW			
A	GATE FRAME 8/2	4	
B	CRADLE 12/2	6	
C	M6 SCREW	4	
D	M12 BOLT 12/2	6	
E	WASHER	2	
F	M12 NUT	5	
G	WHEEL 18/2	9	
H	BEARINGS	8	
TOTAL	44		

RIGHT VIEW			
A	GATE FRAME	5	
B	CRADLE 10/2	5	
E	WASHER	2	
D/F	M12 NUT/BOLT	8	
G	WHEEL	2	
	HIDDEN DETAIL	6	
TOTAL	28		

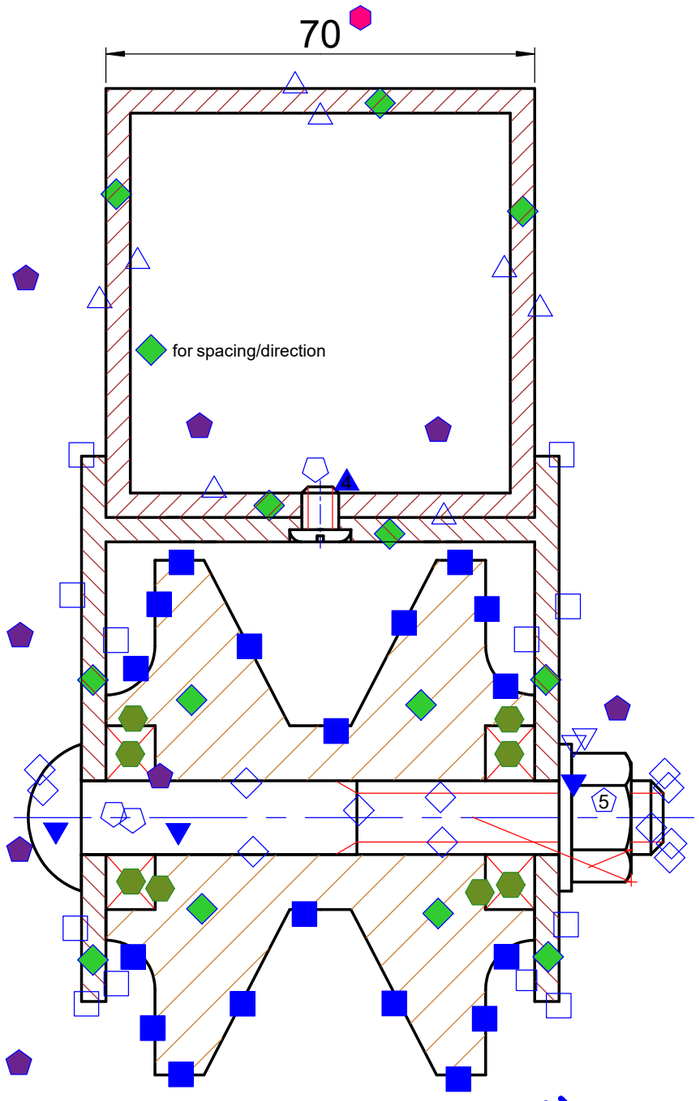
ADDITIONAL		
CORRECT ASS. 8/2	4	
HATCHING 14/2	7	
NON-HATCHING	3	
CENTRE LINES	3	
DIMENSIONS	3	
CUTTING PLANE	2	
SYMBOL	2	
TITLE/SCALE	2	
LABEL	2	
TOTAL	28	
TOTAL	100	

