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ENGINEERING GRAPHICS DESIGN

**REVISION
2023 TERM 1 & 2**

Grade 12

This revision program is designed to assist you in revising the critical content and skills covered during the 2nd term. The purpose is to prepare you to understand the key concepts and to provide you with an opportunity to establish the required standard and the application of the knowledge necessary to succeed in the NCS examination.

The revision program covers the following topics:

- **REVISION TERM 1: Analytical QUESTIONS (Civil and Mechanical)**
- Isometric drawings
- Solids (RIGHT REGULAR SOLIDS)
- Interpenetration and developments (RIGHT REGULAR SOLIDS)
- **GRADE 12 EXAMINATION PAPERS**

CIVIL ANALYTICAL (Paper 1 Question 1)

The analytical questions are the worst answered questions. There are various reasons for that, but it seems that the main reason be the fact that we do not read the questions properly.

Nr	Gr 12 J. Engelbrecht Chapter - page	Gr 12 J. van Leeuwen Page
1.	3 - 14	102
2.	3 - 14	102
3.	3 - 24	102
4.	3 - 24	120
5.	3 - 14	102
6.		
7.		103
8.		
9.	Reasoning / Conclusion	Reasoning / Conclusion
10.	3 - 19	109
11.	See floorplan	See floorplan
12.	See explanation below	See explanation below
13.	3 - 16	105
14.	3 - 14	102
15.	See question: given	See question: given

12. To determine the area, keep the following in mind:

- The area of a building: use outside dimensions, because you want to know what the size of the building is.
- The area of a room: use the inner dimensions, because you want to know how big the room is on the inside to lay tiles or a carpet.
- If the TOTAL area is asked, as in this case, the wall thicknesses will be included.

The formula to calculate area is LENGTH (L) X BREADTH (B)

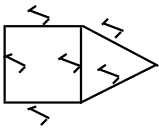
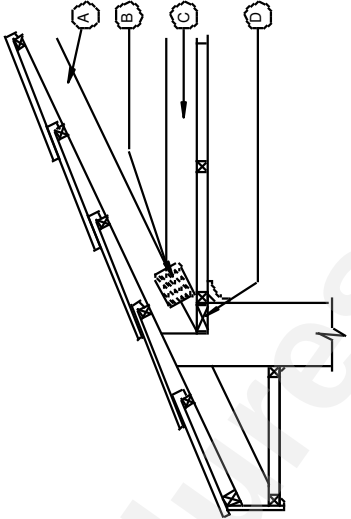
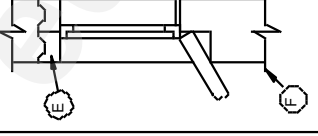
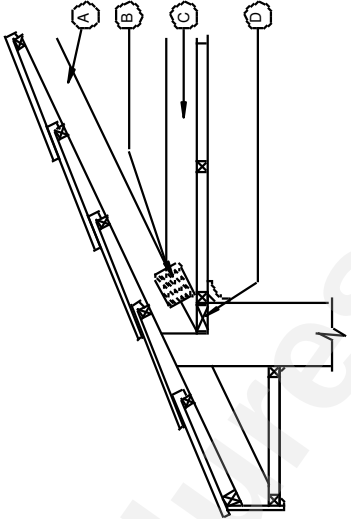
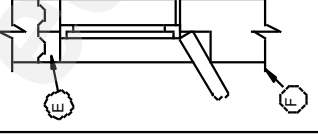
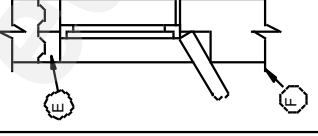
NB Your answer must be in m², but the given measurements are always in mm. Before you start working out, convert measurements in METRES! (1 000 mm = 1 m) (Did you know that there is 1 000 000 mm² in one m²?)

See on p 3 – 9 in J Engelbrecht's book for the method of how to go about to work out the area if a triangle is included.

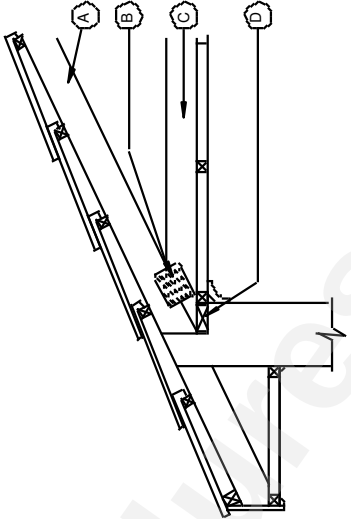
Hints:

- You can expect in these questions also PERIMETER. Make sure you know how to work it out. If asked to work out the perimeter of a fence, remember that the gate is NOT included!
- The veranda / stoep counts in as part of the area of a building.
- The colours used for different materials / new buildings, must also be learned with this question. You will find it on p 3 – 6 in J Engelbrecht's book. (p 114 in van Leeuwen's book)

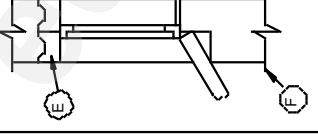
QUESTION 1 PAPER 1: (ANSWER)

ANSWER 13		QUESTION 1: ANALYTIC (CIVIL)	
 Freehand drawing		GIVEN: The partial sections of a foundation, a wall and a roof, as well as a floor plan of a proposed new public toilet and a table of questions. The drawings are not to scale and no hatching detail is shown. Instructions: Complete the table below by neatly answering the questions, which all refer to the accompanying drawings and the title block. [30]	
QUESTIONS		MEMO ANSWER	
1 Label and indicate the Natural Ground Level on the partial section of the foundation.			
2 Label and indicate, on the partial sections of the foundation and the wall, all the places where damp-proof course must be used.			
3 Name parts A, B, C and D on the partial section of the roof.		A Rafter B Purlin C Tie Beam D Wall Plate	
4 What type of roof covering is shown on the partial section of the roof?		Tiles	
5 Name part E on the partial section of the wall.		Lintel / Beam	
6 What is the function of part E on the partial section of the wall?		To carry/support the weight above the window	
7 What is the function of line F on the partial section of the wall?		To indicate that the wall is continuing.	
8 What does the line at G on the outside wall indicate?		CAVITY WALL	
9 Why is the area of the tiled marked H bigger than the area for the other TWO tiles?		It's for the disabled People	
10 How many rodding eyes are indicated on the floor plan?		3	
11 What are the codes for the two types of windows to be used for the public toilet.		ND6/6 & ND9/12	
12 Determine the total area of the public toilet in square meters. Show all calculations.		$= (5,876 \times 5,036) - [(5 \times 2,124) \times 2,113]$ $= 29,59 - 2,244$ $= 27,346 \text{ square meter}$	
13 In the space provided above (ANSWER 13), draw, in neat freehand, the front view of the SABS convention for a water closet (WC).			
14 Draw, in neat freehand, ALL the hatching detail for the partial section of the foundation.			
15 Insert the minimum dimensions of the foundation for a loadbearing wall on the partial section of the foundation.			
TOTAL		30	
ENGINEERING GRAPHICS AND DESIGN		NAME	

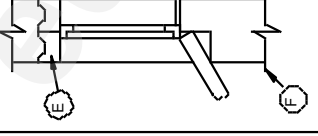
PARTIAL SECTION OF THE ROOF



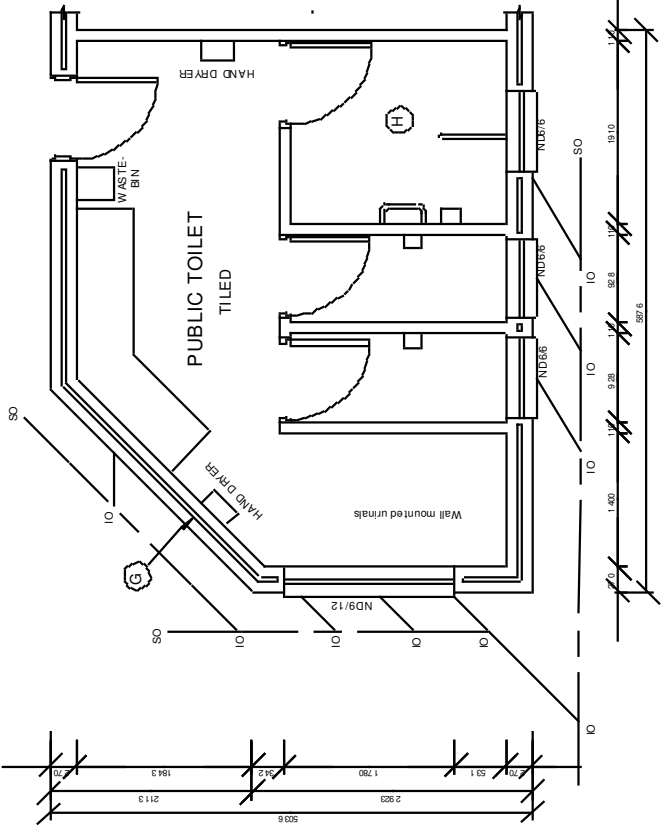
PARTIAL SECTION OF THE WALL



PARTIAL SECTION OF A FOUNDATION



FLOOR PLAN



SCALE 1:50

MECHANICAL ANALYTHICAL (Paper 2 Question 1)

Like the civil analytical questions, these questions are also the worst answered questions. Most of the answers are in the drawing itself and we must just look for it. If you are in a hurry, you will miss it. READ the questions carefully and make sure you know what is asked.

Nr.	Gr 12 J. Engelbrecht Chapter - page	Gr 12 J. van Leeuwen Page
1.	See title block	See title block
2.	See title block	See title block
3.	See title block	See title block
4.	See title block	See title block
5.	See title block	See title block
6.	See title block	See title block
7.	See drawing ✓	See drawing ✓
8.	See title block	See title block
9.	See title block	See title block
10.	See drawing	See drawing
11.	See drawing	See drawing
12.	See drawing	See drawing
13.		63
14.	1 – 10	75
15.	See title block	See title block
16.	See drawing and calculate	See drawing and calculate
17.	See drawing and calculate	See drawing and calculate
18.	See drawing	See drawing
19.	See title block	See title block
20.	1 – 10	75

HINTS:

- Paper 2 is in third angle orthographic projection. The Top View will be ABOVE the Front View. The Left View will be on the LEFT of the Front View.
- A lot of the information can be found in the title block. Study it carefully.
- Sometimes it is asked to sketch the symbol for third angle orthographic projection. If you are unsure, just look for it. It often occurs on the other questions.

PA 2 QU 1 2

QUESTION 1: ANALYTICAL (MECHANICAL)

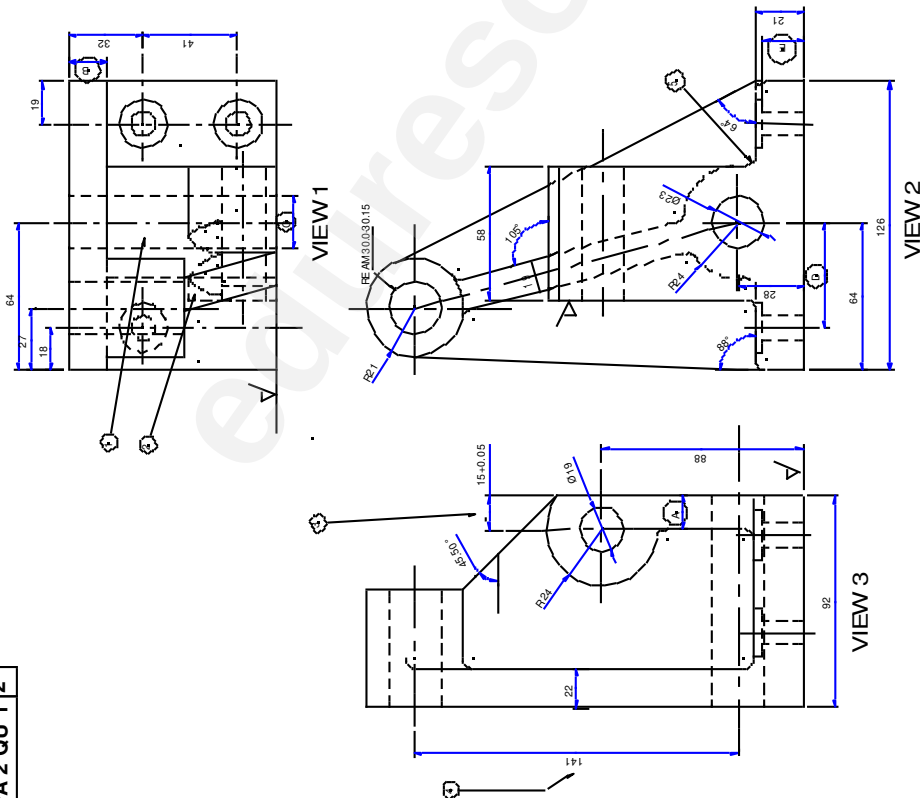
Given:

A detailed drawing showing THREE views of an ejector base, 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 all refer to the accompanying detailed drawing and title block. [30]

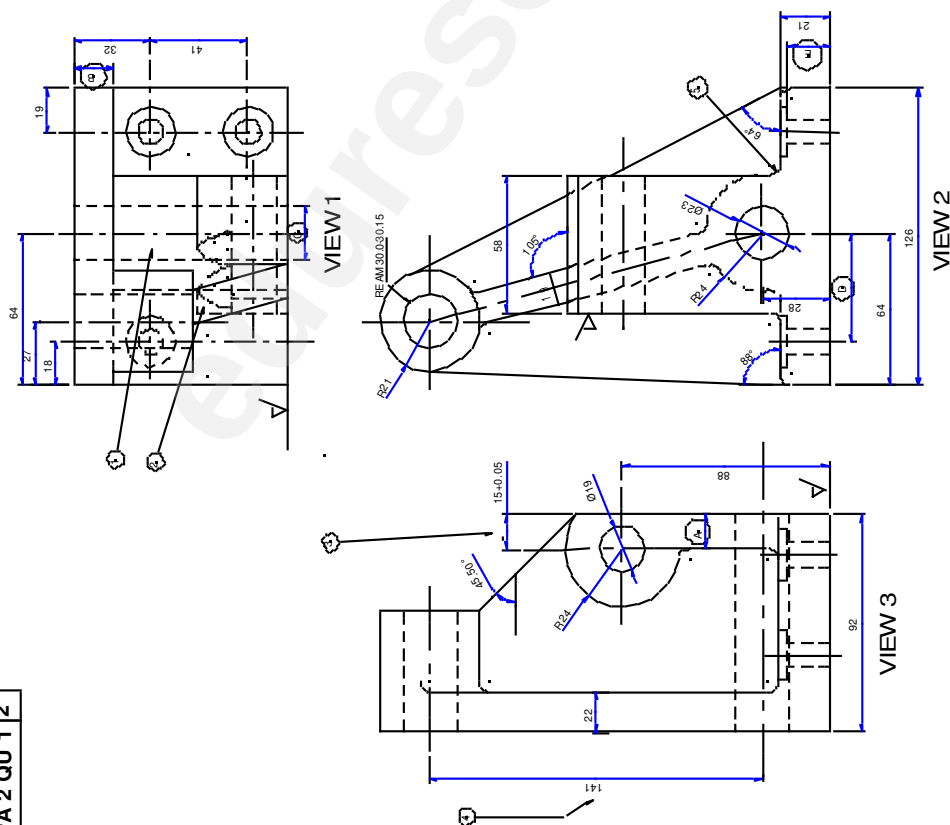
QUESTION	ANSWERS
1 Who approved the drawing?	%
2 What SI unit are the dimensions presented in?	%
3 When was the drawing checked?	%
4 Who was responsible for the revision?	%
5 What drawing method was used to prepare the drawing?	%
6 How many ejector bases must be manufactured?	%
7 How many surfaces require machining?	1
8 What is the roughness value of the machined surfaces?	1
9 What method must be used to produce the machined surfaces?	1
10 What is the angle to the horizontal of the surface at 1?	1
11 What is the angle to the horizontal of the surface at 2?	1
12 How many holes are there in the casting?	1
13 What does the abbreviation C-BORE stand for?	1
14 What would VIEW-2 be called?	1
15 What is the radius of the fillet at 5?	1
16 Determine the complete dimensions at A, B, C, D, E?	5
17 What is the total height of the ejector base?	3
18 What is the upper tolerance of the dimension at 3?	2
19 What is the upper and lower tolerance of the dimension at 3?	4
20 In the box below (ANSWER 20), draw, in neat freehand, the symbol for the projection system used.	4
TOTAL	30



