



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

**NATIONAL CERTIFICATE
BUILDING SCIENCE N1**

29 MARCH 2018

This marking guideline consists of 7 pages.

QUESTION 1

- 1.1 C
- 1.2 D
- 1.3 E
- 1.4 A
- 1.5 B

(5 × 1) [5]

QUESTION 2

- 2.1 False
- 2.2 True
- 2.3 True
- 2.4 False
- 2.5 True

(5 × 2) [10]

QUESTION 3

- 3.1 The relative density (r.d.) of a substance is the density of the substance compared with the density of water or the mass of any volume of the substance compared with the mass of an equal volume of water. (3)

- 3.2 Empty container = 10,5 g
Empty container and paraffin = 43,5 g
Volume of paraffin = 31,4 cm³

$$\begin{aligned}\text{Mass of paraffin} &= \text{empty container and paraffin} - \text{empty container} \checkmark \\ &= 43,5 \text{ g} - 10,5 \text{ g} \\ &= 33 \text{ g} \checkmark\end{aligned}$$

$$\begin{aligned}\text{Density of paraffin} &= \frac{M}{V} \checkmark \\ &= \frac{33}{31,4} \\ &= 1,051 \text{ g/cm}^3 \checkmark \checkmark\end{aligned} \quad (5)$$

3.3
$$\text{R.D.} = \frac{\text{Density of timber}}{\text{Density of water}}$$

$$0.75 = \frac{\text{Density of timber}}{1000 \text{ kg / m}^3} \checkmark$$

$$\text{Density of timber} = 0,75 \times 1\,000 \text{ kg/m}^3 \checkmark$$

$$\text{Density of timber} = 750 \text{ kg/m}^3 \checkmark$$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Mass} = \text{density} \times \text{volume} \checkmark$$

$$= 750 \text{ kg/m}^3 \times [9 \times 0,228 \times 0,05] \checkmark$$

$$= 750 \text{ kg/m}^3 \times 0,103 \checkmark$$

$$\text{Mass} = 76,95 \text{ kg} \checkmark$$

(7)
[15]

QUESTION 4

- 4.1
- Must have correct proportions of fine to coarse aggregates
 - Must have the correct cement-aggregate ratio
 - Must have the correct water-cement ratio
 - Must be well mixed
 - Must be fully compacted
 - Must be well cured

(6)

4.2
$$\text{Water : cement ratio} = \frac{\text{mass of water}}{\text{mass of cement}} \checkmark$$

$$\text{Mass of water} = \text{water-cement ratio} \times \text{mass of cement} \checkmark$$

$$\text{Mass of water} = 0,73 \times 40 \text{ kg}$$

$$\text{Mass of water} = 29,2 \text{ kg} \checkmark$$

$$1 \text{ kg of water} = 1 \text{ litre}$$

$$\text{Therefore the amount of water required is } 29,2 \text{ litres} \checkmark$$

(4)
[10]

QUESTION 5

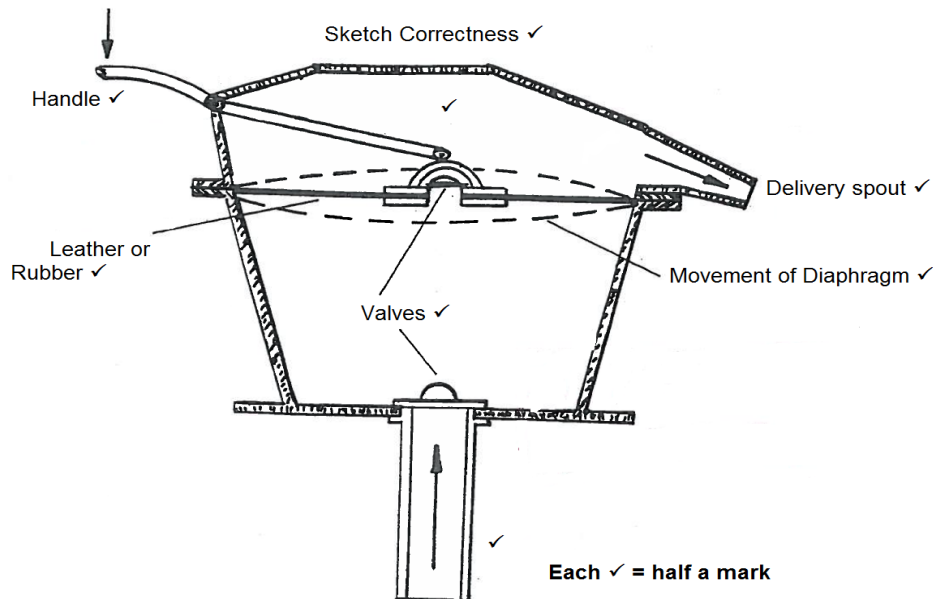
5.1 $K = 273 + ^\circ\text{C}$

$= 273 + 35 ^\circ\text{C} \checkmark$

$= 308 \text{ K} \checkmark$

(2)

