Worksheet: Work & Power Problems Answer Key

I. Work

A. Sample Problems:

1. F = 200 Newtons
   d = 50 meters
   W = ?
   Formula: **W = Fd**
   Substitution: **W = (200 N)(50 m)**
   Answer with unit of measure: **W = 10,000 J**

2. F = 5 Newtons
   W = 75 Joules
   d = ?
   Formula: **d = W/F**
   Substitution: **d = 75 J/5 N**
   Answer with unit of measure: **d = 15 m**

3. W = 125 Joules
   d = 10 meters
   F = ?
   Formula: **F = W/d**
   Substitution: **F = 125 J/10 m**
   Answer with unit of measure: **F = 12.5 N**

4. If 150 Joules of work is needed to move a box 10 meters, what force was used?
   W = 150 J **F = W/d** **F = 15 N**
   d = 10 m **F = 150 J/10 m**

B. Fill-in-the-blank:

1. **Work** is done when an object moves through a distance because of a **force** acting upon the object.

2. When calculating work, you should use the formula: work = force X **distance**.

3. The SI unit for work is the **Joule**. It is represented by the letter **J**.

C. Work Problems:

4. F = 90 N **W=Fd**
   d = 5 m **90(5)**
   W = ? **450 J**

5. F = 6 N **d=W/F**
   W = 72 J **72/6**
   d = ? **12 m**

6. W = 120 J **F=W/d**
   d = 24 m **120/24**
   F = ? **5 N**

7. W = ? **W = Fd**
   F = 62.6 N **62.6(13)**
   d = 13 m **813.8 J**

8. W = 13.2 J **d = W/F**
   F = 2 N **13.2/2**
   d = ? **6.6 m**

9. W = 136 J **F = W/d**
   d = 27.2 m **136/27.2**
   F = ? **5 N**

10. If 360 Joules of work are needed to move a crate a distance of 4 meters, what is the weight of the crate? **W = 360 J** **F = W/d** **F = 90 N**
    d = 4 m **F = 360 J/4 m**

11. If a group of workers can apply a force of 1000 Newtons to move a crate 20 meters, what amount of work will they have accomplished? **F = 1000 N** **W = Fd** **W = 20,000 J**
    d = 20 m **W = 1000(20)**

12. If 68 Joules of work were necessary to move a 4 Newton crate, how far was the crate moved?
    W = 68 J **d = W/F** **d = 17 m**
    F = 4 N **d = 68 J/4N**

13. How much work is done in holding a 15 N sack of potatoes while waiting in line at the grocery store for 3 minutes. **Not moving** **F = 15 N** **W = Fd** **W = 0 J**
    d = 0 m **W = 15(0)**

II. Power

A. Samples

1. W= 500 Joules
   t = 25 seconds
   P = ?
   Formula: **P = W/t**
   Substitution: **P = 500 J/25 sec**
   Answer with unit of measure: **20 W**

2. P = 25 watts
   W = 5000 Joules
   t = ?
   Formula: **t = W/P**
   Substitution: **t = 5000 J/25 W**
   Answer with unit of measure: **t = 200 sec**

3. P = 170 watts
   t = 20 seconds
   W = ?
   Formula: **W = Pt**
   Substitution: **W = 170 W(20 sec)**
   Answer with unit of measure: **W = 3,400 J**

4. If a man moves a large box that weighs 10 Newtons 20 meters in 30 seconds, how much power was used? **F = 10 N** **P = W/t and W = Fd, so P = Fd/t**
   d = 20 m **P = (10 N x 20 m)/30 sec**
   t = 30 sec **P = 6.67 W**

B. Fill-in-the-blank:

1. **Power** is the rate at which work is done.

2. When calculating power, you should use the formula P = **work** divided by **time**. In this formula, "P" stands for power, **W** stands for work, and **t** for time.

3. The SI unit for Power is the **Watt**.

C. Power Problems

4. W = 100 J **P = W/t**
   t = 10 s **P = 100/10**
   P = ? **P = 10 W**

5. W = 225 J **t = W/P**
   P = 25 W **t = 225/25**
   t = ? **t = 9 sec**

6. P = 20 W **W = Pt**
   t = 15 s **W = 20 x 15**
   W = ? **W = 300 J**

7. W = 500 J **P = W/t**
   t = 25 s **P = 500/25**
   P = ? **P = 20 W**

8. W = 336 J **t = W/P**
   t = ? **t = 336/14**
   P = 14 W **t = 24 sec**

9. W = ? **W = Pt**
   t = 16.6 s **W = 64(16.6)**
   P = 64 W **W = 1,062.4 J**

10. A person weighing 600 N gets on an elevator. The elevator lifts the person 6 m in 10 seconds. How much power was used? **F = 600 N** **P = Fd/t**
    d = 6m **P = (600 x 6)/10**
    t = 10 sec **P = 360 W**

11. How much time is needed to produce 720 Joules of work if 90 watts of power is used?
    W = 720 J **t = W/P** **t = 8 sec**
    P = 90 W **t = 720 J/90 W**

12. If 68 W of power is produced in 18 seconds, how much work is done?
    P = 68 W **W = Pt** **W = 1,224 J**
    t = 18 sec **W = 68(18)**

13. A set of pulleys lifts an 800 N 4 meters in 7 seconds. What power was used?
    F = 800 N **P = Fd/t** **P = 457.1 W**
    d = 4 m **P = 800(4)/7**
    t = 7 sec