

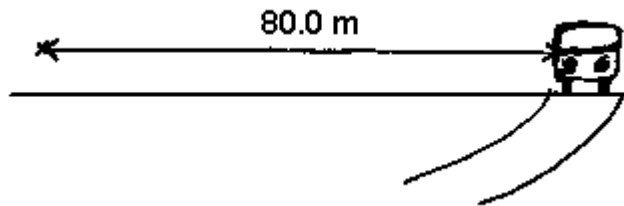
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**Include file name:** Physics\_Worksheet\_0019

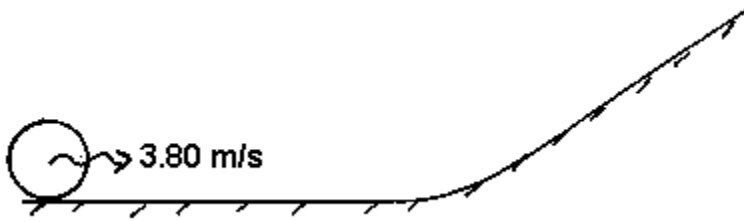
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1. A car is traveling 86.3 km/h around a curve of radius 80.0 m. The frictional forces on the tires totals 7590 N as the car rounds the curve.



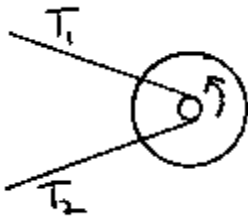
- What is the velocity of the car in m/s?
  - What is the centripetal acceleration of the car?
  - What is the mass of the car? *Hint: Use  $f=ma$  where the frictional force is the centripetal force.*
  - What minimum coefficient of friction is necessary for the tires not to slip?
  - In the above diagram is the frictional force on the tires to the left or right?
2. An aluminum cable 1.56 cm in diameter and 0.293 km long is stretched 0.117 m by a winch. Determine the:
- strain on the cable
  - stress on the cable
  - force the winch exerts
3. The USS Blueback was the last diesel powered submarine in the Navy. It has a volume of 2260 m<sup>3</sup> including ballast tanks.
- What is the buoyant force on this sub when it is completely submerged with empty ballast tanks? Seawater has a density of 1030 kg/m<sup>3</sup>.
  - What is the pressure on the hull when the sub is submerged to a depth of 72.1 m?
4. A 6.00 kg hoop of radius 45.2 cm rolls without slipping along a horizontal surface with a speed of 3.80 m/s as it approaches an incline.



- a) What is the total kinetic energy of the hoop as it rolls along the horizontal?
- b) How high above the floor level will the hoop reach if it does not slip as it rolls up the incline?

5. A 10.0 ft boom holds a 250 lb load on the end. Find the tension  $T$  in the cable that is attached 2.00 ft from the end as shown. You may neglect the weight of the boom itself. You should work directly in pounds and feet. It is *not necessary* to convert to metric units.

6. A flat belt drives a pulley of radius 4.17 cm producing an angular acceleration ccw of  $2.98 \text{ rad/s}^2$ . The pulley is attached to a wheel and the wheel and pulley assembly has a moment of inertia of  $5.98 \text{ kg m}^2$ . If the lower belt tension  $T_2$  is 68.3 N, what is the upper belt tension  $T_1$ ?



7. The engine on an aircraft is shut down and the propeller, which is initially spinning at 1700 rpm, slows down with a constant angular acceleration of  $-31.7 \text{ rad/s}^2$  until it stops. How many revolutions does the propeller make in the first 4 seconds after shutdown?

Extra Credit

A. In problem #2, how much does the cable stretch if the winch force is increased to 40,000 N ?

B. In problem #7, how many revolutions does the prop make in the first seven seconds after shutdown?