

VREDENBURG HOËRSKOOL

SIVIELE TEGNOLOGIE /  
CIVIL TECHNOLOGY

NOV 2014

CIVIL TECHNOLOGY  
SIVIELE TEGNOLOGIE

GRAAD/GRADE 10

NOVEMBER 2014

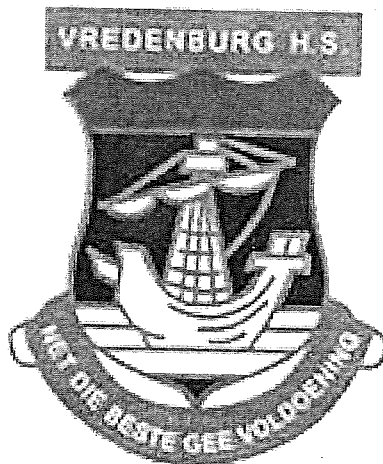
EKS: F. OBERHOLZER

TYD/TIME: 3 URE / 3 HOURS

PUNTE/MARKS: 200

NAAM/NAME: \_\_\_\_\_

GRAAD/GRADE: \_\_\_\_\_



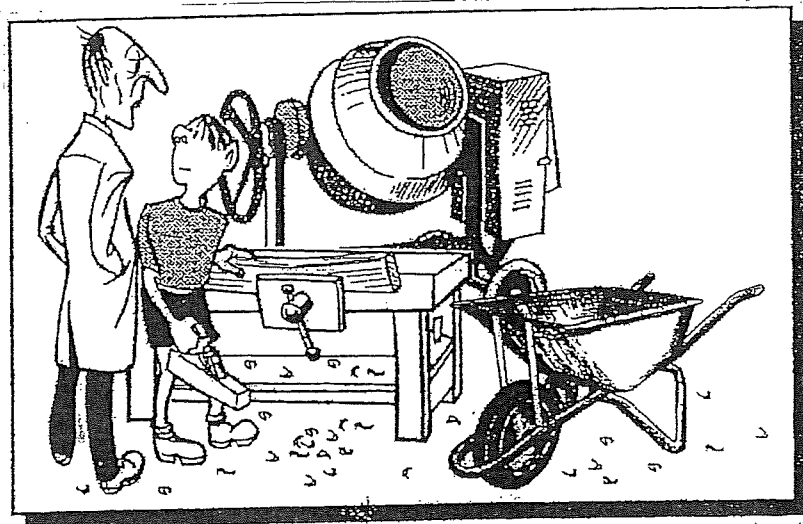
NET DIE BESTE GEE VOLDOENING  
ONLY THE BEST SATISFIES

### BENODIGDHEDE:

- Antwoordeboek
- Teken antwoordeboek
- Tekeninstrumente (leerders voorsien hul eie)
- Geen programmeerbare sakrekenaars nie (leerders voorsien hul eie)

### INSTRUKSIES EN INLIGTING

1. Beantwoord AL die vrae.
2. Begin elke vraag op 'n NUWE bladsy.
3. Beantwoord elke vraag as 'n geheel. MOENIE onderafdelings skei nie.
4. Skets mag gebruik word om jou antwoorde toe te lig.
5. ALLE berekeninge en geskrewe antwoorde moet in die ANTWOORDEBOEK gedoen word.
6. Tekeninge en sketse moet van titels, afmetings en byskrifte voorsien word wat aan die SANS (SABS) se Voorgeskrewe Praktyk vir Boutekene voldoen.
7. Vir die doel van hierdie eksamen word die afmetings vir 'n steen as 220 mm x 110 mm x 75 mm geneem.
8. Gebruik jou eie oordeel waar afmetings en/of detail uitgelaat is.

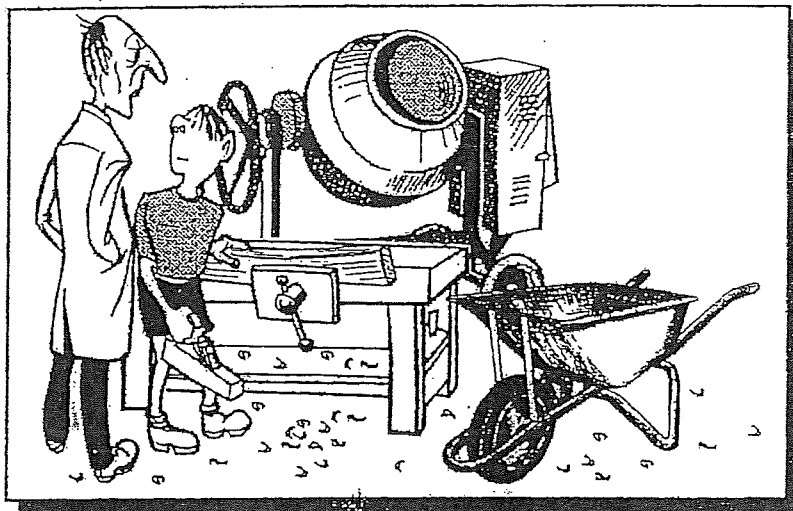


**REQUIREMENTS:**

- Answer book
- Drawing answer book
- Drawing instruments (learners to provide their own)
- Non-programmable calculators (learners to provide their own)

**INSTRUCTIONS AND INFORMATION**

1. ALL the questions are **COMPULSORY**.
2. Start each question on a **NEW** page.
3. Answer each question as a whole, do **NOT** separate sub-questions.
4. Sketches may be used to illustrate your answers.
5. ALL calculations and written answers must be done in the **ANSWER BOOK**.
6. Drawings and sketches must be fully dimensioned and neatly finished off with titles and labels to conform with the *SANS (SABS) Recommended Practice for Building Drawings*.
7. For the purpose of this examination, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
8. Use your own judgement where dimensions and/or details have been omitted.



