

Uitwerkingen oefentoets natuurkunde

Opgave 1

Significantie

- (a) 3 sign. cijfers (s.c)
- (b) 3 s.c
- (c) 4 s.c
- (d) 4 s.c
- (e) 4 s.c

$$(f) \underbrace{0,0300}_{3 \text{ s.c}} \text{ (N)} \times \underbrace{1,200}_{4 \text{ s.c}} \text{ (m)} = \underbrace{0,0360}_{\text{moet in } 3 \text{ s.c}} \text{ Nm}$$

$$(g) \underbrace{1,205}_{4 \text{ s.c}} \text{ (m)} / \underbrace{0,10 \cdot 10^{-2}}_{2 \text{ s.c}} \text{ (s)} = \underbrace{1,2 \cdot 10^3}_{\text{moet in } 2 \text{ s.c}} \text{ m/s}$$

$$(h) 0,0893 \text{ km} + 1,0 \cdot 10^2 \text{ m} \\ \underline{0,0893 \cdot 10^3 \text{ m}} + \underline{1,0 \cdot 10^2 \text{ m}} = 1,9 \cdot 10^2 \text{ m}$$

$$(i) \underbrace{9,81}_{3 \text{ s.c}} \text{ m/s}^2 \times 0,343901 \cdot 10^2 \text{ s} = 3,37 \cdot 10^2 \frac{\text{m}}{\text{s}}$$

$$\left(\frac{\text{m}}{\text{s}^2} \right) \cdot \text{s} \rightarrow \frac{\text{m}}{\text{s}}$$
$$\frac{\text{m}}{\text{s} \cdot \text{s}} \cdot \text{s} = \frac{\text{m} \cdot \cancel{\text{s}}}{\text{s} \cdot \cancel{\text{s}}} = \frac{\text{m}}{\text{s}}$$

$$(j) \underbrace{2,34}_{3 \text{ s.c}} \text{ rad/s} \times 3,1903 \cdot 10^4 \text{ s} = 7,47 \cdot 10^4 \text{ rad}$$

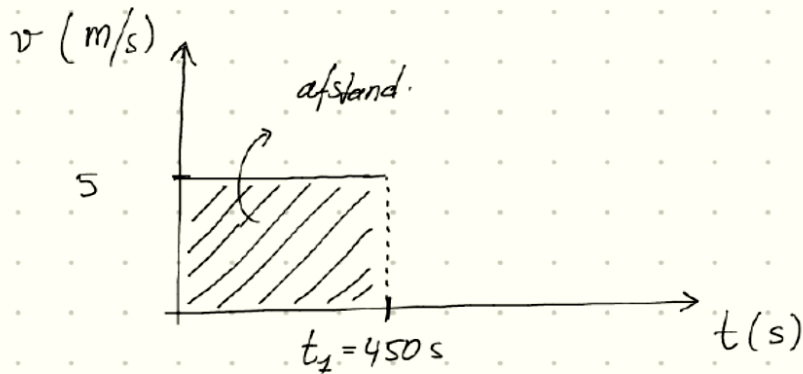
$$\frac{\text{rad}}{\text{s}} \cdot \text{s} \rightarrow \frac{\text{rad} \cdot \cancel{\text{s}}}{\cancel{\text{s}}} = \text{rad}$$

Opgave 2

Naar school fietsen

(a)

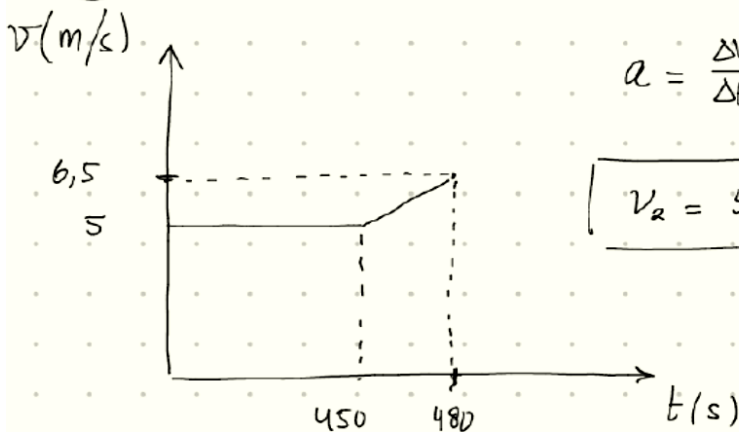
constante snelheid 5 m/s
In totaal 15 min van huis \rightarrow school.



