



# education

Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 10**

**CIVIL TECHNOLOGY**

**EXEMPLAR PAPER**

**MARKS: 100**

**TIME: 3 hours**

**This question paper consists of 12 pages.**

138 0 E

**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.

**QUESTION 1: FORCES****1.1 SI UNITS**

It is important to know and understand the SI units and symbols of different quantities in order to comply with the requirements of design.

Carefully study the table below and complete it by writing the question number in your answer book and filling in the correct SI units and the symbols of the quantities indicated. (Do NOT redraw the table.)

| QUANTITY | UNIT          | SYMBOL         |
|----------|---------------|----------------|
| Area     | Square metres | m <sup>2</sup> |
| Length   | 1.1.1 .....   | 1.1.2 .....    |
| Mass     | 1.1.3 .....   | 1.1.4 .....    |
| Weight   | 1.1.5 .....   | 1.1.6 .....    |

(6)

**1.2 TRIANGLE OF FORCES**

FIGURE 1.2 shows a lamp with a mass of 3 kg hanging from the ceiling. It is fixed by two strings that make an angle of 30° with the ceiling. The system is in equilibrium.

NOTE: 1 kg = 10 N

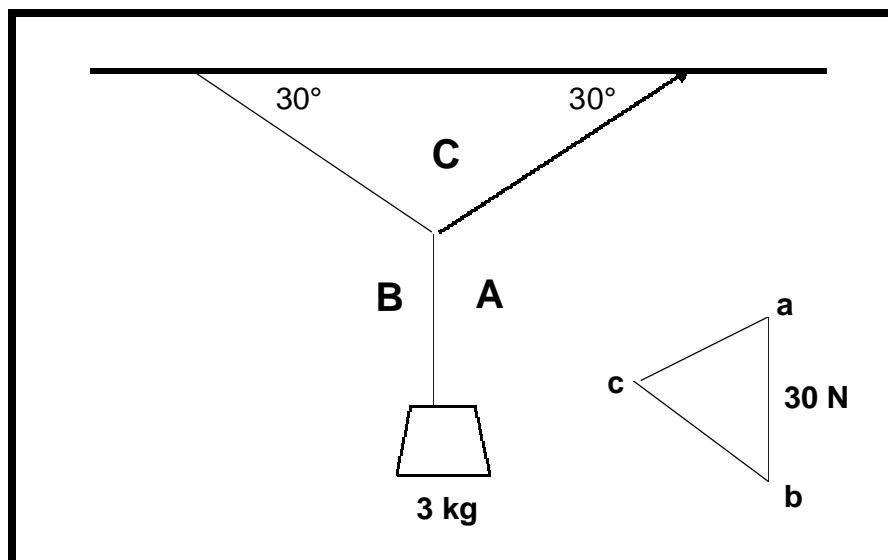


FIGURE 1.2

1.2.1 What is the magnitude of force bc? (2)

1.2.2 Define the following terms:

(a) Triangle of forces (2)

(b) Equilibrium (2)

1.3 A structural engineer has the task of designing the structural part of a bridge. For the engineer to complete the design he/she needs to know the magnitudes of the members at certain points. The members indicated below are in equilibrium.

Graphically determine the magnitudes of members R and S as indicated in FIGURE 1.3 below.

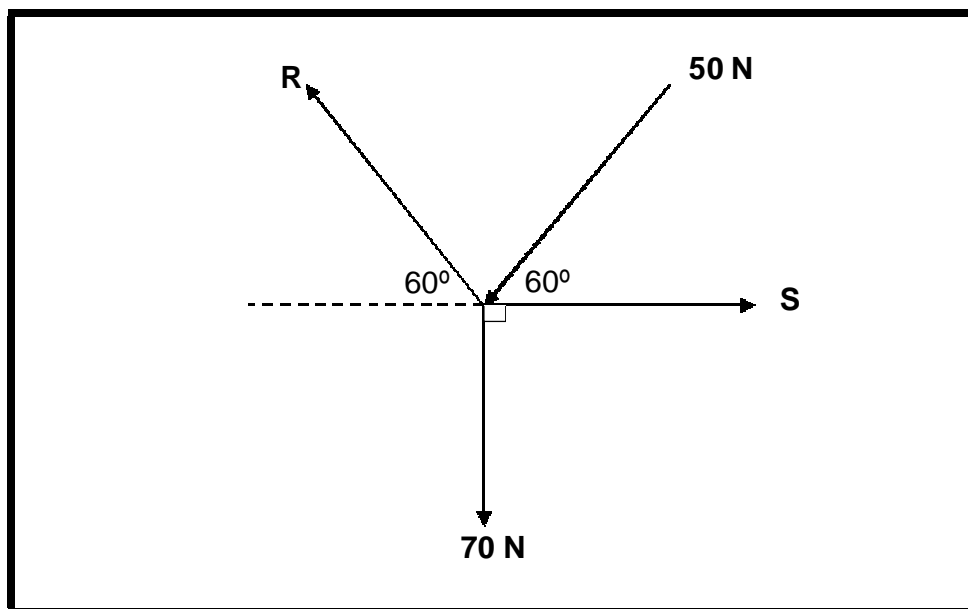


FIGURE 1.3

(10)

- 1.4 The force of gravity is the force that pulls objects towards the centre of the earth, through a specific point, irrespective of the shape, size or position. This point is known as the centre of gravity (centroid).