QUESTION 1: ANALYTICAL (MECHANICAL

Given: A detailed drawing showing THREE views of an ejector base, 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 all refer to the accompanying detailed drawing and title block. [30]



ALL DIMENSIONS IN MILLIMETRES

[illegible]

QUESTION		ANSWERS
1	Who approved the drawing?	J.B. URGER
2	What SI unit are the dimensions presented in?	MILLIMETRE
3	When was the drawing checked?	2012-07-18
4	Who was responsible for the revision?	S.G.O.B.A
5	What drawing method was used to prepare the drawing?	CAD
6	How many ejector bases must be manufactured?	382
7	How many surfaces require machining?	3
8	What is the roughness value of the machined surfaces?	0.03
9	What method must be used to produce the machined surfaces?	GRINDING
10	What is the angle to the horizontal of the surface at 1?	1.05°
11	What is the angle to the horizontal of the surface at 2?	64°
12	How many holes are there in the casting?	6
13	What does the abbreviation C-BORE stand for?	COUNTERBORING
14	What would VIEW-2 be called?	FRONT VIEW
15	What is the radius of the fillet at 5?	6mm
16	Determine the complete dimensions at A, B, C, D, E?	A 15 B 22 C ø23 D 46 E 18
17	What is the total height of the ejector base?	19.0
18	What is the upper tolerance of the dimension at 3?	15.05
19	What is the upper and lower tolerance of the dimension at 3?	140.97 - 141.03
20	In the box below (ANSWER 20), draw, in neat freehand, the symbol for the projection system used.	4
TOTAL		30

NAME:

GRADE: 12

Revision of the previous grades' knowledge: (Gr 12 Johan Engelbrecht)

ISOMETRIC DRAWING

FIG 1

Fig 1a shows the front view, top view and right view of a MODEL in third angle orthographic projection.

If no other instructions are given the isometric drawing should show the same views as the given orthographic views.

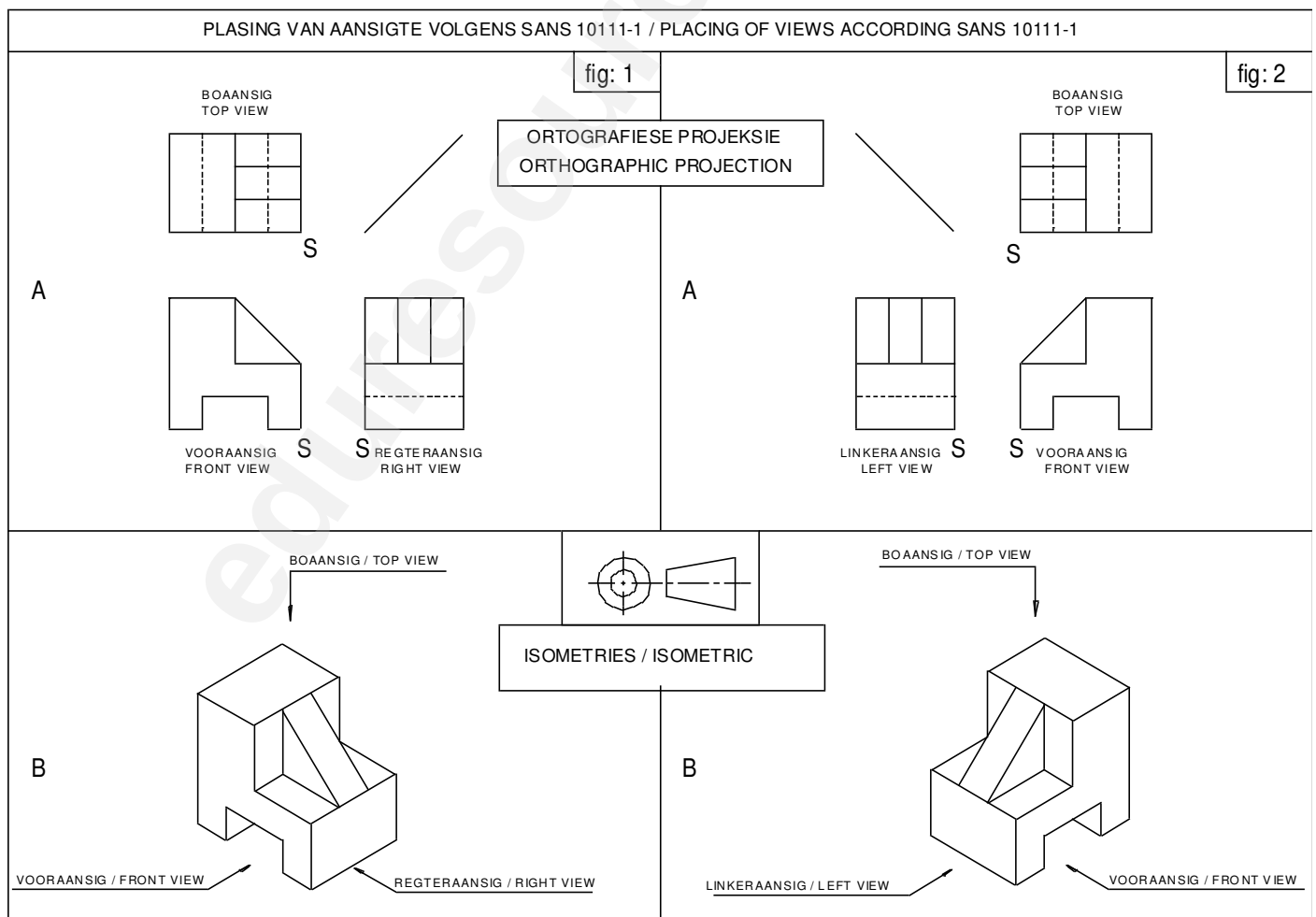
Fig 1b shows the isometric drawing of the MODEL. The isometric drawing is made to show the front view, top view and right view.

FIG 2

Fig 2a shows the front view, top view and left view of a MODEL. A point A is given with the instruction that point A must be the lowest point of the isometric drawing.

Fig 2b shows that the isometric drawing of the MODEL is drawn with point A as the lowest point of the drawing. In this case the isometric drawing shows the front views, top view and left view of the MODEL.

DRAWING 1



DRAWING 2 (FIG 2)

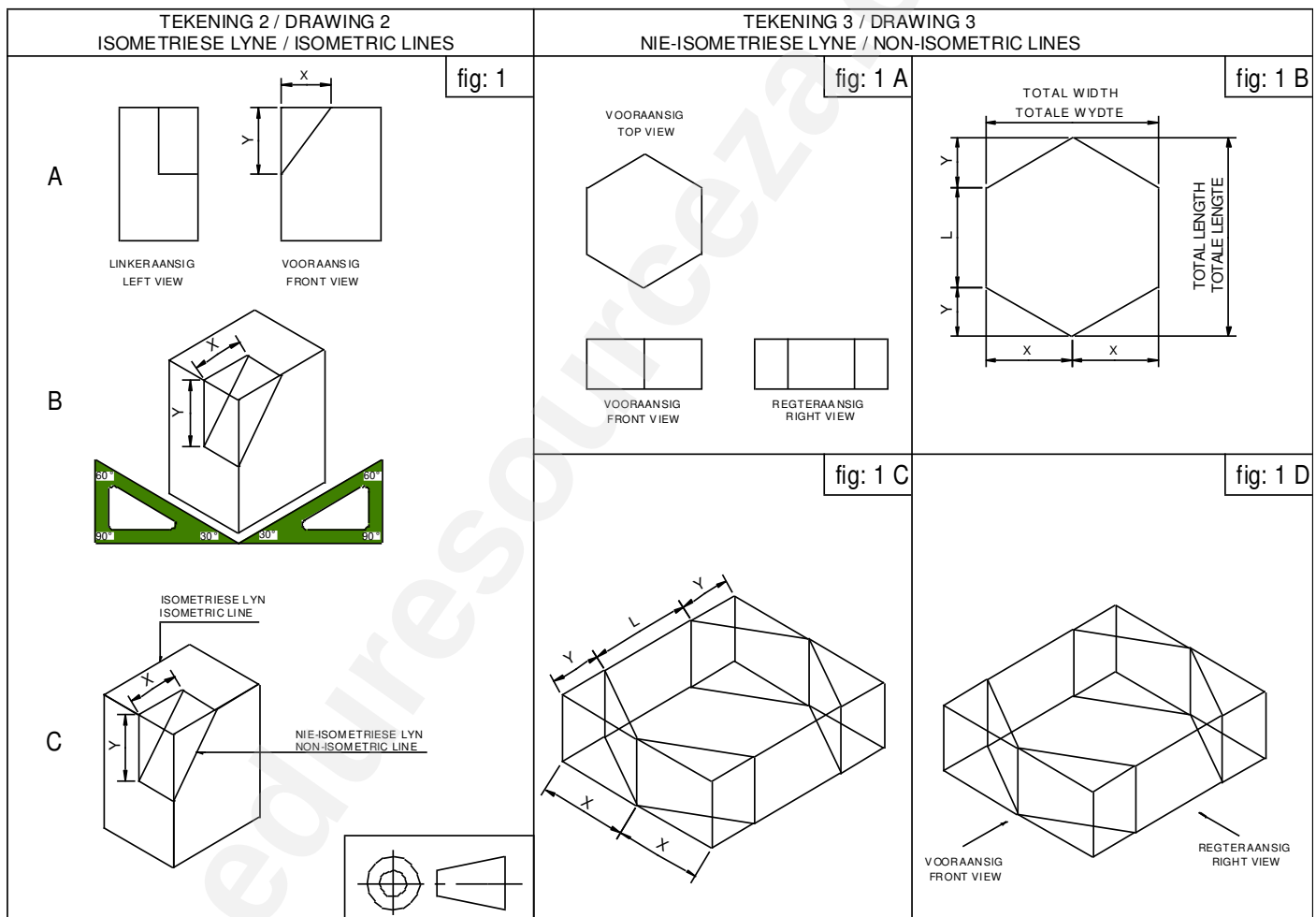
Fig 2a: The figure shows the front view and left view of a MODEL in third angle orthographic projection.

Fig 2b: Draw the isometric box and construct the basic shape within it as in the previous example. The isometric box must show the front plane and left plane, as shown on the figure, so that it will correspond with the given views.

To determine the position of the non-isometric lines, set off dimension (x) and dimension (y) on the appropriate isometric lines, as shown on the figure.

Fig 2c: Complete the isometric drawing of the MODEL by darkening the applicable lines.

DRAWING 2 & 3



AUXILIARY VIEWS

This example shows that the offset measurements for the non-isometric lines can only be determined by drawing an auxiliary view. A block is then drawn to enclose the auxiliary view to obtain the offset measurements.

DRAWING 3 (Fig 1)

FIG 1A

The figure shows the front view, right view and top view of a MODEL in third angle orthographic projection.

FIG 1B

Draw a full scale auxiliary view of the model. Draw the block to enclose the auxiliary view.

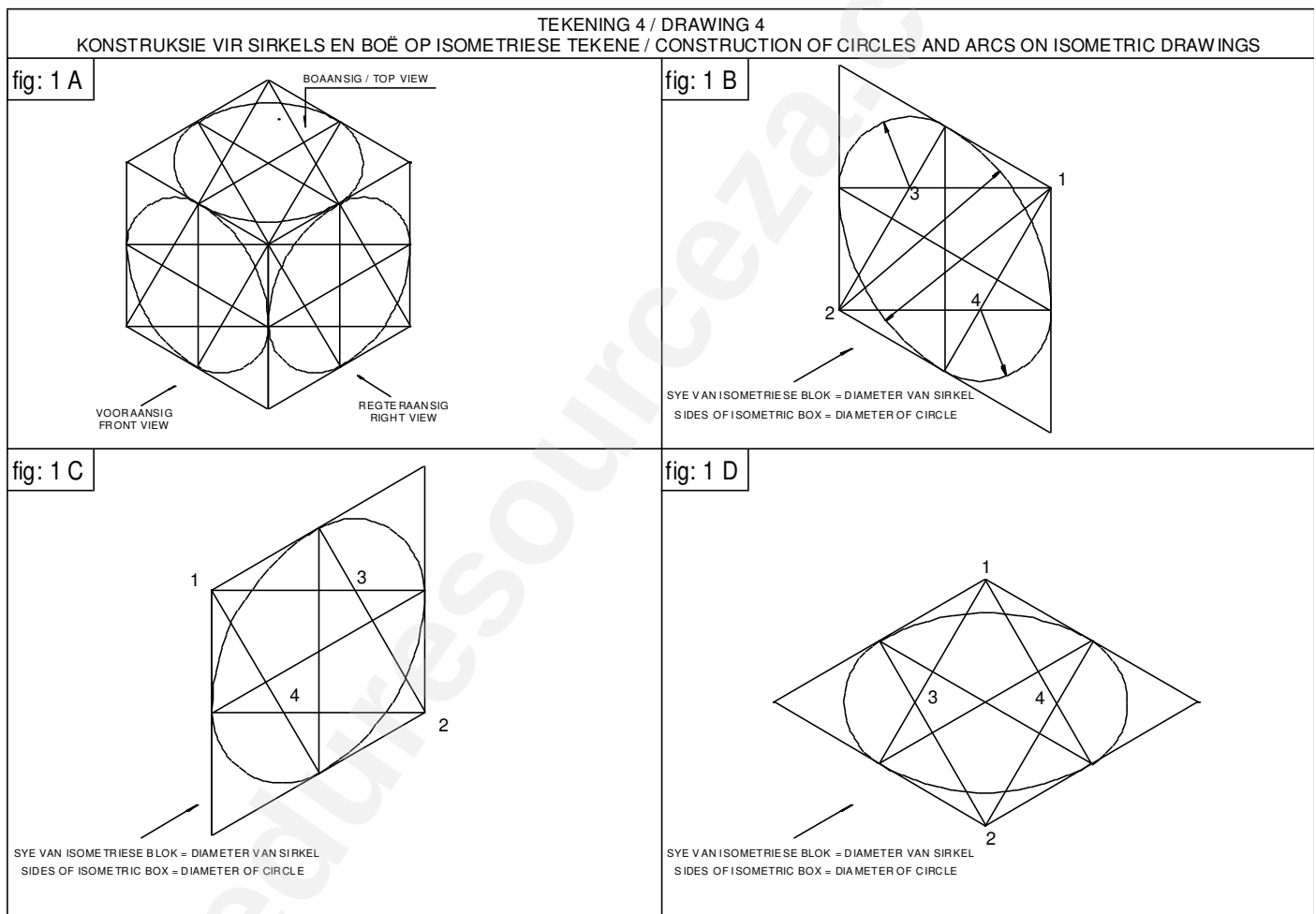
FIG 1C

Draw the isometric axes using a 30°/60° set square. When drawing the isometric box, the total height can be obtained from the given views. The total width and the total depth can be obtained from the auxiliary view. Draw the layout of the isometric box to show the front and right plane, as shown on the figure, so that it will correspond with the given views.

