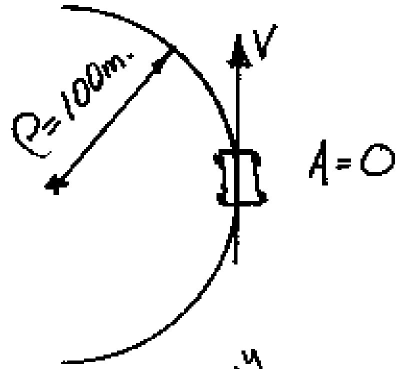
HIBBELER

$\boxed{\text{Hc } 13\text{-}53}$

Top



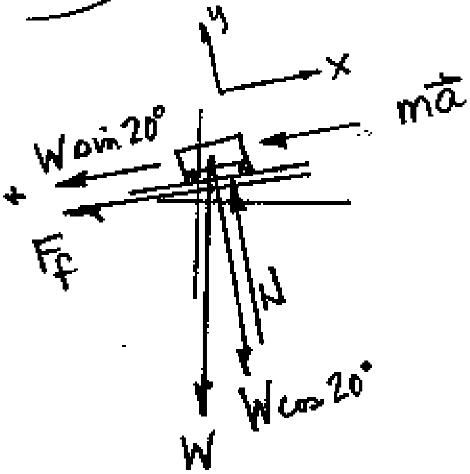

GIVEN: $m = 1700\,kg$

$\therefore W = 1.667 \times 10^4\ N.$

$\mu_s = 0.2$

Travels at constant speed.

FRONT




$\Sigma \vec{F_y} = m\vec{a_y}$

$N - W\cos 20° = 0$

$N = (1.667 \times 10^4)\cos 20°$

$N = 15.671\ kN$

$\mu N = 3.134\ kN$

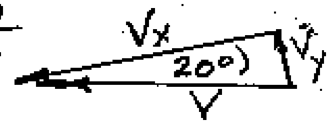
$\Sigma \vec{F_x} = m\vec{a_x}$

$-W\sin 20° - F_f = -m\,a_x^N$ where $a_x^N = \omega \times \omega \times r = \omega^2 r = \dfrac{V^2}{r}$

$(1.667 \times 10^4)\sin 20° + 3.134 \times 10^3 = (1700\,kg)\dfrac{V_x^2}{100m}$

$519.733\ N\dfrac{m}{kg} = V_x^2$ where $N = kg\dfrac{m}{s^2}$

$\sqrt{519.733\ kg\dfrac{m}{s^2}\dfrac{m}{kg}} = V_x = 22.797\ \dfrac{m}{s}$




Since motion analysis is based on 20° embankment, the component is parallel.

$\therefore V_{max} = \dfrac{V}{\cos 20°} = \boxed{24.26\ \dfrac{m}{s} = V_{max}}$