



basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**SENIOR CERTIFICATE/
NATIONAL SENIOR CERTIFICATE**

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2020

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

Barcode label



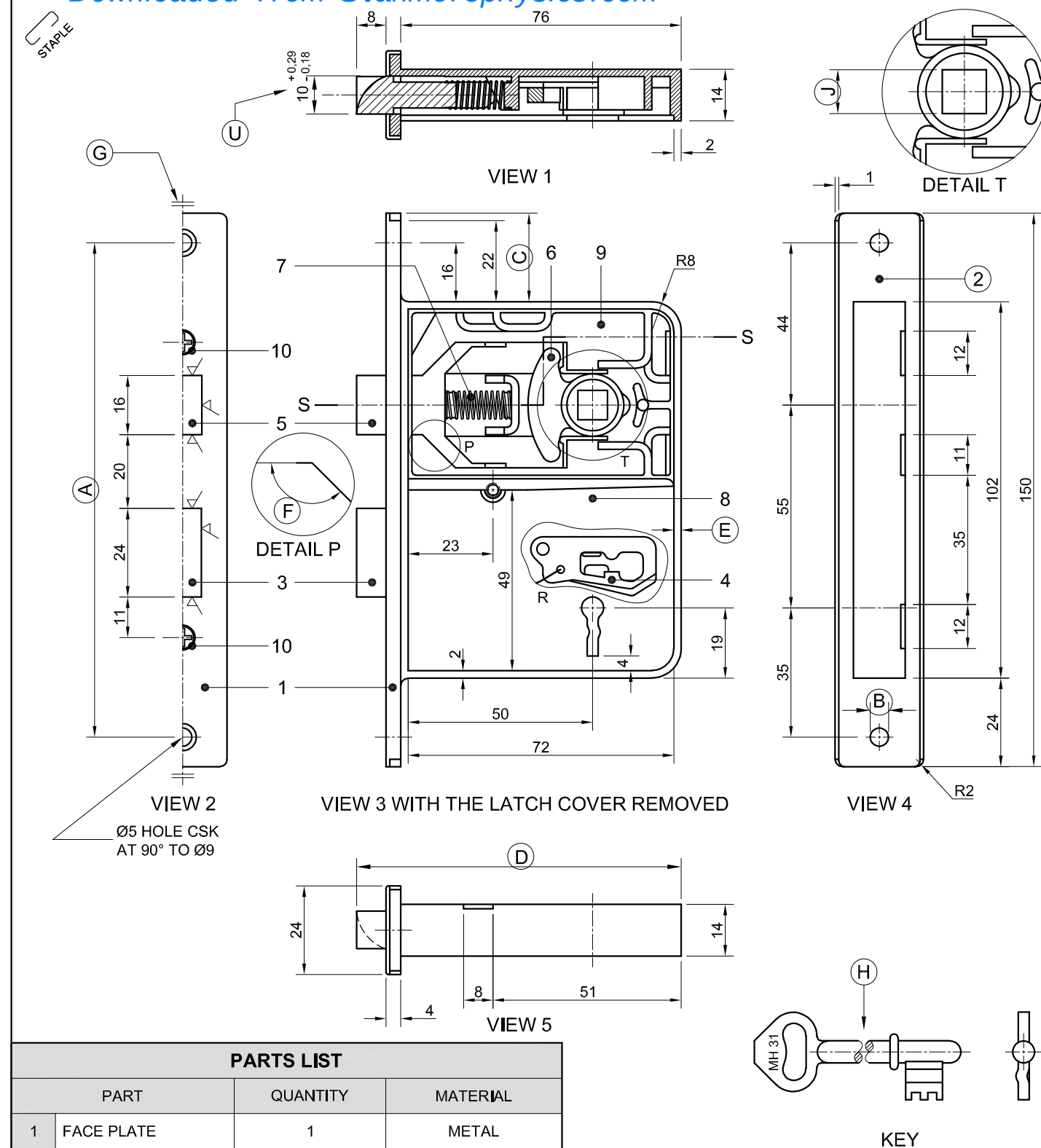
INSTRUCTIONS AND INFORMATION

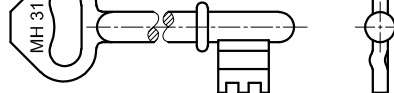
1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in third-angle orthographic projection, unless otherwise stated.
4. ALL drawings must be prepared using pencil and instruments, unless otherwise stated.
5. ALL answers must be drawn accurately and neatly.
6. ALL the questions must be answered on the QUESTION PAPER, as instructed.
7. ALL the pages, irrespective of whether the question was attempted or not, must be re-stapled in numerical sequence in the TOP LEFT-HAND CORNER ONLY.
8. Time management is essential in order to complete all the questions.
9. Print your examination number in the block provided on every page.
10. Any details or dimensions not given must be assumed in good proportion.