To determine the position of the non-isometric lines, set off measurement (x) and measurement (y) on the appropriate isometric lines, as shown on the figure.

FIG 1D

Complete the isometric drawing of the MODEL by darkening the applicable lines and do not show any hidden detail unless it is required to make the drawing clear, or if the question states otherwise.



INTRODUCTION

All circles drawn on an isometric plane will appear as an isometric circle and all arcs as part of an isometric circle. These isometric circles can be constructed in a number of different ways and for this course, the four-centre method will be used to construct the isometric circles.

METHOD OF CONSTRUCTING THE ISOMETRIC CIRCLE (Fig 1)

FIG 1A

The figure shows an isometric cube with an isometric circle constructed on the front plane, the right plane and the top plane using the four-centre method.

FIG 1B

The figure shows the front plane of the isometric cube. The isometric circle is constructed using the following steps, as shown on the figure:

- Draw an isometric box with the sides equal to the diameter of the circle.
- Draw in the centre of the box a horizontal line.

- Draw construction lines from the obtuse angles to the middle of the opposite sides.
- These construction lines intersect each other for two of the centre points, **3** and **4**, of the isometric circle.
- The obtuse angles are the other two centre points, **1** and **2**, of the isometric circle.
- Using radius **R1** and centre points, **3** and **4**, draw the small arcs of the isometric circle.
- Using radius **R2** and the centre points, **1** and **2**, draw the big arcs of the isometric circle.

FIG 1C

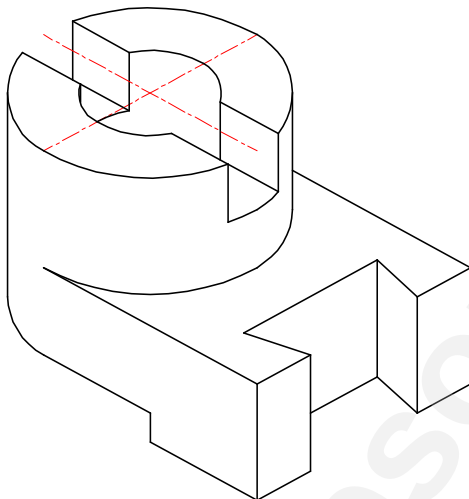
The figure shows the right plane of the isometric cube. The isometric circle is constructed as explained for **Fig 1b**.

FIG 1D

The figure shows the top plane of the isometric cube. The isometric circle is constructed as explained for **Fig 1b**.

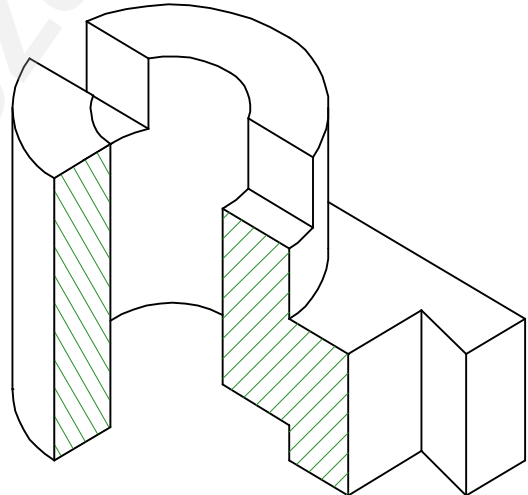
ISOMETRIESE AANSIG

ISOMETRIC VIEW



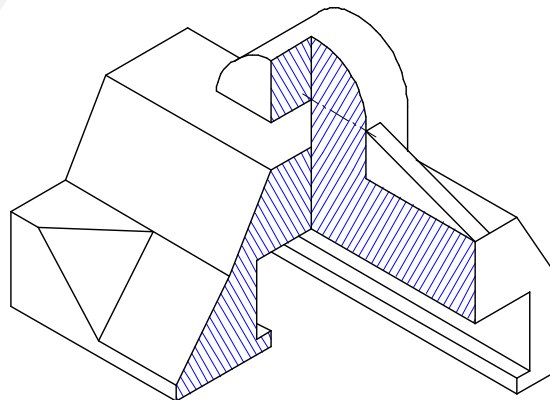
HALFDEURSNEE ISOMETRIESE AANSIG

HALF SECTIONAL ISOMETRIC VIEW

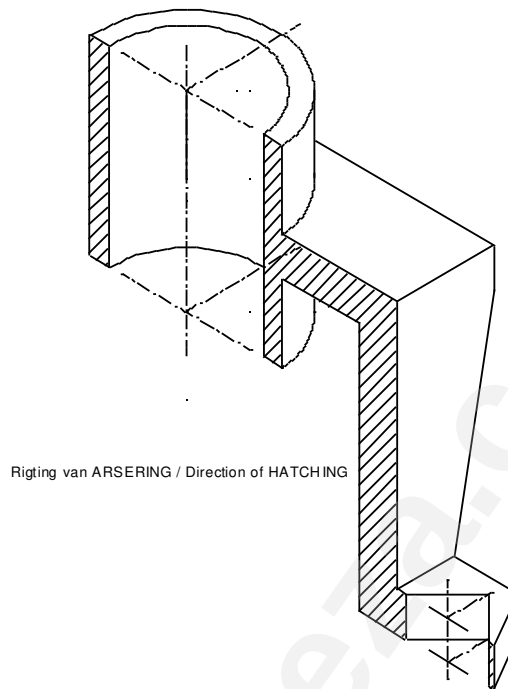


HALFDEURSNEE ISOMETRIESE AANSIG

HALF SECTIONAL ISOMETRIC VIEW



VOLDEURSNEE ISOMETRIESE AANSIG FULL SECTIONAL ISOMETRIC VIEW



ISOMETRIC VIEWS

COMPLEX, MULTIFACETED OBJECT

Isometric views are found in Question Paper 2, Question 3. It is often difficult to 'see' the object and then it helps to follow the following guidelines:

GIVEN:

- Three views are given. The order in which it is presented tells us it is in third angle orthographic projection. Question Paper 2 is also in third angle projection.
- READ the "Given" part attentively. (2X) Identify the different views. The TOP VIEW is at the top. The FRONT VIEW is directly under the top view. The LEFT VIEW is at the left bottom, next to the front view. This is important to know, because it determines the position of your isometric view i.e. where each plane will be.
- Look for point S on the drawing. It will be the lowest point on the isometric view.

INSTRUCTIONS:

- We are going to draw on scale 1:1 – thus full size.
- It must be a sectional view, but we will draw the full view in construction (soft) lines before we attempt the section. (See section line AA)
- S must be the lowest point and S is already marked off from where we must start the drawing.
- Show all constructions – do not erase construction lines!
- NO HIDDEN LINES HAVE TO BE DRAWN IN! Do not waste valuable time by adding hidden detail.
- We have approximately 36 min time to finish this question.

START DRAWING: (1.2)

- The height, length and breadth are given. Draw the outline of the block. (Construction lines are soft lines!)
- Start carrying over measurements, plane by plane. Remember that the detail of the front view is on the right side, the left view on the left side and the top view on top. Choose one plane at a time and carry over the measurements.
- Start drawing in detail. If you are sure of a plane, you may do it in visible (dark) lines. Remember the half section!

CONSTRUCTION OF THE HEXAGON AND SQUARE: (1.3)

- To do the hexagon in isometric, we first have to construct the hexagon. (See p.3, drawing 3, Fig. 1) Draw lines around the hexagon so that it lies in a rectangle. (NB: It is a rectangle and NOT a square!) Construct this rectangle in isometric, on the right place. Remember that the top quarter closest to you, will fall out.
- To determine the position of the square inside the hexagon, it is best to do it in the construction of your hexagon. Then it can be accurately transferred on the isometric drawing. (It is possible to draw the square directly in isometric.)

CONSTRUCTION OF THE CIRCLE: (1.4 and 1.5)

- Draw the square in which the circle must be constructed on the right place. Ensure that height is correct. (See p.4, Drawing 4, Fig 1) for the construction of the isometric circle)
- Construct the top part of the circle. (Remember that the front halve has been cut – use soft lines)
- Now do the bottom part of the circle. The centre points of the compass can be projected down to save time

COMPLETE THE ISOMETRIC: (1.5)

- The remainder of the detail can now be drawn to complete the drawing.
- Make sure of the detail at the half section.

HATCHING: (1.6)

- The cutting planes must now be hatched. It is TWO section planes in TWO different directions.
- The rib may not be hatched.
- Hatching must be done on 60°, because it is isometric.

1.1

VRAAG 3 : ISOMETRIESE TEKENING

Gegee:

- Die vooraansig, bo-aansig en linkeraansig van 'n steunstuk.
- Die posisie van punt S op die tekenvel.

INSTRUKSIES:

Gebruik skaal 1 : 1 en omskep die ortografiese aansigte van die steunstuk in 'n deursnee-isometriese tekening volgens snyvlak A-A.

- Maak S die laagste punt van die tekening.
- Toon ALLE nodige konstruksies.
- GEEN stensils mag gebruik word nie.
- GEEN verborge besonderhede word verlang nie. [40]

QUESTION 3 : ISOMETRIC DRAWING

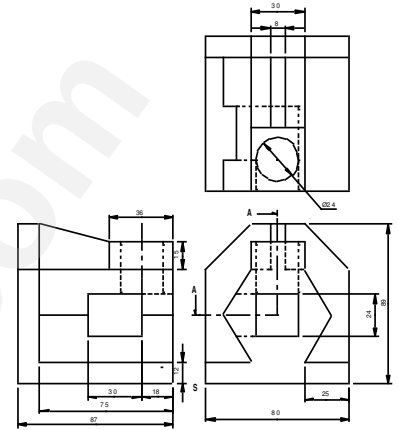
Given:

- 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 sectional isometric drawing on cutting plane A-A.

- Make point S the lowest point of the drawing.
- Show all the necessary construction.
- NO stencils may be used.
- NO hidden detail is required. [40]



ASSESSERINGKRITERIA / ASSESSMENT CRITERIA			
1	HULPAANSIG + PLASING AUXILIARY VIEW + PLACEMENT	1	
2	VOETSTUK / BASE (16 x ½)	8	
3	SESKANTIGE PRISMA / HEXAGONAL PRISM (20 x ½)	10	
4	SIRKELS / CIRCLES (10 x ½)	5	
5	GESNYDE VLAKKE / SECTIONED SURFACES (24 x ½)	12	
6	ARSERING / HATCHING (8 x ½)	4	
TOTAAL / TOTAL		40	



NAAM / NAME:

GRAAD
GRADE 12

VRAESTEL 2 / PAPER 2
VRAAG 3 / QUESTION 3

ISOMETRIES
ISOMETRIC

DATUM / DATE:

1.2

VRAAG 3 : ISOMETRIESE TEKENING

Gegee:

- Die vooraansig, bo-aansig en linkeraansig van 'n steunstuk.
- Die posisie van punt S op die tekenvel.

INSTRUKSIES:

Gebruik skaal 1 : 1 en omskep die ortografiese aansigte van die steunstuk in 'n deursnee-isometriese tekening volgens snyvlak A-A.

- Maak S die laagste punt van die tekening.
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QUESTION 3 : ISOMETRIC DRAWING

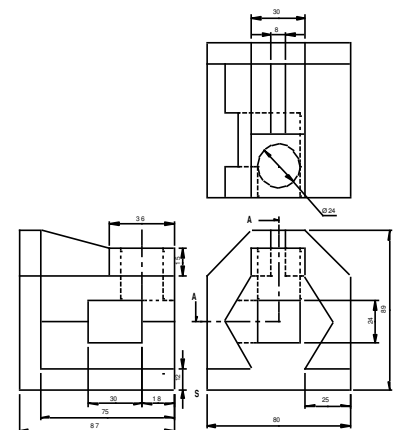
Given:

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

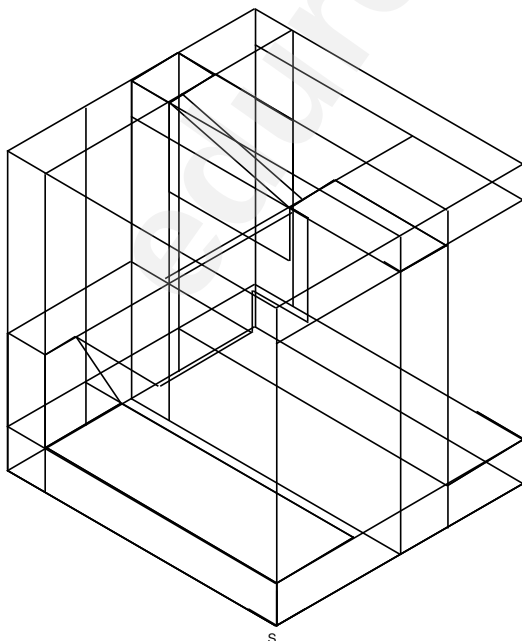
INSTRUCTIONS:

Using scale 1 : 1, convert the orthographic views of the bracket to a sectional isometric drawing on cutting plane A-A.

