



**education**

Department of  
Education  
FREE STATE PROVINCE

**CONTROL TEST / *KONTROLETOETS***

**GRADE 10 / *GRAAD 10***

**TECHNICAL SCIENCES  
*TEGNIJSE WETENSKAPPE***

**MEMORANDUM**

**SEPTEMBER 2017**

**MARKS: 100 / *PUNTE: 100***

**TIME: 2 HOURS / *TYD: 2 URE***

**This memorandum consists of SIX pages.  
*Hierdie memorandum bestaan uit SES bladsye.***

### QUESTION 1/ VRAAG 1

- 1.1 C ✓✓  
1.2 A ✓✓  
1.3 D ✓✓  
1.4 A ✓✓  
1.5 C ✓✓  
1.6 D ✓✓  
1.7 A ✓✓  
1.8 C ✓✓  
1.9 A ✓✓  
1.10 B ✓✓

[20]

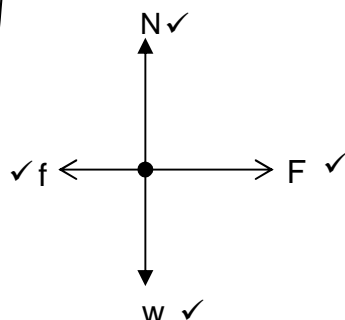
### QUESTION 2/ VRAAG 2

2.1.1 A single force (✓) that has the same effect as all the other forces (✓) acting on an object. / 'n Enkele krag (✓) wat dieselfde uitwerking as al die ander kragte saam (✓) het. (2)

2.1.2 0 ✓ (N) (1)

2.1.3 30 ✓ (N); left / links ✓ (2)

2.2.1



Accept/Aanvaar	
w	$F_g$ /weight/gravity/force of gravity/gravitational force $F_g$ /gewig/gravitasie/gravitasiekrag
F	$F_{app}$ /applied force $F_{toe}$ /toegepaste krag
f	$F_f$ /force of friction/friction $F_f$ /wrywingskrag/wrywing
N	$F_N$ /normal force/force of ground on trolley $F_N$ /normaalkrag/krag van grond op trollie

Comparative lengths of f and F are not required.  
*Vergelykende lengte van f en F word nie vereis nie.*

2.2.2

#### OPTION 1/OPSIE 1

Right: + / Regs: +  
 $R = F_1 + F_2$  ✓  
 $= 70 + (-30)$  ✓  $= 40 \text{ N}$  ✓  
 $\therefore R = 40 \text{ N right/regs}$  ✓

#### OPTION 2/OPSIE 2

Right: - / Regs: -  
 $R = F_1 + F_2$  ✓  
 $= (-70) + 30$  ✓  $= -40 \text{ N}$  ✓  
 $\therefore R = 40 \text{ N right/regs}$  ✓

(4)

(4)

- 2.3.1 A force with the same magnitude as the resultant force (✓)  
but acts in the opposite direction.(✓)

'n Krag wat dieselfde grootte as die resultante krag het (✓)  
maar werk in die teenoorgestelde rigting in. (✓) (2)

2.3.2  $R = F_1 + F_2$  ✓  
 $= 11 + 7$  ✓  
 $R = 18 \text{ N}$  ✓ (3)

2.2.3 18 ✓ (N) (1)  
**[19]**

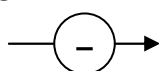
### QUESTION 3/VRAAG 3

- 3.1.1 Torque is defined as the turning effect ✓ of a force about a point. ✓  
**OR**

Torque is the product of a force and the perpendicular distance ✓  
from the point to the line of action of the force. ✓

Draaimoment word gedefinieer as die draai-effek ✓ van 'n krag om 'n punt. ✓  
**OF**  
Draaimoment is die produk van 'n krag en die loodregte afstand ✓ vanaf die punt na die aanwendingslyn van die krag. ✓ (2)

