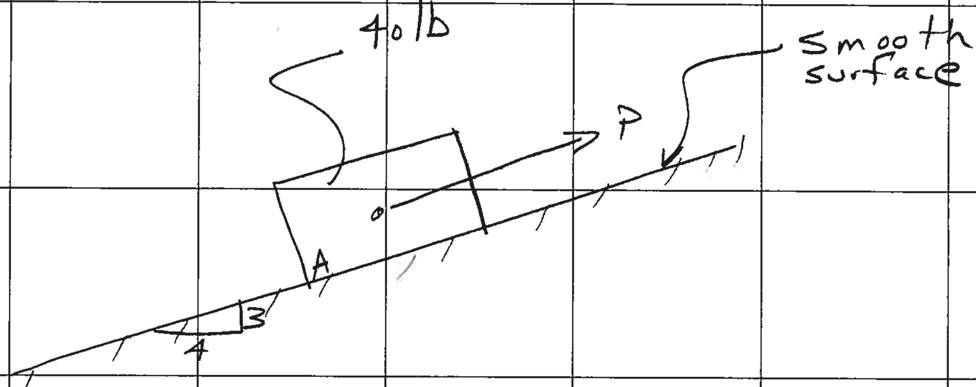
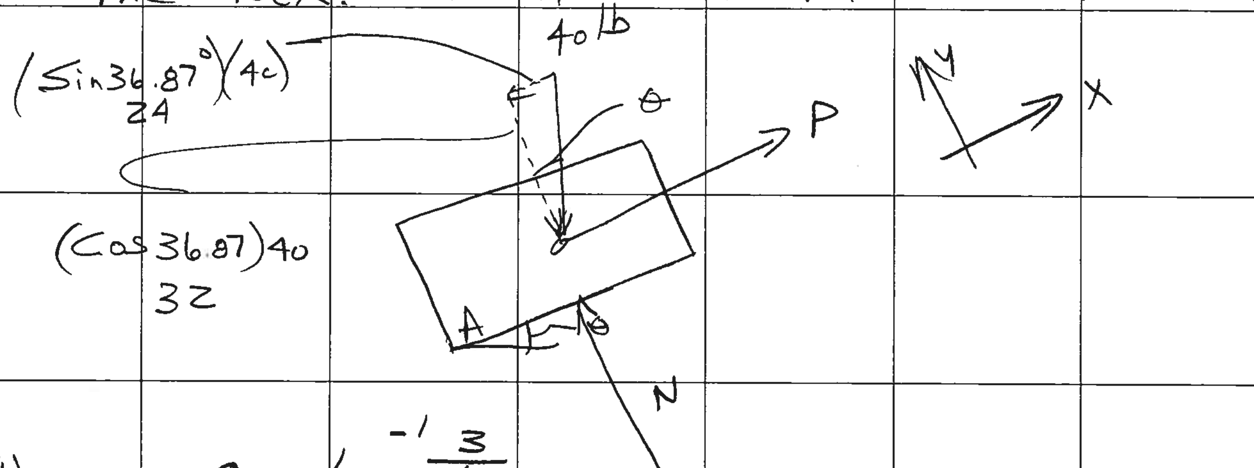
Block A shown rests on a smooth frictionless surface. The block weighs 40 lb. Determine the minimum force, P, required to keep the block from slipping down the incline.



The first step is to draw a F.B.D. of the block. Orient the coordinate axes as shown



(1) $\theta = \tan^{-1}\frac{3}{4}$

(2) $\theta = 36.87^{\circ}$

Scalar Equations of Equilibrium

$\Sigma F_y = 0$

(3) $-32 + N = 0$

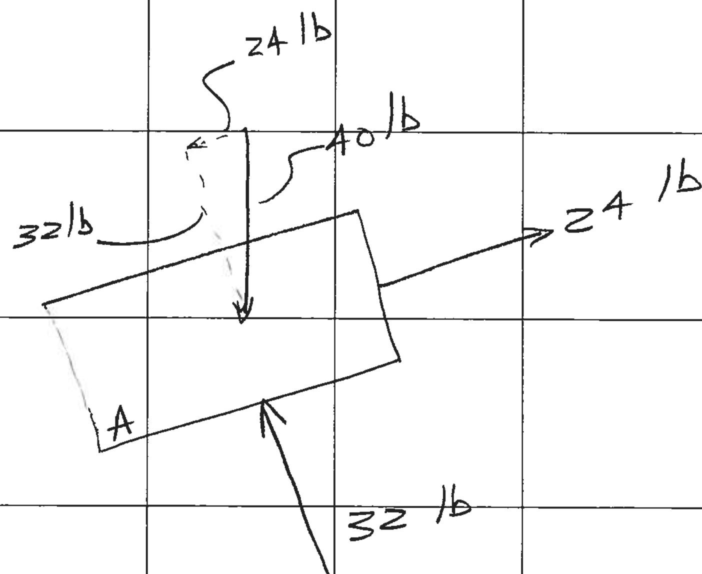
(4) $\underline{N = 32 \text{ lb}}$ ↑ as shown