## VRAAG 1

- 1.1 Stene kan in verskillende verbande gelê word. Sommige word gelê vir hul mooi voorkoms en ander vir hul stabiliteit en sterkte.
- 1.1.1 Teken vryhand, in goeie verhouding, die vooraansig van 'n muur in **strykverband**, DRIE lae hoog. (4)
- 1.1.2 Teken TWEE opeenvolgende planlae van 'n hoekaansluiting (regte hoek) van 'n eensteenmuur gebou in **strykverband**. Toon ten minste DRIE stene weerskante van die hoek. (8)
- 1.2 Jy is 'n messelaar op die terrein en daar word van jou verwag om die muur waarna in VRAAG 1.1 verwys word, te bou.
- 1.2.1 Wat is die bestanddele (materiaal) wat gebruik sal word om dagha (mortel) te meng? (3)
- 1.2.2 Wat is die gemiddelde dikte van dagha (mortel) tussen steenlae? (1)
- 1.2.3 Wat is die eienskappe van goeie dagha (mortel)? (2)
- 1.2.4 Maak 'n netjiese skets van TWEE tipes voegstryking wanneer dagha (mortel) gebruik word om sierstene te lê. (2)
- 1.2.5 Wat is die doel van dagha (mortel)? (1)
- 1.2.6 Watter materiaal word gebruik om steenwerk te versterk (wapen)? (1)
- 1.2.7 Wat sal die spasiëring van wapening tussen die steenlae van 'n muur bepaal? (1)
- 1.3 Jy is 'n messelaar en moet die mure van 'n gebou uitlê.
- 1.3.1 Wat sal jy gebruik om seker te maak dat die stene gelyk gelê word en dat die hoeke op dieselfde vlak ontmoet? (1)
- 1.3.2 Verduidelik hoe jy 'n houtdeurkosyn sal opstel en belyn vir inbou in 'n muur. (4)
- 1.4 Soos werk vorder moet voorsiening gemaak word vir toegang en die vervoer van materiaal tot hoër vlakke. Steierwerk word vir hierdie doeleindes gebruik. (2)
- Noem TWEE veiligheidsmaatreëls van toepassing op steierwerk. (2)

QUESTION 1

- 1.1 Bricks can be laid in different bonds. Some of them are laid to show aesthetic value, whilst others are laid for their strength.
- 1.1.1 Draw freehand, in good proportion, the front elevation of a wall in Stretcher bond. THREE courses high. (4)
- 1.1.2 Draw TWO alternate plan courses of a quoin (right angle) of a one-brick wall built in stretcher bond. Show at least THREE bricks on each corner of the wall. (8)
- 1.2 You are a bricklayer on site, and you are required to build the wall referred to in QUESTION 1.1:
- 1.2.1 What are the ingredients (materials) that will be used for the mixing of mortar? (3)
- 1.2.2 What is the average thickness of mortar between courses? (1)
- 1.2.3 What are the properties of good mortar? (2)
- 1.2.4 Make a neat sketch of TWO types of jointing used on the mortar, when laying face bricks. (2)
- 1.2.5 What is the purpose of mortar? (1)
- 1.2.6 What material is used to reinforce brickwork? (1)
- 1.2.7 What will determine the spacing of the reinforcement between the courses in the wall? (1)
- 1.3 You are a bricklayer and you have to set out the walls for a building.
- 1.3.1 What will you use to ensure that the bricks are laid level, and the corners meet at the same level? (1)
- 1.3.2 Explain how you would set up, align and secure a wooden door frame into a wall. (4)
- 1.4 As work progresses there is a need to provide access and transport materials to higher levels. Scaffolding is used for this purpose.
- List TWO safety precautions applicable to scaffolding. (2)

[30]

**VRAAG 2:****2.1 VEILIGHEID**

'n Bôuperseel kan 'n gevaarlike omgewing wees wat gevare vir werkers en ander mense inhou.

2.1.1 Watter veiligheidstoerusting sal jy gebruik om jou kop, liggaam en voete teen moontlike beserings te beskerm? (3)

2.1.2 Elektriese toerusting word algemeen op boupersele gebruik en as gevolg van klam toestande kan elektriese skokke soms voorkom. Noem VIER stappe wat jy sal volg om iemand wat 'n elektriese skok opgedoen het se lewe te red. (4)

**2.2 TERREINONDERSOEK**

Voordat enige planne vir 'n gebou opgestel kan word moet 'n terreinondersoek uitgevoer word om inligting in te win wat die argitek en ingenieurs sal help met die beplanning van die gebou. Noem enige SES faktore wat belangrik is en ondersoek behoort te word. (6)

**2.3 DIE UITLÊ VAN 'n GEBOU**

FIGUUR 2.3 toon 'n gedetailleerde skets van die uitleg van 'n gebou.

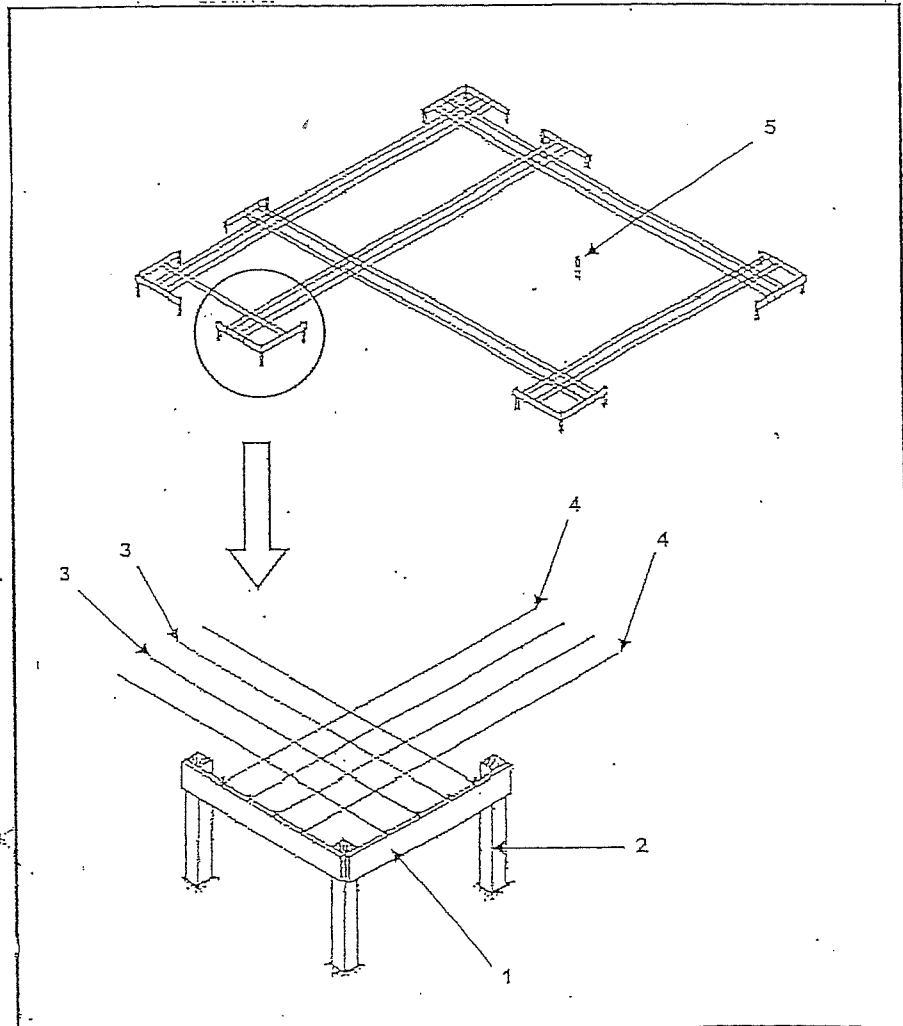


FIGURE 2.3

## Siviele Tegnologie

2.3.1 Skryf die nommers 1 tot 5 ondermekaar in jou antwoordeboek neer en benoem die fasette in die skets soos aangedui deur nommers 1 tot 5. (5)

