

2006 Construction

Higher

Finalised Marking Instructions

© The Scottish Qualifications Authority 2006

The information in this publication may be reproduced to support SQA qualifications only on a non-commercial basis. If it is to be used for any other purposes written permission must be obtained from the Assessment Materials Team, Dalkeith.

Where the publication includes materials from sources other than SQA (secondary copyright), this material should only be reproduced for the purposes of examination or assessment. If it needs to be reproduced for any other purpose it is the centre's responsibility to obtain the necessary copyright clearance. SQA's Assessment Materials Team at Dalkeith may be able to direct you to the secondary sources.

These Marking Instructions have been prepared by Examination Teams for use by SQA Appointed Markers when marking External Course Assessments. This publication must not be reproduced for commercial or trade purposes.

2006 Construction Higher

SECTION A

Marks

- 1 (a) Briefly explain the role of **each** of the following local authority departments:

- (i) Planning

The substance of the following is required: responsible for forward planning and implementation of planning policy, that is: compliance with local plan, environmental impact, effect of new developments proposals on local amenities and the community.

3

- (ii) Building Control

The substance of the following is required: responsible for checking that building proposals and alterations comply with the Scottish Building Standards (earlier legislation – Technical Standards or similar) with regard to quality of construction, health and safety, energy use. Also responsible for the issue of building warrants.

3

- (b) State the principal item of legislation under which **each** department operates.

The legislation is as follows:

Planning – The town and Country Planning (Scotland) Act

1

Building Control – The Scottish Building Standards

1

(8)

- 2 (a) State **two** performance requirements of a building.

Two of the following should be identified:

- Structural – Strength and stability
- Architectural – Appearance, adequate space
- Comfort – Thermal, air quality, weather exclusion, sound control, lighting, ergonomics
- Buildability
- Design life
- Economics
- Environmental – impact, energy demand
- Safety – Fire, occupant safety

2

- (b) Identify the main *design factors* that must be considered for **each** performance requirement stated in part (a).

The substance of **two** of the following is required:

Structural – Design loading, structural concept, load transfer and resistance

Architectural – Appearance, fashion, scale, harmony, landscaping. – Adequate space, flexibility of space, occupant movement. Access, escape, dimensional coordination

Comfort – heating, cooling, condensation, shading, humidity, movement, ventilation, water penetration/movement, wind, acoustics, noise control, natural and artificial lighting

Buildability – standardisation, modular co-ordination, prefabrication, safety

Design Life – Durability, ease of maintenance, materials, interior, exterior envelope

Economics – client's budget, completion date, whole life costs, investment potential

Environmental – visual, pollution, material demand, eco-friendliness, sustainability

Safety – escape, spread of fire, emergency services, accident prevention, radon gas

