STAEDTLER® No. 937 811E Engineer's Computation Pad

••8 In Fig. 8-35, a small block of mass $m = 0.032$ kg can slide along the frictionless loop-the-loop, with loop radius $R = 12$ cm. The block is released from rest at point P, at height $h = 5.0R$ above the bottom of the loop. How much work does the gravitational force do on the block as the block travels from point P to (a) point Q and (b) the top of the loop? If the gravitational potential energy of the block–Earth system is taken to be zero at the bottom of the loop, what is that potential energy when the block is (c) at point P, (d) at point Q, and (e) at the top of the loop? (f) If, instead of merely being released, the block is given some initial speed downward along the track, do the answers to (a) through (e) increase, decrease, or remain the same?

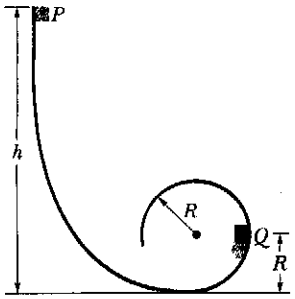
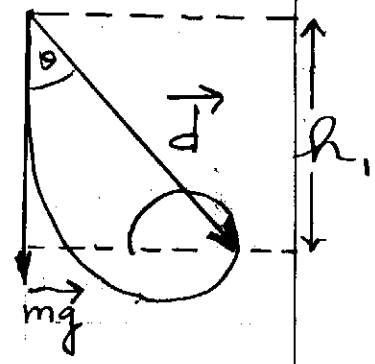
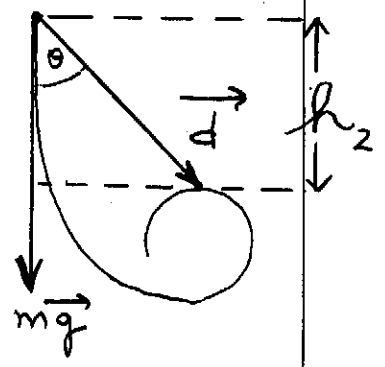


FIG. 8-35
Problems 8 and 19.

$$W_{i\to f} = \int_i^f \vec{F}\cdot d\vec{r} = \int_i^f m\vec{g}\cdot d\vec{r} = m\vec{g}\cdot\int_i^f d\vec{r} = m\vec{g}\cdot(\vec{r}_f - \vec{r}_i) = m\vec{g}\cdot\Delta\vec{r} = m\vec{g}\cdot\vec{d}$$





$W = m\vec{g}\cdot\vec{d} = mgd\cos\theta$

$= mgh$

a) $= mg(h_1 = h - R) = mg(h-R)$

$= mgh - mgR$

b) $= mg(h_2 = h - 2R) = mg(h-2R) = mgh - mg2R$

$W_{i\to f} = -\Delta U = -(U_f - U_i) = U_i - U_f$

$= mgy_i - mgy_f = mg(y_i - y_f)$ ✓

YOU CAN CHOOSE $y=0$ ANYWHERE

THIS PROBLEM @ BOTTOM OF LOOP $\Rightarrow U = mgy$

c) $U_{@P} = mgy_P = mgh$

d) $U_{@Q} = mgy_Q = mgR$

e) $U_{@\,\text{TOP LOOP}} = mgy_{\text{TOP LOOP}_P} = mg2R$

$W_{i\to f} = -\Delta U = U_i - U_f$

a) $U_P - U_Q = mgh - mgR$

b) $U_P - U_{TOP} = mgh - mg2R$

d) & e) OF COURSE NOT!