FOR OFFICIAL USE ONLY											
QUESTION	MARKS OBTAINED			$\frac{1}{2}$	SIGN	MODERATED			$\frac{1}{2}$	SIGN	RE-MARKING
1											
2											
3											
4											
TOTAL											
	2	0	0			2	0	0			2 0 0

FINAL CONVERTED MARK	CHECKED BY
100	

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



PARTS LIST						
PART		QUANTITY	MATERIAL	KEY		
1	FACE PLATE	1	METAL			
2	LOCK BODY	1	PLASTIC			
3	BOLT LOCK	1	PEWTER	DRAWING PROGRAM: CAD	SCALE 1 : 1	MANUFACTURING PROCESSES:
4	LEVER LOCK	2	METAL	APPROVED: ANDY	DATE: 2018/09/14	- PLATE BENDING
5	LATCH	1	PEWTER	CHECKED: JOHN	DATE: 2018/08/31	- INJECTION MOULDING
6	LATCH TRIGGER	1	PLASTIC	DRAWN: SIPO	DATE: 2018/08/30	- MILLING ✓
7	SPRING	1	SPRING STEEL	TOP LOCK COMPANY SAFETY & SECURITY SHOP 2 MORTICE ROAD www.lockcompany.co.za		
8	BOLT COVER	1	PLASTIC			
9	LATCH COVER	1	PERSPEX	TITLE TWO-LEVER DOOR LOCK		
10	SCREW	3	METAL			



QUESTION 1: ANALYTICAL (MECHANICAL)

Given:

Five views of a door lock, two detailed enlargements, two views of a key, a parts list, a title block and a table of questions. The drawing has not been prepared to the indicated scale.

Instructions:

Complete the table below by neatly answering the questions which refer to the accompanying drawing, title block and mechanical content. [30]

QUESTION		ANSWER		
1	What is the title of the drawing?		1	
2	Who prepared the drawing?		1	
3	On what date was the drawing approved?		1	
4	What is the drawing number?		1	
5	How many manufacturing processes are required?		1	
6	How many parts make up the door lock?		1	
7	What material is used to manufacture the latch cover?		1	
8	What is VIEW 5 called?		1	
9	Determine the complete dimensions at A: B: C: D: E:		5	
10	Measure the angle at F.		1	
11	Name the convention at G.		1	
12	What type of view is produced by the S-breaks at H?		1	
13	What type of section is produced by cutting plane S-S?		1	
14	Insert the arrows for cutting plane S-S on the drawing.		2	
15	If the square in DETAIL T is 9 x 9 mm, show the alternative method of showing the dimension of 9 x 9 at J.		1	
16	How many flat surfaces must be machined?		1	
17	Name the direction of lay that must be applied to machined surfaces.		1	
18	With reference to the tolerance, determine the maximum dimension at U.		2	
19	In the space below (ANSWER 19), draw, in neat freehand, the conventional representation of a coil spring.		3	
20	In the space below (ANSWER 20), draw, in neat freehand, the symbol for the projection system used.		3	
TOTAL			30	

ANSWER 19: Conventional representation for a coil spring

ANSWER 20: Projection symbol

EXAMINATION NUMBER

EXAMINATION NUMBER

2



QUESTION 2: LOCI

NOTE: Answer QUESTION 2.1 and 2.2.

2.1 HELIX

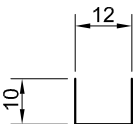
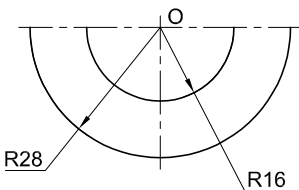
- Given:
- An auxiliary view and the profile of a chute that does not have a core
 - The position of centre point O on the drawing sheet

- Specifications:
- Starting position: Bottom right
 - Pitch: 60 mm
 - Turns: ONE
 - Direction: Lefthanded

Instructions:
Draw, to scale 1 : 1, the following views of the chute:

- 2.1.1 The given auxiliary view
2.1.2 The complete front view

- Show ALL construction.
 - NO hidden detail is required.
- [22]



CHUTE PROFILE

ASSESSMENT CRITERIA 2.1					
1	GIVEN	1			
2	CONSTRUCTION	6			
3	HELIX + CL	13			
4	CURVE QUALITY	2			
PENALTY (-)					
SUBTOTAL		22			

2.2 CAM

Given:
The starting position (0°) of the displacement graph on the drawing sheet

- Motion:
A cam rotates at constant velocity imparting the following motion to the follower:
- There is a dwell period for the first 45°
 - It descends 44 mm with uniform motion over the next 45°
 - It descends 24 mm with simple harmonic motion over the next 90°
 - It rises 42 mm with uniform acceleration and retardation over the next 90°
 - It returns with uniform motion to the original position over the rest of the rotation

Instructions:
Draw, to a rotational scale of 120 mm = 360° and a displacement scale of 1 : 1, the complete displacement graph for the required motion.