- Make point S the lowest point of the drawing.
- Show all the necessary construction.
- NO stencils may be used.
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ASSESSERINGKRITERIA / ASSESSMENT CRITERIA			
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2	VOETSTUK / BASE (16 x ½)	8	
3	SESKANTIGE PRISMA / HEXAGONAL PRISM (20 x ½)	10	
4	SIRKELS / CIRCLE (10 x ½)	5	
5	GESNYDE VLAKKE / SECTIONED SURFACES (24 x ½)	12	
6	ARSERING / HATCHING (8 x ½)	4	
TOTAAL / TOTAL		40	



NAAM / NAME:

GRAAD
GRADE 12

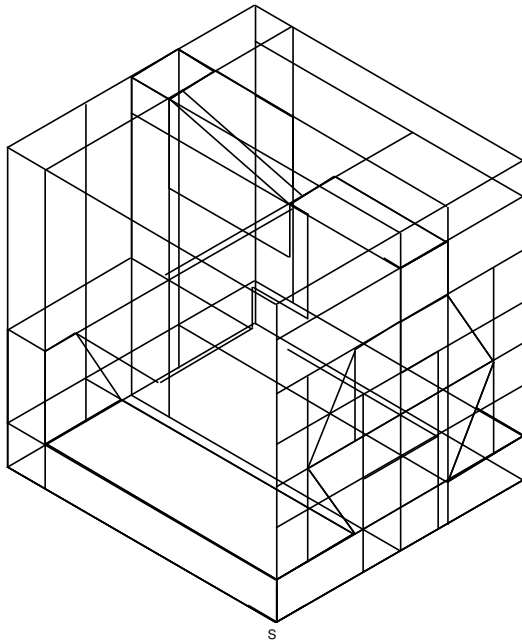
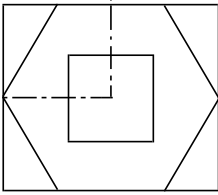
VRAESTEL 2 / PAPER 2
VRAAG 3 / QUESTION 3

ISOMETRIES
ISOMETRIC

DATUM / DATE:

1.3

HULPAANSIG KONSTRUKSIE
AUXILIARY CONSTRUCTION



S

VRAAG 3 : ISOMETRIESE TEKENING

Gegee:

- Die vooraansig, bo-aansig en linkeraansig van 'n steunstuk.
- Die posisie van punt S op die tekenvel.

INSTRUKSIES:

Gebruik skaal 1 : 1 en omskep die ortografiese aansigte van die steunstuk in 'n deursnee-isometriese tekening volgens snyvlak A-A.

- Maak S die laagste punt van die tekening.
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- GEEN verborge besonderhede word verlang nie. [40]

QUESTION 3 : ISOMETRIC DRAWING

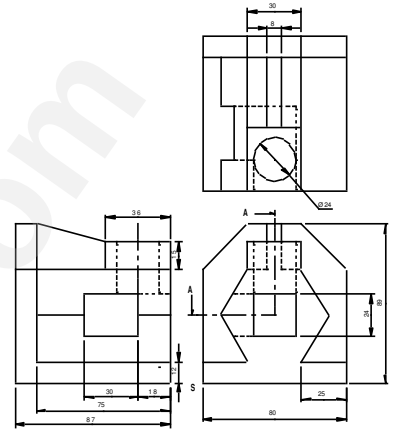
Given:

- 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 sectional isometric drawing on cutting plane A-A.

- Make point S the lowest point of the drawing.
- Show all the necessary construction.
- NO stencils may be used.
- NO hidden detail is required. [40]



ASSESSERINGKRITERIA / ASSESSMENT CRITERIA

1	HULPAANSIG + PLASING AUXILIARY VIEW + PLACEMENT	1
2	VOETSTUK / BASE (16 x 1/2)	8
3	SESKANTIGE PRISMA / HEXAGONAL PRISM (20 x 1/2)	10
4	SIRKELS / CIRCLES (10 x 1/2)	5
5	GESNYDE VLAKKE / SECTIONED SURFACES (24 x 1/2)	12
6	ARSERING / HATCHING (8 x 1/2)	4
TOTAAL / TOTAL		40

NAAM / NAME:

GRAAD

GRADE

12

VRAESTEL 2 / PAPER 2

VRAAG 3 / QUESTION 3

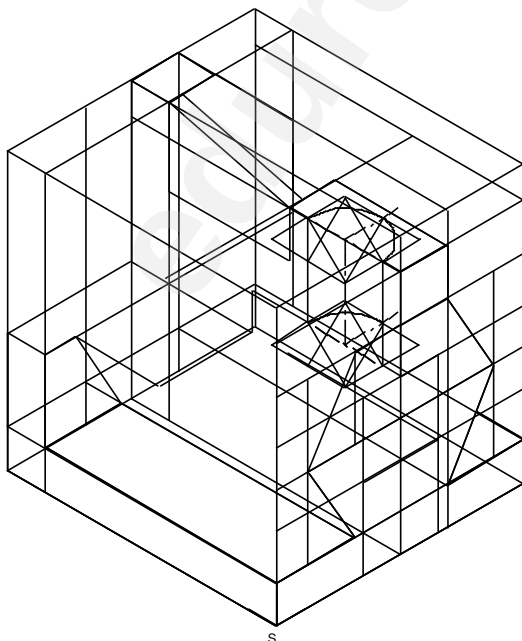
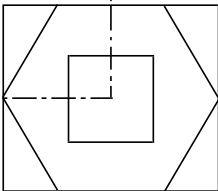
ISOMETRIES

ISOMETRIC

DATUM / DATE:

1.4

HULPAANSIG KONSTRUKSIE
AUXILIARY CONSTRUCTION



S

VRAAG 3 : ISOMETRIESE TEKENING

Gegee:

- Die vooraansig, bo-aansig en linkeraansig van 'n steunstuk.
- Die posisie van punt S op die tekenvel.

INSTRUKSIES:

Gebruik skaal 1 : 1 en omskep die ortografiese aansigte van die steunstuk in 'n deursnee-isometriese tekening volgens snyvlak A-A.

- Maak S die laagste punt van die tekening.
- Toon ALLE nodige konstruksies.
- GEEN stensils mag gebruik word nie.
- GEEN verborge besonderhede word verlang nie. [40]

QUESTION 3 : ISOMETRIC DRAWING

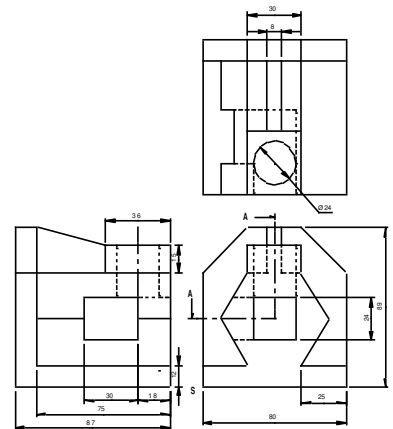
Given:

- 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 sectional isometric drawing on cutting plane A-A.

- Make point S the lowest point of the drawing.
- Show all the necessary construction.
- NO stencils may be used.
- NO hidden detail is required. [40]



ASSESSERINGKRITERIA / ASSESSMENT CRITERIA

1	HULPAANSIG + PLASING AUXILIARY VIEW + PLACEMENT	1
2	VOETSTUK / BASE (16 x 1/2)	8
3	SESKANTIGE PRISMA / HEXAGONAL PRISM (20 x 1/2)	10
4	SIRKELS / CIRCLES (10 x 1/2)	5
5	GESNYDE VLAKKE / SECTIONED SURFACES (24 x 1/2)	12
6	ARSERING / HATCHING (8 x 1/2)	4
TOTAAL / TOTAL		40

NAAM / NAME:

GRAAD

GRADE

12

VRAESTEL 2 / PAPER 2

VRAAG 3 / QUESTION 3

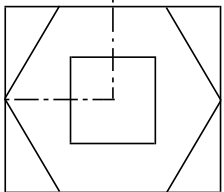
ISOMETRIES

ISOMETRIC

DATUM / DATE:

1.5

HULPAANSIG KONSTRUKSIE
AUXILIARY CONSTRUCTION



VRAAG 3 : ISOMETRIESE TEKENING

Gegee:

- Die vooraansig, bo-aansig en linkeraansig van 'n steunstuk.
- Die posisie van punt S op die tekenvel.

INSTRUKSIES:

Gebruik skaal 1 : 1 en omskep die ortografiese aansigte van die steunstuk in 'n deursnee-isometriese tekening volgens snyvlak A-A.

- Maak S die laagste punt van die tekening.
- Toon ALLE nodige konstruksies.
- GEEN stensils mag gebruik word nie.
- GEEN verborge besonderhede word verlang nie. [40]

QUESTION 3 : ISOMETRIC DRAWING

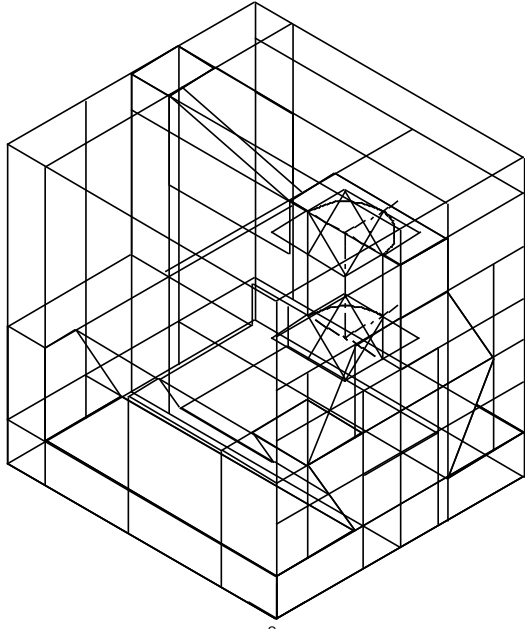
Given:

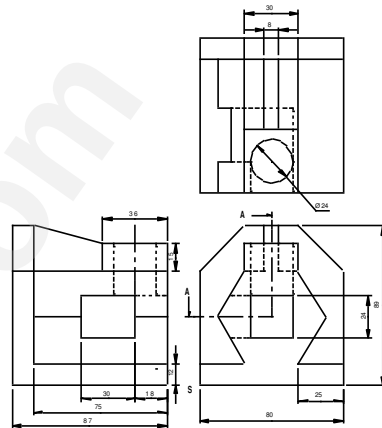
- The front view, top view and left view of a bracket.
- The position of point S on the drawing sheet.

INSTRUCTIONS:

Using scale 1 : 1, convert the orthographic views of the bracket to a sectional isometric drawing on cutting plane A-A.

- Make point S the lowest point of the drawing.
- Show all the necessary construction.
- NO stencils may be used.
- NO hidden detail is required. [40]





ASSESSERINGKRITERIA / ASSESSMENT CRITERIA			
1	HULPAANSIG + PLASING AUXILIARY VIEW + PLACEMENT	1	
2	VOETSTUK / BASE (16 x 1/2)	8	
3	SESKANTIGE PRISMA / HEXAGONAL PRISM (20 x 1/2)	10	
4	SIRKELS / CIRCLES (10 x 1/2)	5	
5	GESNYDE VLAKKE / SECTIONED SURFACES (24 x 1/2)	12	
6	ARSERING / HATCHING (8 x 1/2)	4	
TOTAAL / TOTAL		40	

NAAM / NAME: _____

DATUM / DATE: _____

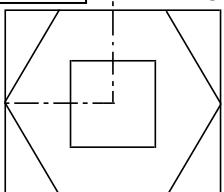
GRAAD
GRADE 12

VRAESTEL 2 / PAPER 2
VRAAG 3 / QUESTION 3

ISOMETRIES
ISOMETRIC

1.6

HULPAANSIG KONSTRUKSIE
AUXILIARY CONSTRUCTION



VRAAG 3 : ISOMETRIESE TEKENING

Gegee:

- Die vooraansig, bo-aansig en linkeraansig van 'n steunstuk.
- Die posisie van punt S op die tekenvel.

INSTRUKSIES:

Gebruik skaal 1 : 1 en omskep die ortografiese aansigte van die steunstuk in 'n deursnee-isometriese tekening volgens snyvlak A-A.

- Maak S die laagste punt van die tekening.
- Toon ALLE nodige konstruksies.
- GEEN stensils mag gebruik word nie.
- GEEN verborge besonderhede word verlang nie. [40]

QUESTION 3 : ISOMETRIC DRAWING

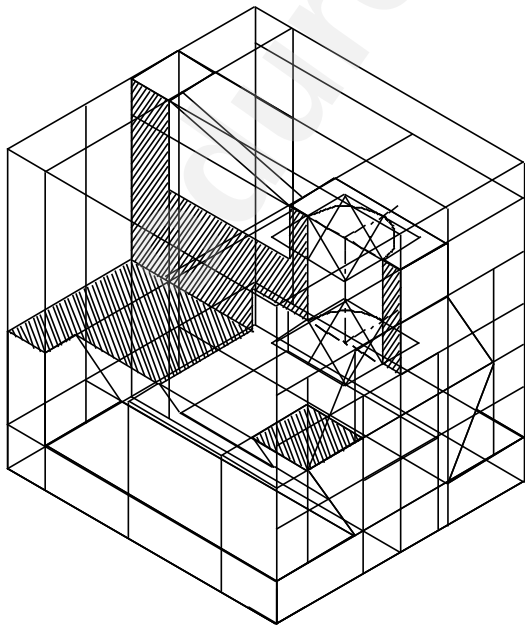
Given:

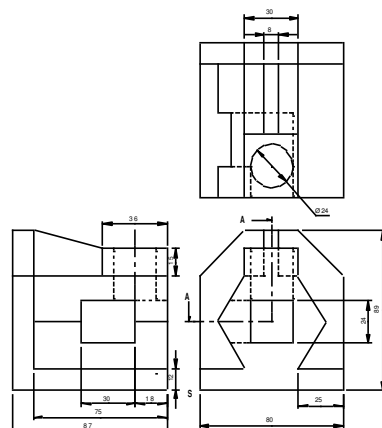
- The front view, top view and left view of a bracket.
- The position of point S on the drawing sheet.

INSTRUCTIONS:

Using scale 1 : 1, convert the orthographic views of the bracket to a sectional isometric drawing on cutting plane A-A.

- Make point S the lowest point of the drawing.
- Show all the necessary construction.
- NO stencils may be used.
- NO hidden detail is required. [40]





ASSESSERINGKRITERIA / ASSESSMENT CRITERIA			
1	HULPAANSIG + PLASING AUXILIARY VIEW + PLACEMENT	1	
2	VOETSTUK / BASE (16 x 1/2)	8	
3	SESKANTIGE PRISMA / HEXAGONAL PRISM (20 x 1/2)	10	
4	SIRKELS / CIRCLES (10 x 1/2)	5	
5	GESNYDE VLAKKE / SECTIONED SURFACES (24 x 1/2)	12	
6	ARSERING / HATCHING (8 x 1/2)	4	
TOTAAL / TOTAL		40	

NAAM / NAME: _____

DATUM / DATE: _____

GRAAD
GRADE 12

VRAESTEL 2 / PAPER 2
VRAAG 3 / QUESTION 3

ISOMETRIES
ISOMETRIC

QUESTION 3 : ISOMETRIC DRAWING

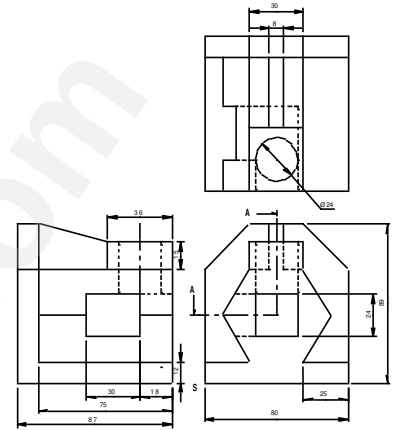
Given:

- 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 sectional isometric drawing on cutting plane A-A.