2.3.2 Beskryf kortliks die funksie van elke faset verteenwoordig in FIGUUR 2.3, genummer 1 tot 5. (5)

2.3.3 Beskryf kortliks hoe jy die 3-4-5 metode sal gebruik om regte hoeke uit te meet. Gebruik 'n vryhandskets om jou antwoord toe te lig. (5)

## 2.4 FONDASIES

2.4.1 Wat is die doel van fondasies? (2)

2.4.2 Noem DRIE faktore wat die grootte van 'n fondasie bepaal. (3)

## 2.5 FONDASIEMURE

Teken in goeie verhouding die vooraansig van 'n eensteenmuur. Toon die volgende:

2.5.1 Vier agtereenvolgende lae in strykverband (4)

2.5.2 Toon verbanding aan die een kant (1)

2.5.3 Skuinsverband aan die ander kant (1)

## 2.6 DIE VLOERBLAD

Wat is die dikte van die vloerblad vir 'n enkelverdieping woonhuis? (1)  
[40]



**QUESTION 2:**

2.1 SAFETY

A building site can be a dangerous environment which creates risks for the building workers and other people.

2.1.1 What safety gear/equipment will you use to protect your head, body and feet against possible injury? (3)

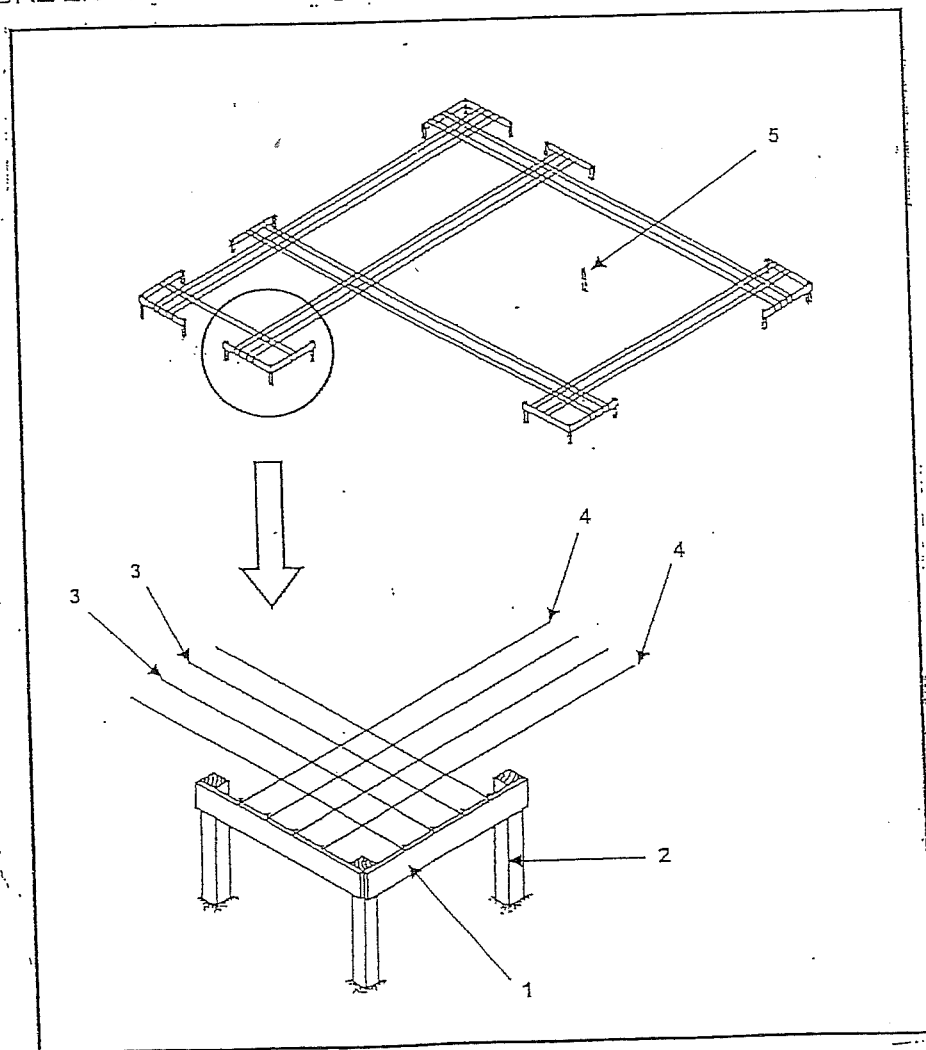
2.1.2 Electrical equipment is commonly used on building sites and due to the sometimes wet conditions, electrical shocks may be possible. State FOUR steps you would follow to save a person's life that suffers an electrical shock on site. (4)

2.2 SITE INVESTIGATION

Before any plans can be made to erect a building on a site, an investigation should be carried out to gather information to guide/assist the architect and engineers in the planning of the building. State any SIX factors which are important and which should be investigated. (6)

2.3 SETTING OUT THE BUILDING

FIGURE 2.3 shows the setting out of a building and a detailed sketch.



