EURÊKA: Moments de forces
Corrigés

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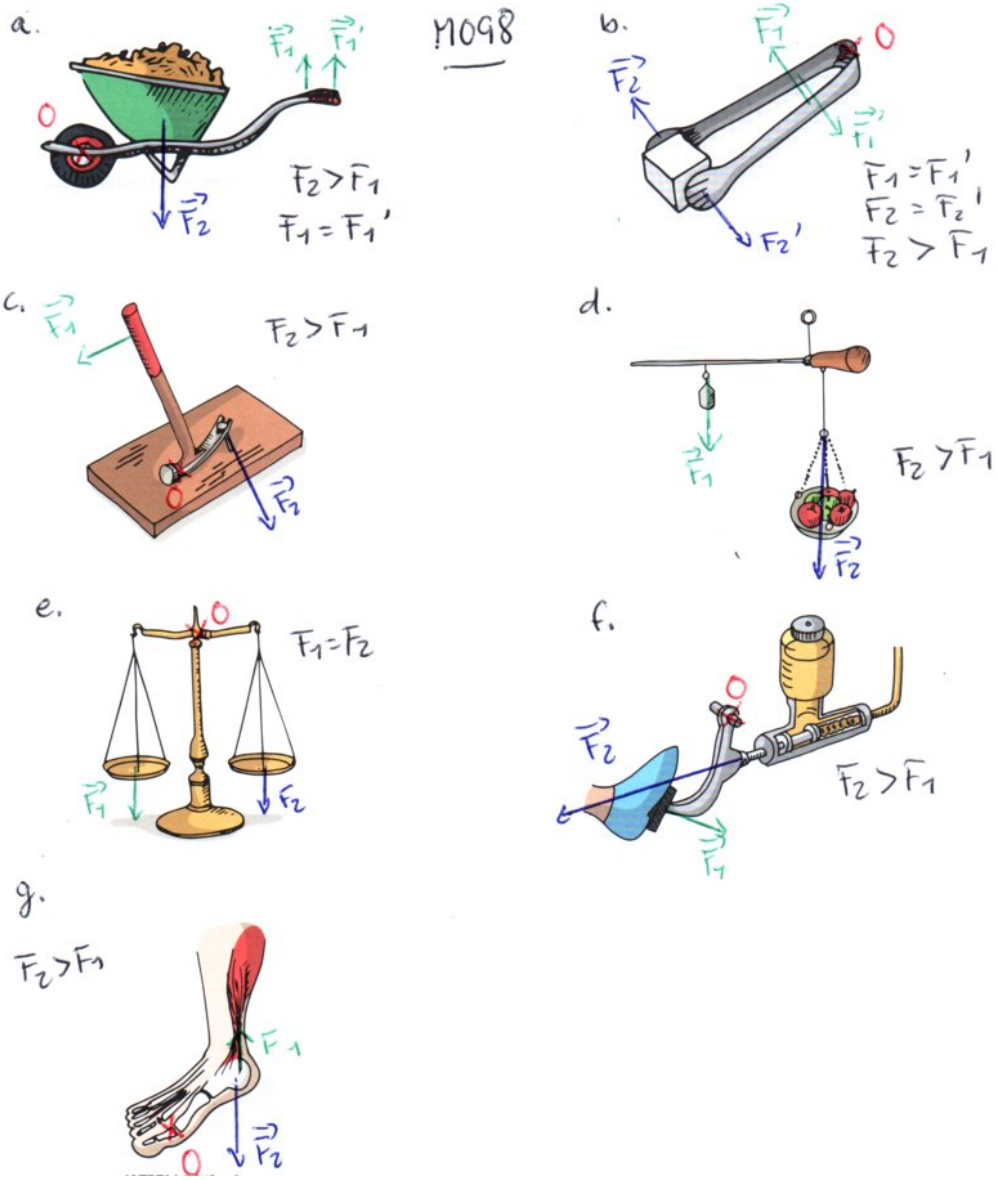
10 juin 2024



M099

a) La brouette rouge car son centre de gravité est plus près de l'axe de la roue

b) Dans la position de droite car la distance entre la main et l'axe de rotation est plus grande

c) 1 Les intensités en A et C sont identiques
L'intensité en B est $\frac{8}{1.5} = 5.33$ fois plus grande

2 Pour tenir un objet plus facilement.

3 Pour pouvoir le sectionner

d) le A car son manche n'est ni trop long (ce qui évite les problèmes de précision de la frappe), ni trop court (on diminue ainsi la force nécessaire), sans avoir besoin d'une grande masse.