- Make point S the lowest point of the drawing.
- Show all the necessary construction.
- NO stencils may be used.
- NO hidden detail is required. [40]



ASSESSERINGKRITERIA / ASSESSMENT CRITERIA			
1	HULPAANSIG + PLASING AUXILARY VIEW + PLACEMENT	1	
2	VOETSTUK / BASE (16 x ½)	8	
3	SESKANTIGE PRISMA / HEXAGONAL PRISM (20 x ½)	10	
4	SIRKELS / CIRCLES (10 x ½)	5	
5	GESNYDE VLAKKE / SECTIONED SURFACES (24 x ½)	12	
6	ARSERING / HATCHING (8 x ½)	4	
TOTAAL / TOTAL		40	

ISOMETRIES
ISOMETRIC

DATUM / DATE:

SOLID GEOMETRY

Triangular prism

These types of questions can be found in the examination paper in Question Paper 1 (first angle orthographic projection) Question 2.

Drawing of solid structures often cause problems for learners, especially if they do not have enough depth insight. It is, however, not difficult if you follow these simple steps.

NB This method is used for all shapes of solid structures, tilted and / or combined shapes.

Steps:

Ensure that you know exactly what the shape of the pyramid is and how it is been placed. READ through the instructions attentively. (2x!)

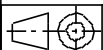
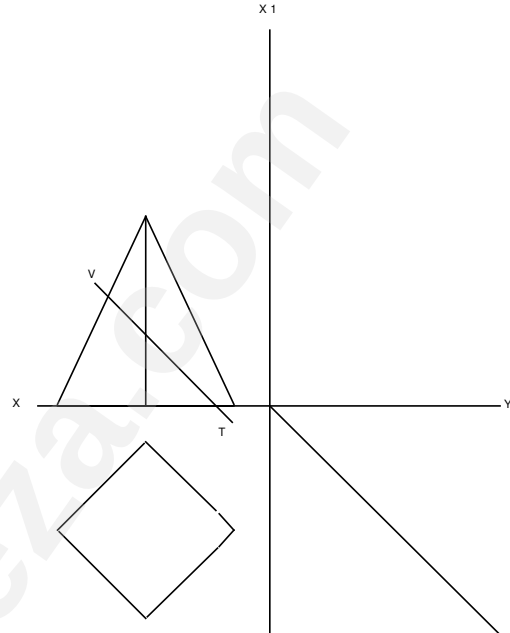
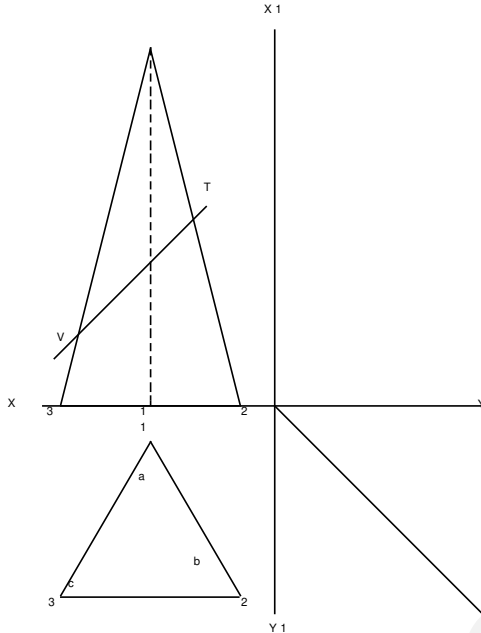
Tick off the completed steps in the block on the right.

Position the drawing paper on your board. (2.1)	
Copy the given incomplete views	
Project the views to draw a left	
Draw the left view in soft lines (it is a sectional view, so all lines will not be visible)	
Number the corners at the base of the TOP VIEW 1; 2; 3. (clockwise)	
Number the bottom corners of the FRONT VIEW (1; 2; 3) so that it corresponds with the corners of the top view.	
Number the apex of the pyramid "A" on the FRONT VIEW.	
Number the corresponding point in the TOP VIEW also "A"	
We are going to do the section on the LEFT VIEW. (2.2) To be able to do this, we must look at the front view from the left, directly on the section in the direction of the arrows at RR. To see the section, we must remove the top part of the pyramid.	
Project and number the corners on the base. The apex of the pyramid is "A"	
Project the lines from the section line on the front view to the left view.	
On the front view: The section line runs through side A1. Follow the projection line to the left view. Find the A1 on the left view and make a mark.	
Do the same with A2 and A3	
There are supposed to be three marks on the sides in the left view. Connect them to form the sectioned plane.	
Hatch the sectioned plane at 45°	
Complete the view.	
We are going to do the section on the TOP VIEW. (2.3) To be able to do that, we must look from above, down on the front view, directly on the section in the direction of arrows SS. To be able to see the section, we must remove the top part of the pyramid.	
Project the lines from the cutting line on the front view to the top view.	
Only one corner of the section in the top view cannot be projected directly from the front view. Do it as follows: On the front view, draw a line from the cutting line to the top view.	

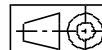
projection line to the left view and project it down to the 45° line and then across to the top view. Where this line crosses with the projection line from the front view, is the point we are looking for.	
Plot the section points on the sides in the top view at A2 and A3.	
There must now be three dots on the sides in the top view. Connect them to form the section plane.	
Hatch the section plane at 45°	
Complete the view.	
True shape of the section. (2.2) Both sections on the two views are at an angle which gives you a distorted image of the sectional plane. We are now going to do the TRUE shape of the section.	
Look at the section line on the front view. Draw lines 90° with the section line, away from the front view.	
Draw a line parallel with the section line without touching the front view.	
Name this line X1 and X1. (The XX line is duplicated, but at an angle	
Look at the TOP VIEW: Use your compass and take the distance from the XX line down to a corner of the section. (a1)	
Follow the projection line up to the front view, and from there to the X1 X1 line.	
Use the measurements of the compass and plot it from the X1X1 line up. (a1)	
Repeat the process with the other two measurements of the section from the top view to the true shape. (a2 and a3)	
Connect the dots that you have marked off to complete the true shape.	
It is NOT necessary to hatch the true shape!	
The true shape can also be constructed from the YY lines. The sectional left view can also be used instead of the sectional top view. You can use any one of the above-mentioned methods to check your answer.	

HSE GR10 8 - 15 A VASTE LIGGAME: GEGEW E INFORMASIE - Die onvoltooid e vooraansig en die onvoltooid e boansig van 'n regte reë lmatige driehoekige piramide. INSTRUKSIES - Voltooi die gegewe aansigte . - Teken die deursnee lke raansig . - Teken die deursnee boansig . - Teken die ware vorm van die snit op snyvlak VT. - Alle konstruksie moet getoon word . - Alle verborge detail moet getoon word .	HSE GR10 8 - 15 A SOLID GEOMETRY: GIVEN INFORMATION - The incomplete front view and top view of a right regular triangular pyramid. INSTRUCTIONS - Complete the given views. - Draw the sectional left view. - Draw the sectional top view. - Draw the true shape of the section on cutting plane VT. - All construction must be shown. - All hidden detail must be shown.	HSE GR10 8 - 15 B VASTE LIGGAME: GEGEW E INFORMASIE - Die onvoltooid e vooraansig en die onvoltooid e boansig van 'n regte reë lmatige vierkantige piramide . INSTRUKSIES - Voltooi die gegewe aansigte . - Teken die deursnee lke raansig . - Teken die deursnee boansig . - Teken die ware vorm van die snit op snyvlak VT. - Alle konstruksie moet getoon word . - Alle verborge detail moet getoon word .	HSE GR10 8 - 15 B SOLID GEOMETRY: GIVEN INFORMATION - The incomplete front view and top view of a right regular square pyramid. INSTRUCTIONS - Complete the given views. - Draw the sectional left view. - Draw the sectional top view. - Draw the true shape of the section on cutting plane VT. - All construction must be shown. - All hidden detail must be shown.
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2.1



NAAM
NAME
DRIEHOEKIGE PIRAMIDE
TRIANGULAR PYRAMID

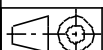
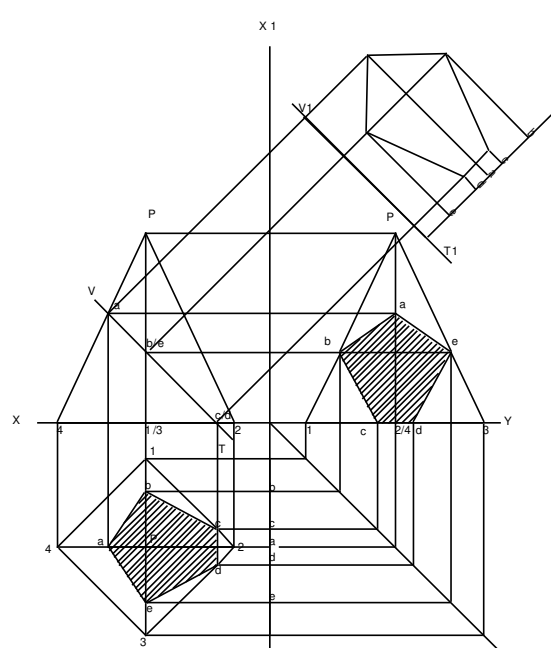
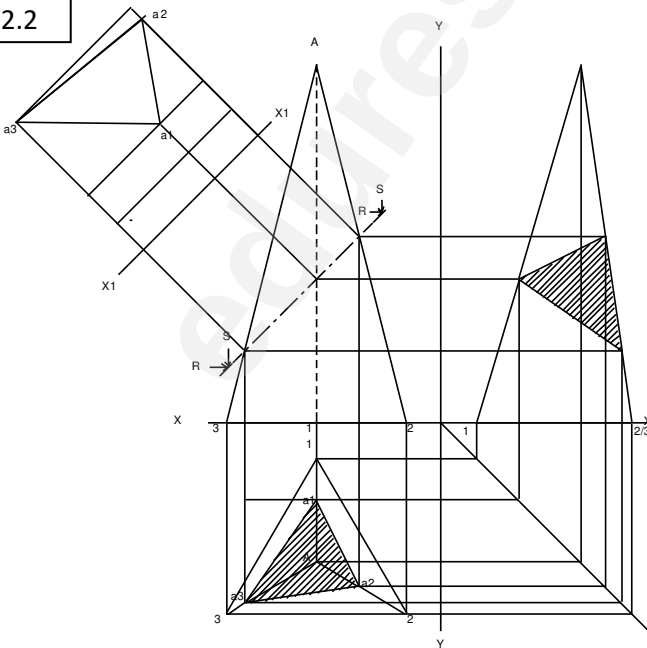


NAAM
NAME
VIERKANTIGE PIRAMIDE
SQUARE PYRAMID

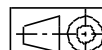
NAAM/NAME:	DATUM/DATE:	GRAAD 10	GRADE 10	VASTE LIGGAME SOLID GEOMETRY	WERKVEL 01 WORKSHEET 01	8 - 15
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HSE GR10 8 - 15 A VASTE LIGGAME: GEGEW E INFORMASIE - Die onvoltooid e vooraansig en die onvoltooid e boansig van 'n regte reë lmatige driehoekige piramide. INSTRUKSIES - Voltooi die gegewe aansigte . - Teken die deursnee lke raansig op VV. - Teken die deursnee boansig op SS. - Teken die ware vorm van die snit. - Alle konstruksie moet getoon word . - Alle verborge detail moet getoon word .	HSE GR10 8 - 15 A SOLID GEOMETRY: GIVEN INFORMATION - The incomplete front view and top view of a right regular triangular pyramid. INSTRUCTIONS - Complete the given views. - Draw the sectional left view on VV. - Draw the sectional top view on SS. - Draw the true shape of the section. - All construction must be shown. - All hidden detail must be shown.	HSE GR10 8 - 15 B VASTE LIGGAME: GEGEW E INFORMASIE - Die onvoltooid e vooraansig en die onvoltooid e boansig van 'n regte reë lmatige vierkantige piramide . INSTRUKSIES - Voltooi die gegewe aansigte . - Teken die deursnee lke raansig . - Teken die deursnee boansig . - Teken die ware vorm van die snit op snyvlak VT. - Alle konstruksie moet getoon word . - Alle verborge detail moet getoon word .	HSE GR10 8 - 15 B SOLID GEOMETRY: GIVEN INFORMATION - The incomplete front view and top view of a right regular square pyramid. INSTRUCTIONS - Complete the given views. - Draw the sectional left view. - Draw the sectional top view. - Draw the true shape of the section on cutting plane VT. - All construction must be shown. - All hidden detail must be shown.
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2.2



NAAM
NAME
DRIEHOEKIGE PIRAMIDE
TRIANGULAR PYRAMID



NAAM
NAME
VIERKANTIGE PIRAMIDE
SQUARE PYRAMID

NAAM/NAME:	DATUM/DATE:	GRAAD 10	GRADE 10	VASTE LIGGAME SOLID GEOMETRY	WERKVEL 01 WORKSHEET 01	8 - 15
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HSE GR10 8 - 15 A VASTE LIGGAME: GEGEWEE INFORMATIE - Die onvoltooide vooraansig en die onvoltooide bo-aansig van 'n regte reëlmattige driehoekige piramide. INSTRUKSIES - Voltooi die gegewe aansigte. - Teken die deursnee inke-raansig. - Teken die ware vorm van die snit op snyvlak VT. - Alle konstruksie moet getoon word. - Alle verborge detail moet getoon word.		HSE GR10 8 - 15 A SOLID GEOMETRY: GIVEN INFORMATION - The incomplete front view and top view of a right regular triangular pyramid. INSTRUCTIONS - Complete the given views. - Draw the sectional left view. - Draw the true shape of the section on cutting plane VT. - All construction must be shown. - All hidden detail must be shown.		HSE GR10 8 - 15 B VASTE LIGGAME: GEGEWEE INFORMATIE - Die onvoltooide vooraansig en die onvoltooide bo-aansig van 'n regte reëlmattige vierkantige piramide. INSTRUKSIES - Voltooi die gegewe aansigte. - Teken die deursnee inke-raansig. - Teken die ware vorm van die snit op snyvlak VT. - Alle konstruksie moet getoon word. - Alle verborge detail moet getoon word.		HSE GR10 8 - 15 B SOLID GEOMETRY: GIVEN INFORMATION - The incomplete front view and top view of a right regular square pyramid. INSTRUCTIONS - Complete the given views. - Draw the sectional left view. - Draw the true shape of the section on cutting plane VT. - All construction must be shown. - All hidden detail must be shown.	
2.3							
NAAM/NOME: DRIEHOEKIGE PIRAMIDE NAME: TRIANGULAR PYRAMID		NAAM/NOME: VIERKANTIGE PIRAMIDE NAME: SQUARE PYRAMID		Werktyd 01 WORKSHEET 01			
GRAAD/GRADE: DATUM/DATE:		GRAAD 10 GRADE 10		VASTE LIGGAME SOLID GEOMETRY			
				MEMO			
				8 - 15			

SOLID GEOMETRY

Hexagonal prism and a pentagonal pyramid

These types of questions can be found in the examination paper in Question Paper 1 (first angle orthographic projection) Question 2.