FIGURE 1.4 represents an object of uniform thickness.

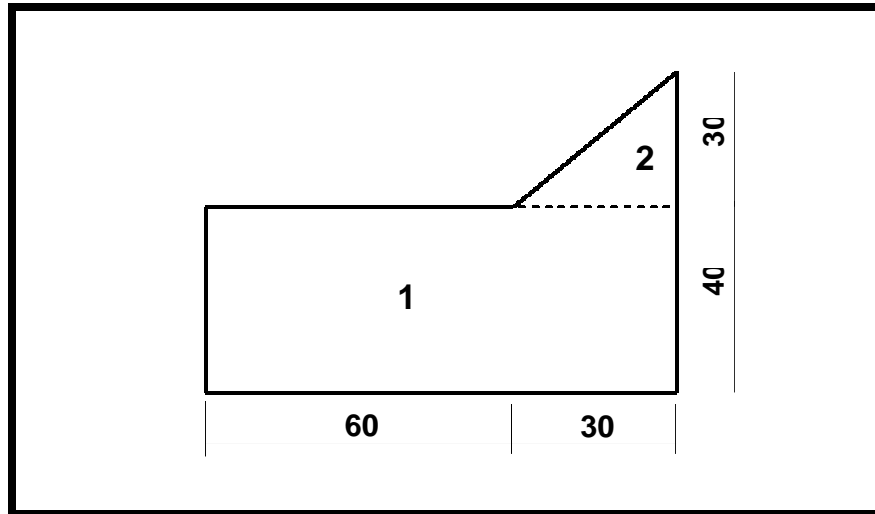


FIGURE 1.4

- 1.4.1 Calculate the centre of gravity of this object.

The following formula can be used:

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

(8)  
[30]

**QUESTION 2: SAFETY, MANUFACTURING PROCESS AND CONSTRUCTION METHODS****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.