FIGUUR 2.3

Civil Technology

2.3.1 Write the numbers 1 to 5 underneath each other in your answer book and name the facets in the drawing indicated by the numbers 1 to 5. (5)

2.3.2 Briefly describe the function of each facet labelled 1 to 5 presented in FIGURE 2.3. (5)

2.3.3 Briefly describe how you will use the 3-4-5 method to set out right angles. Use a freehand drawing to support your explanations. (5)

2.4 FOUNDATIONS

2.4.1 What is the purpose of foundations? (2)

2.4.2 State THREE factors which will determine the size of a foundation. (3)

2.5 FOUNDATION WALLS

Draw, to good proportion, the front elevation of a one-brick wall showing the following:

2.5.1 FOUR consecutive courses in stretcher bond (4)

2.5.2 Show tothing on the one end (1)

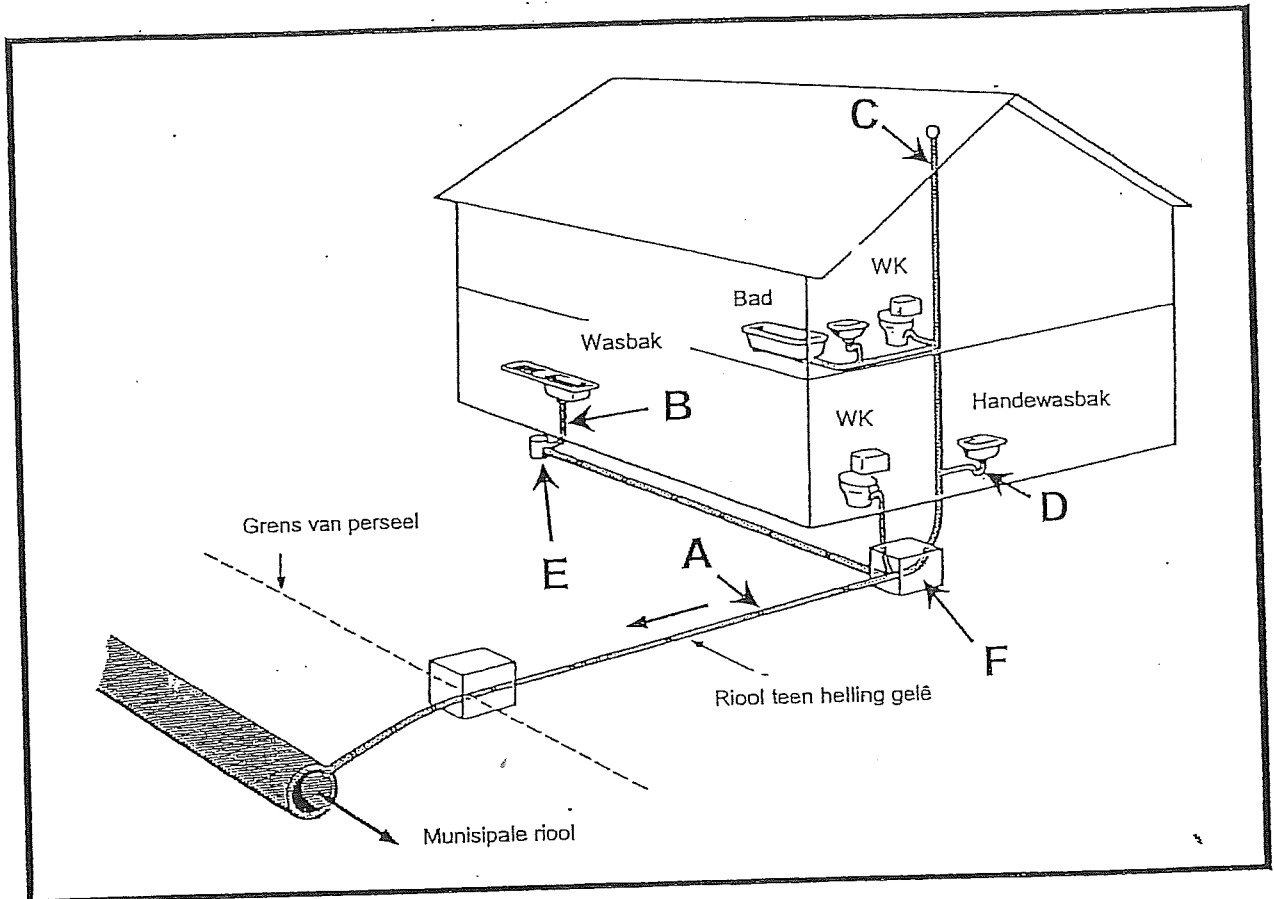
2.5.3 Show raking on the other end (1)

2.6 THE FLOOR SLAB

What is the thickness of a floor slab for a single-storey residential house? (1)  
[40]

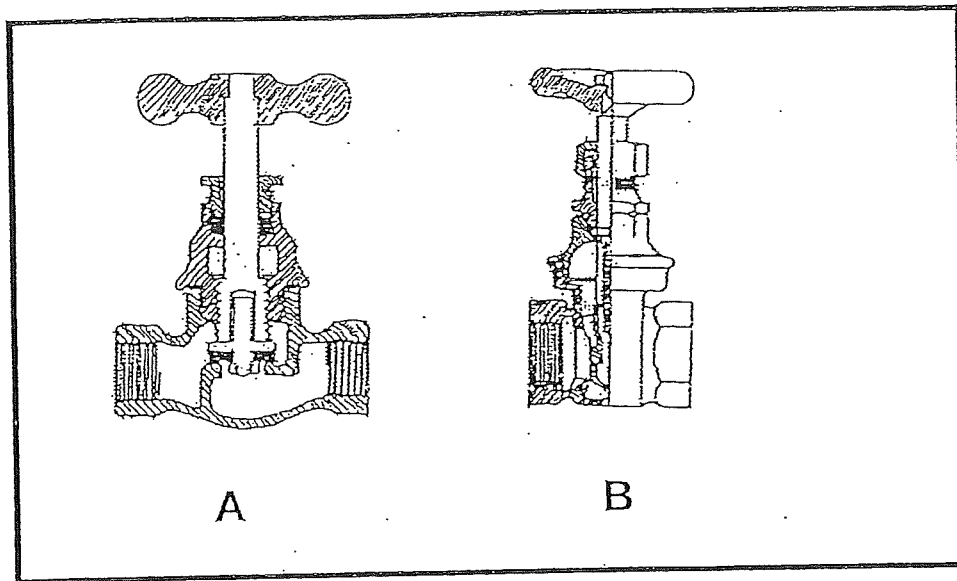
VRAAG 3

3.1 Die onderstaande skets toon die afvoertleg van vuilwater en riool vanaf die huis na die munisipale riool. Bestudeer die skets en beantwoord die volgende vrae:



- 3.1.1 : Wat behoort die deursnee van pyp A te wees? (1)
- 3.1.2 : Wat behoort die deursnee van pyp B te wees? (1)
- 3.1.3 : Wat is die doel van C? (1)
- 3.1.4 : Wat is die doel van D? (1)
- 3.1.5 : Identifiseer onderdeel E. (1)
- 3.1.6 : Wat is die doel van F? (1)
- 3.1.7 : Wat is die aanbevole helling vir A? (1)