Drawing of solid structures often cause problems for learners, especially if they do not have enough depth insight. It is, however, not difficult if you follow these simple steps.

NB This method is used for all shapes of solid structures, tilted and / or combined shapes.

Steps:

Ensure that you know exactly what the shape of the pyramid and hexagon is and how it is been placed. READ through the instructions attentively. (2x!)

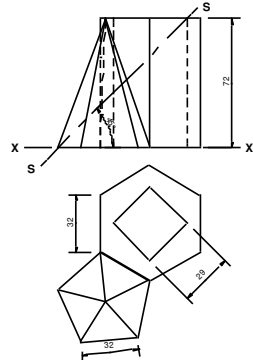
Tick off the completed steps in the block on the right.

Position the drawing paper on your board. (3.1)	
• Copy the given views	
• Project the views to draw a left view	
• Draw the left view in soft lines (it is a sectional view, so all lines will not be visible)	
• Number the corners at the base in the TOP VIEW	
• Number the bottom corners of the FRONT VIEW so that it corresponds with the corners of the top view.	
• Number the apex of the pyramid "A" on the FRONT VIEW.	
• Number the corresponding point in the TOP VIEW also "A"	

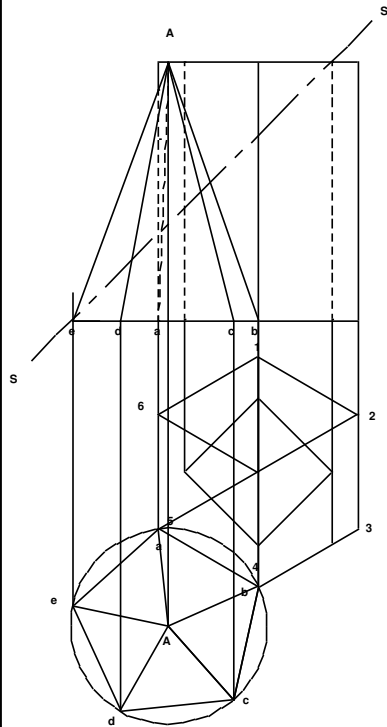
We are going to do the section on the TOP VIEW. (3.2 and 3.3) To be able to do that, we must look from above down on the front view, directly on the section in the direction of arrows SS. To be able to see the section, we must remove the top part of the pyramid and prism.	
• Project the lines from the cutting line on the front view to the top view. (3.2)	
• Plot the section points on the sides in the top view	
• There must now be marks on the sides in the top view. Connect them to form the section plane.	
• Hatch the section plane at 45°	
• Complete the view.	

We are going to do the section on the LEFT VIEW. (3.4 and 3.5) To be able to do this, we must look at the front view from the left, directly on the section in the direction of the arrows at SS. To see the section, we must remove the top part of the pyramid.	
• Project and number the corners on the base. The apex of the pyramid is "A" (3.2)	
• Project the lines from the section line on the front view to the left view. (3.5)	
• On the front view: We do the pyramid first. The section line runs through	

side Ae. Follow the projection line to the left view. Find the Ae on the left view and make a mark.	
The section line cuts through Ad. Follow the projection line to the left view and mark off Ad. Do the same with Aa; Ac and Ab.	
Connect your marks to form the sectioned plane.	
Hatch the sectioned plane at 45°	
Do the prism in the same way.	
Complete the view.	

3.1	VRAAG 2: VASTE LIGGAME GEGEE : Die vooraansig en bo-aansig van 'n regte reëlmatige seskantige prisma met 'n regte vierkantige gat en 'n regte reëlmatige vyfhoekige piramide Spesifikasies: Een basis van die seskantige prisma is in kontak met een basis van die vyfhoekige piramide. Beide vaste liggame word deur die snyvlak SS gesny. Instrukties: Teken die volgende aansigte van die TWEE vaste liggame volgens skaal 1:1: 2.1 Die gegewe vooraansig 2.2 Die deursnee-bo-aansig 2.3 Die deursnee-linkeraansig. Toon ALLE verborge besonderhede. Toon ALLE nodige konstruksies . (40)	QUESTION 2: SOLID GEOMETRY GIVEN : The front view and top view of a right regular hexagonal prism with square hole and a right regular pentagonal pyramid. Specifications: One base edge of the hexagonal prism is in contact with one base edge of the pentagonal pyramid. Both solids are cut by a cutting plane SS. Instructions: Draw, to scale 1:1, the following views of the TWO solids: 2.1 The given front view 2.2 The sectional top view. 2.3 The sectional left view. Show ALL hidden detail. Show all necessary construction. (40)																								
																										
		<table><tr><th colspan="4">ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA</th></tr><tr><td>1</td><td>KONST. + VOORAANSIG CONST. + FRONT VIEW</td><td>7</td><td></td></tr><tr><td>2</td><td>DEURSNEE BOAANSIG SECTIONAL TOP VIEW</td><td>14</td><td></td></tr><tr><td>3</td><td>DEURSNEE-LINKERAANSIG SECTIONAL LEFT VIEW</td><td>30 X ½</td><td>15</td></tr><tr><td>4</td><td>ARSEERING HATCHING</td><td>4</td><td></td></tr><tr><td colspan="3">TOTAAL / TOTAL</td><td>40</td></tr></table>	ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA				1	KONST. + VOORAANSIG CONST. + FRONT VIEW	7		2	DEURSNEE BOAANSIG SECTIONAL TOP VIEW	14		3	DEURSNEE-LINKERAANSIG SECTIONAL LEFT VIEW	30 X ½	15	4	ARSEERING HATCHING	4		TOTAAL / TOTAL			40
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TOTAAL / TOTAL			40																							
VRAAG 2 QUESTION 2	VASTE LIGGAME SOLID GEOMETRY	NAAM / NAME: DATUM / DATE:	GRAAD GRADE 12																							

3.2



VRAAG 2: VASTE LIGGAME

GEGEE :

Die vooraansig en boaansig van 'n regte reëlmattige seskantige prisma met 'n regte vierkantige gat en 'n regte reëlmattige vyfhoekige piramide.

Spesifikasies:

Een basis van die seskantige prisma is in kontak met een basis van die vyfhoekige piramide. Beide vaste liggame word deur die snyvlak SS gesny.

Instrukasies:

Teken die volgende aansig van die TWEE vaste liggame volgens skaal 1:1:

- 2.1 Die gegewe vooraansig
- 2.2 Die deursnee-boaansig
- 2.3 Die deursnee-linkeraansig. Toon ALLE verborge besonderhede.

Toon ALLE nodige konstruksies .

(40)

QUESTION 2: SOLID GEOMETRY

GIVEN :

The front view and top view of a right regular hexagonal prism right square hole and a right regular pentagonal pyramid.

Specifications:

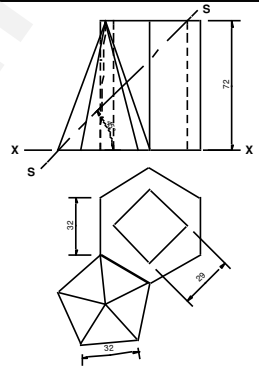
One base edge of the hexagonal prism is in contact with one base edge of the pentagonal pyramid. Both solids are cut by a cutting plane SS.

Instructions:

Draw, to scale 1:1, the following views of the TWO solids:

- 2.1 The given front view
- 2.2 The sectional top view.
- 2.3 The sectional left view. Show ALL hidden detail. Show all necessary construction.

(40)



ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA

1	KONST. + VOORAANSIG CONST. + FRONT VIEW	7	
2	DEURSNEE BOAANSIG SECTIONAL TOP VIEW	14	
3	DEURSNEE-LINKERAANSIG SECTIONAL LEFT VIEW	30 X ½	15
4	ARSEERING HATCHING	4	

TOTAAL / TOTAL

40

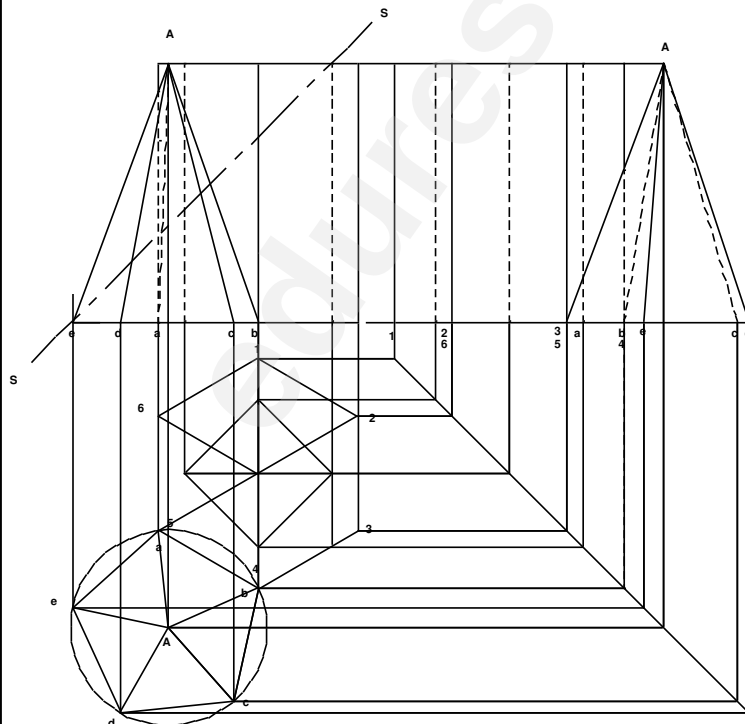
VRAAG 2
QUESTION 2

VASTE LIGGAME
SOLID GEOMETRY

NAAM / NAME:
DATUM / DATE:

GRAAD
GRADE 12

3.3



VRAAG 2: VASTE LIGGAME

GEGEE :

Die vooraansig en boaansig van 'n regte reëlmattige seskantige prisma met 'n regte vierkantige gat en 'n regte reëlmattige vyfhoekige piramide.

Spesifikasies:

Een basis van die seskantige prisma is in kontak met een basis van die vyfhoekige piramide. Beide vaste liggame word deur die snyvlak SS gesny.

Instrukasies:

Teken die volgende aansig van die TWEE vaste liggame volgens skaal 1:1:

- 2.1 Die gegewe vooraansig
- 2.2 Die deursnee-boaansig
- 2.3 Die deursnee-linkeraansig. Toon ALLE verborge besonderhede.

Toon ALLE nodige konstruksies .

(40)

QUESTION 2: SOLID GEOMETRY

GIVEN :

The front view and top view of a right regular hexagonal prism right square hole and a right regular pentagonal pyramid.

Specifications:

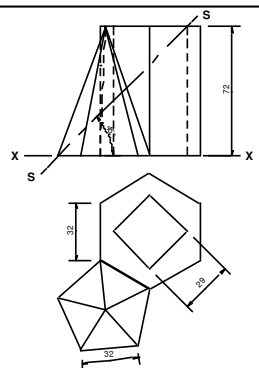
One base edge of the hexagonal prism is in contact with one base edge of the pentagonal pyramid. Both solids are cut by a cutting plane SS.

Instructions:

Draw, to scale 1:1, the following views of the TWO solids:

- 2.1 The given front view
- 2.2 The sectional top view.
- 2.3 The sectional left view. Show ALL hidden detail. Show all necessary construction.

(40)



ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA

1	KONST. + VOORAANSIG CONST. + FRONT VIEW	7	
2	DEURSNEE BOAANSIG SECTIONAL TOP VIEW	14	
3	DEURSNEE-LINKERAANSIG SECTIONAL LEFT VIEW	30 X ½	15
4	ARSEERING HATCHING	4	

TOTAAL / TOTAL

40

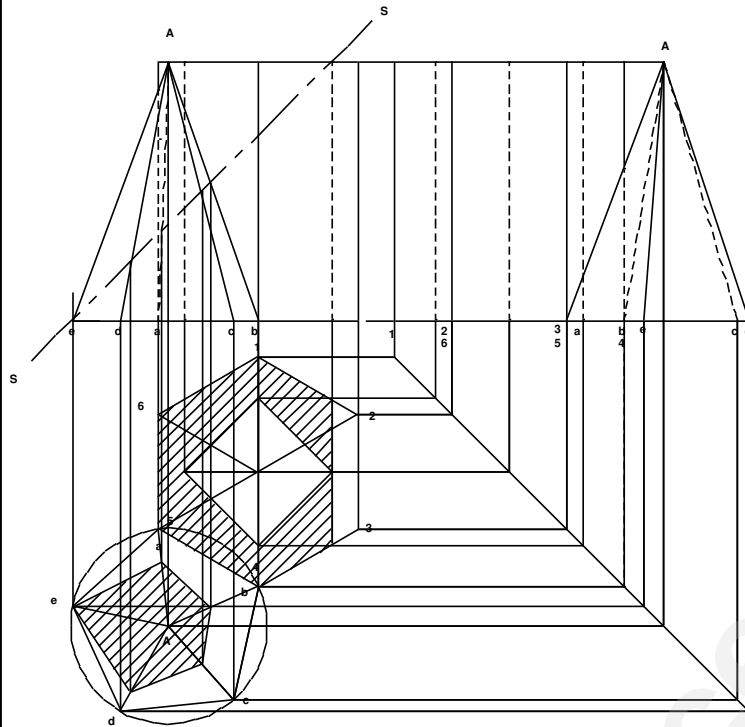
VRAAG 2
QUESTION 2

VASTE LIGGAME
SOLID GEOMETRY

NAAM / NAME:
DATUM / DATE:

GRAAD
GRADE 12

3.4



VRAAG 2: VASTE LIGGAME

GEGEE :

Die voorraansig en boaansig van 'n regte reëlmattige seskantige prisma met 'n regte vierkantige gat en 'n regte reëlmattige vyfhoekige piramide.

Spesifikasies:
Een basis sy van die seskantige prisma is in kontak met een basis sy van die vyfhoekige piramide.
Beide vaste liggame word deur die snyvlak SS gesny.

Instrukasies:
Teken die volgende aansigte van die TWEE vaste liggame volgens skaal 1:1:
2.1 Die gegewe voorraansig
2.2 Die deursnee-boaansig
2.3 Die deursnee-linkeraansig. Toon ALLE verborge besonderhede.