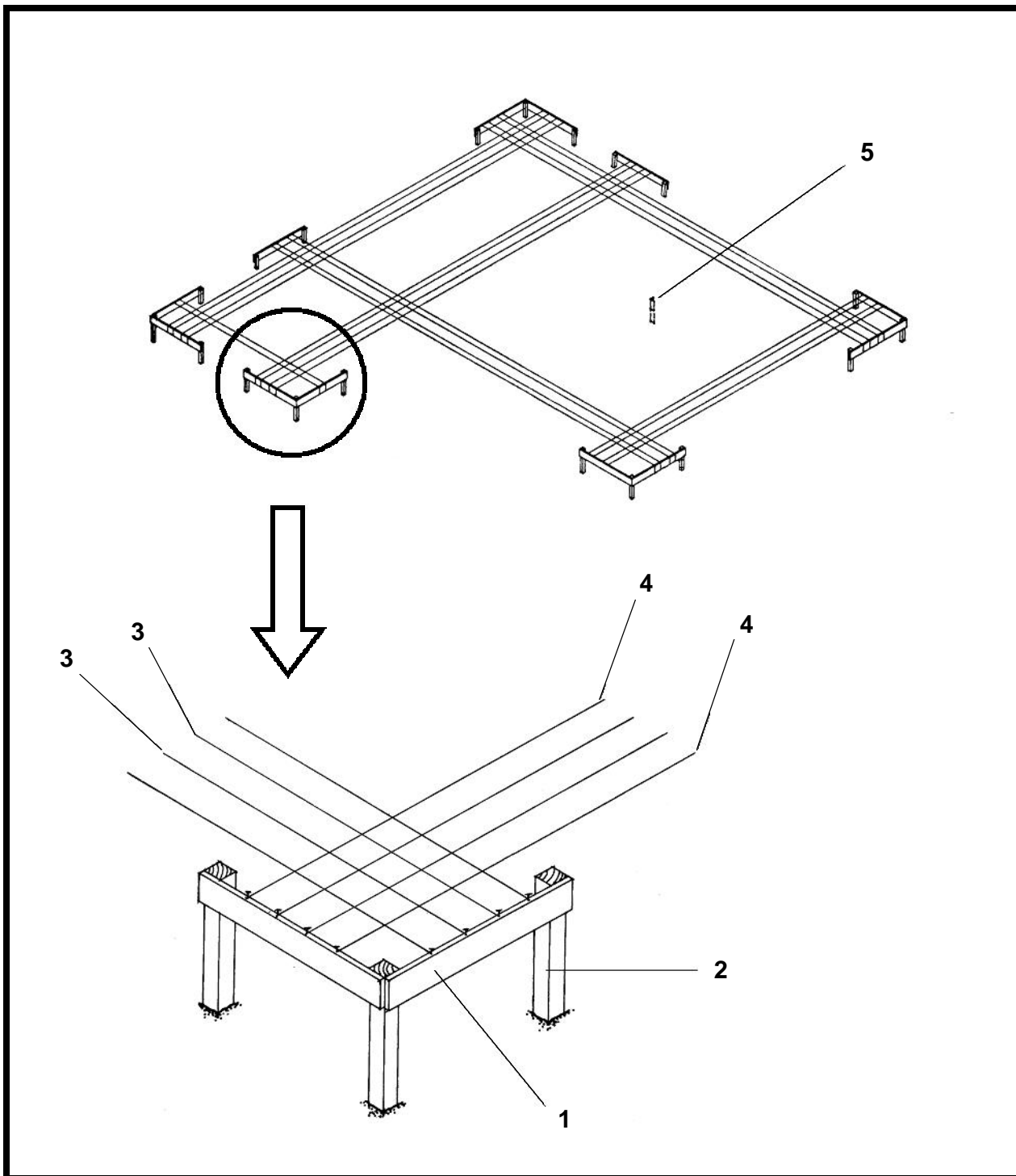


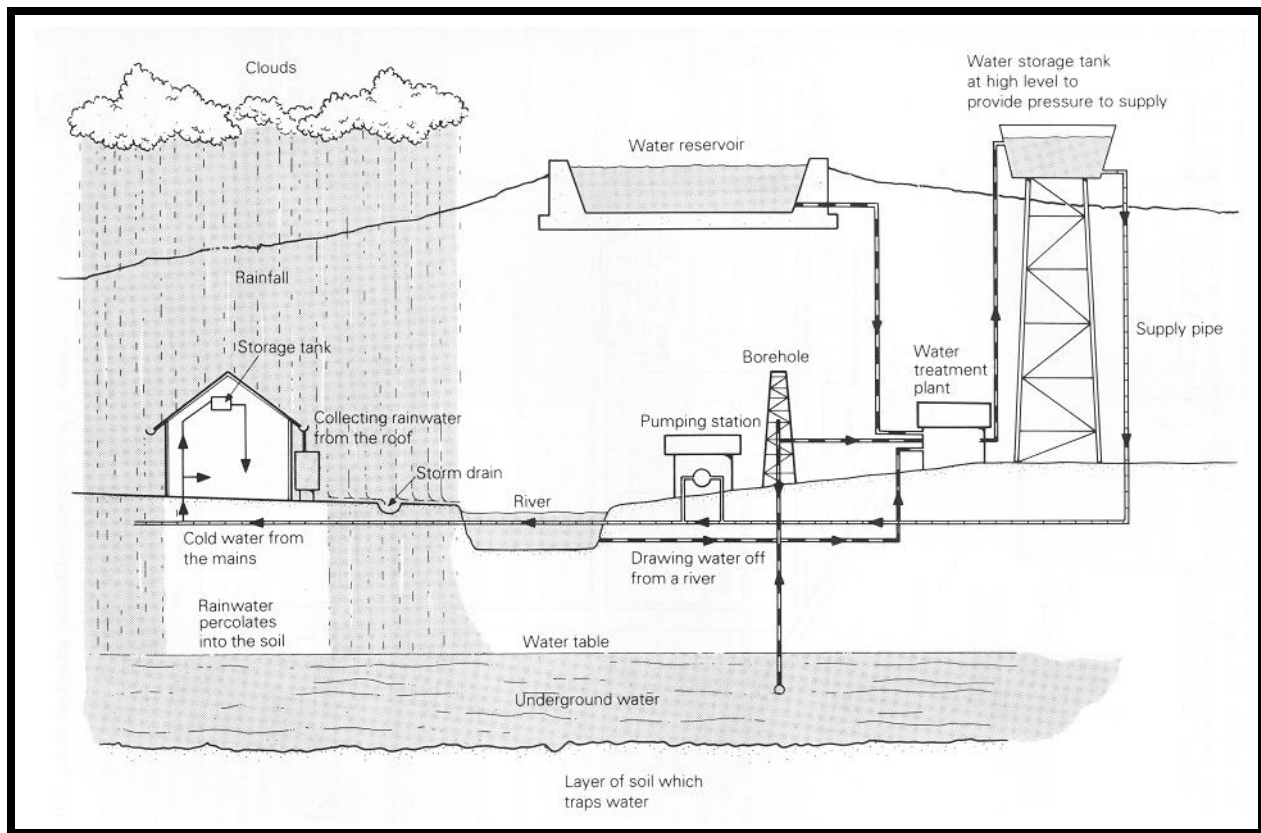
FIGURE 2.3

- 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 toothing 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]**