$\Sigma F_x = 0$

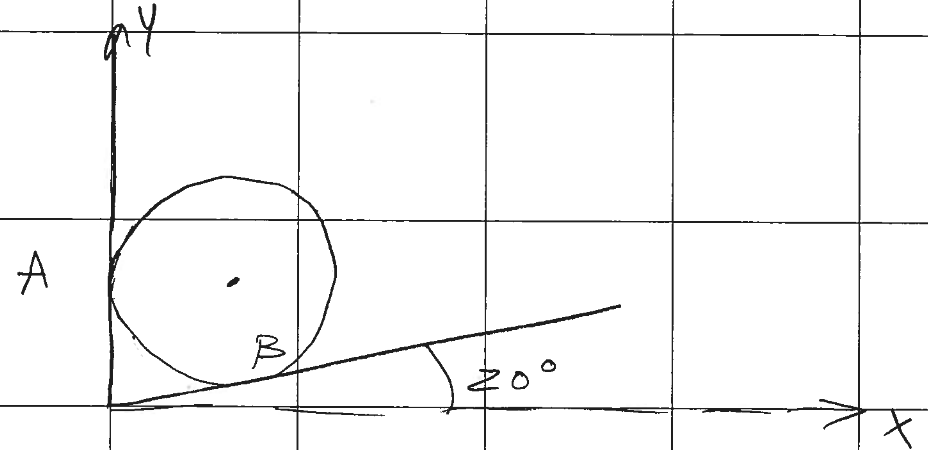
(5) $-24 + P = 0$

(6) $\underline{P = 24 \text{ lb}}$ ↗ as shown

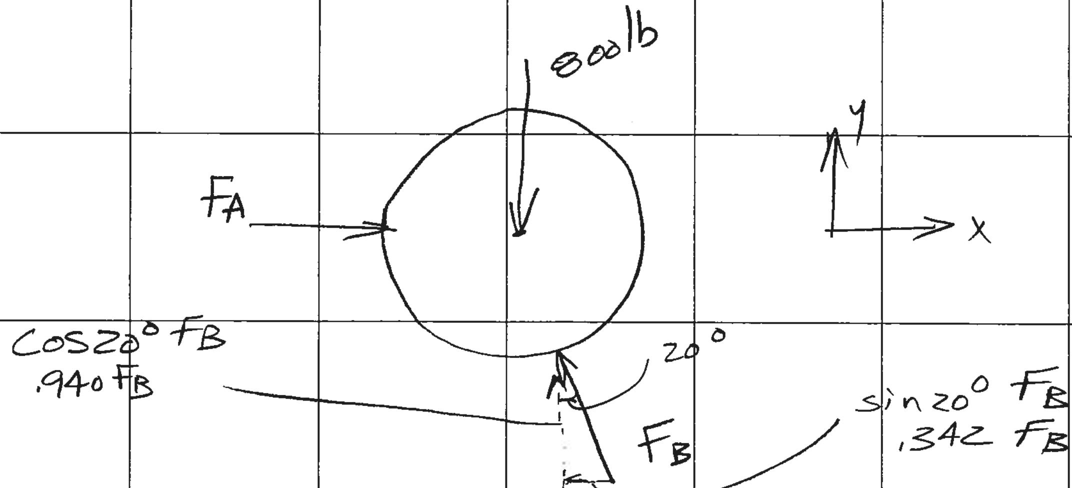
Show results on F.B.D



A homogeneous cylinder rests against two smooth surfaces as shown. The cylinder weighs 800lb. Determine the forces exerted on the cylinders at contact points A and B.



The first step is to draw a F.B.D. of the cylinder. Remember that contact forces between Cylinders and flat surfaces are normal to the flat surfaces.