$$t_1 = \frac{15 \text{ min}}{2} = 7,5 \text{ min} \rightarrow 7,5 \times 60 = 450 \text{ s}$$

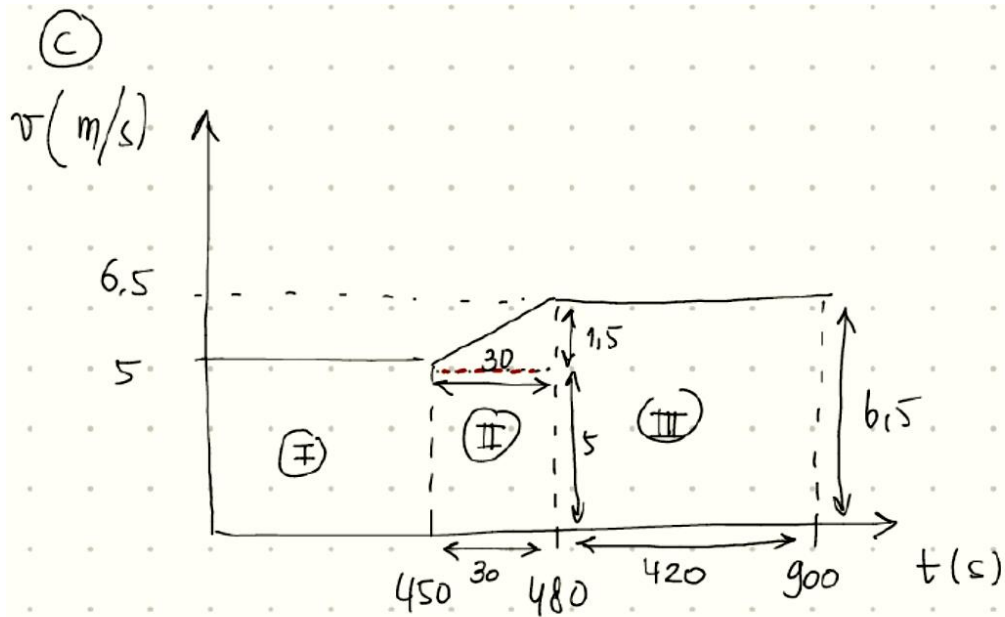
$$s = 5 \cdot 450 = 2250 \text{ m}$$

(b) Versnellen met $a = 0,05 \text{ m/s}^2$ voor $t = 30 \text{ s}$.



$$a = \frac{\Delta v}{\Delta t} \rightarrow \Delta v = a \cdot \Delta t$$
$$\Delta v = 0,05 \cdot 30 = 1,5 \text{ m/s}$$

$$v_2 = 5 + 1,5 = 6,5 \text{ m/s}$$



Afstand = oppervlakte onder (v,t) -diagram

$$s_I = 5 \cdot 450 = 2250 \text{ m}$$

$$s_{II} = 5 \cdot 30 + \frac{1}{2} \cdot 1,5 \cdot 30 = 172,5 \text{ m}$$

$$s_{III} = 6,5 \cdot 420 = 2730 \text{ m}$$

$$s_{TOT} = s_I + s_{II} + s_{III} = 2250 + 172,5 + 2730$$

$$s_{TOT} = 5152,5 \text{ m}$$

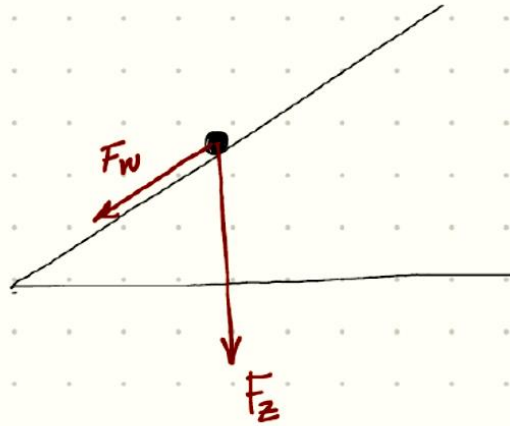
(d)