5.2



The diaphragm pump has a thick rubber or leather diaphragm bolted into the frame of the cylinder. This diaphragm is used to divide the cylinder into two sections. A large metal washer is bolted on either side of the rubber diaphragm and connected to a handle. When the handle is moved up and down, the rubber allows the washer to act as a piston, which moves up and down as a lift pump. ✓✓✓✓

(8)

5.3 Pressure = height × density × gravitational acceleration

$= h \times d \times g \checkmark$

$= 35 \times 1\,000 \times 10 \checkmark$

$= 350\,000 \text{ N/m}^2 \checkmark$

$= 350 \text{ kPa} \checkmark \checkmark$

(5)
[15]

QUESTION 6

6.1 6.1.1 $\overleftarrow{\hspace{1cm}} \quad \overrightarrow{\hspace{1cm}}$
 $350 \text{ N} - 220 \text{ N} \checkmark \checkmark$
 $R = 130 \text{ N}$ towards the left $\checkmark \checkmark$ (4)

6.1.2 Equilibrant = $\overrightarrow{\hspace{1cm}}$ 130 N towards the right $\checkmark \checkmark$ (2)

6.2 Horizontal component:

$$HC = F \cdot \cos \theta \checkmark$$

$$= 50 \times \cos 60^\circ \checkmark$$

$$= 25 \text{ kN} \checkmark$$

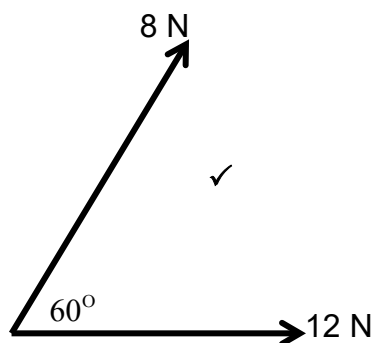
Vertical component:

$$VC = F \cdot \sin \theta \checkmark$$

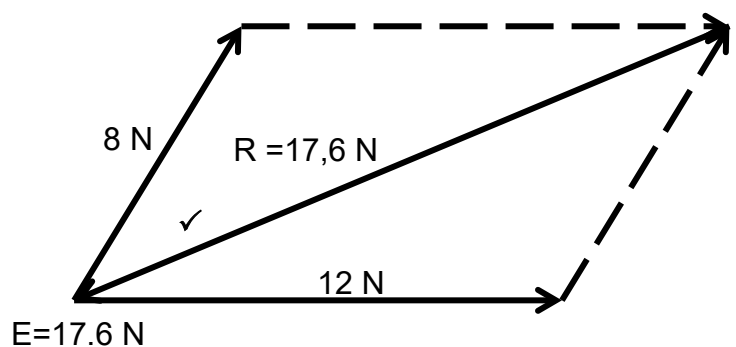
$$= 50 \times \sin 60^\circ \checkmark$$