Scalar equations of equilibrium

$\Sigma F_y = 0$

(1) $-800 + .940 F_B = 0$

(2) $F_B = 851.1 \text{ lb} \uparrow$ as shown

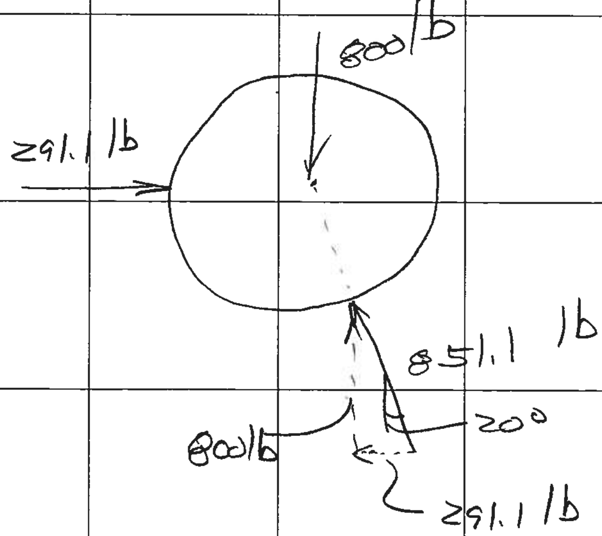
$\Sigma F_x = 0$

(3) $F_A - .342 F_B = 0$

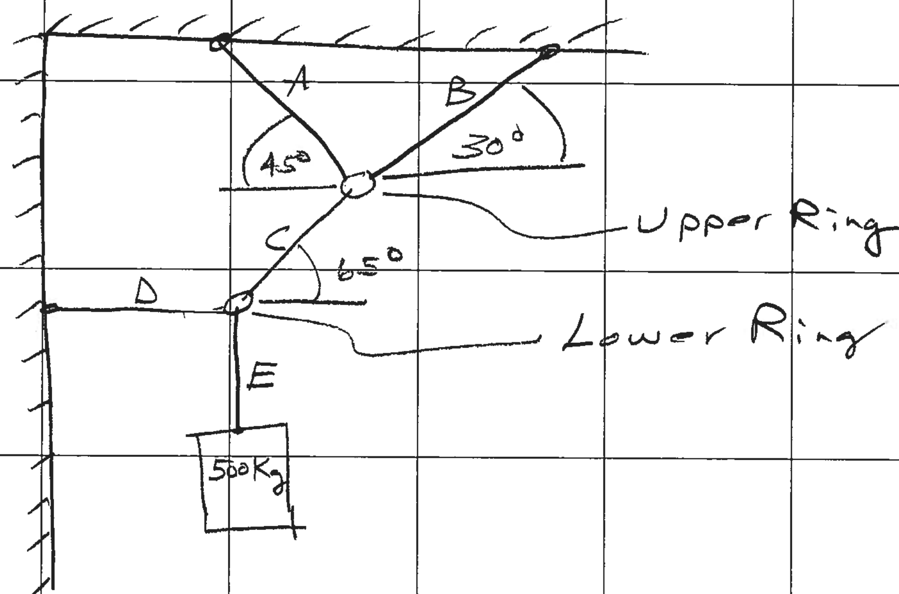
(4) $F_A = .342 (851.1)$

(5) $F_A = 291.1 \text{ lb} \rightarrow$ as shown

Show results on F.B.D of cylinder

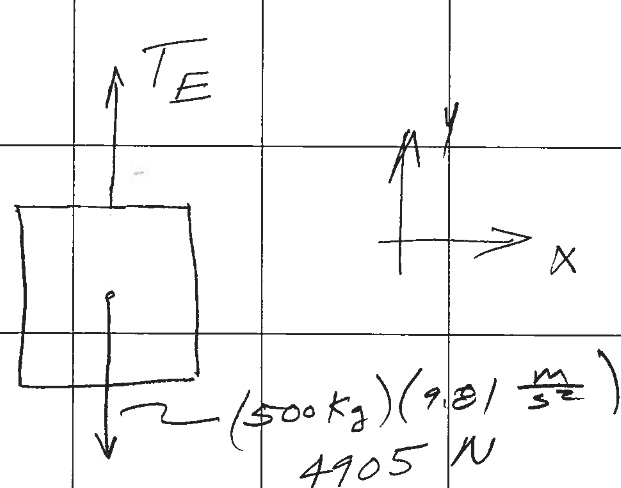


A body with a mass of 500 Kg is supported by the flexible cable system shown. Determine the tensions in cables A, B, C, D, and E.



This problem requires three F.B.D.'s.