$$v_{gem} = \frac{\Delta s}{\Delta t} = \frac{5152,5}{900} = 5,7 \text{ m/s}$$

Opgave 3

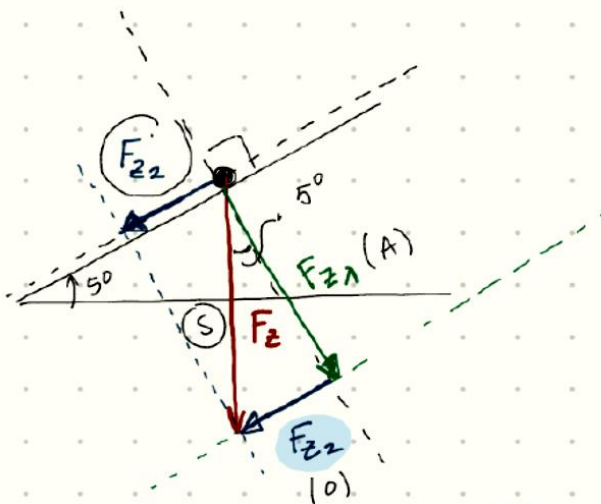
Fietsen op een helling

(a)



(b) $F_z = m \cdot g = 95 \cdot 10 = 950 \text{ N}$

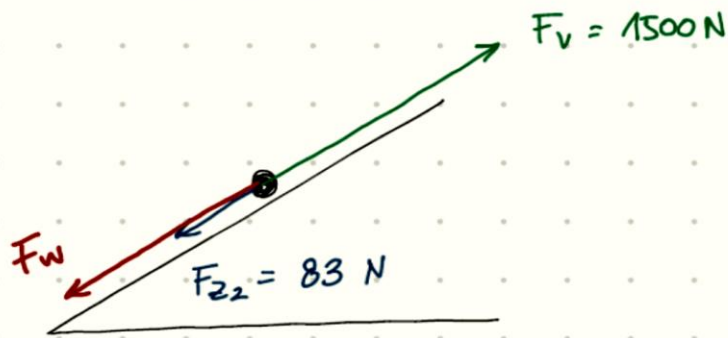
(c)



$$F_{z1} \rightarrow c \cdot \Delta s \rightarrow \cos(5^\circ) = \frac{F_{z1}}{F_z} \rightarrow F_{z1} = F_z \cdot \cos(5^\circ)$$
$$F_{z1} = 950 \cdot \cos(5^\circ) = 946 \text{ N}$$

$$F_{z2} \rightarrow s \cdot \Delta s \rightarrow \sin(5^\circ) = \frac{F_{z2}}{F_z} \rightarrow F_{z2} = F_z \cdot \sin(5^\circ)$$
$$F_{z2} = 950 \cdot \sin(5^\circ) = 83 \text{ N}$$

④



$$F_{\text{res}} = m \cdot a$$

$$F_V - F_{z_2} - F_w = m \cdot a$$

$$-F_w = -F_V + F_{z_2} + m \cdot a$$

$$F_w = F_V - F_{z_2} - m \cdot a$$

$$F_w = 1500 - 83 - 95 \cdot 0,01$$

$$F_w = 1416\text{ N}$$

Opgave 4

Een kokosnoot

Stap 1. Is er wrijvingskracht?

$$E_{z_b} + E_{k_b} - \underbrace{F_w \cdot s}_{\text{net wrijving}} = E_{z_e} + E_{k_e}$$

②

$$E_{z_b} + E_{k_b} - F_w \cdot s = E_{z_e} + E_{k_e}$$

Stap 2: welke termen zijn 0.