M0100

1. 7.5 cm 2. 36 g 3. 600 g
4. 40 cm 5. $\frac{m_1 \cdot d_1 - m_3 \cdot d_3}{m_2}$

M0101

Lucie : $60 \cdot 0.2 = 12$ N·m

Valentin : $25 \cdot 0.5 = 12.5$ N·m

Lucie doit reculer

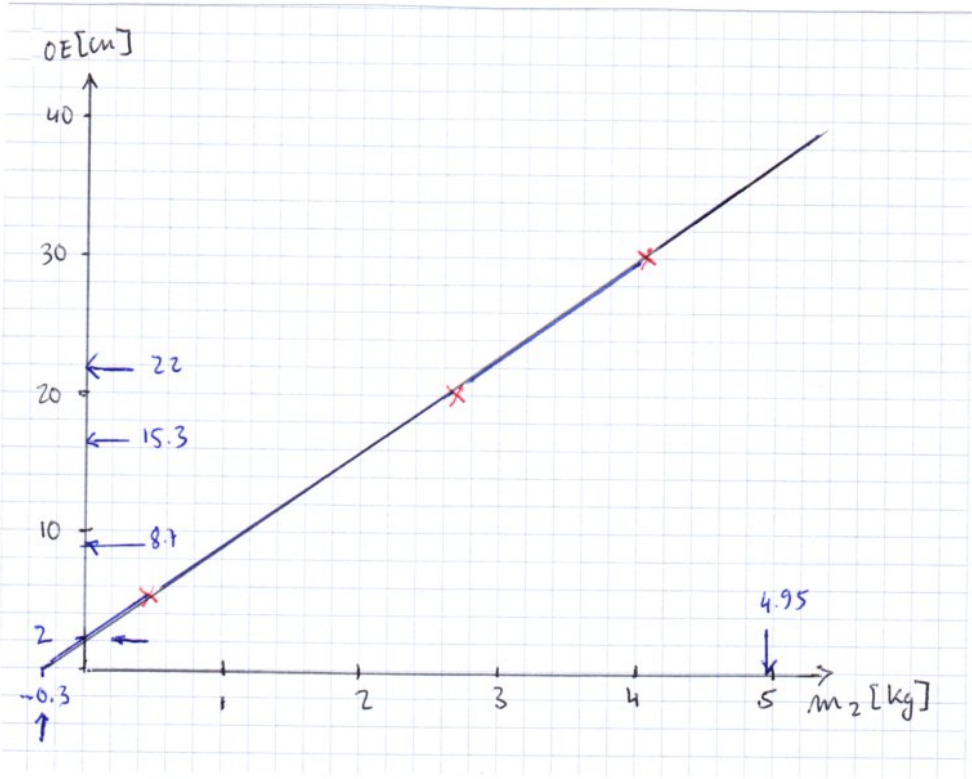
M0102

a) $\frac{6 \cdot 40}{15} = 16$ t.

b) $6 + 16 = 22$ t

c) Elle risque de basculer en arrière

M0103



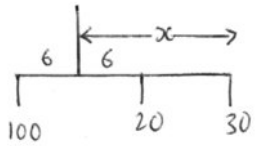
a) 4.95 kg, 8.7 cm, 15.3 cm, 22 cm

b) à 2 cm de O

c) 0.3 kg

M0105

a)



$100 \cdot 6 = 20 \cdot 6 + 30 \cdot x$

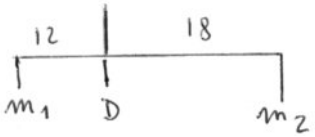
$600 = 120 + 30x$

$30x = 600 - 120 = 480$

$x = 16$ cm

$\Rightarrow 16 + 6 = 22$ cm

b)