Toon ALLE nodige konstruksies. (40)

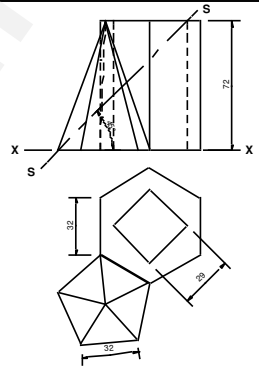
QUESTION 2: SOLID GEOMETRY

GIVEN :

The front view and top view of a right regular hexagonal prism right square hole and a right regular pentagonal pyramid.

Specifications:
One base edge of the hexagonal prism is in contact with one base edge of the pentagonal pyramid.
Both solids are cut by a cutting plane SS.

Instructions:
Draw, to scale 1:1, the following views of the TWO solids:
2.1 The given front view
2.2 The sectional top view
2.3 The sectional left view. Show ALL hidden detail. Show all necessary construction. (40)



ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA

1	KONST. + VOORAANSIG CONST. + FRONT VIEW	7	
2	DEURSNEE BOAANSIG SECTIONAL TOP VIEW	14	
3	DEURSNEE-LINKERAANSIG SECTIONAL LEFT VIEW	30 X ½	15
4	ARSEERING HATCHING	4	

TOTAAL / TOTAL 40

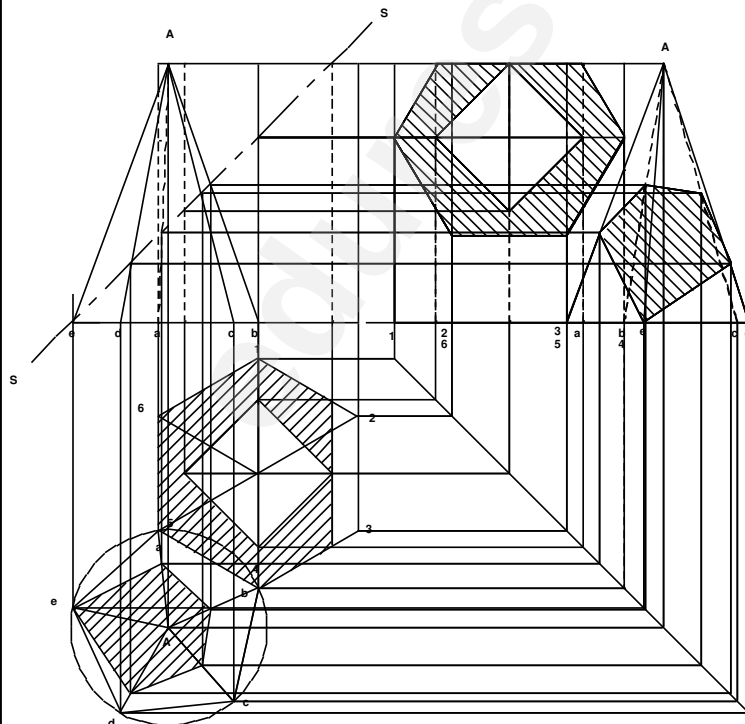
VRAAG 2
QUESTION 2

VASTE LIGGAME
SOLID GEOMETRY

NAAM / NAME:
DATUM / DATE:

GRAAD
GRADE 12

3.5



VRAAG 2: VASTE LIGGAME

GEGEE :

Die voorraansig en boaansig van 'n regte reëlmattige seskantige prisma met 'n regte vierkantige gat en 'n regte reëlmattige vyfhoekige piramide.

Spesifikasies:
Een basis sy van die seskantige prisma is in kontak met een basis sy van die vyfhoekige piramide.
Beide vaste liggame word deur die snyvlak SS gesny.

Instrukasies:
Teken die volgende aansigte van die TWEE vaste liggame volgens skaal 1:1:
2.1 Die gegewe voorraansig
2.2 Die deursnee-boaansig
2.3 Die deursnee-linkeraansig. Toon ALLE verborge besonderhede.

Toon ALLE nodige konstruksies. (40)

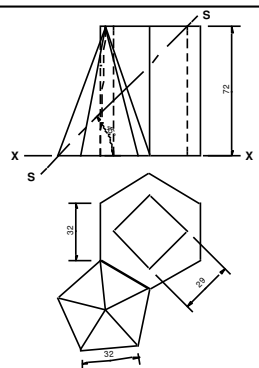
QUESTION 2: SOLID GEOMETRY

GIVEN :

The front view and top view of a right regular hexagonal prism right square hole and a right regular pentagonal pyramid.

Specifications:
One base edge of the hexagonal prism is in contact with one base edge of the pentagonal pyramid.
Both solids are cut by a cutting plane SS.

Instructions:
Draw, to scale 1:1, the following views of the TWO solids:
2.1 The given front view
2.2 The sectional top view
2.3 The sectional left view. Show ALL hidden detail. Show all necessary construction. (40)



ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA

1	KONST. + VOORAANSIG CONST. + FRONT VIEW	7	
2	DEURSNEE BOAANSIG SECTIONAL TOP VIEW	14	
3	DEURSNEE-LINKERAANSIG SECTIONAL LEFT VIEW	30 X ½	15
4	ARSEERING HATCHING	4	

TOTAAL / TOTAL 40

VRAAG 2
QUESTION 2

VASTE LIGGAME
SOLID GEOMETRY

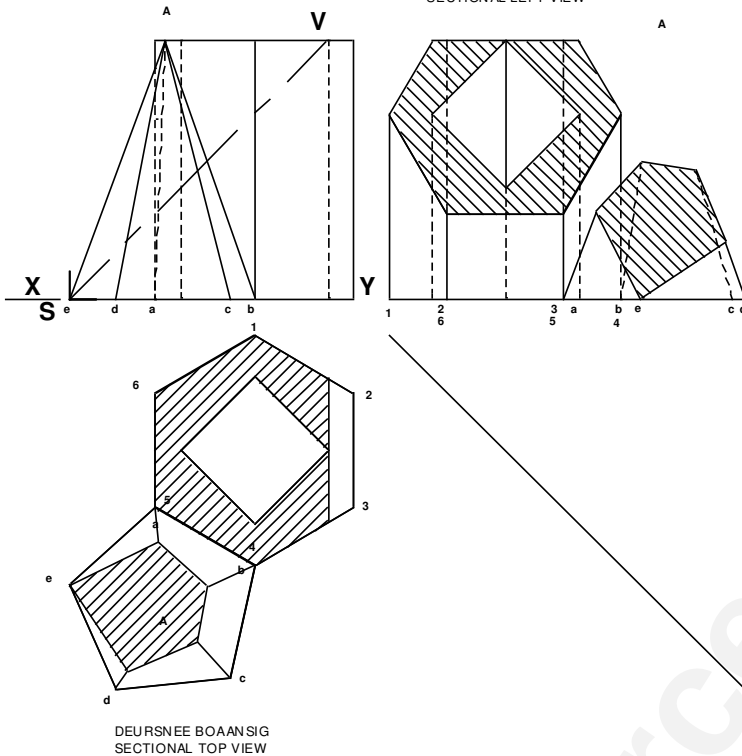
NAAM / NAME:
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GRADE 12

3.6

VOORAANSIG / FRONT VIEW

DEURSNEE-LINKERAANSIG
SECTIONAL LEFT VIEW



VRAAG 2: VASTE LIGGEME

GEGEE :

Die vooraansig en booaansig van 'n regte reëlmatige seskantige prisma met 'n reële vierkantige gat en 'n reële reëlmatige vyfhoekige piramide.

Spesifikasies:

Een basis van die seskantige prisma is in kontak met een basis van die vyfhoekige piramide. Beide vaste liggeme word deur die snyvlak SS gesny.

Instruksies:

Teken die volgende aansigte van die TWEE vaste liggeme volgens skaal 1:1:

2.1 Die gegewe vooraansig

2.2 Die deursnee-booaansig

2.3 Die deursnee-linkeraansig. Toon ALLE verborge besonderhede.

Toon ALLE nodige konstruksies.

(40)

QUESTION 2: SOLID GEOMETRY

GIVEN :

The front view and top view of a right regular hexagonal prism right square hole and a right regular pentagonal pyramid.

Specifications:

One base edge of the hexagonal prism is in contact with one base edge of the pentagonal pyramid. Both solids are cut by a cutting plane SS.

Instructions:

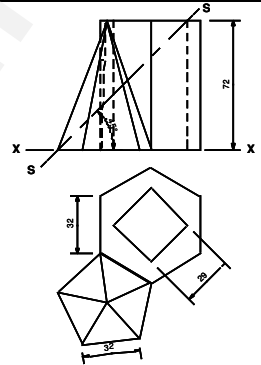
Draw, to scale 1:1, the following views of the TWO solids:

2.1 The given front view

2.2 The sectional top view

2.3 The sectional left view. Show ALL hidden detail. Show all necessary construction.

(40)



ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA

1	KONST. + VOORAANSIG CONST. + FRONT VIEW	7	
2	DEURSNEE BOAANSIG SECTIONAL TOP VIEW	14	
3	DEURSNEE-LINKERAANSIG SECTIONAL LEFT VIEW	30 X ½	15
4	ARSEERING HATCHING	4	

TOTAAL / TOTAL

40

VRAAG 2
QUESTION 2

VASTE LIGGEME
SOLID GEOMETRY

NAAM / NAME:
DATUM / DATE:

GRAAD
GRADE 12

INTERPENETRATIONS AND DEVELOPMENTS

HEXAGON AND CYLINDER

Interpenetrations and developments are in Question Paper 1 Question 2. Let's see what we must do:

Drawing 1 (4.1)

GIVEN:

- It is paper 1, so it will be in first orthographic projection.
- An incomplete front view (A) and an incomplete top view (B) are shown.
- It is a hexagonal prism in which a cylinder penetrates at a 60° angle.
- The position from which we must start drawing is given i.e. point D. This is the CENTRE POINT from where the hexagon must be constructed.

INSTRUCTIONS:

- We draw in scale 1:1.
- Start at point D, the centre point of the hexagon.
- Next we draw the front view with the penetration curve.
- Then we must do the development.
- All constructions and calculations must be shown.

Drawing 2 (4.2)

START DRAWING:

- We start with the hexagon. Use the vertical centre line and measure 25 mm above and 25 mm below. Draw horizontal construction lines through the points, at the top and below. Lengthen the given horizontal centre line at D to both sides. Draw a 60° line through the centre point. Where your 60° line crosses with the 25 mm line, is the point where the rest of the hexagon can be constructed. You may use the 60° set square or a compass. Another method can be used where you draw a circle inside the hexagon and use the 60° set square to complete the hexagon around the circle.
- The front view can be done now. Please note where the 45° centre line of the cylinder starts.

Drawing 3 (4.3)

- The end (ellipse) of the cylinder can be drawn now. Look at the cylinder on the front view. Draw semi-circle and divide in six equal parts.
- Project these points down to to the top view.
- Draw another semi-circle, but this time on the cylinder at the top view. Project these points across horizontally.
- Find the points for the construction of the ellipse and draw the curve with a French curve or a flexi curve.

Drawing 4 (4.4)

- Top View: Where the projection line touches the hexagonal prism, project then up to the front view. The curve will be the projection of the cylinder, on the front view,

cuts the projection lines of the top view. Draw this curve with a French curve or a flexi-curve.

Drawing 5 (4.5)

- Development of the cylinder: Project all the points obtained on the cylinder in the front view, down. Please note: These lines must be at an angle of 90° with the sides of the cylinder. In this case it will be at 45° , because the cylinder is also on 45° .
- We must do an easy mathematical calculation to determine the circumference of the cylinder. Do the calculations on your drawing sheet, it counts marks.
- Measure the distance (144,6 mm)
- Determine the points for the development and draw the curve with a French curve or a flexi curve. Remember that a freehand curve is not worth any marks!

Drawing 6 (4.6)

- This is the complete drawing, without any construction lines. Do not erase your construction lines! This drawing is there for you to check the correctness of your drawing.

4.1

VRAAG 2: DEURDRINGING EN ONTWIKKELING

GEGEE:

- Die onvolledige vooraansig en bo-aansig van 'n verbindingsstuk vir 'n ventiliestelsel. Die verbindingsstuk bestaan uit 'n seskantige pyp (A) en 'n silindriese takpyp (B) wat in 'n gemeenskaplike vertikale vlak lê.
- Middelpunt D as die verwysingspunt op die tekenvel

INSTRUKSIES:

2.1 Teken, volgens skaal 1 : 1, die volgende aansigte van die verbindingsstuk:

2.1.1 Die volledige bo-aansig deur punt D as die verwysingspunt te gebruik.

2.1.2 Die volledige vooraansig wat die deurdringingskurwe duidelik toon.

2.2 Ontwikkel die oppervlak van die silindriese takpyp (B).

• Toon ALLE nodige konstruksies en berekeninge. **[40]**

QUESTION 2: INTERPENETRATION AND DEVELOPMENT

GIVEN:

- The incomplete front view and top view of a connecting piece for a ventilation system. The connecting piece consists of a hexagonal pipe (A) and a cylindrical branch pipe (B) that lie in a common vertical plane.
- Centre point D as the reference point on the drawing sheet.

INSTRUCTIONS:

2.1 Draw, to a scale 1 : 1, the following views of the connecting piece:

2.1.1 The complete top view using point D as the reference point.

2.1.2 Develop the surface of the cylindrical pipe (B).

• Show ALL necessary construction and calculations. **[40]**

ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA			
1	GEGEE / GIVEN SENTELYNE / CENTE LINES	3	
2	HULPSIRKELS / AUX. CIRCLES	4	
3	PROJEKSIE / PROJECTION	4	
4	VOORAANSIG / FRONT VIEW	7	
5	BOAANSIG TOP VIEW	8	
6	ONTWIKKELING C / DEVELOPMENT C	14	
TOTAAL / TOTAL		40	

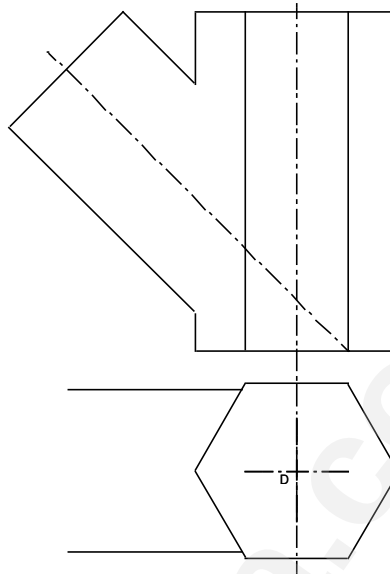
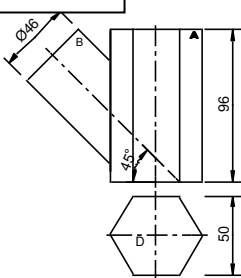
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VRAAG 2
QUESTION 2

DEURDRINGING & ONTWIKKELING
INTERPENETRATION & DEVELOPMENT

NAAM / NAME:
DATUM / DATE:

**GRAAD
GRADE** 12

4.2

**VRAAG 2: DEURDRINGING EN ONTWIKKELING****GEGEE:**

- Die onvolledige vooraansig en bo-aansig van 'n verbindingstuk vir 'n ventilasiesistiem. Die verbindingstuk bestaan uit 'n seskantige pyp (A) en 'n silindriese takpyp (B) wat in 'n gemeenskaplike vertikale vlak lê.