We will start with the mass



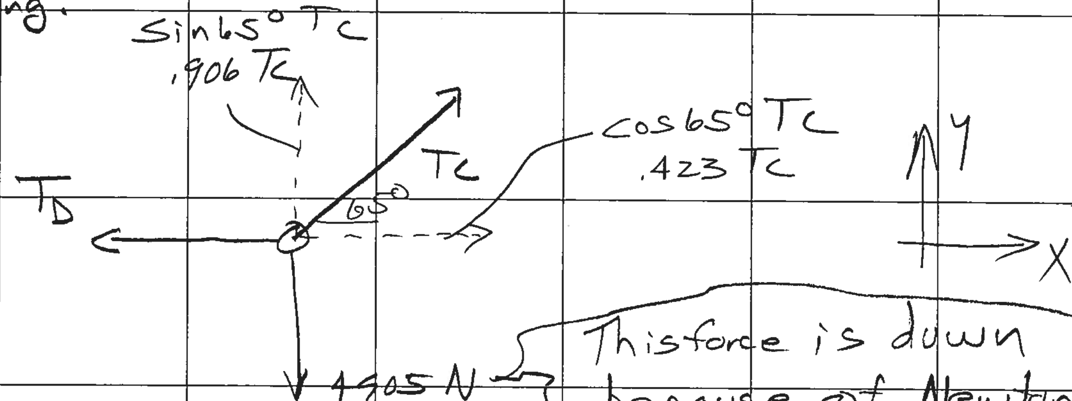
Scalar equation of equilibrium

$\Sigma F_y = 0$

(1) $T_E - 4905 = 0$

(2) $\underline{T_E = 4905\ N} \uparrow$ as shown

Next move to F.B.D of the lower ring.



This force is down because of Newton's 3rd law

Scalar equations of equilibrium

$\Sigma F_y = 0$

(3) $.906\,T_C - 4905 = 0$

(4) $\underline{T_C = 5413.9\ N} \nearrow$ as shown

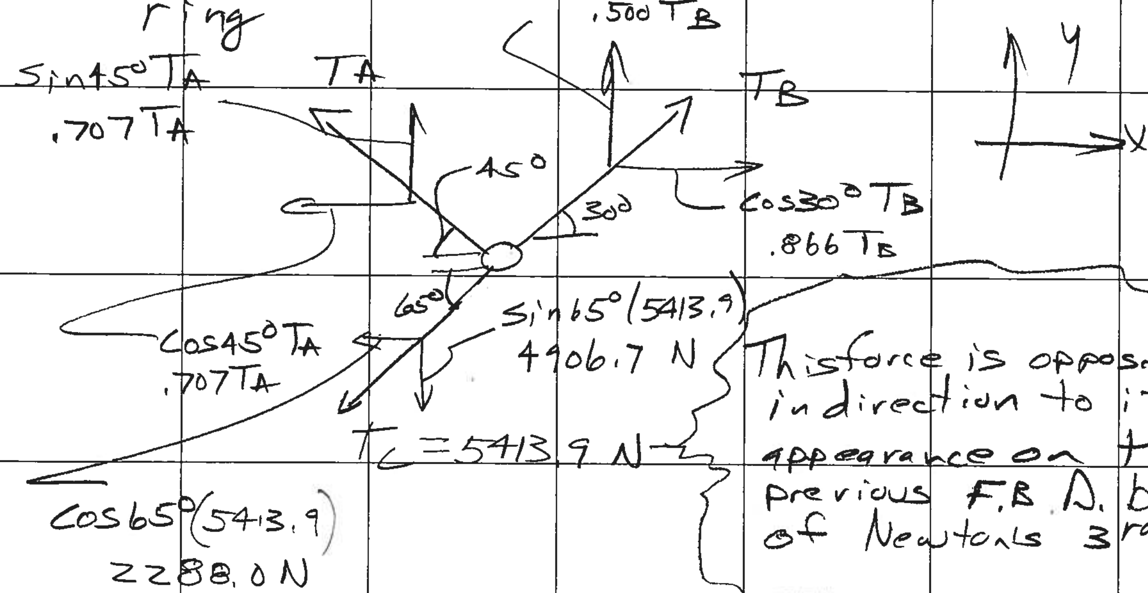
$\Sigma F_x = 0$

(5) $-T_D + .423\,T_C = 0$

(6) $T_D = .423(5413.9)$

(7) $\underline{T_D = 2290.1\ N} \leftarrow$ as shown

Finally move to F.B.D of the upper ring



This force is opposite in direction to its appearance on the previous F.B.D. because of Newton's 3rd law

Scalar Equations of equilibrium

$$\Sigma F_y = 0$$

(8) $.707\ T_A + .500\ T_B - 4906.7 = 0$

(9) $T_B = 9813.4 - 1.414\ T_A$

$$\Sigma F_x = 0$$

(10) $-2288.0 - .707\ T_A + .866\ T_B = 0$

(11) $.866\ T_B = .707\ T_A + 2288.0$

(12) $T_B = .816\ T_A + 2642.0$

The value of T_A can then be found by combining equations (9) and (12)

(13) $9813.4 - 1.414T_A = .816T_A + 2642.0$

(14) $2.230T_A = 7171.4$

(15) $\underline{T_A = 3215.9\ N}$ as shown

Then the value of T_B can be found from either equation (9) or (12)

$T_B = 9813.4 - 1.414(3215.9)$

$\underline{T_B = 5266.1}$ as shown

<u>Or</u>

$T_B = (.816)(3215.9) + 2642.0$

$\underline{T_B = 5266.2}$ as shown

<u>Result</u>

$T_A = 3215.9N$, $T_B = 5266.1N$

$T_C = 5413.9N$, $T_D = 2290.1\ N$

$T_E = 4905\ N$