- Label the graph and indicate the rotational scale.
 - Show ALL construction.
- [15]

ASSESSMENT CRITERIA 2.2					
1	CONSTRUCTION	6			
2	POINTS + CURVES	9			
PENALTIES (-)					
SUBTOTAL 2.2		15			
SUBTOTAL 2.1		22			
TOTAL		37			
EXAMINATION NUMBER					
EXAMINATION NUMBER					3

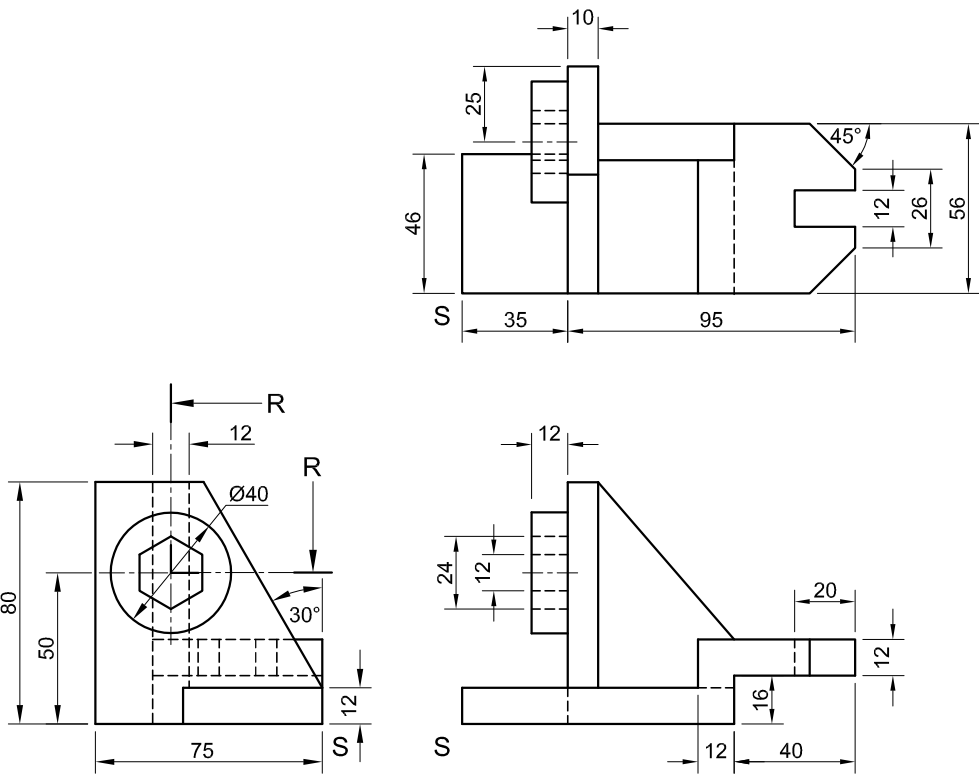


QUESTION 3: ISOMETRIC DRAWING

- Given:**
- The front view, top view and left view of a jig
 - The position of point S on the drawing sheet

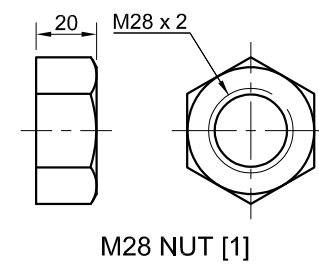
Instructions:
Using scale 1 : 1, convert the orthographic views of the jig into a sectional isometric drawing on cutting plane R-R.

- Make S the lowest point of the drawing.
 - Show ALL construction.
 - NO hidden detail is required.
- [40]



ASSESSMENT CRITERIA					
1	PLACEMENT + AUX VIEW	3			
2	BASE	13			
3	UPRIGHT	4½			
4	CIRCLE + HEZAGON	9½			
5	SECTION	10			
PENALTIES (-)					
TOTAL		40			
EXAMINATION NUMBER					
EXAMINATION NUMBER					4





Given:

- Instructions:**

-
- WOODRUFF
KEY [5]
- SHAFT [4]

- Planning is essential.
- The drawing must comply with the guidelines as contained in the *SANS 10111*.
- The convention of symmetry may NOT be applied.
- The surfaces marked **V** on the shaft (part 4) and the right bearing (part 7), must be aligned with the surface marked **V** on the inside of bearing housing (part 6).
- Show **THREE** faces of the M28 nut (part 1) in the half-sectional front view.
- Draw the **left** bearing in detail and the **right** bearing as a convention representation.
- Add cutting plane A-A.
- **NO** hidden detail is required.

