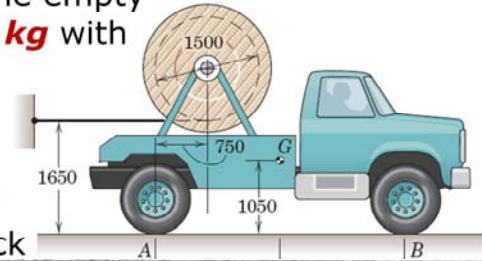


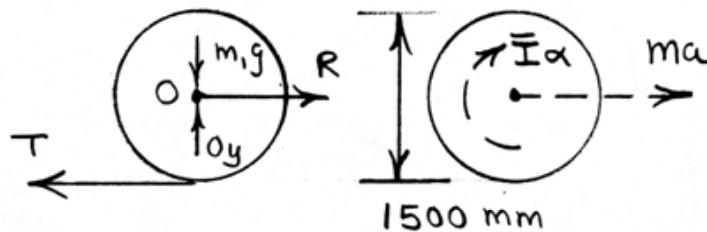
## General Plane Motion: Exercise

A truck has a **mass** of **2030 kg** and carries a **1500-mm-diameter spool** of cable with a **mass** of **0.75 kg per meter of length**. There are **150 turns** on the full spool. The empty spool has a **mass** of **140 kg** with **radius of gyration** of **530 mm**.



Determine the **tension  $T$**  in the cable when the truck

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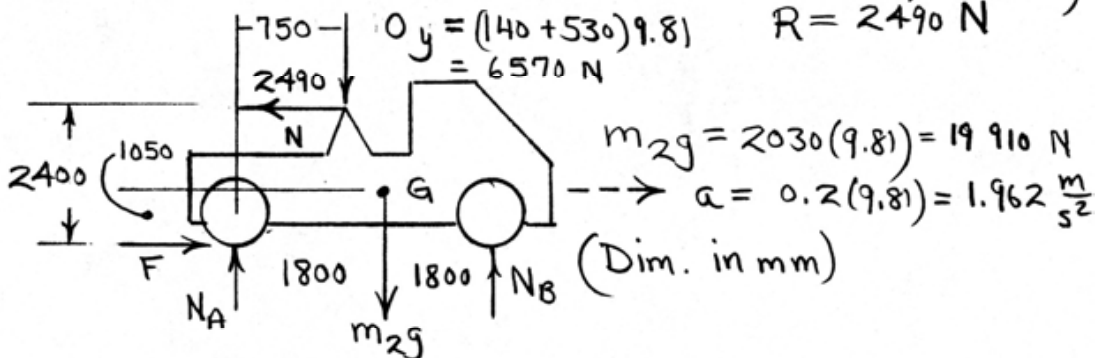


$$a = r\alpha : \alpha = \frac{0.2(9.81)}{1.500/2} = 2.62 \text{ rad/s}^2$$

$$\text{Spool \& cable: } \bar{I} = 140(0.530)^2 + 150\pi(1.5)(0.75)\left(\frac{1.5}{2}\right)^2 = 338 \text{ kg}\cdot\text{m}^2$$

$$\sum M_O = \bar{I}_O \alpha : T\left(\frac{1.500}{2}\right) = 338(2.62), \underline{T = 1177 \text{ N}}$$

$$\sum F = m\bar{a} : R - 1177 = (140 + 150\pi(1.5)(0.75))(0.2)(9.81)$$



$$\sum M_A = \sum m\bar{a}d : 6570(0.750) + 19910(1.8) - 2490(2.4) - 3.6N_B = 2030(1.962)(1.05)$$

$$\sum F_y = 0 : N_A + N_B - 6570 - 19910 = 0 \Rightarrow \underline{N_A = 17980 \text{ N}, N_B = 8500 \text{ N}}$$