6

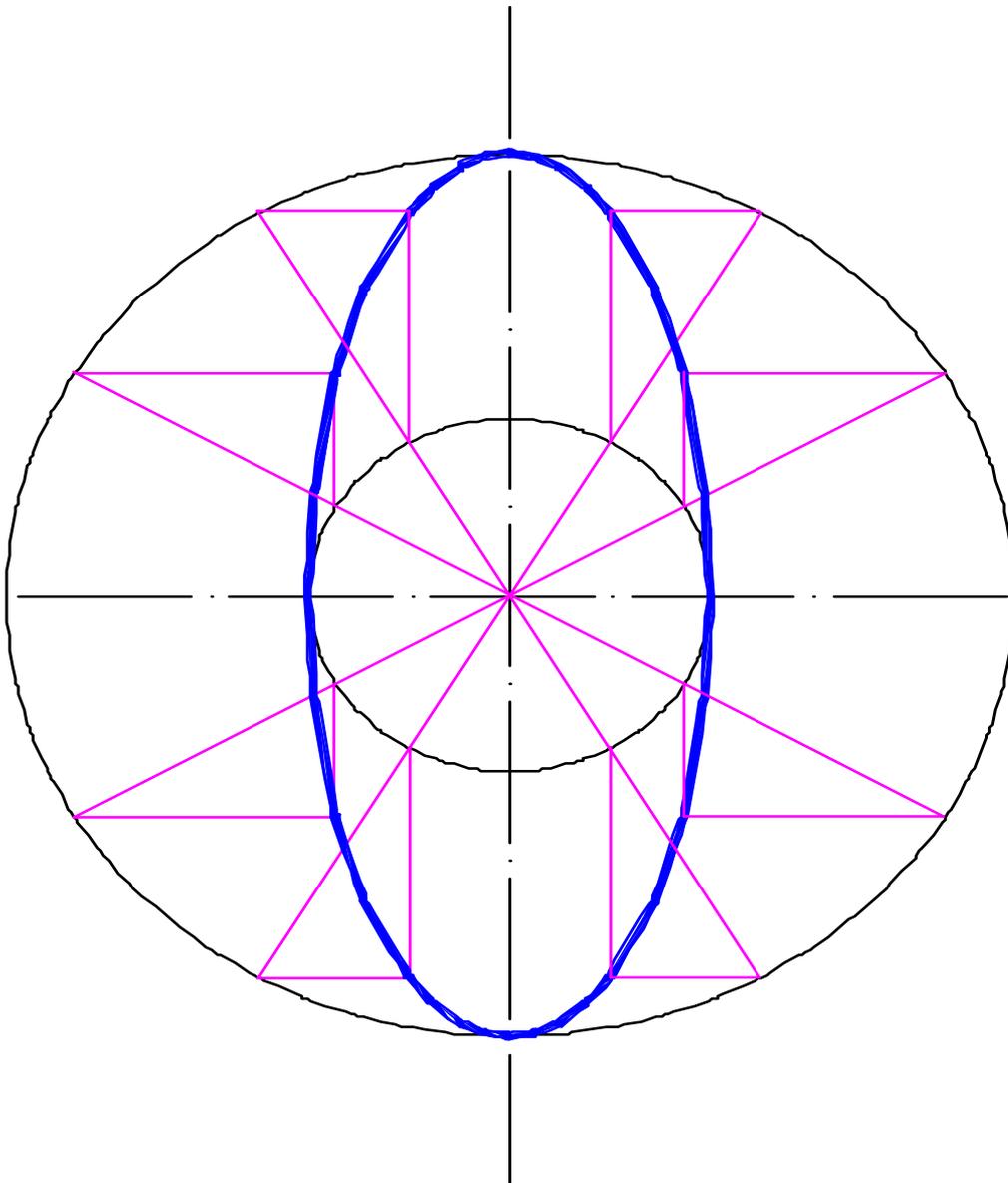
(8)

- 3 **Worksheet Q3** shows the centre lines of a proposed ellipse.
On **Worksheet Q3** draw an ellipse which has a major axis of 150mm
and a minor axis of 60mm. Dimension the shape and add a title. Show
all construction lines.

8

(8)

WORKSHEET Q3



4 (a) State **four** items of *technical information* that should be included on each of the following drawing types:

(i) building location drawings (general arrangement drawings)

Answer to include **four** items of information from the following list:

- means of compliance with the Scottish Building Standards in a number of different areas
- overall shapes of building by plan
- sections and elevations
- dimensions
- construction levels
- foundation details
- wall construction(s) and finishes
- window and door types and locations
- floor constructions, spans and supports
- stair details
- roof construction, spans and supports
- positions of fittings
- location of services

2

(ii) assembly drawings (details)

Answer to include **four** items of information from the following list:

- true shape and size of building elements (to scale)
- true related positions of building elements
- relative position of components
- fixing of components
- dimensions
- finishes

2

(b) State **two** appropriate scales for **each** of the above drawings.

Building location drawings: 1:100, 1:50, 1:20, 1:10.

1

Assembly drawings: 1:20, 1:10, 1:5, 1:1.

1

- (c) Briefly explain why different *line types* and *line weights* are used in the preparation of construction drawings.

The substance of the following is required:

It is common to use different line types to distinguish between different parts of the drawing for example:

- when different services or utilities have to be shown on the same plan
- when different materials are to be illustrated
- when hidden detail needs to be shown
- when centre lines and grid lines are shown.

