Practice Exercises - Work

#1: On his way off to college, Russell drags his suitcase 15.0 m from the door of his house to the car at a constant speed with a horizontal force of 95.0 N. a) How much work does Russell do to overcome the force of friction? b) If the floor has just been waxed, does he have to do more work or less work to move the suitcase? Explain.

Sketch: Given: Solve:

$F = 95$

$d = 15m$

$W = F \times d$
$W = 95 \times 15$
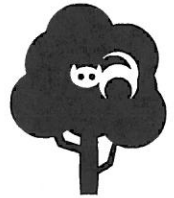$W =$

Answer: __142rJ__

Answer: __less, less friction__

#2: Katie, a 30.0 kg child, climbs a tree to rescue her cat who is afraid to jump 8.0 m to the ground. How much work does Katie do in order to reach the cat?

Sketch: Given: Solve:

$F = m \times g$
$F = 30 \times 90$
$F = 300N$

$W = F \times d$
$W = 300 \times 8$
$W =$

Answer: __2,400 J__

#3: James carries a 150 N tuba up two flights of stairs to a height of 10 meters. He then pushes it with a horizontal force of 40 N at a constant speed of 1 m/s for 10 seconds. How much work has James done on his tuba?

Sketch: Given: Solve:

↑ $W = 150 \times d$
$W = 150 \times 10$
$W = 1,500J$

→ $W = 40N \times d$
$W = 40 \times 10$
$W = 400J$

$V = \frac{d}{t}$
$V \times t = d$
$1 \times 10 = 10m$

↑ + → =
$1,500 + 400 = 1,900J$

POWER

#4: Atlas and Hercules, two carnival sideshow strong men, each lift 200 kg barbells 2.00 m off the ground. Atlas lifts his barbells in 1.00 s and Hercules lifts his in 3.00 s. a) Which strong man does more work? b) Calculate which man is more powerful.

Sketch: Given: Solve:

$W = F \times d$ $F = m \times g$

$W = 2,000 \times 2$ $F = 200 \times 10$

$W = 4,000 J$ $F = 2,000 N$

Atlas

$P = \dfrac{W}{t} = \dfrac{4,000}{1s} = 4,000 W$

Hercules $\dfrac{4,000}{3s} = 1,333 W$

Ans:_____

Ans:_____

#5. How much energy is transferred by using a 1500 W hair dryer in 5.0 minutes ?

Sketch: Given: Solve:

$5 \times 60 = 300 s$

$P \times t = W$

$1500 \times 300 = W$

$450,000 = W$

Ans:_____

#6. How long would it take a 7.5 kW motor to raise a 500 kg piano to an apartment window 10 meters above the sidewalk below ?

Sketch: Given: Solve:

$P = \dfrac{W}{t}$ $W = F \times d$ $F = m \times g$

$W = 5,000 \times 10$ $F = 500 \times 10$

$W = 50,000 J$ $F = 5,000 N$

$t = \dfrac{W}{P} = \dfrac{50,000 J}{7,500} = 6.67 s$