WORK, POWER, AND ENERGY

Lesson 1—Work

PRACTICE EXERCISES ANSWERS AND SOLUTIONS

1. $W = Fd$
$= (20.0\text{ N})(1.50\text{ m})$
$= 30.0\text{ J}$

2. $W = Fd$
$= (6.00\text{ N})(3.00\text{ m})$
$= 18.0\text{ J}$

3. $W = Fd$
$= (2.20\text{ N})(0)$
$= 0$

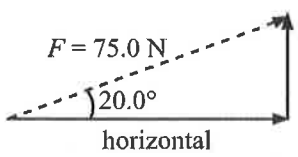
4. $d = \left(\frac{v + v_0}{2}\right)t$
$= \left(\frac{11.0\text{ m/s} + 0}{2}\right)(5.00\text{ s})$
$= 27.5\text{ m}$

$a = \frac{v - v_0}{t}$
$= \frac{11.0\text{ m/s} - 0}{5.00\text{ s}}$
$= 2.20\text{ m/s}^2$

$F = ma$
$= (10.0\text{ kg})(2.20\text{ m/s}^2)$
$= 22.0\text{ N}$

$W = Fd$
$= (22.0\text{ N})(27.5\text{ m})$
$= 605\text{ J}$

5. Find horizontal component of the force.



$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$
$\cos 20.0° = \frac{\text{horizontal}}{75.0\text{ N}}$
$\text{horizontal} = (75.0\text{ N})(\cos 20.0°)$
$= 70.5\text{ N}$

$W = Fd$
$= (70.5\text{ N})(10.0\text{ m})$
$= 705\text{ J}$

6. $W = F_g d$
$= mgh$
$= (60.0\text{ kg})(9.81\text{ m/s}^2)(3.2\text{ m})$
$= 1.9 \times 10^3\text{ J}$

7. Here the force is the gravitational force and no displacement occurs parallel to the force. Therefore, work done on the box = 0

8. $W = mgh$
$= (80.0\text{ kg})(9.81\text{ m/s}^2)(7.0\text{ m})$
$= 5.5 \times 10^3\text{ J}$

9. Find out work done against friction:
$W = F_{fr} d$
$= (3.8\text{ N})(6.0\text{ m})$
$= 22.8\text{ J}$

Find out work done to accelerate from rest through a distance of 6.0 m:

$d = v_0 t + \frac{1}{2}at^2$
$6.0\text{ m} = \frac{1}{2}(a)(4.0\text{ s})^2$
$a = 0.75\text{ m/s}^2$

$F = ma$
$= (25.0\text{ kg})(0.75\text{ m/s}^2)$
$= 18.8\text{ N}$

$W = Fd$
$= (18.8\text{ N})(6.0\text{ m})$
$= 1.13 \times 10^2\text{ J}$

$\text{Total work done} = 1.1 \times 10^2\text{ J} + 22.8\text{ J}$
$= 1.4 \times 10^2\text{ J}$