



education

Department of
Education
FREE STATE PROVINCE

GRADE 10 / *GRAAD 10*

**PROVINCIAL FORMAL
ASSESSMENT TASK**

***PROVINSIALE FORMELE
ASSESSERINGSTAAK***

SEPTEMBER 2016/ *SEPTEMBER 2016*

MEMORANDUM

**TECHNICAL SCIENCES /
TEGNIIESE WETENSKAPPE
CONTROL TEST 2 / *KONTROLETOETS 2***

TIME: 2 hours

TYD: 2 ure

MARKS: 100

PUNTE: 100

**This memorandum consists of SEVEN pages.
*Hierdie memorandum bestaan uit SEWE bladsye.***

QUESTION 1/ VRAAG 1

1.1 C ✓✓

1.2 B ✓✓

1.3 B ✓✓

1.4 B ✓✓

1.5 A ✓✓

1.6 C ✓✓

1.7 A ✓✓

1.8 C ✓✓

1.9 D ✓✓

1.10 B ✓✓

[20]

QUESTION 2/ VRAAG 2

2.1 For T
tension ✓ OR
applied force OR
force of chain on engine

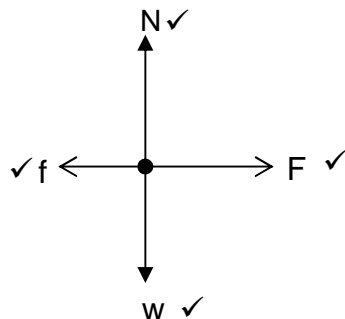
Vir T
spanning ✓ OF
toegepaste/aangewende krag OF
krag van ketting op enjin

For w
weight ✓ OR
gravity OR
force of gravity OR
gravitational force

Vir w
gewig ✓ OF
gravitasie OF
gravitasiekrag

(2)

2.2



Accept/Aanvaar	
w	F_g /weight/gravity/force of gravity/gravitational force F_g /gewig/gravitasie/gravitasiekrag
F	F_B /applied force F_B /toegepaste krag
f	F_f /force of friction/friction F_f /wrywingskrag/wrywing
N	F_N /normal force/force of ground on fridge F_N /normaalkrag/krag van grond op yskas

(4)

2.3.1 w/weight ✓

w/gewig ✓

(1)

2.3.2 Any two of: ✓✓
F OR N OR f OR T

Enige twee van: ✓✓
F OF N OF f OF T

Accept correct names of forces. / **Aanvaar** korrekte name vir kragte.

(2)

2.4.1 1 550 N ✓

If numerical answer is given, unit is required, but if omitted, penalise only once.

(1)

2.4.2 0 N / zero / nil / nul ✓

As numeriese antwoord gegee word, word die eenheid vereis, maar penaliseer slegs een keer indien uitgelaat.

(1)

2.4.3 0 N / zero / nil / nul ✓

(1)

2.5.1 Resultant = $(35 + 37)✓ = 72 \text{ N}$ ✓

(2)

2.5.2

OPTION 1/OPSIE 1

Direction of push: positive

Stootrigting: positief

$$R = (72 - 15) ✓ = 57 \text{ N} ✓$$

∴ R = 57 N in the original direction. ✓

$$R = (72 - 15) ✓ = 57 \text{ N} ✓$$

∴ R = 57 N in die oorspronklike rigting. ✓

OR

OF

$$R = (35 + 37 - 15) ✓ = 57 \text{ N} ✓$$

∴ R = 57 N in the original direction. ✓

$$R = (35 + 37 - 15) ✓ = 57 \text{ N} ✓$$

∴ R = 57 N in die oorspronklike rigting. ✓

OPTION 2/OPSIE 2

Direction of push: negative

Stootrigting: negatief

$$R = (-72 + 15) ✓ = -57 \text{ N} ✓$$

∴ R = 57 N in the original direction. ✓

$$R = (-72 + 15) ✓ = -57 \text{ N} ✓$$

∴ R = 57 N in die oorspronklike rigting. ✓

OR

OF

$$R = (-35 - 37 + 15) ✓ = -57 \text{ N} ✓$$

∴ R = 57 N in the original direction. ✓

$$R = (-35 - 37 + 15) ✓ = -57 \text{ N} ✓$$

∴ R = 57 N in die oorspronklike rigting. ✓

(3)

[17]

Alternative formulae are not given in each calculation below. Accept correct alternatives.

Alternatiewe formules word nie in elke berekening hieronder gewys nie. Aanvaar korrekte alternatiewe.

QUESTION 3/VRAAG 3

3.1

$\begin{aligned}\tau &= Fd_{\perp} \checkmark \\ &= 4 \times 0,5 \checkmark \\ &= 2 \text{ N}\cdot\text{m} \checkmark \\ \tau &= 2 \text{ N}\cdot\text{m}; \text{ anticlockwise/antikloksgewys} \checkmark\end{aligned}$	(4)
--	-----

3.2.1 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 aanwendinglyn van die krag. ✓ (2)

3.2.2

$\begin{aligned}\tau_A &= Fd_{\perp} \\ &= 20 \times 0,18 \checkmark \\ &= 3,6 \text{ N}\cdot\text{m} \checkmark\end{aligned}$	$\begin{aligned}\tau_B &= Fd_{\perp} \\ &= 20 \times 0,15 \checkmark \\ &= 3 \text{ N}\cdot\text{m} \checkmark\end{aligned}$	More torque: A ✓ Grootste draaimoment: A	(5)
--	--	---	-----

3.2.3

$\begin{aligned}\tau &= Fd_{\perp} \\ 700 &= (140) d_{\perp} \checkmark \\ d_{\perp} &= 5 \text{ m} \checkmark\end{aligned}$	(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 Sum of the clockwise moments about a point is equal to the sum of anticlockwise moments about the same point ✓✓ AND $F_{\text{resultant}} = 0$. ✓✓