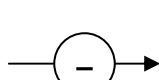
- 3.1.2 C ✓



$\tau_B = Fd_{\perp}$ ✓	$\tau_C = Fd_{\perp}$
$= 20 \times 0,07$ ✓	$= 20 \times 0,12$ ✓
$= 1,4 \text{ N}\cdot\text{m}$ ✓	$= 2,4 \text{ N}\cdot\text{m}$ ✓

(6)

- 3.1.3 C ✓



The longer the distance from the rotation point, (✓)  
the smaller the force for the same torque. (✓)  
*Hoe langer die afstand vanaf die rotasiepunt, (✓) hoe kleiner die krag vir dieselfde draaimoment.* (✓) (3)

- 3.2.1

$\tau = Fd_{\perp}$ $= (140)(9,8)$ ✓ (0,6) ✓ $= 823,20 \text{ N}\cdot\text{m}$ ✓ $\tau = 823,20 \text{ N}\cdot\text{m}$ ; Clockwise/Kloksgewys ✓
---

(4)

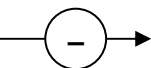
- 3.2.2

$\tau = Fd_{\perp}$ $= (200) (1,26)$ ✓ $= 252 \text{ N}\cdot\text{m}$ ✓ $\tau = 252 \text{ N}\cdot\text{m}$ ; Anticlockwise/Antikloksgewys ✓
---

(3)

**3.2.3 Positive marking from 3.2.1 and 3.2.2.**  
**Positiewe nasien vanaf 3.2.1 & 3.2.2.**

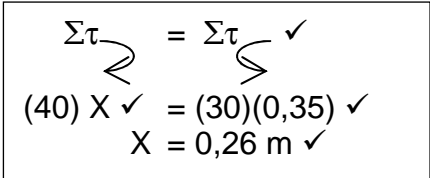
No/Nee ✓

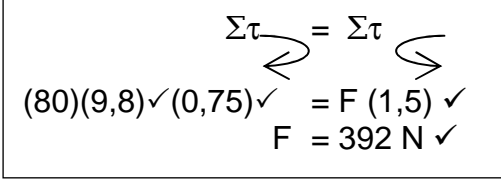
 The moment of force of the weight of the wheelbarrow and concrete is greater than the moment of force of the builder's force. ✓

*Die kragmoment van die gewig van die kruitwa en beton is groter as die kragmoment van die krag van die bouer. ✓* (2)

**3.3.1** For a body in equilibrium ✓  
the sum of the clockwise moments about a point is equal to the sum of anticlockwise moments about the same point. ✓

*Vir 'n liggaam in ewewig ✓*  
*is die som van die kloksgewyse momente om 'n punt gelyk aan die som die antikloksgewyse momente om dieselfde punt. ✓* (2)

**3.3.2**  (4)

**3.4**  (4)  
**[30]**

**QUESTION 4/VRAAG 4**

**4.1.1 OPTION 1/OPSIE 1**

Up: positive / Op: positief

$$\left. \begin{aligned} F_{\text{net}} &= 0 \\ F_{\text{net}} &= F_L + F_M + F_N + F_O + F_P \end{aligned} \right\} \checkmark$$

$$0 = F_L + (-15\,000) + (-12\,000) + (-50\,000) + 48\,000$$

$$F_L = 29\,000\text{ N}$$

**OPTION 2/OPSIE 2**

Up: negative / Op: negatief

$$F_{\text{net}} = 0$$

$$F_{\text{net}} = F_L + F_M + F_N + F_O + F_P \quad \checkmark$$

$$0 = F_L + 15\,000 + 12\,000 + 50\,000 + (-48\,000)$$

$$F_L = -29\,000 \text{ N}$$

(3)