$m_2 = 100 + 20 + 30 = 150$

$m_1 \cdot 12 = m_2 \cdot 18 = 2700$

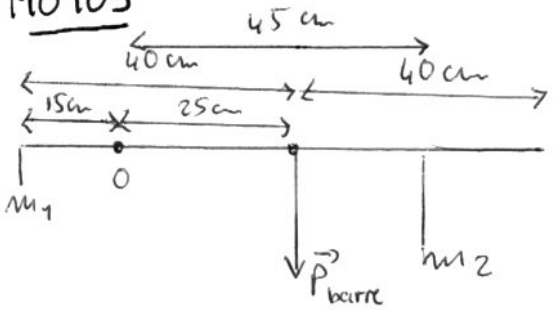
$m_1 = \frac{270}{12} = 225$ g

$225 = 2 \cdot 80 + 65$

$\Rightarrow D = 65$ g

$\Rightarrow$ A et C $= 80$ g ; B $= 65$ g

M0109



$m_1 \cdot g \cdot 0.15 = m_2 \cdot g \cdot 0.45 + m_b \cdot g \cdot 0.25$

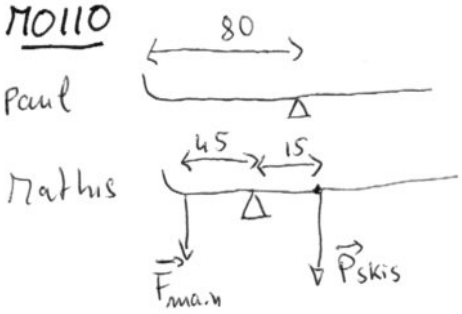
$1.2 \cdot 10 \cdot 0.15 = 0.35 \cdot 10 \cdot 0.45 + m_b \cdot 10 \cdot 0.25$

$1.8 = 1.575 + m_b \cdot 2.5$

$m_b \cdot 2.5 = 1.8 - 1.575 = 0.225$

$m_b = \frac{0.225}{2.5} = 0.09$ kg

M0110



a) $F_{main} \cdot 0.45 = m_{skis} \cdot g \cdot 0.15$

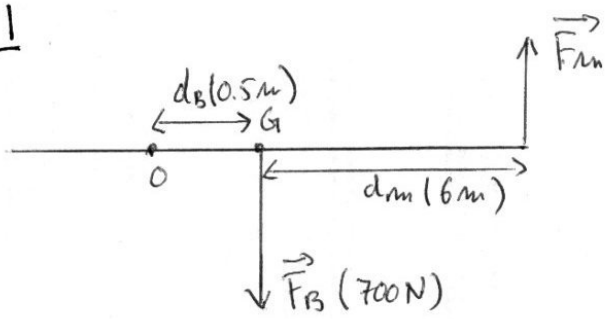
$F_{main} \cdot 0.45 = 5 \cdot 10 \cdot 0.15$

$F_{main} = \frac{75}{0.45} = 16.7\ N$

b) $5 \cdot 10 + 16.7 = 66.7\ N$

c) $50\ N$

M0111



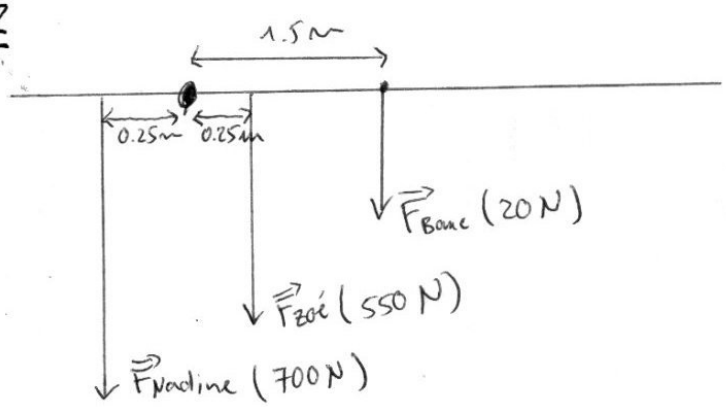
a) $M_B = F_B \cdot d_B = 700 \cdot 0.5 = 350\ N$