Som van die kloksgewyse momente om 'n punt is gelyk aan die som van die antikloksgewyse momente om dieselfde punt ✓✓ EN $F_{\text{resultant}} = 0$. ✓✓ (4)

3.3.3

$$\begin{aligned}\Sigma \tau \curvearrowright &= \Sigma \tau \curvearrowleft \checkmark \\ (0,2)w \checkmark &= (25)(0,4) \checkmark \\ w &= 50 \text{ N} \checkmark\end{aligned}$$

(4)

3.4

$$\begin{aligned}\Sigma \tau \curvearrowright &= \Sigma \tau \curvearrowleft \checkmark \\ (10)(0,8) &= 2X \checkmark \\ X &= 4 \text{ N} \checkmark\end{aligned}$$

(2)

3.5

$$\begin{aligned}\Sigma \tau \curvearrowright &= \Sigma \tau \curvearrowleft \checkmark \\ 3w \checkmark &= (320)(3) \checkmark + (540)(1) \checkmark \\ w &= 500 \text{ N} \checkmark\end{aligned}$$

(4
[29])

QUESTION 4/VRAAG 4

4.1

OPTION 1/OPSIE 1

A) $\Sigma \tau \curvearrowright = \Sigma \tau \curvearrowleft \checkmark$
 $T_A(0) + (60)(0,090) \checkmark = T_B(0,3) \checkmark$
 $T_B = 18 \text{ N} \checkmark$

B) $\Sigma \tau \curvearrowright = \Sigma \tau \curvearrowleft \checkmark$
 $T_A(0,3) \checkmark = T_B(0) + (60)(0,210) \checkmark$
 $T_A = 42 \text{ N} \checkmark$

OR/OF

NB: if distances are not converted to metres, then max: $\frac{6}{7}$ marks

Up/Op: +
 $F_{\text{net}} = 0$
 $T_A + (+18) + (-60) \checkmark = 0 \checkmark$
 $T_A = 42 \text{ N} \checkmark$

OR/OF

Up/Op: –
 $F_{\text{net}} = 0$
 $T_A + (-18) + (+60) \checkmark = 0 \checkmark$
 $T_A = -42 \text{ N}$
 $\therefore T_A = 42 \text{ N} \checkmark$

OPTION 2/OPSIE 2

B) $\sum \tau = \sum \tau$ ✓
 $T_A(0,3) + T_B(0) = (60)(0,21)$ ✓
 $T_A = 42 \text{ N}$ ✓

NB: if distances are not converted to metres, then max: $\frac{6}{7}$ marks

A) $\sum \tau = \sum \tau$
 $T_A(0) + (60)(0,09) = T_B(0,3)$ ✓
 $T_B = 18 \text{ N}$ ✓

OR/OF

Like last two calculations in option 1.
 Soos laaste twee berekeninge in opsie 1.

(7)

4.2.1

S) $\sum \tau = \sum \tau$
 $10(2+x) = (5)(1+x) + 10x$ ✓
 $x = 3 \text{ m}$ ✓

(4)

4.2.2

P) $\sum \tau = \sum \tau$
 $(5)(1) + (10)(2) = F(5)$ ✓
 $F = 5 \text{ N}$ ✓

(4)

4.3.1

L M N O

20 N

4 N

-16 N

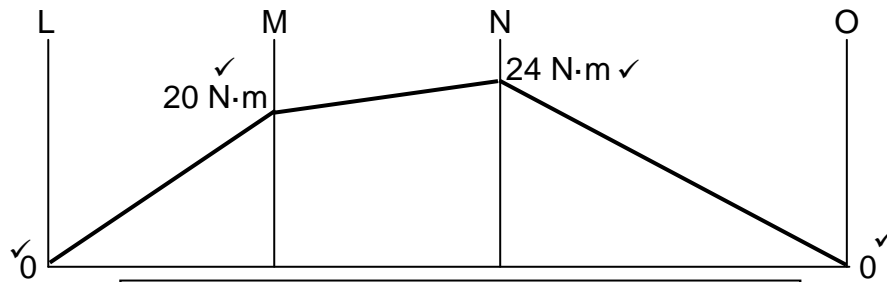
If unit omitted: Max -1
 Indien eenheid weggelaat is: Maks -1

Marking criteria
 Force with horizontal line: L to M. ✓
 Force with horizontal line: M to N. ✓
 Force with horizontal line: N to O. (✓✓)
 Correct shape ✓

Nasienkriteria
 Krag met horisontale lyn: L na M ✓
 Krag met horisontale lyn: M na N ✓
 Krag met horisontale lyn: N na O (✓✓)
 Korrekte vorm ✓

(5)

4.3.2



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)
[25]

QUESTION 5/VRAAG 5

5.1.1 3 ✓ (1)

5.1.2 1 ✓ (1)

5.1.3 2 ✓ (1)

5.2.1 R ✓ (1)

5.2.2 P ✓ (1)

5.2.3 Q ✓ (1)

5.3.2

$$MA = \frac{\text{Load}}{\text{Effort}} \checkmark = \frac{100}{30} \checkmark = 3,33 \checkmark$$

OR

$$MA = \frac{\text{effort distance}}{\text{load distance}} = \frac{1}{0,3} = 3,33$$

$$MV = \frac{\text{Las}}{\text{Krag}} \checkmark = \frac{100}{30} \checkmark = 3,33 \checkmark$$

OF

$$MV = \frac{\text{kragafstand}}{\text{lasafstand}} = \frac{1}{0,3} = 3,33$$

(3)
[9]

GRAND TOTAL/GROOTTOTAAL: 100