4.1.2 N

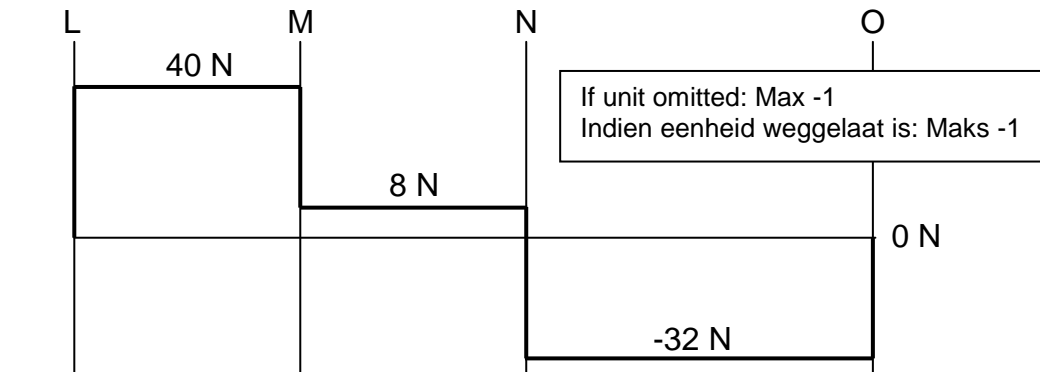
$$\Sigma \tau = \Sigma \tau \quad \checkmark$$

$$(29\,000)(700 + x) \checkmark + (50\,000)(800) \checkmark = (15\,000)(700) \checkmark + (48\,000)(1300) \checkmark$$

$$x = 434,48 \text{ m} \quad \checkmark$$

(6)

4.2.1



**Marking criteria**

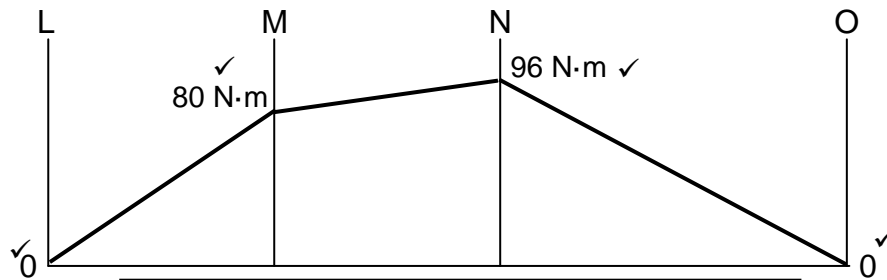
Force with horizontal line: L to M.  $\checkmark$   
Force with horizontal line: M to N.  $\checkmark$   
Force with horizontal line: N to O. ( $\checkmark\checkmark$ )  
Correct shape  $\checkmark$

**Nasienkriteria**

Krag met horisontale lyn: L na M  $\checkmark$   
Krag met horisontale lyn: M na N  $\checkmark$   
Krag met horisontale lyn: N na O ( $\checkmark\checkmark$ )  
Korrekte vorm  $\checkmark$

(5)

4.2.2



Lines connect bending moments from L through O. ✓  
If units are left out at M and N: Max -1

Lyne verbind buigmomente korrek van L na O. ✓  
Indien eenhede uitgelaat is by M en N: Maks -1 ✓

(5)  
[19]

### QUESTION 5/VRAAG 5

5.1.1 1 ✓ (1)

5.1.2 3 ✓ (1)

5.1.3 3 ✓ (1)

5.2 P: Load / Las ✓ (1)

Q: Pivot / Steunpunt ✓ (1)

R: Force / Krag (Mag) ✓ (1)

5.3.1 
$$MA = \frac{\text{effort distance}}{\text{load distance}} \checkmark = \frac{60}{20} \checkmark = 3 \checkmark$$
 
$$MV = \frac{\text{kragafstand}}{\text{lasafstand}}$$
 (3)

5.3.2 To / Na ✓

→ Shorter load distance ✓ greater MA ✓  
Korter lasafstand ✓ groter MV ✓

(3)  
[12]

**GRAND TOTAL/GROOTTOTAAL: 100**