$M_m = F_m \cdot d_m \Rightarrow F_m = \frac{M_m}{d_m}$

$M_m = M_B \Rightarrow F_m = \frac{M_B}{d_m} = \frac{350}{6} \simeq 58.3\ N$

b) $d_m = \frac{M_B}{F_m} = \frac{350}{550} \simeq 0.64\ m$

M0112

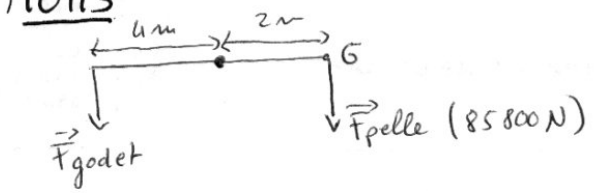


$M_{Nadine} = 700 \cdot 0.25 = 175 \text{ N m}$

$M_{Zoé} + M_{Banc} = 550 \cdot 0.25 + 20 \cdot 1.5 = 167 \text{ N m}$

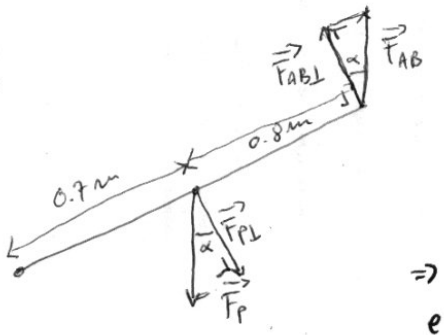
$\Rightarrow$ non, elle va basculer.

M0113



$F_{godet} = \dfrac{85\,800 \cdot 2}{4} = 42\,900 \text{ N} \Rightarrow 4290 \text{ kg}$

M0114



$$\cos\alpha = \frac{F_{P\perp}}{F_P} = \frac{F_{AB\perp}}{F_{AB}}$$

$$\Rightarrow F_{P\perp} = \cos\alpha \cdot F_P$$

et $F_{AB\perp} = \cos\alpha \cdot F_{AB}$

a. $\cos\alpha \cdot F_P \cdot 0.7 = \cos\alpha \cdot 1.5 \cdot F_{AB}$

$$F_{AB} = \frac{F_P \cdot 0.7}{1.5} = \frac{600 \cdot 0.7}{1.5} = \underline{280\ N}$$ donc

140 N sur chaque poignée

b. $600 - 280 = \underline{320\ N}$

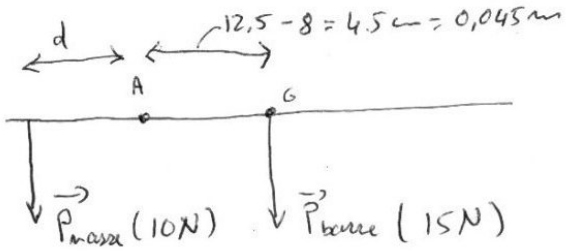
c. 155 kg → 1550 N

$(600 + P_m) \cdot 0.7 = 1550 \cdot 1.5$

$$P_m = \frac{1550 \cdot 1.5}{0.7} - 600 \simeq 2721\ N \Rightarrow \sim \underline{272\ kg}$$

M0115

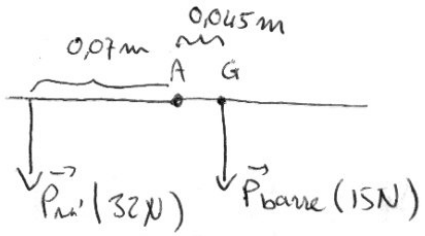
a)



$$d = \frac{15 \cdot 0.045}{10} = 0.0675\ m$$

⇒ à $\underline{6.75}$ cm à gauche de A

b)

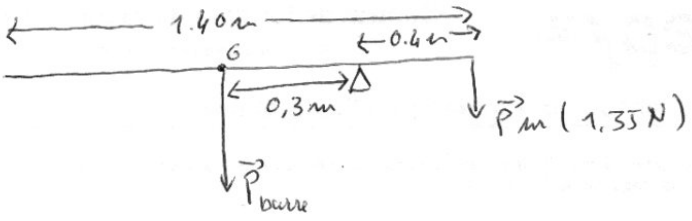


$32 \cdot 0.07 > 15 \cdot 0.045 \rightarrow$ on doit placer m à droite de A.