1

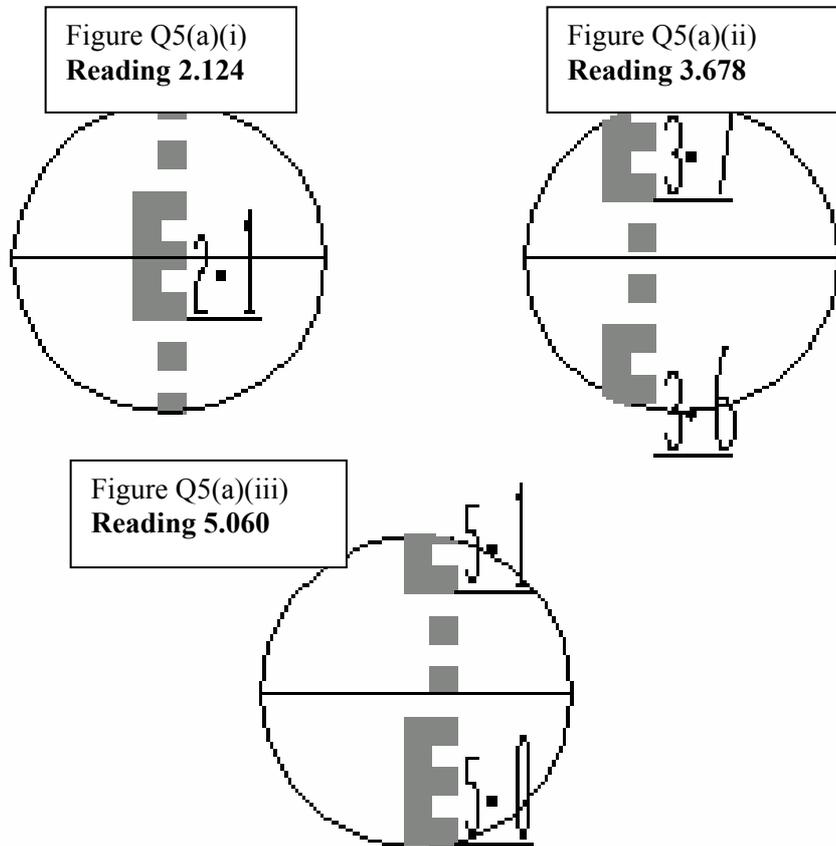
Line weight helps to convey meaning to the drawing. Important objects in the drawing can be highlighted by using heavier lines. In elevations the objects nearer to the viewer can be shown darker to make them appear closer. Grid lines and dimension lines can be drawn in fine line so as not to overcrowd the drawing.

1

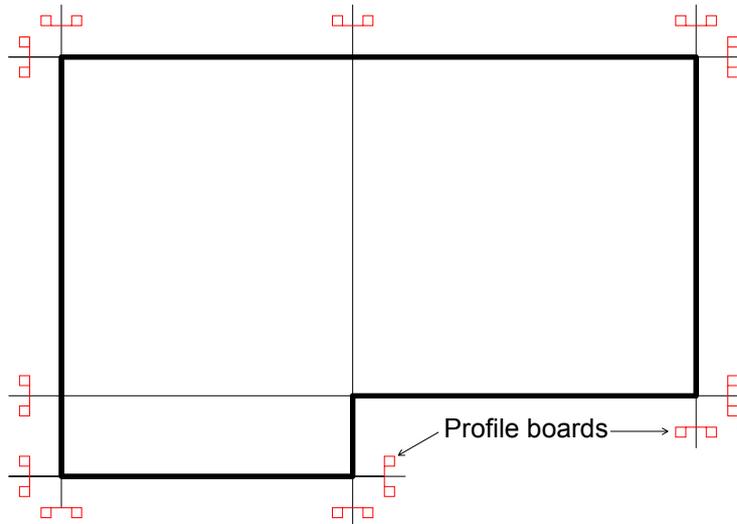
(8)

- 5 (a) Figures Q5(a) (i), (ii) and (iii) show three sightings through a surveyor's level. State the observed staff readings to the nearest millimetre.

3



- (b) Briefly describe, with the aid of an annotated sketch, the use of *profile boards* in the setting out of a small L-shaped building.