$$= 43,30 \text{ kN} \checkmark \quad (6)$$

6.3



SPACE DIAGRAM \checkmark
No scale



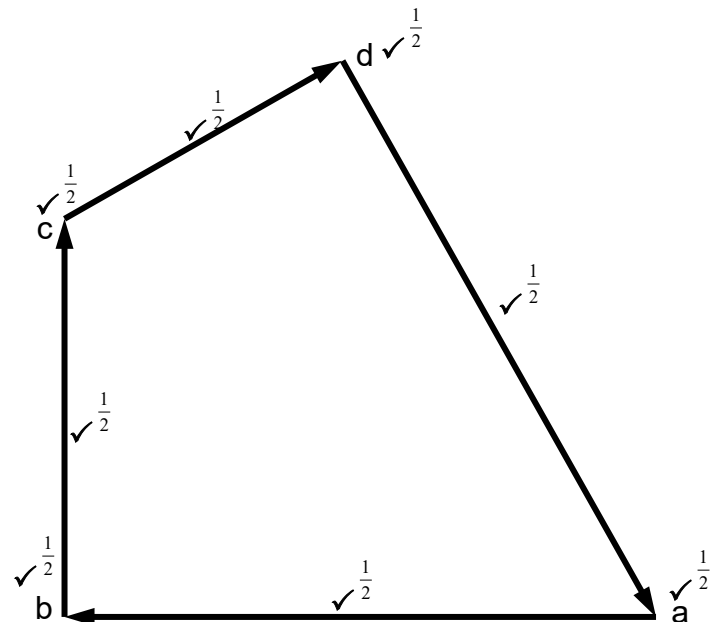
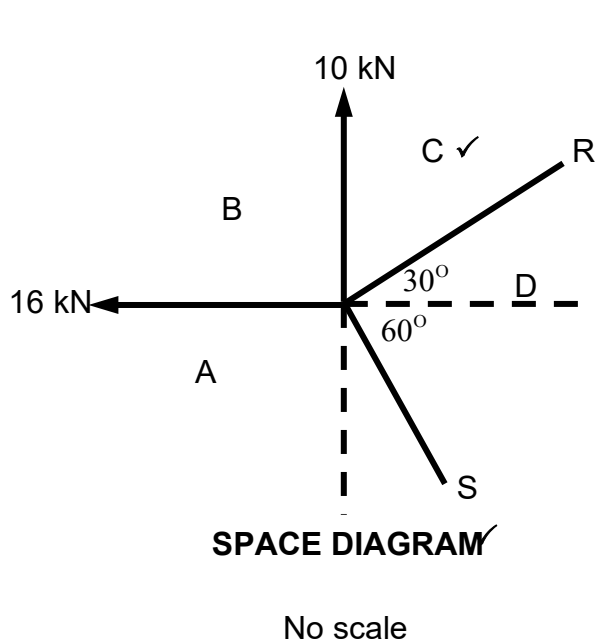
No scale to the drawing
FORCE DIAGRAM
 Scale 1 cm = 2 N \checkmark

Equilibrant = 17,6 N at 24° to horizontal $\checkmark \checkmark$
 (6)
[18]