3.2 Onderstaande figuur toon twee loodgieterstoebehore.









- 3.2.1 Identifiseer toebehore A en B nadat jy die samestelling van die twee tekening hierbo vergelyk het. (2)
- 3.2.2 Waar sal toebehore A en B in die watertoevoerstelsel gebruik word? (2)
- 3.2.3 Wat is die oorsake van 'n waterslag in 'n warmwaterstelsel? (3)
- 3.2.4 Wanneer bouplanne geteken word, word loodgietersinstallasies deur middel van verskillende simbole aangedui. Wat stel die volgende simbole voor? (5)
- (a) RP
  - (b) IO
  - (c) MG
  - (d) OWB
  - (e) DWP

3.3 As tekenaar word van jou verwag om 'n huis te ontwerp en die korrekte elektriese simbole vir elektriese toebehore aan te toon. Deur na die simbolestaat te verwys, toon die toepaslike simbole deur van die goedgekeurde SANS (SABS) kode op die aangehegte antwoordblad gebruik te maak.

Die volgende moet op die antwoordblad wat voorsien is, getoon word:

- 'n Lig en ligskakelaar in elke vertrek
- Vier kontakskakke moet in die huis aangebring word
- Die posisie van die elektrisiteitsmeter
- Die posisie van die verdeelbord

1	2	3	4
Beskrywing	Simbool	Beskrywing	Simbool
<b>KRAG</b>		<b>BELIGTING</b>	
Verdeelkas		Noodlig	
Aarde		Fluoresseerlig (3 buise van 40 W)	 3 x 40 W
Meterkas (watt-meterlesing)		Lig (3 gloeilampe van 40 W)	 3 x 40 W
Eenrigtingskakelaar enkelpool		Lig, muurgemonteer	
Eenrigtingskakelaar dubbelpool		<b>KOMMUNIKASIE</b>	
Eenrigtingskakelaar driepool		Telefoon, binnenshuis	
Tweerigtingskakelaar		Telefoon, publieke	
Reëlskakelaar, by- voorbeeld verdof- skakelaar			
Sokuitgang			
Skakelaarsok			

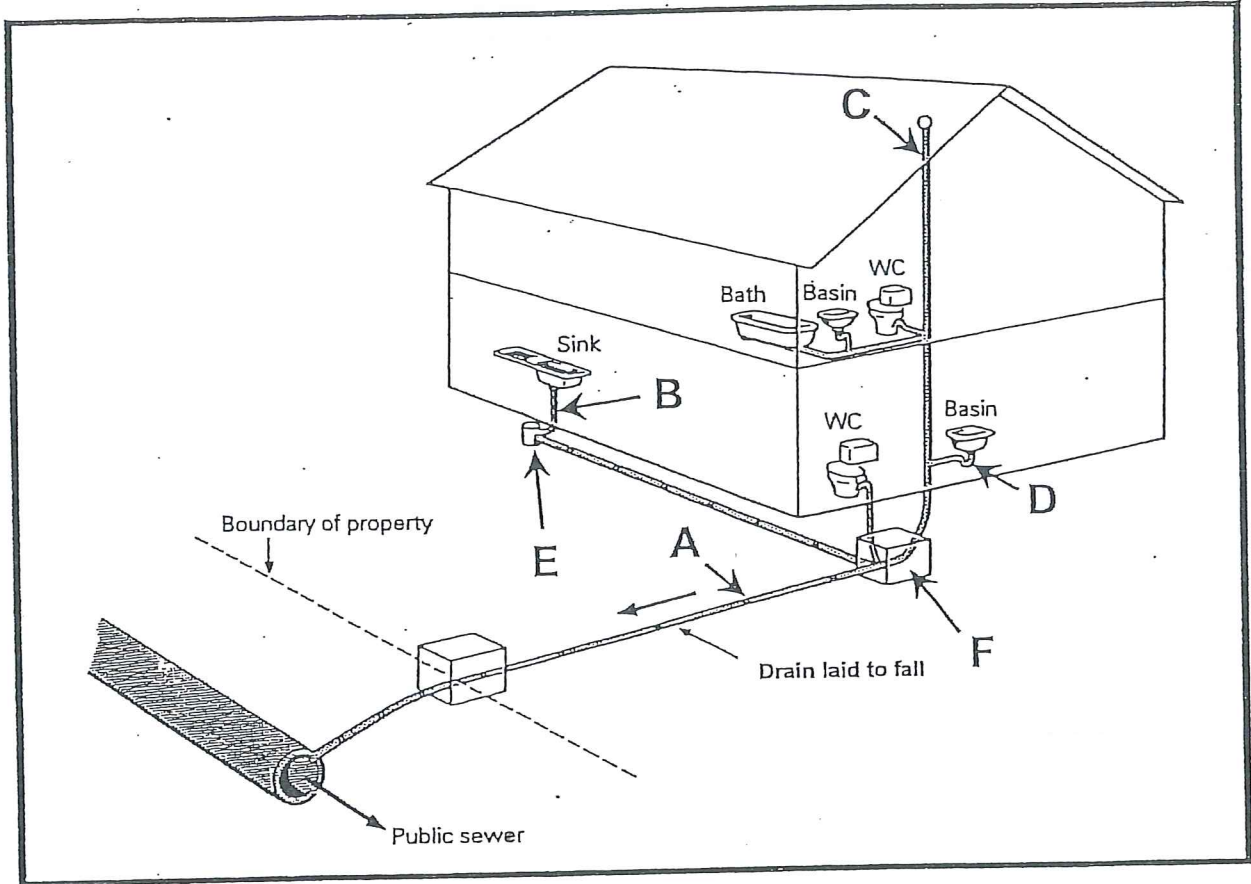
3.4 Behalwe om 'n gekwalifiseerde elektrisiën te wees, watter ander kwalifikasie moet 'n elektrisiën hê om wettiglik die bedrading van 'n huis te doen? (1)

3.5 Wat is die doel van 'n aardlekkasie-toestel in 'n verdeelbord? (2)

[30]

