PHYSICS IN MOTION
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# Unit 4I
# Power
## *Practice Problems TEACHER*

**Work each of the following problems. SHOW ALL WORK.**

1. **A Chevy Camaro engine exerts 650 hp to move the car. How many watts of power does the engine exert?**

$$\frac{650\,hp}{1}\left(\frac{746\,W}{1\,hp}\right) = 484900\,W$$

2. **If 400 J of work is done on an object in 8 seconds, how much power does the object experience?**

$$P = \frac{W}{t} = \frac{400\,J}{8\,s} = 50\,W$$

3. **If a riding lawnmower engine exerts 19 hp in one minute to move the mower, how much work is done?**

$$\frac{19\,hp}{1}\left(\frac{746\,W}{1\,hp}\right) = 14174\,W$$

$$P = \frac{W}{t}$$

$$14174\,W = \frac{W}{60\,s}$$

$$W = 850440\,J$$

4. **If a 75 N force is applied to a box, moving it 4 m in 6 seconds, how much power does the force exert?**

$$P = \frac{W}{t}$$

$$P = \frac{Fd}{t}$$

$$P = \frac{(75\,N)(4\,m)}{6\,s}$$

$$P = 50\,W$$

**questions continued on next page**

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5. **If a constant force of 20 N is applied to a cart, how much power does the force exert on the cart when it reaches a speed of 4 m/s?**

$$P = \frac{W}{t}$$
$$P = \frac{Fd}{t}$$
$$P = Fv$$
$$P = (20\,N)(4\,{}^{m}\!/_{s})$$
$$P = 80\,W$$

6. **If a 2 kg object is falling at 3 m/s, at what rate is gravity working on the object?**

$$P = \frac{W}{t}$$
$$P = \frac{Fd}{t}$$
$$P = Fv$$
$$P = (mg)v$$
$$P = (2\,kg)(9.8\,{}^{m}\!/_{s^2})(3\,{}^{m}\!/_{s})$$
$$P = 58.8\,W$$

7. **A 1,200 kg car accelerates from rest to 27 m/s in 6 seconds. How much power does the engine exert on the car during this acceleration?**

$$P = \frac{W}{t}$$
$$P = \frac{\Delta KE}{t}$$
$$P = \frac{KE_f - KE_i}{t}$$
$$P = \frac{\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2}{t}$$
$$P = \frac{\frac{1}{2}(1200\,kg)(27\,{}^{m}\!/_{s})^2 - \frac{1}{2}(1200\,kg)(0)^2}{6\,s}$$
$$P = \frac{437400\,J}{6\,s}$$
$$P = 72900\,W$$

**questions continued on next page**

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**Work each of the following problems. SHOW ALL WORK.**

**8. A 400 hp engine in a 1,600 kg car applies maximum force for 2 seconds to accelerate the car onto the interstate. If the car moves at 8 m/s before accelerating, what is its speed after the 2 seconds of acceleration?**

$$\frac{400\,hp}{1}\left(\frac{746\,W}{1\,hp}\right) = 298400\,W$$

$$P = \frac{W}{t}$$

$$P = \frac{\Delta KE}{t}$$

$$P = \frac{KE_f - KE_i}{t}$$

$$P = \frac{\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2}{t}$$

$$298400\,W = \frac{\frac{1}{2}(1600\,kg)v_f^2 - \frac{1}{2}(1600\,kg)(8\,{}^{m}\!/_{s})^2}{2\,s}$$

$$298400\,W = \frac{\frac{1}{2}(1600\,kg)v_f^2 - 51200\,J}{2\,s}$$

$$596800\,J = \frac{1}{2}(1600\,kg)v_f^2 - 51200\,J$$

$$648000\,J = (800\,kg)v_f^2$$

$$810\,{}^{m^2}\!/_{s^2} = v_f^2$$

$$v_f = 28.5\,{}^{m}\!/_{s}$$