The answer should include the substance of the following: Profile Boards are used to define the corners of buildings because the pegs which are initially used, are lost immediately when excavation for foundations begins. The corner points are transferred to profile boards which are erected near each corner, clear of and above the base of the excavations. Nails are driven in to the horizontal boards to define the corner points and also to define the external lines of foundations and walls. The profiles may be set at a constant level and used to control construction levels.

5

(8)

SECTION B

Attempt any THREE questions in this Section (total 60 marks)

6 You are a design team leader and your client is a developer who has a site on the outskirts of a small Scottish town. The land is suitable for housing development but the soil consists of a 10.0m thick layer of *shrinkable clay* overlying a very thick layer of dense boulder clay.

- (a) Identify and briefly explain **two** factors that should be considered when selecting a suitable foundation for a low-rise building on this site.

6

The substance of **two** of the following responses is required:

- i* Every building should be so constructed that the combined loads to which the building may be subject are sustained and transmitted to the ground without impairing the stability of the building.
- ii* The applied loading must not overstress the subsoil beneath the foundation. A sufficient plan area of foundation must also be provided to avoid excessive total settlement.
- iii* The pattern of loading and subsoil conditions must not result in excessive differential settlement.
- iv* The foundation concrete must be of adequate strength in compression, bending and shear. It must also be unaffected by the chemical content of either the soil or the ground water.

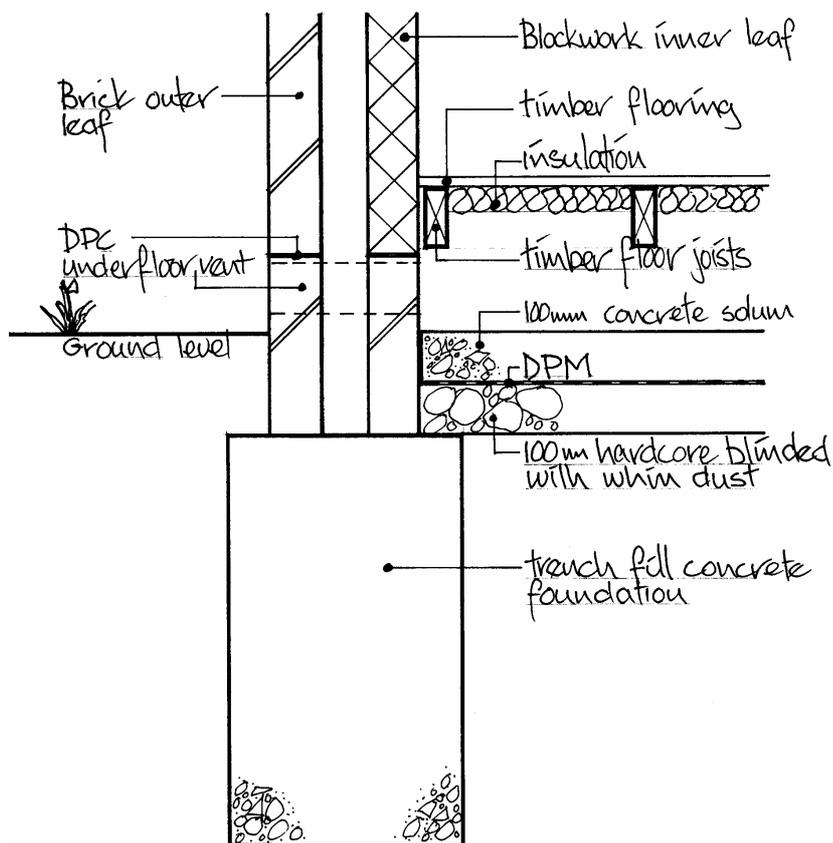
- (b) Select a suitable foundation for the soil conditions and produce an instrument-aided, annotated sketch of the substructure of a typical domestic building of traditional construction.

The sketch should show each of the following:

- Foundation
- Underbuilding to floor level
- Damp proofing
- Suspended timber floor
- Insulation
- Ventilation

14

See Sketch Q6(b)



(20)

7 (a) The following list shows construction materials used in specific situations:

- Facing brick to outer leaf of cavity wall
- Timber frame inner leaf to cavity wall
- Foamed polyurethane insulation to walls
- Mass concrete in foundations

For each material listed above, briefly describe **two advantageous** properties of the materials which make them suitable for their location and **one disadvantageous** property which may compromise their use.