- Middelpunt D as die verwysingspunt op die tekenvel

INSTRUKSIES:

- 2.1 Teken, volgens skaal 1 : 1, die volgende aansigte van die verbindingstuk:

- 2.1.1 Die volledige bo-aansig deur punt D as die verwysingspunt te gebruik.

- 2.1.2 Die volledige vooraansig wat die deurdringingskurwe duidelik toon.

- 2.2 Ontwikkel die oppervlak van die silindriese takpyp (B).

- Toon ALLE nodige konstruksies en berekeninge. [40]

QUESTION 2: INTERPENETRATION AND DEVELOPMENT**GIVEN:**

- The incomplete front view and top view of a connecting piece for a ventilation system. The connecting piece consists of a hexagonal pipe (A) and a cylindrical branch pipe (B) that lie in a common vertical plane.

- Centre point D as the reference point on the drawing sheet.

INSTRUCTIONS:

- 2.1 Draw, to a scale 1 : 1, the following views of the connecting piece:

- 2.1.1 The complete top view using point D as the reference point.

- 2.1.2 Develop the surface of the cylindrical pipe (B).

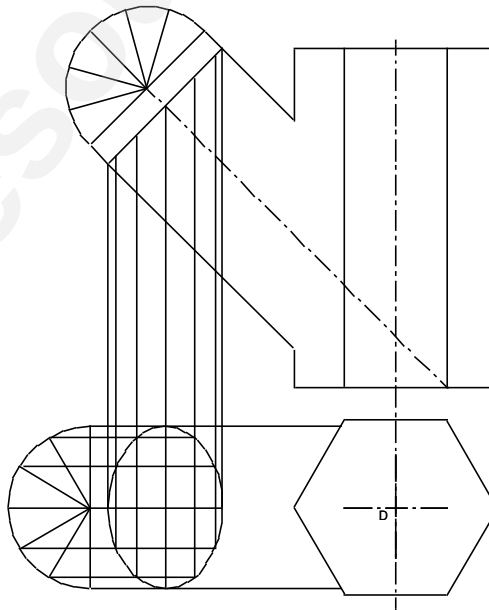
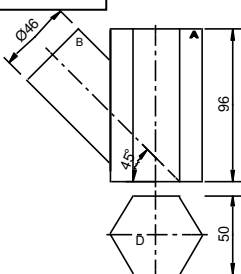
- Show ALL necessary construction and calculations. [40]

ASSESSINGSKRITERIA / ASSESSMENT CRITERIA

1	GEGEE / GIVEN SENTELYNE / CENTE LINES	3	
2	HULPSIRKELS / AUX. CIRCLES	4	
3	PROJEKSIE / PROJECTION	4	
4	VOORAANSIG / FRONT VIEW	7	
5	BOAANSIG TOP VIEW	8	
6	ONTWIKKELING C / DEVELOPMENT C	14	
	TOTAAL / TOTAL	40	

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QUESTION 2DEURDRINGING & ONTWIKKELING
INTERPENETRATION & DEVELOPMENTNAAM / NAME:
DATUM / DATE:GRAAD
GRADE 12

4.3

**VRAAG 2: DEURDRINGING EN ONTWIKKELING****GEGEE:**

- Die onvolledige vooraansig en bo-aansig van 'n verbindingstuk vir 'n ventilasiesistiem. Die verbindingstuk bestaan uit 'n seskantige pyp (A) en 'n silindriese takpyp (B) wat in 'n gemeenskaplike vertikale vlak lê.

- Middelpunt D as die verwysingspunt op die tekenvel

INSTRUKSIES:

- 2.1 Teken, volgens skaal 1 : 1, die volgende aansigte van die verbindingstuk:

- 2.1.1 Die volledige bo-aansig deur punt D as die verwysingspunt te gebruik.

- 2.1.2 Die volledige vooraansig wat die deurdringingskurwe duidelik toon.

- 2.2 Ontwikkel die oppervlak van die silindriese takpyp (B).

- Toon ALLE nodige konstruksies en berekeninge. [40]

QUESTION 2: INTERPENETRATION AND DEVELOPMENT**GIVEN:**

- The incomplete front view and top view of a connecting piece for a ventilation system. The connecting piece consists of a hexagonal pipe (A) and a cylindrical branch pipe (B) that lie in a common vertical plane.

- Centre point D as the reference point on the drawing sheet.

INSTRUCTIONS:

- 2.1 Draw, to a scale 1 : 1, the following views of the connecting piece:

- 2.1.1 The complete top view using point D as the reference point.

- 2.1.2 Develop the surface of the cylindrical pipe (B).

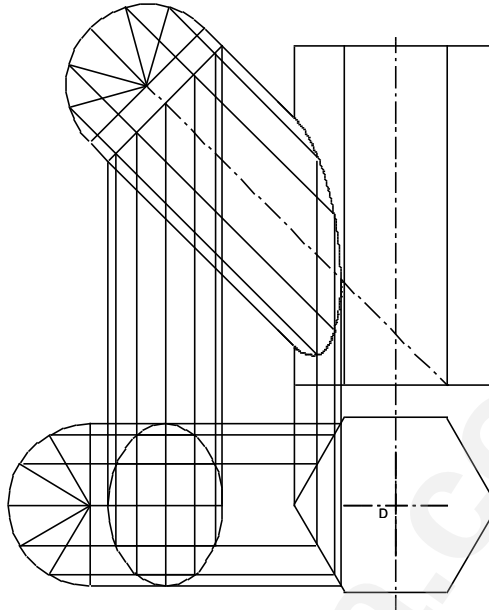
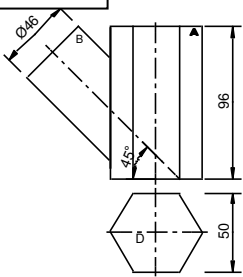
- Show ALL necessary construction and calculations. [40]

ASSESSINGSKRITERIA / ASSESSMENT CRITERIA

1	GEGEE / GIVEN SENTELYNE / CENTE LINES	3	
2	HULPSIRKELS / AUX. CIRCLES	4	
3	PROJEKSIE / PROJECTION	4	
4	VOORAANSIG / FRONT VIEW	7	
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QUESTION 2DEURDRINGING & ONTWIKKELING
INTERPENETRATION & DEVELOPMENTNAAM / NAME:
DATUM / DATE:GRAAD
GRADE 12

4.4

**VRAAG 2: DEURDRINGING EN ONTWIKKELING****GEGEE:**

- Die onvolledige vooraansig en bo-aansig van 'n verbindingstuk vir 'n ventilasiesistiem. Die verbindingstuk bestaan uit 'n seskantige pyp (A) en 'n silindriese takpyp (B) wat in 'n gemeenskaplike vertikale vlak lê.

- Middelpunt D as die verwysingspunt op die tekenvel

INSTRUKSIES:

- 2.1 Teken, volgens skaal 1 : 1, die volgende aansigte van die verbindingstuk:

- 2.1.1 Die volledige bo-aansig deur punt D as die verwysingspunt te gebruik.

- 2.1.2 Die volledige vooraansig wat die deurdringingskurwe duidelik toon.

- 2.2 Ontwikkel die oppervlak van die silindriese takpyp (B).

- Toon ALLE nodige konstruksies en berekeninge. [40]

QUESTION 2: INTERPENETRATION AND DEVELOPMENT**GIVEN:**

- The incomplete front view and top view of a connecting piece for a ventilation system. The connecting piece consists of a hexagonal pipe (A) and a cylindrical branch pipe (B) that lie in a common vertical plane.

- Centre point D as the reference point on the drawing sheet.

INSTRUCTIONS:

- 2.1 Draw, to a scale 1 : 1, the following views of the connecting piece:

- 2.1.1 The complete top view using point D as the reference point.

- 2.1.2 Develop the surface of the cylindrical pipe (B).

- Show ALL necessary construction and calculations.

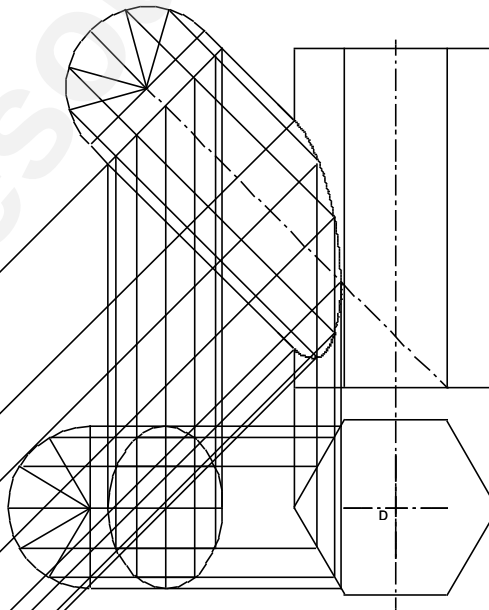
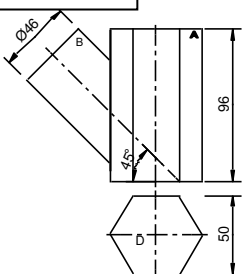
[40]

ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA

1	GEGEE / GIVEN SENTELYNE / CENTE LINES	3
2	HULPSIRKELS / AUX. CIRCLES	4
3	PROEKSIE / PROJECTION	4
4	VOORAANSIG / FRONT VIEW	7
5	BOAANSIG TOP VIEW	8
6	ONTWIKKELING C / DEVELOPMENT C	14
	TOTAAL / TOTAL	40

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VRAAG 2
QUESTION 2DEURDRINGING & ONTWIKKELING
INTERPENETRATION & DEVELOPMENTNAAM / NAME:
DATUM / DATE:GRAAD
GRADE 12

4.5

**BEREKENINGE / CALCULATIONS**

$$\begin{aligned}\text{OMTREK VAN SIRKEL / CIRCUMFERENCE OF CIRCLE} &= 2 \pi r \\ &= 2 \times \pi \times 23 \\ &= 144.6\end{aligned}$$

VRAAG 2: DEURDRINGING EN ONTWIKKELING**GEGEE:**

- Die onvolledige vooraansig en bo-aansig van 'n verbindingstuk vir 'n ventilasiesistiem. Die verbindingstuk bestaan uit 'n seskantige pyp (A) en 'n silindriese takpyp (B) wat in 'n gemeenskaplike vertikale vlak lê.

- Middelpunt D as die verwysingspunt op die tekenvel

INSTRUKSIES:

- 2.1 Teken, volgens skaal 1 : 1, die volgende aansigte van die verbindingstuk:

- 2.1.1 Die volledige bo-aansig deur punt D as die verwysingspunt te gebruik.

- 2.1.2 Die volledige vooraansig wat die deurdringingskurwe duidelik toon.

- 2.2 Ontwikkel die oppervlak van die silindriese takpyp (B).

- Toon ALLE nodige konstruksies en berekeninge. [40]

QUESTION 2: INTERPENETRATION AND DEVELOPMENT**GIVEN:**

- The incomplete front view and top view of a connecting piece for a ventilation system. The connecting piece consists of a hexagonal pipe (A) and a cylindrical branch pipe (B) that lie in a common vertical plane.

- Centre point D as the reference point on the drawing sheet.

INSTRUCTIONS:

- 2.1 Draw, to a scale 1 : 1, the following views of the connecting piece:

- 2.1.1 The complete top view using point D as the reference point.

- 2.1.2 Develop the surface of the cylindrical pipe (B).

- Show ALL necessary construction and calculations.

[40]

ASSESSERINGSKRITERIA / ASSESSMENT CRITERIA

1	GEGEE / GIVEN SENTELYNE / CENTE LINES	3
2	HULPSIRKELS / AUX. CIRCLES	4
3	PROEKSIE / PROJECTION	4
4	VOORAANSIG / FRONT VIEW	7
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6	ONTWIKKELING C / DEVELOPMENT C	14
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VRAAG 2
QUESTION 2DEURDRINGING & ONTWIKKELING
INTERPENETRATION & DEVELOPMENTNAAM / NAME:
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GRADE 12

4.6

VRAAG 2: DEURDRINGING EN ONTWIKKELING

GEGEE:

- Die onvolledige vooraansig en bo-aansig van 'n verbindingstuk vir 'n ventilasiesetel. Die verbindingstuk bestaan uit 'n seskantige pyp (A) en 'n silindriese takpyp (B) wat in 'n gemeenskaplike vertikale vlak lê.
- Middelpunt D as die verwysingspunt op die tekenvel.

INSTRUKSIES:

2.1 Teken, volgens skaal 1 : 1, die volgende aansigte van die verbindingstuk:

2.1.1 Die volledige bo-aansig deur punt D as die verwysingspunt te gebruik.

2.1.2 Die volledige vooraansig wat die deurdringingskurwe duidelik toon.

2.2 Ontwikkel die oppervlak van die silindriese takpyp (B).

• Toon ALLE nodige konstruksies en berekeninge. **[40]**

QUESTION 2: INTERPENETRATION AND DEVELOPMENT

GIVEN:

- The incomplete front view and top view of a connecting piece for a ventilation system. The connecting piece consists of a hexagonal pipe (A) and a cylindrical branch pipe (B) that lie in a common vertical plane.
- Centre point D as the reference point on the drawing sheet.

INSTRUCTIONS:

2.1 Draw, to a scale 1 : 1, the following views of the connecting piece:

2.1.1 The complete top view using point D as the reference point.

2.1.2 Develop the surface of the cylindrical pipe (B).

• Show ALL necessary construction and calculations. **[40]**

BEREKENINGE / CALCULATIONS

OMTREK VAN SIRKEL / CIRCUMFERENCE OF CIRCLE = $2 \pi r$

= $2 \times \pi \times 23$

= 144.6

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VRAAG 2
QUESTION 2

DEURDRINGING & ONTWIKKELING
INTERPENETRATION & DEVELOPMENT

NAAM / NAME:
DATUM / DATE:

GRAAD
GRADE 12

GRADE 12 EXAMINATION PAPERS

GRADE 12 EXAMINATION PAPERS					
PAPER 1 -Civil-(3 hours) In first-angle orthographic projection			PAPER 2 -Mechanical-(3 hours) In third-angle orthographic projection		
Q 1	Civil analytical	± 15%	Q 1	Mechanical analytical	± 15%
Q 2	Interpenetration and development and/or development of a transition piece and/or solid geometry	± 20%	Q 2	Loci of a helix and/or loci of a cam and/or loci of a point(s) of a mechanism	± 20%
Q 3	2-point perspective drawing	± 20%	Q 3	Isometric drawing	± 20%
Q 4	Civil working drawing including electrical features	± 45%	Q 4	Mechanical assembly	± 45%