$32 \cdot 0.07 = 15 \cdot 0.045 + 10 \cdot x$

$x = 15{,}65$ cm

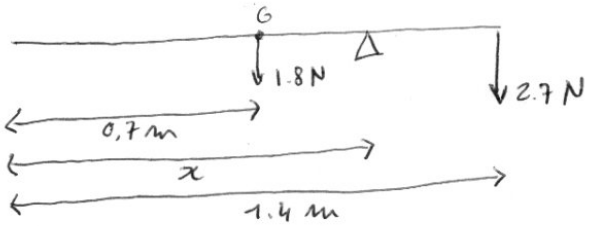
M0116



a) $P_{barre} = \dfrac{0.4 \cdot 1.35}{0.3} = 1.8$ N $\Rightarrow$ 180 g

b) verticale vers le haut de $1.80 + 1.35 = 3.15$ N

c)



$1.8\,(x - 0.7) = 2.7 \cdot (1.4 - x)$

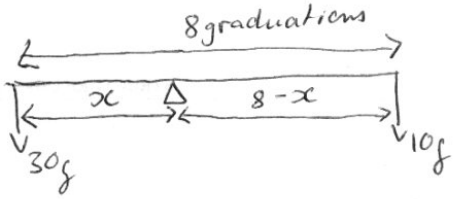
$1.8x - 1.26 = 3.78 - 2.7x \quad | +2.7x + 1.26$

$4.5x = 5.04$

$x = \dfrac{5.04}{4.5} = 1.12$ m

M0117

a)



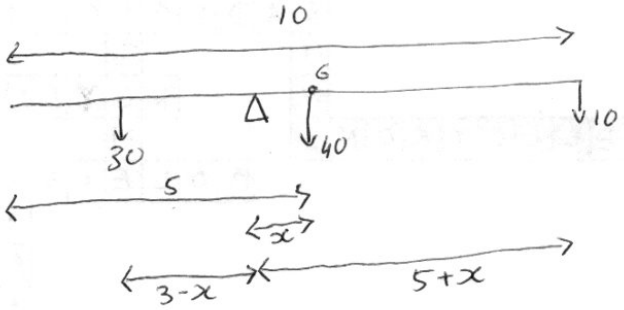
$30x = 10(8-x)$

$30x = 80 - 10x \quad | +10x$

$40x = 80$

$x = \frac{80}{40} = 2 \Rightarrow$ 2 graduations à droite de la masse de 30g

b)



$30 \cdot (3-x) = 40 \cdot x + 10(5+x)$

$90 - 30x = 40x + 10x + 50$

$90 - 30x = 50x + 50 \quad | +30x - 50$

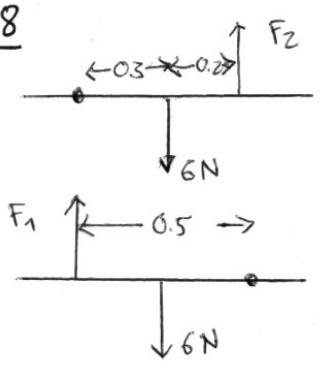
$90 - 50 = 50x + 30x$

$40 = 80x$

$x = \frac{40}{80} = 0.5 \Rightarrow$ à 0.5 graduation à gauche du milieu de la barre, donc à 1/2 graduation à droite de la position trouvée en a).

M0118

a)



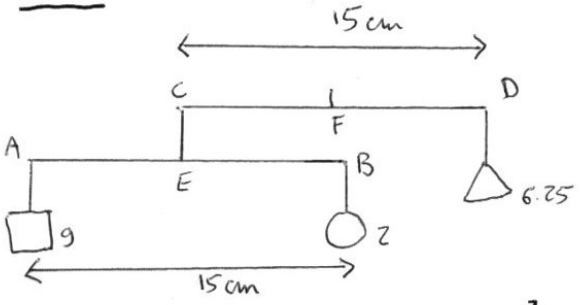
$F_2 \cdot 0.5 = 6 \cdot 0.3$

$F_2 = \frac{6 \cdot 0.3}{0.5} = 3.6\ N$

$F_1 \cdot 0.5 = 0.2 \cdot 6 \Rightarrow$

$F_1 = \frac{0.2 \cdot 6}{0.5} = 2.4\ N$

M0119



□ : $3 \cdot 3 = 9$

○ : $\pi \cdot 0.8^2 \approx 2$

$\overset{a}{\underset{5}{\triangle}}\overset{a}{}$: $a^2 + a^2 = 25 = 2a^2$

$a^2 = 12.5$. Aire $= \frac{a^2}{2} = 6.25$

a) $\begin{cases} 9 \cdot AE = 2 \cdot EB \\ AE + EB = 15 \Rightarrow AE = 15 - EB \end{cases}$