**QUESTION 3: CIVIL SERVICES**

Study the diagram below and answer the following questions:



- 3.1 The community in Rimpies settlement receive water from a reservoir that is located at the top of the mountain. (1)
- 3.1.1 Where does the water in the reservoir come from? (1)
- 3.1.2 Why has the reservoir been placed at the top of the mountain? (2)
- 3.2 Identify THREE sources that feed water into the water treatment plant. (3)
- 3.3 How does the water in the water treatment plant end up in the houses? (4)
- 3.4 Explain the purpose of a water treatment plant. (2)
- 3.5 It is unlikely that floods can affect the house indicated. Give TWO reasons why this statement may be TRUE. (2)
- 3.6 Name TWO types of pipe materials you know. (2)

3.7 Define the following drainage terms:

3.7.1 Soil water

(2)

3.7.2 Waste water

(2)

**[20]**

#### QUESTION 4: MATERIALS COSTING AND QUANTITIES

4.1 The total length of a 220 mm thick brick wall of a building is 30 m. The wall is 600 mm high, and rests on a concrete foundation measuring 600 mm (wide) x 200 mm (deep).

Calculate the following:

4.1.1 The number of bricks required to build the wall if 100 bricks are required to build 1 m<sup>2</sup> (one square metre) of wall

(8)

4.1.2 The amount of concrete required for the foundation

(6)

4.1.3 The cost of purchasing the bricks if the bricks cost R600,00 per 1 000

(3)

4.2 Define the term *concrete*.

(3)

**[20]**

#### QUESTION 5: TOOLS AND EQUIPMENT

5.1 Concrete can be prepared in the following ways:

- Hand mixed
- Machine mixed
- Ready mixed

State ONE advantage and ONE disadvantage of each method.

(6)

5.2 The soil structure of a site consists of loose wet soil. While you are excavating the foundation trenches, you find the sides caving in.

What precaution would you take to prevent the sides from caving in, and name TWO materials that could be used?

(3)

5.3 What tools can be used to cut bricks on a building site?

(4)

5.4 How will you take care of a handsaw?

(2)

5.5 You have excavated the foundation trenches and the concrete must be poured into the trenches. What tools can you use to ensure that the level of concrete will be uniform throughout the trench?

(3)

- 5.6 What purpose does a profile serve to a bricklayer on a building site? (2)  
[20]

## QUESTION 6

### 6.1 MATERIALS TESTING

- 6.1.1 What is the purpose of carrying-out the cube test on concrete? (2)
- 6.1.2 Copy the grid in your answer book and complete it:

| MATERIAL   | FERROUS/<br>NON-FERROUS | PROPERTIES | USE IN THE<br>BUILDING<br>ENVIRONMENT |
|------------|-------------------------|------------|---------------------------------------|
| Copper     |                         |            |                                       |
| Aluminium  |                         |            |                                       |
| Brickforce |                         |            |                                       |
| Cast iron  |                         |            |                                       |
| Weldmesh   |                         |            |                                       |

(15)

- 6.1.3 What is the purpose of a slump test? (3)

### 6.2 INSTRUMENTS

Use the description of the bathroom cabinet in FIGURE 6.3.

- 6.2.1 List FVIE handtools you would use to make the bathroom cabinet. (5)
- 6.2.2 Name five methods that could be used to join parts A and B of the bathroom cabinet. (5)
- 6.2.3 Name TWO other methods that could be used to complete the drawing of the bathroom cabinet other than instrument drawings. (2)
- 6.2.4 List TWO uses of the following small plant used on the building site:
- (a) Concrete vibrator (2)
  - (b) Plate compacter (2)
  - (c) Concrete mixer (2)
  - (d) Electric hammer (2)

**6.3 DRAWING**

Answer this question on the A4 answer sheet provided.

The figure below represents an isometric view of a BATHROOM CABINET.  
Using the information on the isometric view, draw in first-angle orthographic projection, to a scale of 1:5, the following:

- |       |  |             |
|-------|--|-------------|
| 6.3.1 | The front view                             | (14)        |
| 6.3.2 | The left view – showing ALL hidden details | (8)         |
| 6.3.3 | Label the views                            | (4)         |
| 6.3.4 | Write the title and scale of the drawing   | (4)         |
|       |  | <b>[70]</b> |

**TOTAL: 200**