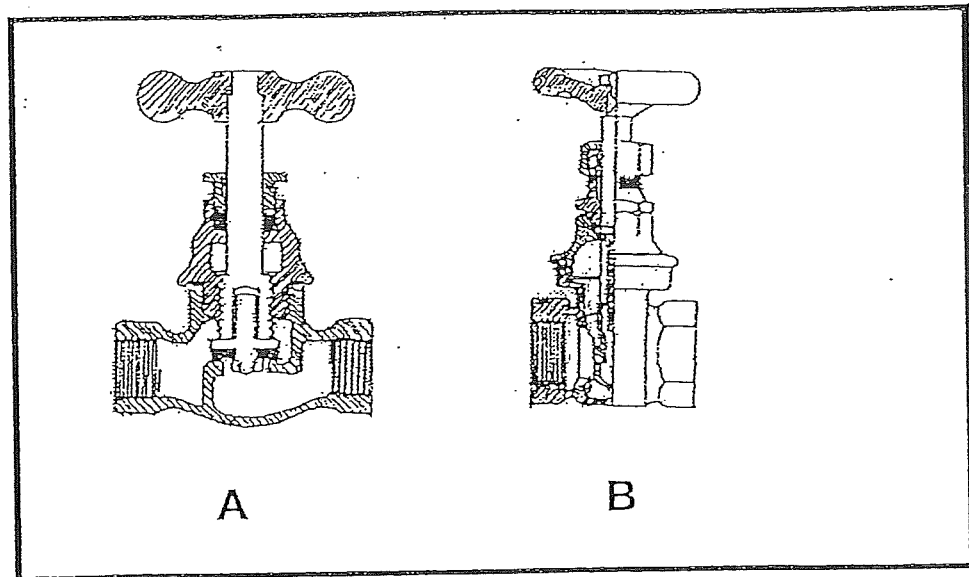
QUESTION 3

3.1 The sketch below shows the layout of the discharge of wastewater and sewerage from a house to a public sewer. Study the sketch and answer the following questions:



- 3.1.1 What should the diameter of pipe A be? (1)
- 3.1.2 What should the diameter of pipe B be? (1)
- 3.1.3 What is the purpose of C? (1)
- 3.1.4 What is the purpose of D? (1)
- 3.1.5 Identify part E. (1)
- 3.1.6 What is the purpose of F? (1)
- 3.1.7 What is the recommended gradient for A? (1)

3.2 The figure below shows two plumbing fittings.

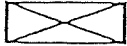

















- 3.2.1 Identify fittings A and B after comparing the composition of the TWO drawings above.
- 3.2.2 Where would fittings A and B be used in the water supply system?
- 3.2.3 What are the causes of a water hammer in a hot-water system?
- 3.2.4 When building plans are drawn symbols are used to indicate different plumbing fittings. What do the following symbols indicate:
- (a) G
  - (b) IE
  - (c) MH
  - (d) S
  - (e) SP

3.3 As a draughtsman you are required to design a house and indicate the correct electrical symbols for electrical fixtures. By referring to the symbol sheet below, insert the appropriate symbols using the SANS (SABS) approved code on the attached answer sheet.

The following must be indicated on the answer sheet provided:

- A light and light switch in every room
- Four plug points must be fitted into the house
- The position of the meter box
- The position of the distribution box

1	2	3	4
Description	Symbol	Description	Symbol
POWER		LIGHTING	
Distribution board		Emergency light	
Earth		Fluorescent light (3 tubes of 40 W)	 3 x 40 W
Electricity meter (Watt-meter recording)		Light (3 lamps of 40 W)	 3 x 40 W
One-way switch single pole		Light wall-mounted	
One-way switch double pole		COMMUNICATIONS	
One-way switch three pole		Telephone, internal	
Two-way switch		Telephone, public	
Regulating switch, for example dimmer			
Socket outlet			
Switched socket outlet			

3.4 Apart from being a qualified electrician, what other formal qualification must an electrician have to be authorised to wire a house? (1)

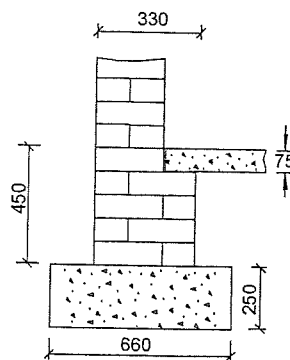
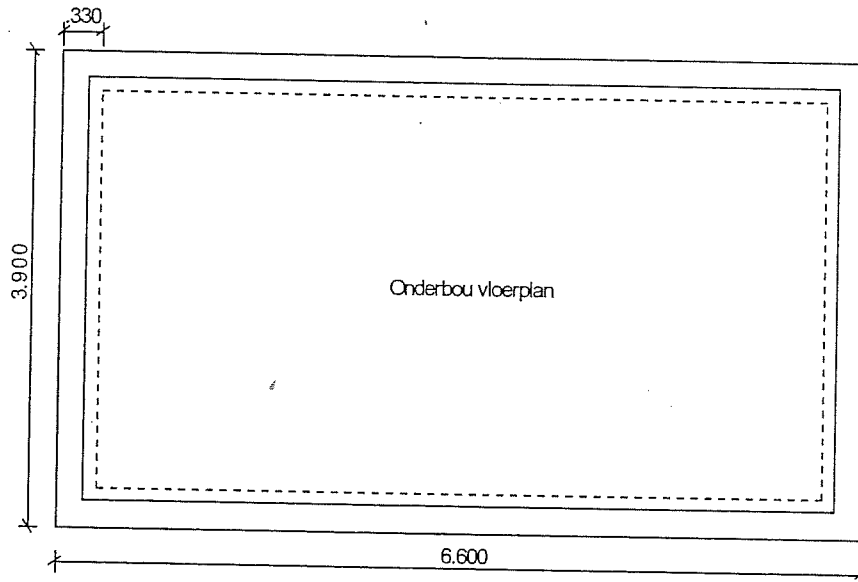
3.5 What is the purpose of the earth leakage unit in a distribution box? (2)



#### VRAAG 4:

Die vloerplan en detail van die onderbou asook 'n spesifikasielys word verskaf om jou met die berekening van die gebou by te staan. Bereken die pleisterstene, fondasie beton, en ook die maasbinding en vogwering benodig onder die betonvloer vir die onderbou struktuur. Die mates is geneem vanaf die **buitemates** van die gebou.

- a) Onderbou is 330 mm breed x 450 mm hoog.
- b) Betonfondasie is 660 mm x 250 mm.
- c) Betonvloer is 75 mm dik.
- d) Tel 5% afval by vir stene.



