 **Pulleys, Wheel and Axle, and Gears**

**Introduction**

* Rotary motion is one of the most common types of motion found in machines;
* Machines generate motion that has to be transmitted from one place to another;
* This is accomplished by mechanisms that use pulleys, gears, and wheels;
* There is a mechanical advantage to these mechanisms that is greater than one;
* Comes at a price – the effort force must move over a greater distance than the load force.

**Wheel and Axle**

* Most common wheel mechanism;
* The effort force on the wheel magnifies the load force on the axle;
* The steering wheel of a car performs the same function on magnifying the driver’s force on the steering column;
* The larger the steering wheel, the more force the driver can send to the wheels.

**Pulleys**

* Cranes or the rigging on a sailboat use sets of pulleys joined together by ropes and chains to lift heavy loads or exert large forces;
* A single pulley is a wheel-and-axle mechanism;
* Two types of pulley systems – fixed and movable;
* Fixed pulleys are useful when the object’s volume is too large to be picked up by hand or when space is limited;
* Movable pulleys use only half of the effort force which doubles the mechanical advantage of the system.

**Gears**

* Gears are toothed wheels, usually made from metal or plastic;
* Used to speed up or slow down motion;
* Gears work by reducing the required revolving force or increasing it;
* You can find the gear ratio by simply counting the number of teeth on each gear.

**Conclusion**

* In some cases, like a bicycle, the gears turn separately and are joined by a chain;
* The pedal drives the front gear, and the chain transfers the turning force to the rear gear;
* By using a variety of gear ratios on changing terrain, you can increase or decrease the turning force and even out the effort required;
* This makes you less tired.