

HW Assignment # 9: Rigid Body Statics

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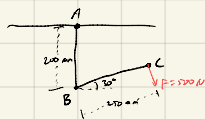
ENGR 216-445

Question 1

Given: $F = 500 \text{ N}$

Find: Moment around point A

Diagram:



Theory: $M_{\text{moment}} = F \cdot d_{\perp}$

Assumptions: No external work is done

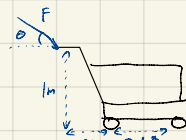
Solution: $\text{moment} = (0.25 - 0.2 \cos 60) 500$
 $= 75 \text{ Nm}$

Question 2

Given: $F = 75 \text{ N}$

Find: The moment of the front and back wheel

Diagram:



Theory: $\tau = F \cdot d_{\perp}$

Assumptions: There is no slippage

Solution: Front wheel: $75 \cos 60 \cdot 1 - 75 \sin 60 \cdot 0.9$
 $= 21 \text{ Nm}$

Back wheel: $75 \cos 60 \cdot 1 - 75 \sin 60 \cdot 0.2$
 $= -25 \text{ Nm}$

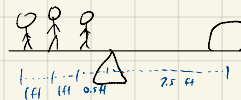
Question 3

Given: kids weigh 35, 45, 25 lbs

See-saw weighs 15 lbs

Find: Weight of the rock

Diagram:



Theory: $\tau = F \cdot d_{\perp}$

Assumptions: Total torque is zero

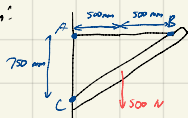
Solution: $35(2.5) + 45(1.5) + 25(0.5) = 7.5W + 15(2.5)$
 $W = 17.3 \text{ lbs}$

Question 4

Given: steel mass = 12 kg

Find: tension in the cable and reaction in point C

Diagram:



Theory: $\sum F = ma$

Assumptions: The system is at equilibrium

Solution: $T(750) = 500 \cdot 500 + 117.712(655) \cdot \frac{1000}{1610}$

$T = 412 \text{ N} = C_x$

$C_y = 12(9.8) + 500$

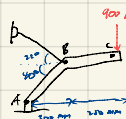
$= 618 \text{ N}$

Question 5

Given: $F = 900 \text{ N}$

Find: The force exerted by the cable at point B and A

Diagram:



Theory: $\sum F = ma$

Assumptions: The system is in equilibrium

Solution: $T \sin 22 \cdot 300 + T \cos 22 (300 \tan 22) = 900 (300 + 250)$

$T = 1430 \text{ N}$

$A_x = 1413.54 \cos 22 = 1330 \text{ N}$

$A_y = 1413.54 \sin 22 = 536 \text{ N}$