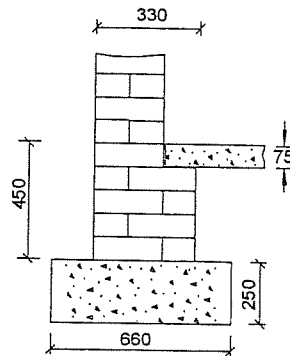
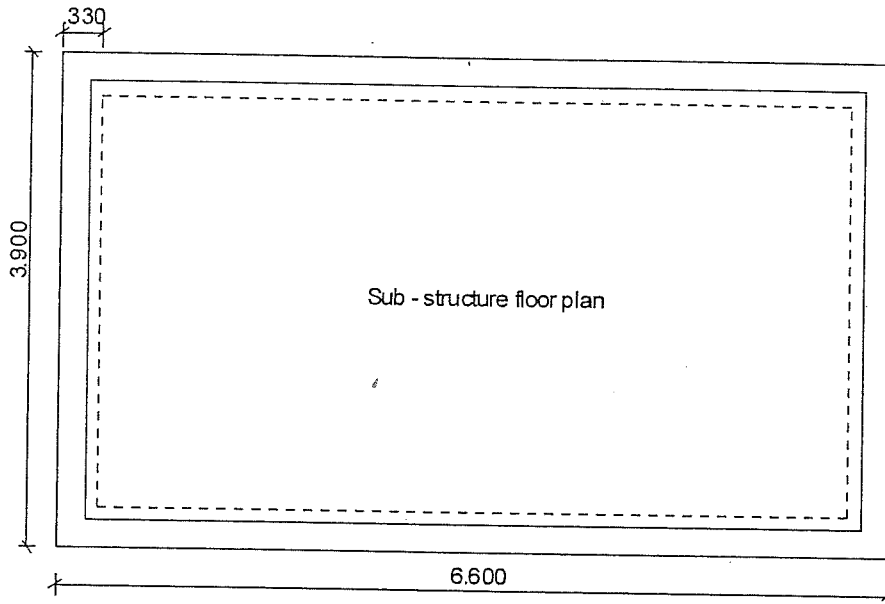
DETAIL VAN DIE ONDERBOU

[30]

**QUESTION 4:**

The floor plan of a sub-structure and a specification list are given to assist with the calculation. Determine the plaster bricks, foundation concrete, floor concrete as well as the welded mesh and damp proof sheeting required for the sub-structure. The measurements of the building are taken from **outside** measurements.

- a) Substructure brickwork is 330 wide x 450 mm high.
- b) Concrete foundation is 660 x 250 mm.
- c) Concrete floor is 75 mm thick.
- d) Add 5% waste for bricks.



DETAIL OF SUB-STRUCTURE

[30]

**VRAAG 5:**

**Swaartepunt**

- 5.1. Figuur 9 toon 'n voorwerp aan. Bereken die posisie van die sentroïed van  $X - X$ .
- 5.2. Bereken die swaartepunt vir die voorwerp vir figuur 10 relatief tot  $AA$  EN  $BB$
- 5.3. Bereken die swaartepunt vir die voorwerp vir figuur 11 relatief tot  $X - X$
- 5.4. Bereken die swaartepunt vir die voorwerp van figuur 12 relatief tot  $X - X$

**QUESTION 5:**

**Centre of gravity**

- 5.1 Figure 9 shows an object. Calculate the position of the centroid from  $X - X$ .
- 5.2 Calculate the centre of gravity for figure 10 relative to  $AA$  AND  $BB$
- 5.3 Calculate the position, relative to  $X - X$  of the shown centroid in figure 11.
- 5.4 Calculate the position of the centroid, relative to  $X - X$  for the given figure 12.

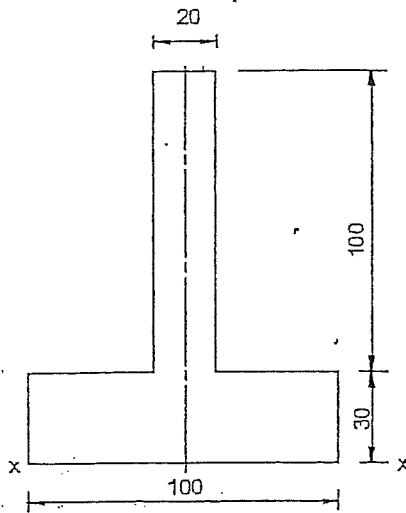


FIG 9

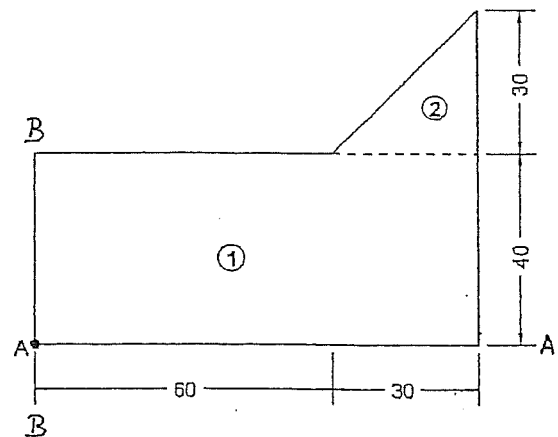


FIG 10

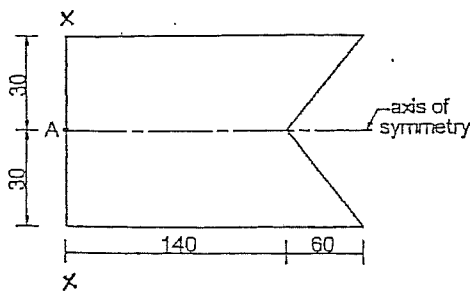


FIG 11

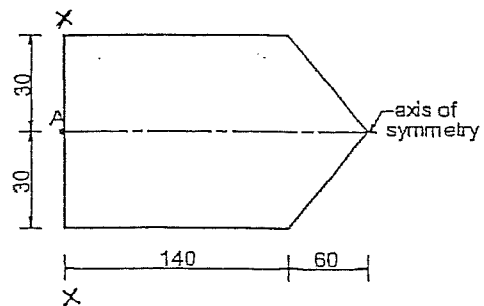


FIG 12

**VRAAG 6:**

Voltooi tot 'n volledige

- vloerplan (Fig 4.12). Dui al die nodige name, simbole en material aan. Maak gebruik van die gegewe vensters. (AANGEHEG BY ANTWOORDSTEL).