The response should, in essence, highlight **two** advantageous properties and **one** disadvantageous property from the following list for each material.

Facing brick to outer leaf of cavity wall.

Advantageous properties:

Compressive strength, durability, appearance, fire resistance and water resistance

Disadvantageous properties:

Thermal resistance

Timber frame inner leaf to cavity wall.

Advantageous properties:

Strength/weight ratio, thermal resistance, renewable resource and easily shaped.

Disadvantageous properties:

Durability if untreated

Foamed polyurethane insulation to walls.

Advantageous properties:

Low density, thermal resistance and durability if protected.

Disadvantageous properties:

Fire resistance

Mass concrete in foundations

Advantageous properties:

Compressive strength, durability, density and fire resistance.

Disadvantageous properties:

Tensile strength and bending strength.

(b) Identify **three** common defects in low-rise timber frame housing.

Three responses are required to cover the substance of the following:

- Timber in direct contact with the ground
- The outer cladding of external walls
- Damage to the vapour control layer
- Damage to the breather membrane
- Omission of cavity barriers and firestops.

Similar defects which are specific to timber frame construction will be acceptable.

3

(c) Briefly explain how *quality assurance* procedures could reduce defects and improve building performance.

The substance of the following is required:

Planning control is concerned with the suitability and architectural quality of development and Building Control requirements ensure that minimum standards of construction and health and safety are achieved.

In housing, approval by the National House Building Council (NHBC) with its Buildmark scheme applies a self-regulating procedure on all development.

Most construction, design and building companies have tailored quality assurance procedures which cover such areas as:

Control of design process, purchasing, product certification, drawing issue, building process control and defect identification and correction.

The combination of statutory control, advice, self-regulation and QA procedures is serving to improve the quality of construction.

5

(20)

- 8** A new access road is to be constructed into a small industrial estate. The table below shows the reduced levels of the existing ground along the centre line of the proposed road. The road will be 100m long. Point **A** marks the beginning of the road and point **B** the end.

There is to be a constant gradient between points **A** and **B**, the existing levels at these two points being maintained.

(a) Using **Worksheet Q8(a)**,

- (i) Draw a longitudinal section along the centre line of the road to a horizontal scale of 1:500 and a vertical scale of 1:50. 6
- (ii) Determine, by scaling, from the section, the depth of cutting or depth of fill at each chainage point to form the new roadway. Enter the depths in the box provided on the worksheet and state whether **cut** or **fill**. 6

See Worksheet Q8(a)

- (b) Explain how the contractor's engineer could establish the location of the **Ordnance Bench Marks (OBMs)** in the vicinity of the site. 2

One method to be identified in the answer. Acceptable answers are as follows:

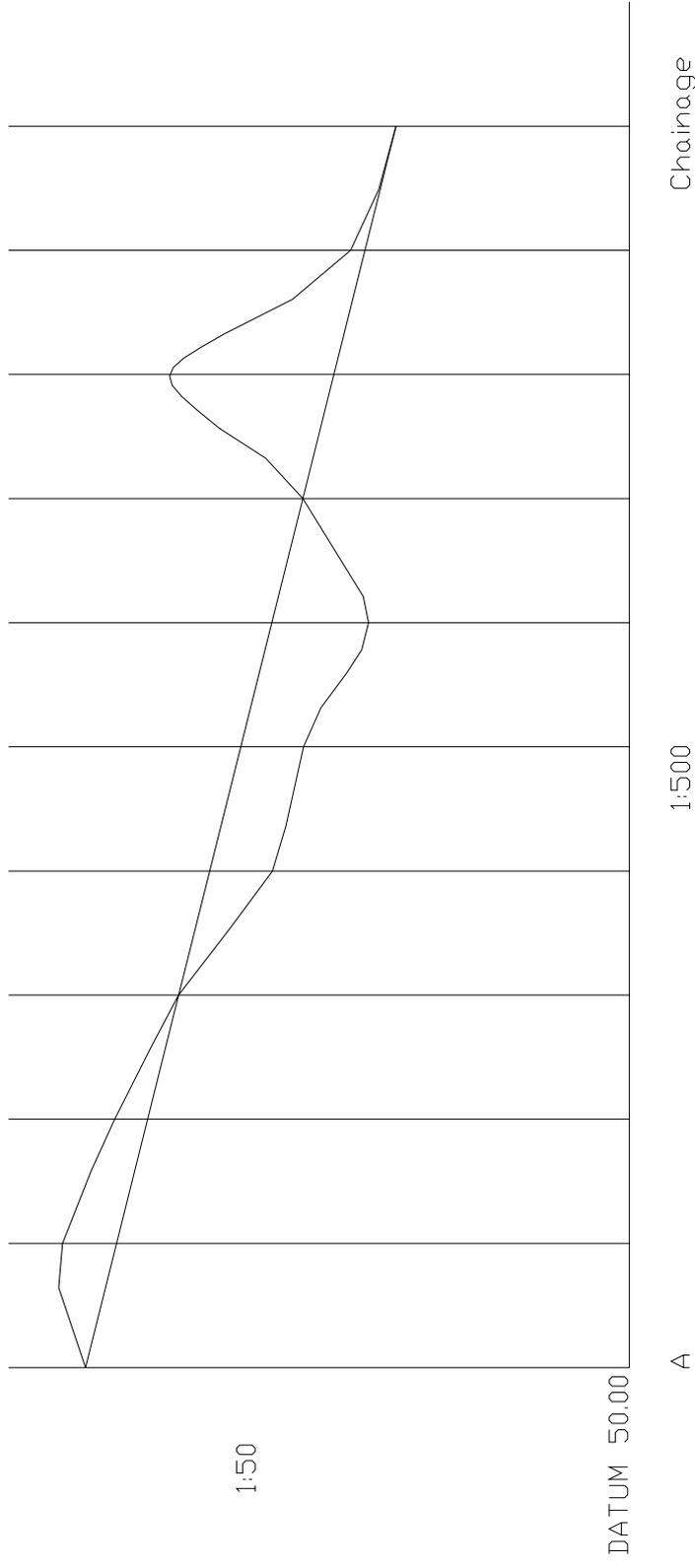
- By reference to 1:1250 scale OS map of the area.
- By reference to the Bench Mark list for the area.
- By direct reference to OS giving coordinates of the site.

- (c) Explain, with the aid of an annotated sketch, how the engineer would use the OBM(s) to establish levels on site and how the accuracy of day-to-day levelling work could be controlled. 6

The substance of the following is required:

The engineer would establish a Temporary/ transferred Bench Mark (TBM) from the most conveniently located OBM. This TBM would be used for day-to-day site levelling work.

(20)