[93]

[93]

BEARING HOUSING [6]

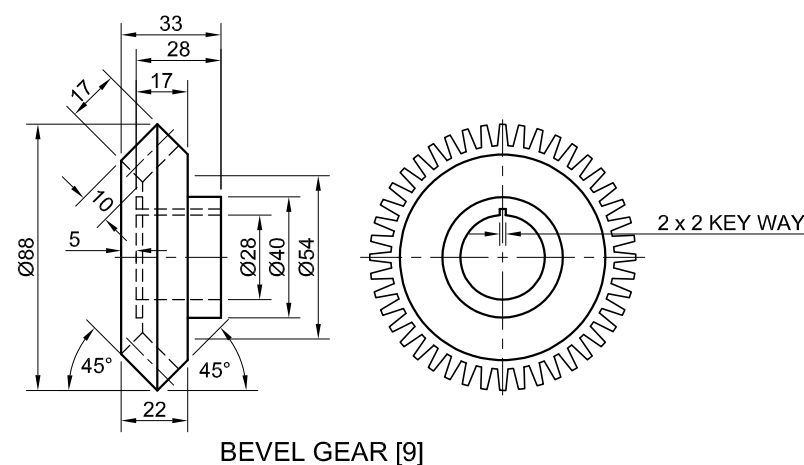
FRONT VIEW

EXPLODED ISOMETRIC DRAWING

This exploded isometric drawing illustrates the assembly of a bearing housing. The components are numbered 1 through 9. Component 1 is a hexagonal nut. Component 2 is a large circular flange. Component 3 is a smaller circular flange. Component 4 is a long cylindrical shaft with a threaded section. Component 5 is a small pin or screw. Component 6 is a large, complex bearing housing with a central circular opening and mounting flanges. Component 7 is a circular flange with a central hole. Component 8 is a small circular flange. Component 9 is a large circular flange with a central hole and a serrated outer edge. The drawing shows the relative positions of these components as they would be assembled, with dashed lines indicating the alignment of the parts. A 'FRONT VIEW' arrow points towards the assembly from the bottom left.

SPACER [8]

BEARING [7]

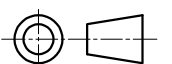


BEVEL GEAR [9]

SHAFTS AND GEARS

CYLINDER STREET
INDUSTRIAL PARK
www.shaftsgalore.co.za

ALL DIMENSIONS ARE IN MILLIMETRES





Downloaded from Stanmorephysics.com

FOR OFFICIAL USE ONLY	
INCORRECT ORTHOGRAPHIC PROJECTION	
INCORRECT OVERALL SCALE	
INCORRECT HATCHING	
PARTS NOT ASSEMBLED	
TOTAL PENALTIES (-)	

ASSESSMENT CRITERIA					
RIGHT VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	BODY	4 ¹ ₂			
2	SHAFT	1 ¹ ₂			
3	M28 NUT + FLANGE	3 ¹ ₂			
SUBTOTAL		9 ¹ ₂			
HALF SECTIONAL FRONT VIEW					
1	BODY	13			
2	SHAFT + KEY	16			
3	BEARING + SPACER	9			
4	FLANGES	13			
5	M28 NUT	4 ¹ ₂			
6	GEAR	11			
SUBTOTAL		66 ¹ ₂			
GENERAL					
1	CENTRE LINES	4			
2	CUTTING PLANE A-A	4			
3	ASSEMBLY	9			
SUBTOTAL		17			
TOTAL		93			
PENALTIES (-)					
GRAND TOTAL					
EXAMINATION NUMBER					
EXAMINATION NUMBER					6





basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**SENIOR CERTIFICATE/
NATIONAL SENIOR CERTIFICATE**

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2020

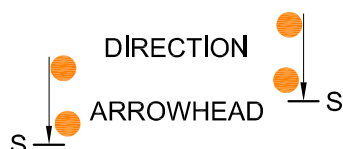
MARKING GUIDELINES

MARKS: 100

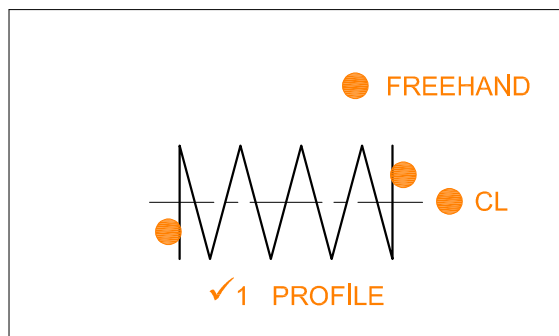
These marking guidelines consist of 8 pages.

ANSWER		
1	TWO-LEVER DOOR LOCK	1
2	SIPO	1
3	2018/09/14	1
4	DL 04	1
5	3	1
6	13 / 10	1
7	PERSPEX	1
8	BOTTOM VIEW	1
9	A: 134 B: Ø 5 C: 24 D: 88 E:2	5
10	134°, 135° , 136°	1
11	SYMMETRY	1
12	INTERRUPTED VIEW	1
13	MULTI PLANE / OFFSET SECTION	1
14	See below	2
15	□9	1
16	7	1
17	CROSSED	1
18	10,29	2
19	See below	3
20		3
TOTAL		30

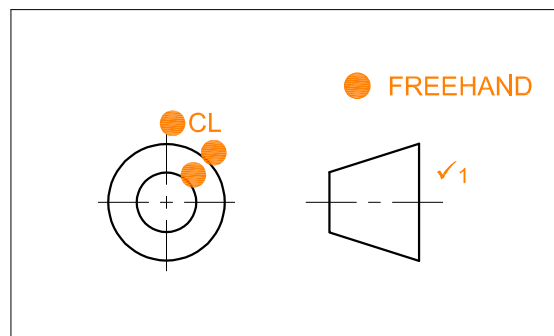
ANSWER 14:



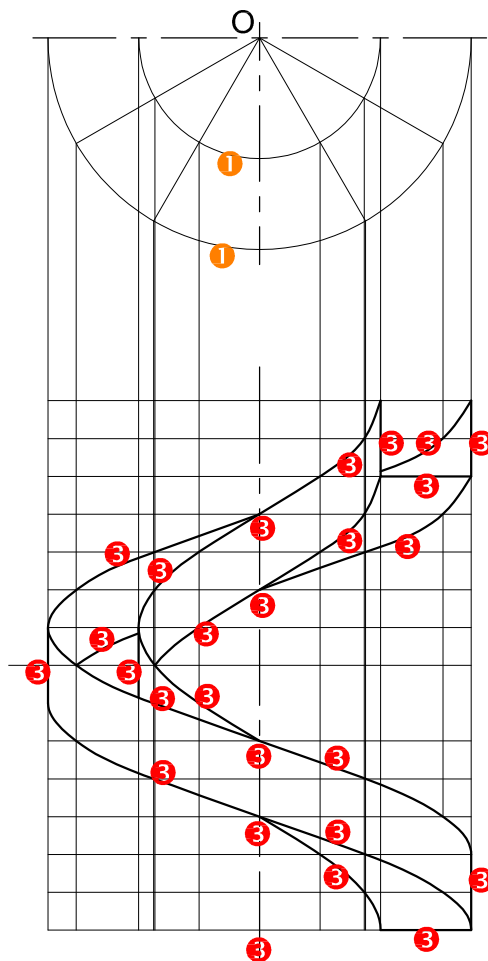
ANSWER 19: Conventional representation for a coil spring



ANSWER 20: Projection symbol



PAPER 2 QUESTION 1
GRADE 12
SC/NSC 2020
MARKING GUIDELINES

**2. CONSTRUCTIONS**

▪ CIRCLE DIVISIONS	0,5
▪ PITCH	0,5
▪ PITCH DIVISIONS	1
▪ VERTICAL PROJECTION	1
▪ HORIZONTAL PROJECTION	1
▪ DIRECTION	<u>2</u>
	6