- hoogte = 0 of

- snelheid = 0

$$v_b = 0 \rightarrow E_{k_b} = 0 \left(\frac{1}{2} m v_b^2 \right)$$

$$h_e = 0 \rightarrow E_{z_e} = 0 \left(m \cdot g \cdot h_e \right)$$

$$E_{z_b} - F_w \cdot s = E_{k_e}$$

$$\bar{m} \cdot g \cdot h_b - \underbrace{F_w}_{\checkmark} \cdot \underbrace{h_b}_{\checkmark} = \frac{1}{2} \cdot \bar{m} \cdot \underbrace{v_e^2}_{\checkmark}$$

$$\underline{m} \cdot g \cdot h_b - \frac{1}{2} \underline{m} v_e^2 = F_w \cdot h_b$$

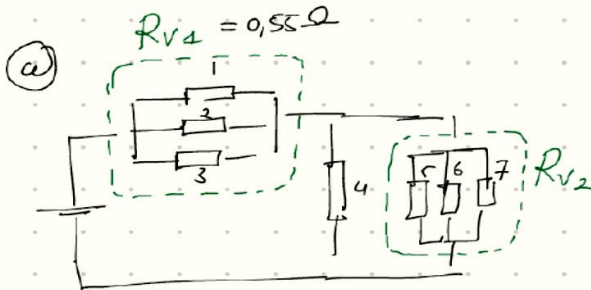
$$m \cdot \left(g \cdot h_b - \frac{1}{2} v_e^2 \right) = F_w \cdot h_b$$

$$m = \frac{F_w \cdot h_b}{g \cdot h_b - \frac{1}{2} v_e^2}$$

$$m = \frac{10 \cdot 3}{10 \cdot 3 - \frac{1}{2} \cdot 4^2} = \frac{30}{30 - 8} = 1,4 \text{ kg.}$$

Opgave 5

Schaltungen vereinfachen



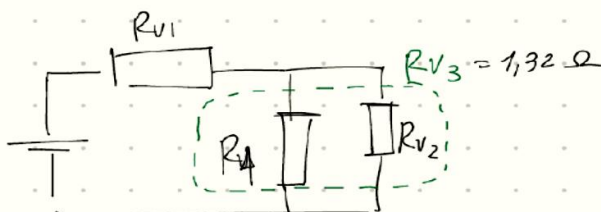
parallel

$$\frac{1}{R_{V1}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{1} + \frac{1}{2} + \frac{1}{3} = 1,83$$

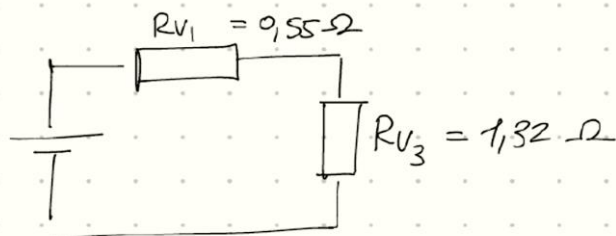
$$R_{V1} = \frac{1}{1,83} = 0,55 \Omega$$

$$\frac{1}{R_{V2}} = \frac{1}{R_5} + \frac{1}{R_6} + \frac{1}{R_7} = \frac{1}{5} + \frac{1}{6} + \frac{1}{7} = 0,51$$

$$R_{V2} = \frac{1}{0,51} = 1,96 \Omega$$



$$\frac{1}{R_{V3}} = \frac{1}{R_4} + \frac{1}{R_{V2}} = \frac{1}{4} + \frac{1}{1,96} = 0,76 \rightarrow R_{V3} = \frac{1}{0,76} = 1,32 \Omega$$