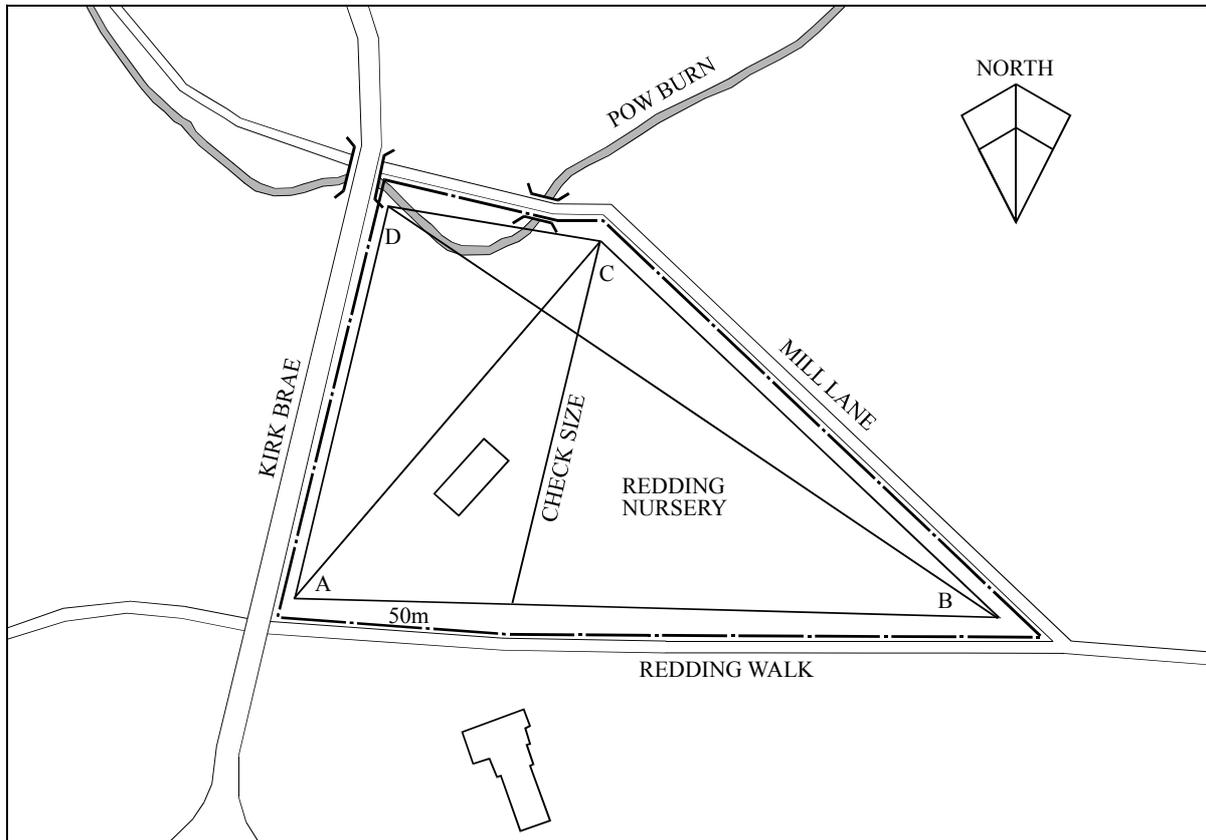
LONGITUDINAL SECTION

Cut	Cut	Fill	Fill	Cut	Cut
0.46	0.32	0.05	0.46	0.48	0.62
				0.07	1.38
					0.20

DEPTH OF CUTTING OR FILL REQUIRED
(center depth in box at each 10m)

- 9 (a) Refer to the 1:1250 Ordnance Survey Superplan Sheet. The National Grid sheet reference at the centre of this plan is **NS7993SW**.
- (i) Explain what is meant by the National Grid sheet reference of **NS7993SW**. 4
- The substance of the following is required:
The OS National Grid divides the British Isles into a grid of 500km squares denoted by letters of the alphabet. Each 500km square is further divided into 100km squares also identified by letters of the alphabet, hence **NS**. Each 100km square is subdivided into 1km squares each identified by the coordinates of the SW corner of the square, hence **NS7993** at scale 1:2500. At 1:1250 scale the quadrant reference is added, hence **NS7993SW**.
- (ii) Describe the detail in plan square **NS794934**. 2
- Detail includes: Ward Boundary, Watch Tower, Town Hall, Education Offices, Snowdon School for Girls, Allans Primary School, Burgh Court.
- (iii) Identify the building with the 10m grid reference of **NS79659339**. 2
- Golden Lion Hotel
- (iv) State the 1m grid reference for the **war memorial** adjacent to Corn Exchange Road. 2
- NS7947193365**
- (v) Identify and state the meaning of **four** of the conventional symbols and notations shown in plan square **NS796932**. 2
- Four of the following are required:
BM Bench Mark 19.02
House Address Numbers
PH Public House
+ Spot Level
----- Ward Boundary
Barrasyett Antiquity
- (vi) Determine the average gradient of **Port Street** from its junction with Kings Park Road to its junction with Dumbarton Road. 2
- Levels: +21.0 and +19.5m Distance: 112m
Gradient: 1:74.6 (1:74) or 1.3%

- (b) **Worksheet Q9(b)** shows a vacant site at Redding Nursery which is soon to be developed for housing.
Describe how you would carry out a linear survey of this site, marking your survey lines on **Worksheet Q9(b)**.