4. CURVE QUALITY

▪ CURVE THROUGH POINTS	1
▪ CURVE CONTINUOUS / SMOOTH	<u>1</u>
	2

ASSESSMENT CRITERIA 2.1

1	GIVEN + CL	1
2	CONSTRUCTION	6
3	HELIX	13
4	CURVE QUALITY	2
TOTAL		22

PAPER 2 QUESTION 2.1
GRADE 12
SC/NSC 2020
MARKING GUIDELINE

1. CONSTRUCTIONS

- LENGTH : 120 mm 0,5
- 12 DIVISIONS 0,5

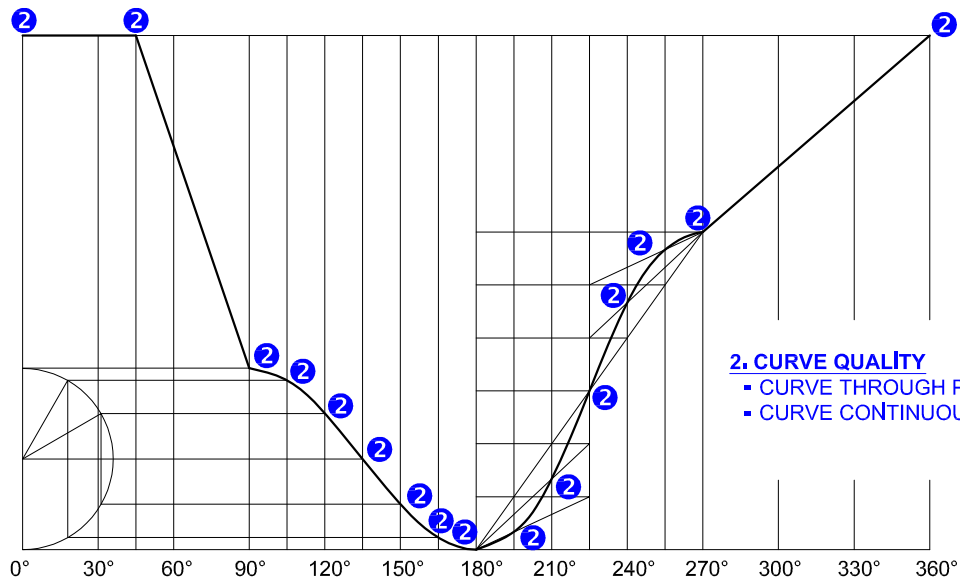
SIMPLE HARMONIC

- 15° SUBDIVISIONS 0,5
- SEMI CIRCLE 0,5
- CIRCLE DIVISION 0,5
- HORIZONTAL PROJECTION 0,5

UNIFORM ACCELERATION & RETARDATION

- 15° SUBDIVISIONS 0,5
- LINE DIVISION 0,5
- FIRST HALF CONSTRUCTION 0,5
- SECOND HALF CONSTRUCTION 0,5

LABELING 1
6

**2. CURVE QUALITY**

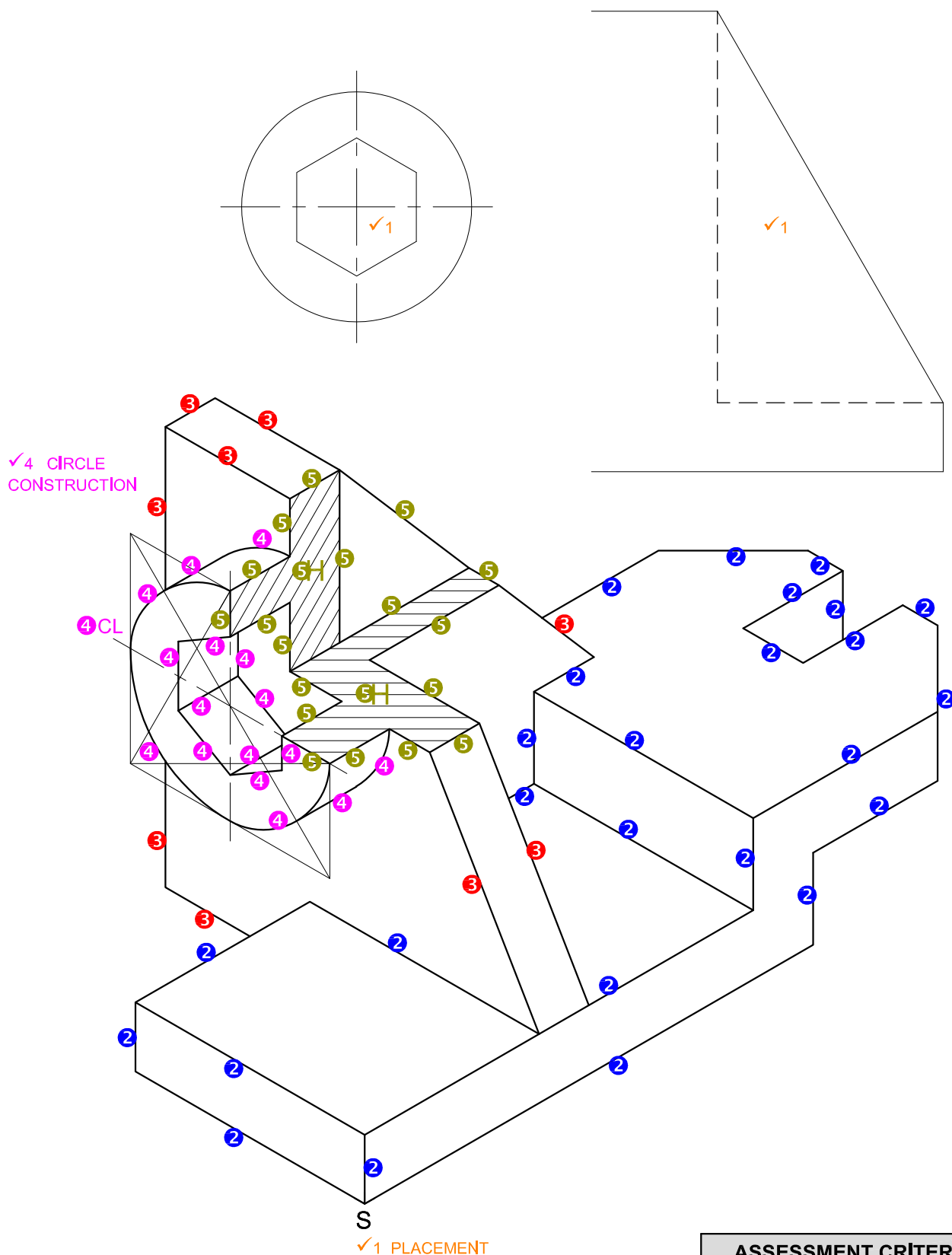
- CURVE THROUGH POINTS 0,5
- CURVE CONTINUOUS / SMOOTH 0,5
1