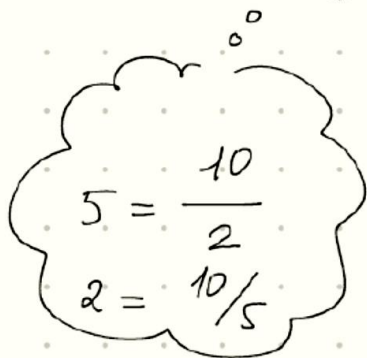


Serie:

$$R_V = 0,55 + 1,32 = 1,87 \Omega$$

(b)

$$R = \frac{U}{I} \rightarrow I = \frac{U}{R}$$


$$5 = \frac{10}{2}$$
$$2 = \frac{10}{5}$$

$$I = \frac{24}{1,87} = 12,8 \text{ A}$$

c

$$R = \frac{\rho \ell}{A} \text{ met } R = \frac{1}{G} = \frac{1}{50} = 0,020 \Omega$$

Vermenigvuldig links en rechts met A en deel links en rechts door R , dan vind je:

$$A = \frac{\rho \ell}{R} = \frac{17 \cdot 10^{-9} \times 0,80}{0,020} = 6,8 \cdot 10^{-7} \text{ m}^2$$

$$A = \pi r^2, \text{ dus } r = \sqrt{\left(\frac{A}{\pi}\right)} = \sqrt{\left(\frac{6,8 \cdot 10^{-7}}{\pi}\right)} = 4,65 \cdot 10^{-4} \text{ m}$$

$$d = 2r = 2 \times 4,65 \cdot 10^{-4} = 9,3 \cdot 10^{-4} \text{ m } (= 0,93 \text{ mm})$$

Opgave 6

A

Er geldt: $Q_{\text{graniet}} = Q_{\text{water}} \rightarrow c_{\text{graniet}} m_{\text{graniet}} \Delta T_{\text{graniet}} = c_{\text{water}} m_{\text{water}} \Delta T_{\text{water}}$.

Hieruit volgt:

$$m_{\text{water}} = \frac{c_{\text{graniet}} m_{\text{graniet}} \Delta T_{\text{graniet}}}{c_{\text{water}} \Delta T_{\text{water}}} = \frac{0,82 \cdot 10^3 \cdot 2,3 \cdot (384 - 100)}{4,18 \cdot 10^3 \cdot (100 - 18)} = 1,6 \text{ kg water.}$$

B

$E = 124 \cdot 10^8 \text{ Pa}$
 $l_0 = 4,0 \text{ m}$
 $\Delta l = ? \text{ (m)}$
 $\epsilon = ? \text{ (-)}$
 $\sigma = ? \text{ (Pa)}$

**Binas 6^e editie
Tabel 8**

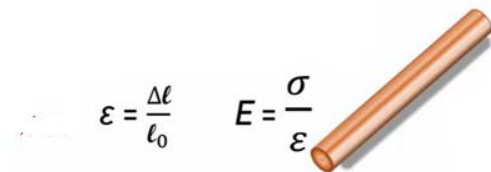
$$\epsilon = \frac{\Delta l}{l_0} \quad E = \frac{\sigma}{\epsilon}$$
$$\sigma = \frac{F}{A} \quad A = \pi \cdot r^2$$
$$r = \frac{1}{2}d$$

$$F = 5,0 \cdot 9,81 = 49,05 \text{ N}$$

$$A = \pi \cdot (\frac{1}{2} \cdot 0,005)^2 = 1,96 \cdot 10^{-5} \text{ m}^2$$

$$\sigma = \frac{49,05}{1,96 \cdot 10^{-5}} = 2,5 \cdot 10^6 \text{ Pa}$$

$$\epsilon = \frac{\Delta l}{l_0} \quad E = \frac{\sigma}{\epsilon}$$
$$\epsilon = \frac{\sigma}{E}$$
$$\epsilon = \frac{2,5 \cdot 10^6}{124 \cdot 10^8} = 2,0 \cdot 10^{-4}$$



$$2,0 \cdot 10^{-4} = \frac{\Delta l}{4,0}$$

$$\Delta l = 2,0 \cdot 10^{-4} \cdot 4,0 = 8,0 \cdot 10^{-4} \text{ m}$$