QUESTION 7

7.1 Bow's notation is the numbering of the spaces between the lines of action in a system of forces. (3)

7.2



$$R = cd = 8,6 \text{ kN} \checkmark$$

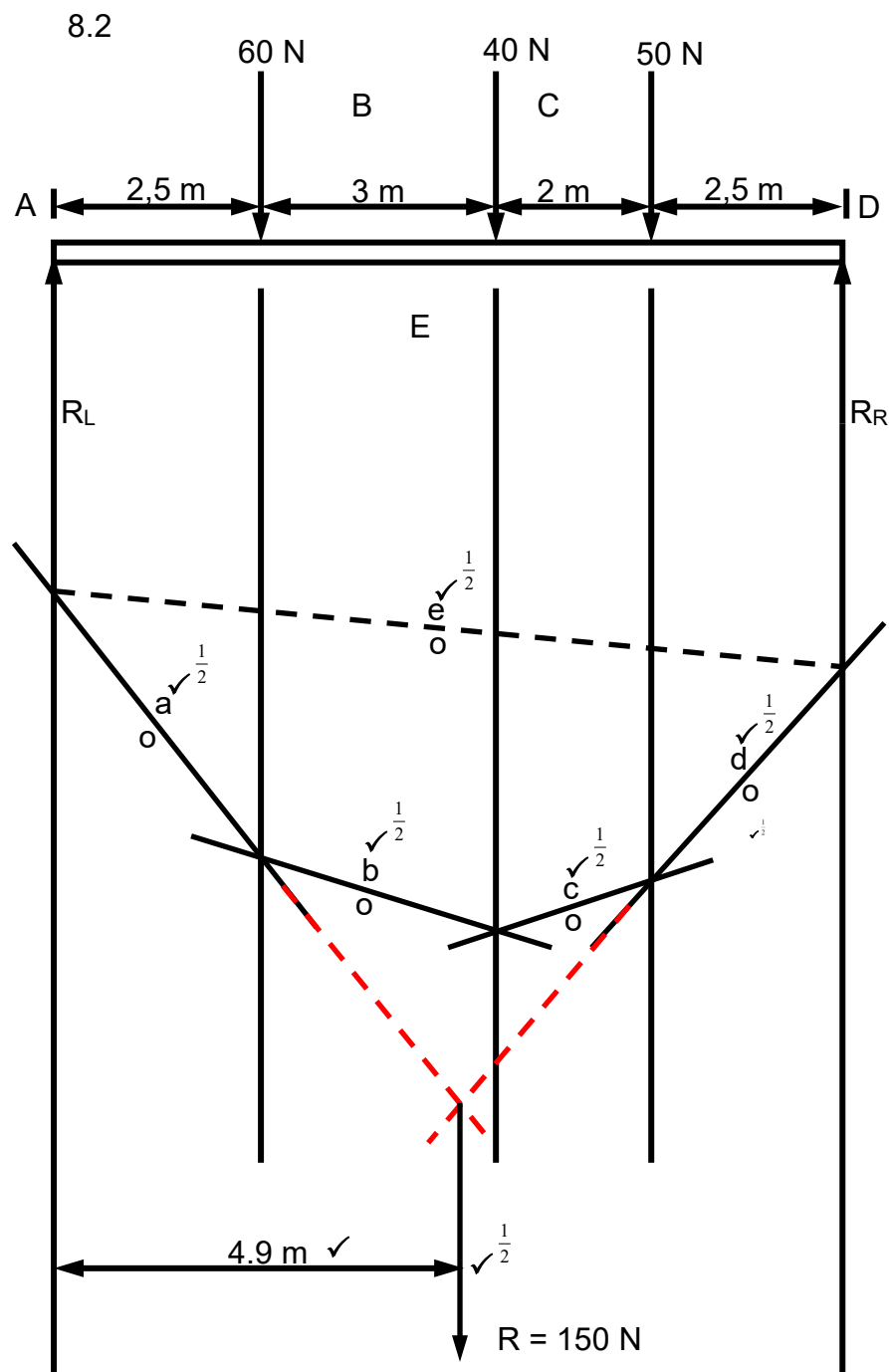
$$S = da = 16,4 \text{ kN} \checkmark$$

✓

(9)
[12]

QUESTION 8

8.1 If more than three forces acting on a point are in equilibrium, they can be represented in magnitude and direction by the sides of a closed polygon, taken in order. (4)



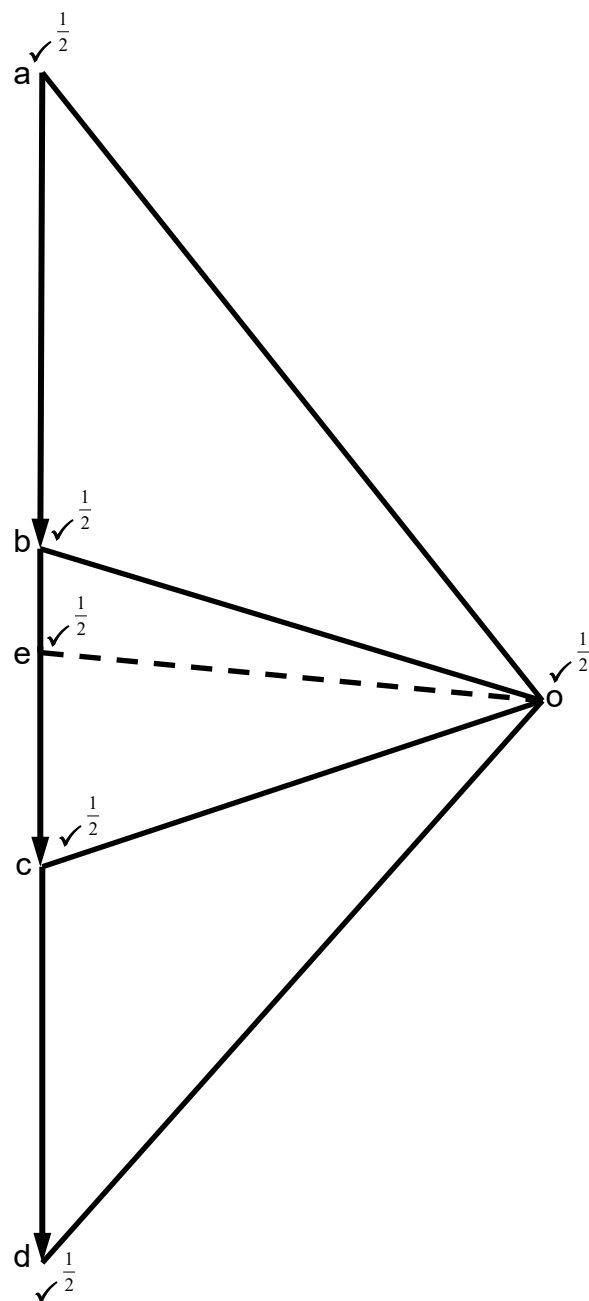
SPACE DIAGRAM ✓
Scale 1 cm = 1 m

$$R_R = de = 74 \text{ N}$$

$$R_L = ea = 76 \text{ N}$$

✓

✓



POLYGON DIAGRAM ✓
Scale 1 cm = 10 N

(11)
[15]

TOTAL: 100