SITE AT REDDING NURSERY

APPROX. SCALE 1:2500

Worksheet Q9(b) should be completed to show the proposed lines of survey within the site. These survey lines should be in some form of triangulation and should be capable of being individually identifiable.

The description should summarise the following:

To carry out a linear survey of this site a baseline would be required to be set out such as line AB. From this line, other survey lines would be set out in such a way as to triangulate the site. Each line in turn would be measured and recorded in a fieldbook. The detail of the site such as boundaries, fences, buildings and the burn would be located by using offsets measured from the main survey lines.

6

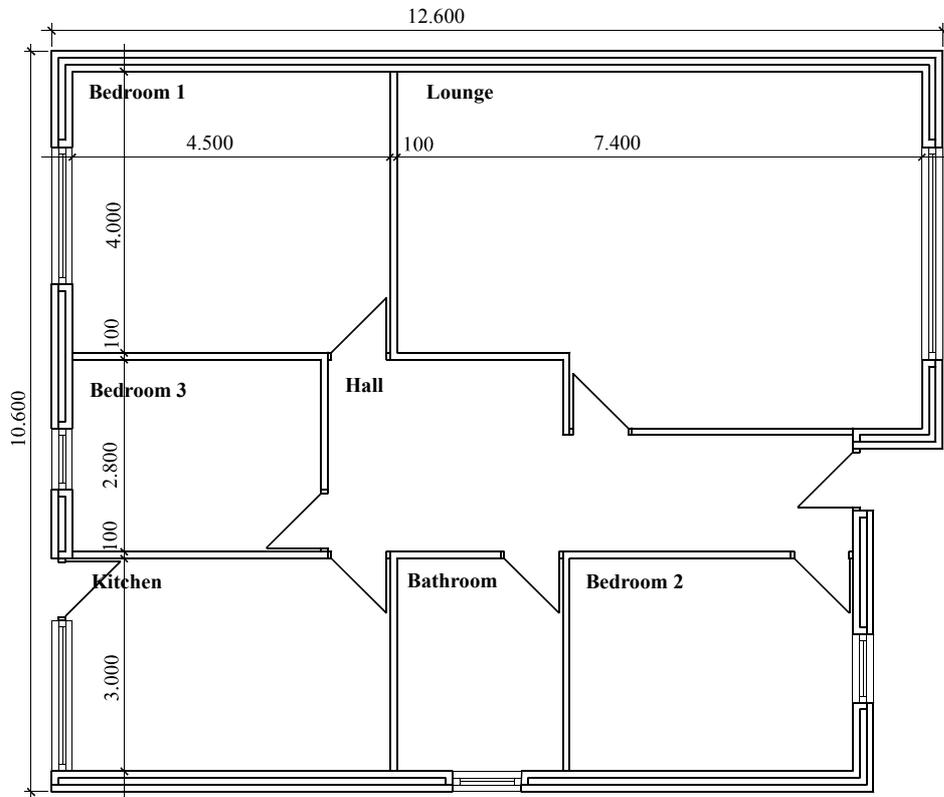
(20)

10 (a) **Figure 10(a)** shows the sketch plan, accommodation list and basic specification for a proposed 4 apartment, detached bungalow.

On **Worksheet Q10(a)** prepare a general arrangement drawing (plan) at a scale of 1:50 to show:

- External cavity walls
- Cavity closures at all openings
- Window positions
- Door positions
- Internal partitions
- Titles
- Dimensions

14



4apt Bungalow

Marks	
Layout	2
Scaling/	
Accuracy	6
Linework	2
Dimensions	2
Titles	2
Total	14

(b) Briefly explain how each of the following commands could be used to prepare a computer-generated version of the general arrangement drawing.

- Copy: This command could be used to duplicate items of detail already drawn such as doors and windows.
- Offset: This command would be used to duplicate lines at a specified distance from those already drawn. In this way lines representing walls and partitions can be reproduced quickly, easily and accurately.
- Layer: This command would be used to build up the drawing in layers. Separate layers could be prepared to show walls, windows, doors, text and dimensions and the layers merged to produce the final drawing.

6

(20)

[END OF MARKING INSTRUCTIONS]