$9 \cdot (15 - EB) = 2 \cdot EB \mid + 9EB$

$135 = 11 EB \Rightarrow EB = \underline{\underline{12,3}}$ cm

b) en C : $2 + 9 = 11$

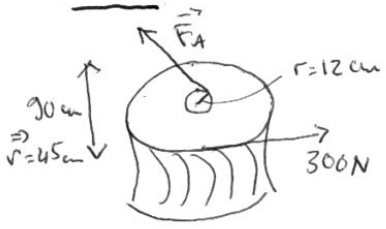
$\begin{cases} 11 \cdot CF = 6.25 \cdot FD \\ CF + FD = 15 \Rightarrow CF = 15 - FD \end{cases}$

$11(15 - FD) = 6.25\,FD$

$165 - 11\,FD = 6.25\,FD \mid + 11\,FD$

$165 = 17.25\,FD \Rightarrow FD = \underline{\underline{9.57}}$ cm

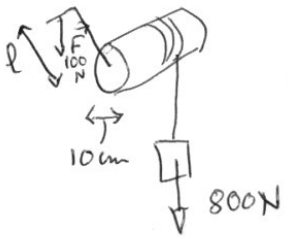
M0122



$300 \cdot 0.45 = F_A \cdot 0.12$

$F_A = \frac{300 \cdot 0.45}{0.12} = \underline{\underline{1125\ N}}$

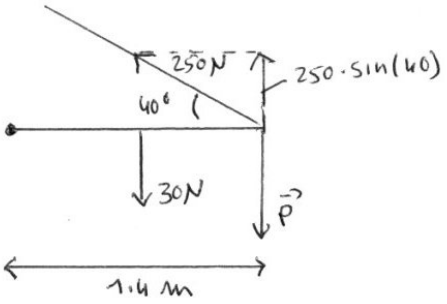
M0123



$800 \cdot 0.05 = 100 \cdot l$

$l = \frac{800 \cdot 0.05}{100} = 0.4 \text{ m}$

M0126



$30 \cdot 0,7 + P \cdot 1.4 =$

$250 \cdot \sin(40) \cdot 1.4$

$21 + 1.4P = 224.98$

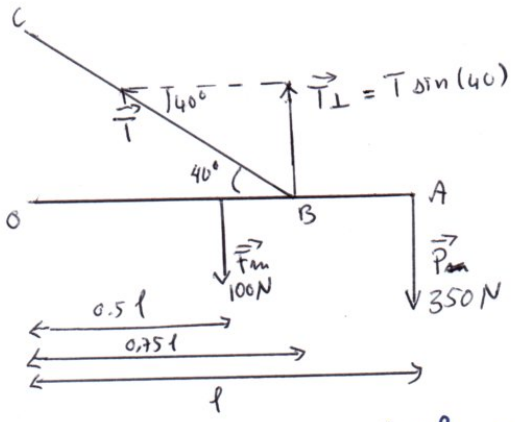
$1.4P = 224.98 - 21 = 203.98$

$P = \frac{203.98}{1.4} = 145.7 \text{ N}$

$m = \frac{P}{g} = 14.57 \text{ kg}$

M0127

a)

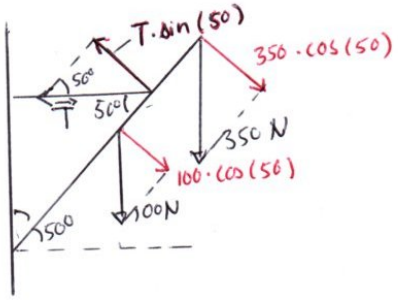


$T \cdot \sin(40) \cdot 0.75l = 100 \cdot 0,5l + 350 \cdot l$

$T \cdot \sin(40) \cdot 0.75 = 50 + 350$

$T = \frac{400}{0.75 \cdot \sin(40)} \simeq 829.7 \text{ N}$

b)



$T \cdot \sin(50) \cdot 0.75\,l =$

$350\cos(50) \cdot l + 100\cos(50) \cdot 0.5\,l$

$0.75 \cdot T \cdot \sin(50) = 400 \cdot \cos(50)$

$T = \dfrac{400 \cdot \cos(50)}{0.75 \cdot \sin(50)} \approx 447.5\ N$