DISPLACEMENT GRAPH
SCALE 360° : 120 mm

ASSESSMENT CRITERIA 2.2

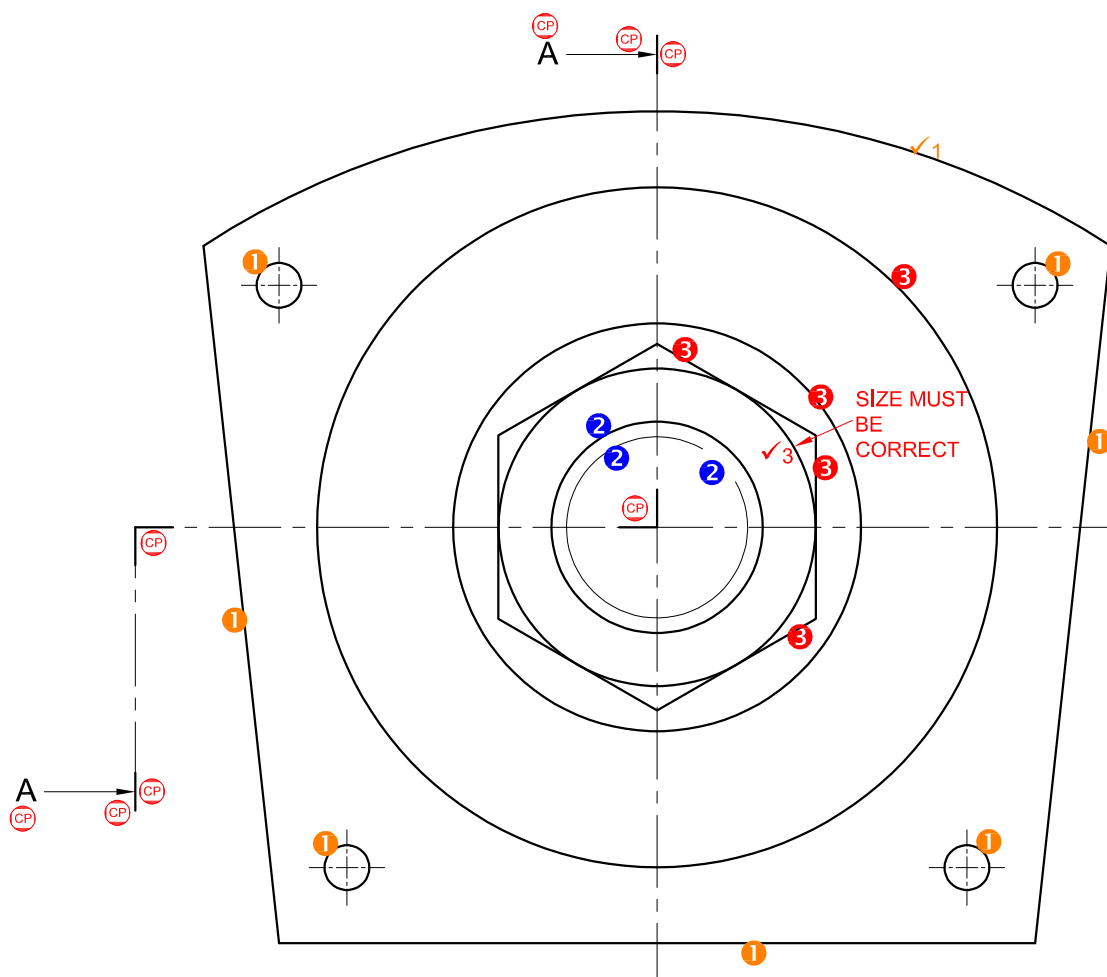
1	CONSTRUCTION	6
2	POINTS + CURVES	9
TOTAL		15