[40]

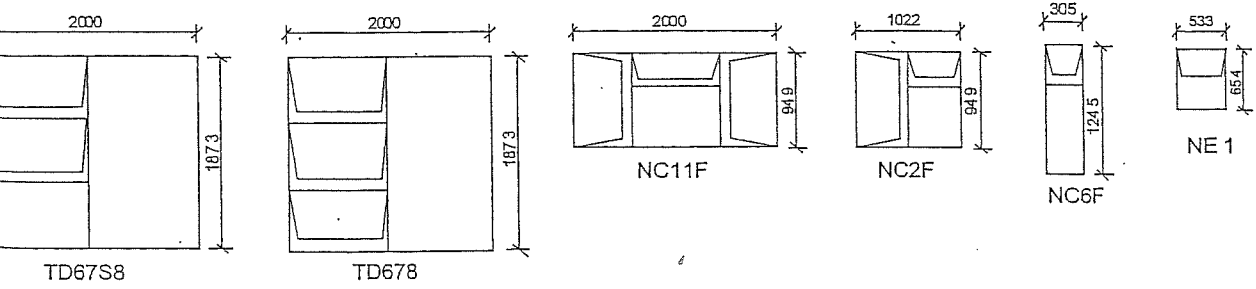
**QUESTION 6:**

- Complete this drawing (Fig 4.12) with all the necessary names, symbols and materials required for the plan. Make use of the given windows. (ATTACHED TO ANSWERSHEET).

[40]

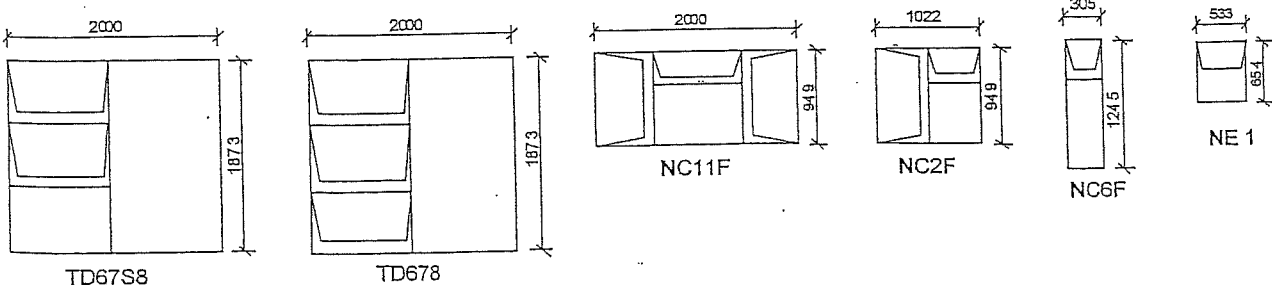
**venster katalogi**

venster en deur katalogi kodes word gebruik om die tipe en grootte van vensters na te slaan en dan aan te dui op bouplanne maar die gebruik daarvan word eers in graad 11 bespreek. Die vensters soos hieronder aangedui is geneem uit 'n katalogus om ons vir nou te help.



**Window catalogue**

Window and door catalogue codes are required to indicate the type and size of windows on a floor plan; however catalogues will only be dealt with in grade 11. The following windows are taken from a catalogue as an example of what is to follow.



TOTAAL / TOTAL: 200.

## FORMULEBLAD

## BELANGRIKE AFKORTINGS

SIMBOOL	BESKRYWING	SIMBOOL	BESKRYWING	SIMBOOL	BESKRYWING
G	Swaartepunt	h	Hoogte	d	Diameter
C	Sentroïed	b	Breedte/Wydte	r	Radius
L	Lengte	s	Sy	A	Area
$\pi$	$Pi = \frac{22}{7} = 3,142$	$\emptyset$	Diameter	V	Volume

## FORMULES

OPPERVLAKTE VAN	FORMULE (in woorde)	FORMULE (in simbole)	FORMULE VIR DIE POSISIE VAN SENTROÏEDE	
			X-as	Y-as
Vierkant	Lengte x Breedte	$l \times b$	$\frac{l}{2}$	$\frac{b}{2}$
Reghoek	Lengte x Breedte	$l \times b$	$\frac{l}{2}$	$\frac{b}{2}$
Reghoekige driehoek	$\frac{1}{2} \times$ basis x hoogte	$\frac{1}{2}b \times h$	$\frac{b}{3}$	$\frac{h}{3}$
Gelyksydige driehoek/Piramide	$\frac{1}{2} \times$ basis x hoogte	$\frac{1}{2}b \times h$	$\frac{b}{2}$	$\frac{h}{3}$
Sirkel	$\pi \times$ radius x radius	$\pi r^2$	Sentroïed in die middel	
Sirkel	$\pi \times$ diameter x diameter gedeel deur 4	$\frac{\pi d^2}{4}$		
Halwe sirkel	$\pi \times$ radius x radius gedeel deur 2	$\frac{\pi r^2}{2}$	Sentroïed $0,424r$ op die middellyn	

$$\text{Posisie van sentroïed} = \frac{(A1 \times d) + (A2 \times d)}{\text{Totale oppervlakte (area)}}$$

OF

$$X = \frac{\sum Ay}{\sum A}$$



## FORMULA SHEET

## IMPORTANT ABBREVIATIONS

SYMBOL	DESCRIPTION	SYMBOLS	DESCRIPTIONS	SYMBOL	DESCRIPTION
G	Centre of gravity	h	Height	d	Diameter
C	Centroid	b	Breadth/Width	r	Radius
L	Length	s	Side	A	Area
$\pi$	$\text{Pi} = \frac{22}{7} = 3,142$	$\emptyset$	Diameter	V	Volume

## FORMULAE

AREA OF	FORMULA (in words)	FORMULA (in symbols)	FORMULA FOR THE POSITION OF CENTROIDS	
			X-axis	Y-axis
Square	Length x Breadth	$l \times b$	$\frac{l}{2}$	$\frac{b}{2}$
Rectangle	Length x Breadth	$l \times b$	$\frac{l}{2}$	$\frac{b}{2}$
Right-angled triangle	$\frac{1}{2} \times \text{base} \times \text{height}$	$\frac{1}{2}b \times h$	$\frac{b}{3}$	$\frac{h}{3}$
Equilateral triangle/ Pyramid	$\frac{1}{2} \times \text{base} \times \text{height}$	$\frac{1}{2}b \times h$	$\frac{b}{2}$	$\frac{h}{3}$
Circle	$\pi \times \text{radius} \times \text{radius}$	$\pi r^2$	Centroid in the centre	
Circle	$\pi \times \text{diameter} \times$ diameter divided by 4	$\frac{\pi d^2}{4}$		
Semi-circle	$\pi \times \text{radius} \times \text{radius}$ divided by 2	$\frac{\pi r^2}{2}$		

$$\text{Position of centroid} = \frac{(A1 \times d) + (A2 \times d)}{\text{Total area}}$$

OR

$$X = \frac{\sum Ay}{\sum A}$$