TITLE	GATE WHEEL
SCALE	I:I

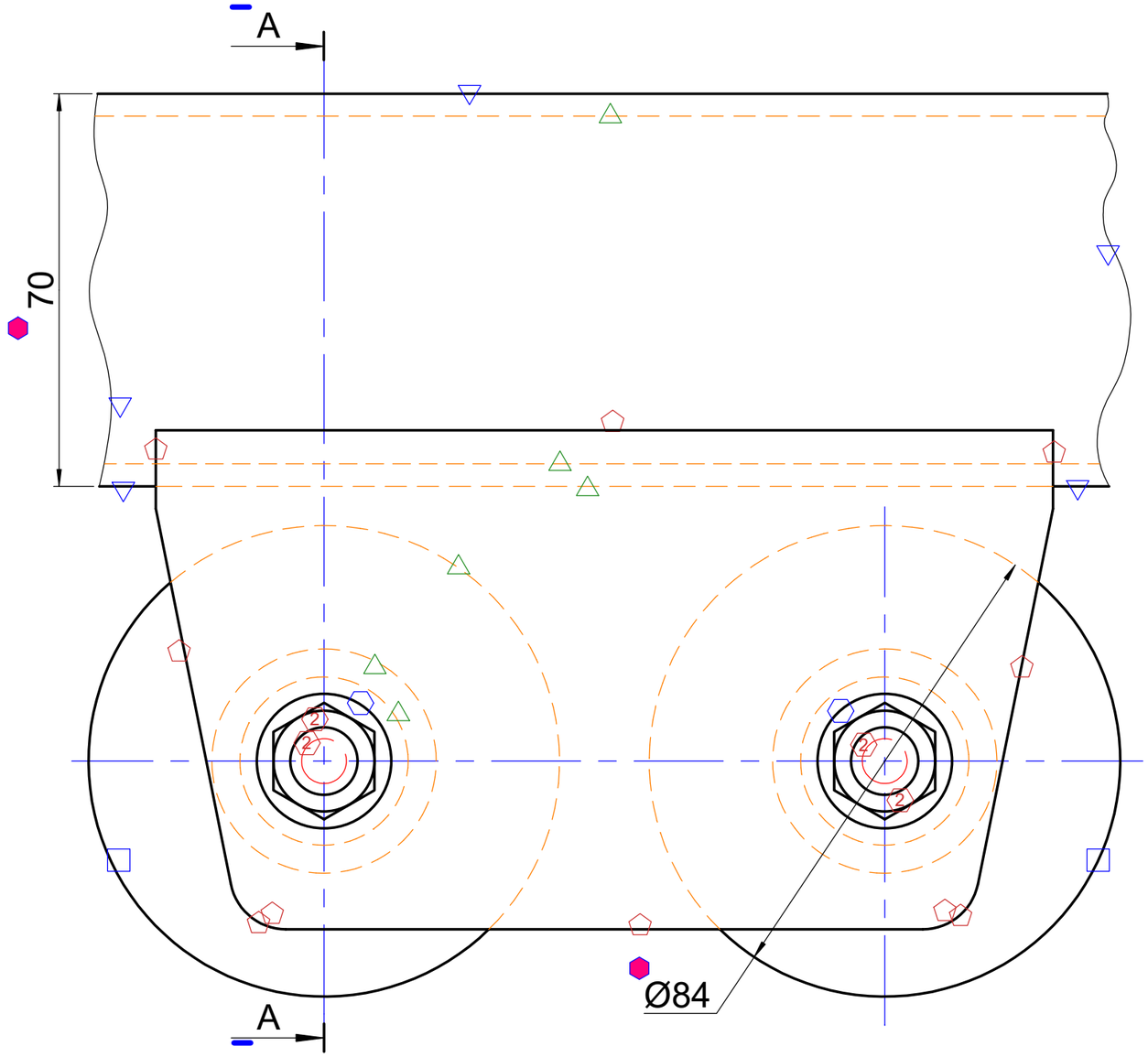
SYMBOL 

ANSWER SHEET 4

EXAMINATION NUMBER



SECTIONED FRONT VIEW TO AA
SECTION AA



Sectioned front view			
Gate frame	△	4	8/2
Cradle	□	6	12/2
M6 screw	4	4	
M12 bolt	◇	6	12/2
Washer	▽	2	
M12 nut	5	5	
Wheel	■	9	18/2
Bearings	⬢	8	
		44	

Right View			
Gate frame	▽	5	
Cradle	⬠	5	10/2
Washer	⬡	2	
M12 Nut/bolt	2	8	
Wheel	□	2	
Hid. Detail	△	6	
		28	

Additional			
Corr. Ass.	⬟	4	8/2
Hatching	◇	7	14/2
Non-hatching	▼	3	
Centre lines	⬠	3	
Dimensions	⬢	3	
Cutting plane	–	2	
Symbol	⁄	2	
Title/Scale	I	2	
Label	⌐	2	
		28	
		100	

TITLE	GATE WHEEL
SCALE	I:I

SYMBOL	