PAPER 2 QUESTION 2.2
GRADE 12
SC/NSC 2020
MARKING GUIDELINE



PAPER 2 QUESTION 3
GRADE 12
SC/NSC 2020
MARKING GUIDELINE

ASSESSMENT CRITERIA		
1	PLACEMENT + AUX VIEW	3
2	BASE	13
3	UPRIGHT	4½
4	CIRCLE + HEXAGON	9½
5	SECTION	10
TOTAL		40



1. CENTRE LINE MARK ALLOCATION

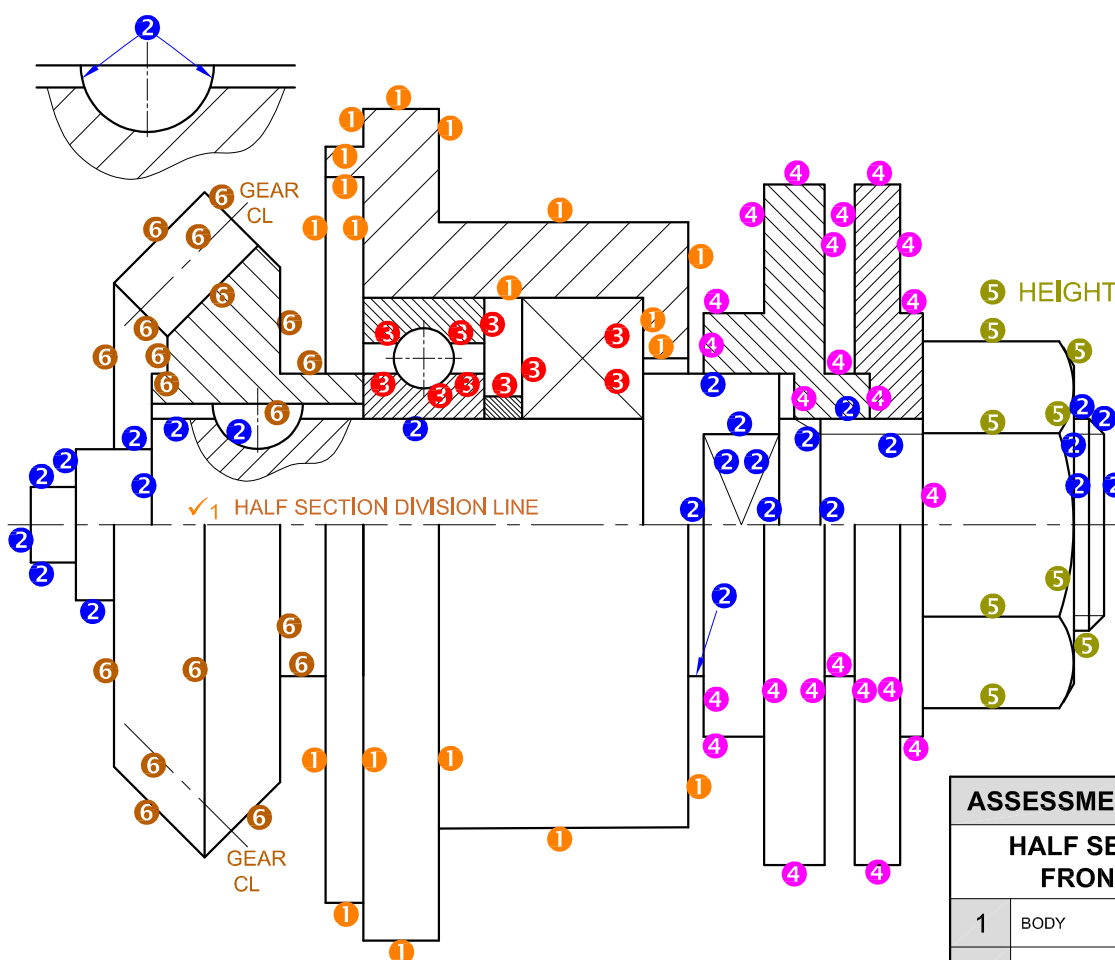
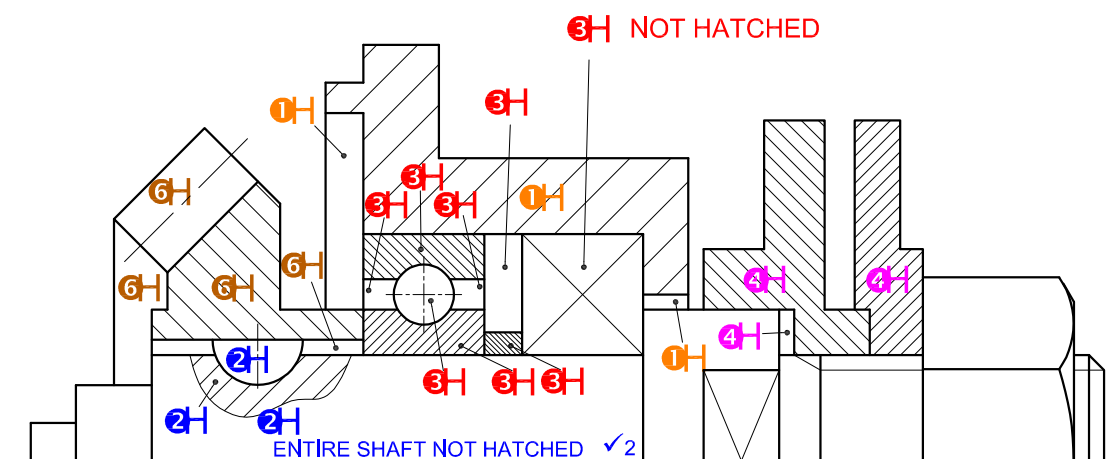
SANS COMPLIANT (LINE TYPE)	2
CENTRE LINES	
(0 to 3 = 0); (4 to 9 = 1); (10 to 13 = 2)	2
TOTAL	4

3. ASSEMBLY

1 MARK FOR EVERY COMPONENT
CORRECTLY ASSEMBLED
(10 PARTS $\times$ 1) = 9

PAPER 2 QUESTION 4
GRADE 12
SC/NSC 2020
MARKING GUIDELINE

ASSESSMENT CRITERIA		
RIGHT VIEW		
1	BODY	4 $\frac{1}{2}$
2	SHAFT	1 $\frac{1}{2}$
3	M28 NUT + FLANGE	3 $\frac{1}{2}$
SUBTOTAL		9 $\frac{1}{2}$

**ASSESSMENT CRITERIA****HALF SECTIONAL
FRONT VIEW**

1	BODY	13
2	SHAFT + KEY	16
3	BEARING + SPACER	9
4	FLANGES	13
5	M28 NUT	4 $\frac{1}{2}$
6	GEAR	11

SUBTOTAL 66 $\frac{1}{2}$ **GENERAL**

2	CUTTING PLANE A-A	4
3	ASSEMBLY	9

PAPER 2 QUESTION 4
GRADE 12
SC/NSC 2020
MARKING GUIDELINE