Notes: Transmission and Transformation Systems

**Transmission systems:**

* Multiple \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that have the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of movement (rotational, linear, etc)

**Transformation systems:**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the system have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_types of movement
  + Ex: rotational movement leads to linear movement

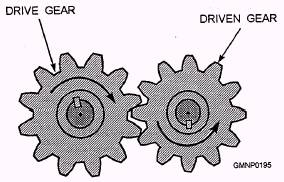
Components can be connected \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or through an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Reversibility:**

* A system is considered reversible if \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + **Driver:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the motion
  + **Driven:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the motion
    - Remember: there can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_components too

# Transmission Systems

**1) Gear Trains**

* At least \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_whose teeth \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Notice that the gears move in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ directions
* Are they reversible?
* Speed of the gears depends on:
  + The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

OR

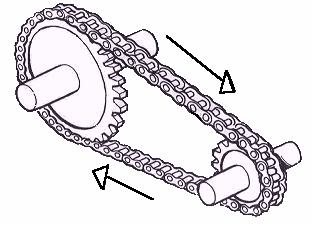
* + The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the gears (friction wheels)

### Example:

If a driver gear has a diameter of 20cm and the driven gear has a diameter of 40 cm, what is the speed ratio?

Which one is moving faster?

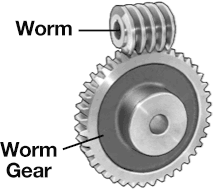
**2) Chain and Sprocket**

* At least \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_connected by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Notice:** all the gears turn in the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ direction
* If it had gears on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; they would turn in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ direction
* Are they reversible?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-

**3) Worm and worm gear**

* Consists of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and at least one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

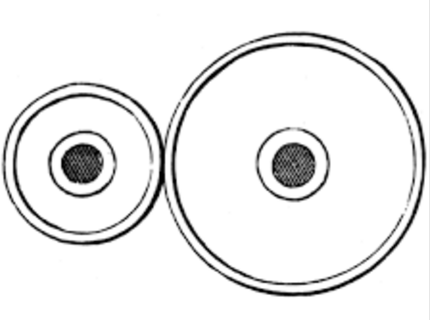


* Are they reversible?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4) Friction wheels (or friction gears)**

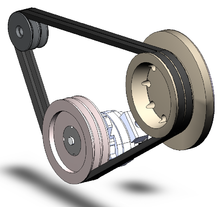
* Like gears but \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Touch \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ causes the movement



* Are they reversible?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5) Belt and pulley system**

* Like chain and sprocket but \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Are they reversible?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Transformation Systems

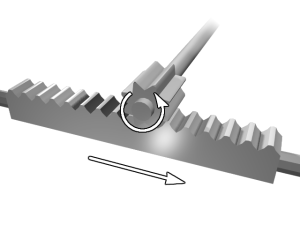
Also have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_components and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ components

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Remember:**

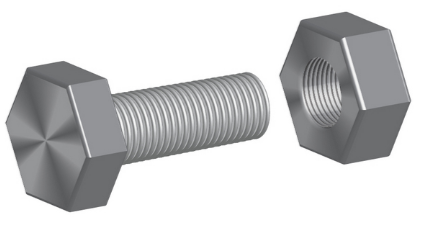
* **Transmission:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of movement throughout
* **Transformation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the type of movement
  + Ex: rotational to translational

1) **Rack and Pinion**

* Composed of a gear (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) and a grooved/toothed bar (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
* Are they reversible?

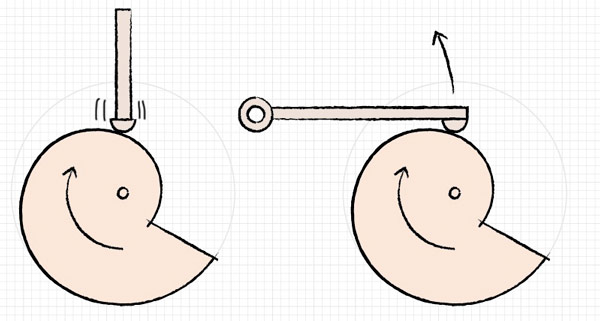
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2) **Screw gear system**

* Composed of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Are they reversible?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3) **Cam and follower**

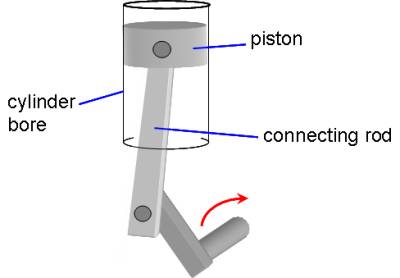
* Composed of a wheel that is often oddly shaped (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) and stick that raises and lowers (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
* Are they reversible?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4) **Slider and crank (piston)**

* Similar to cam and follower but the crank is usually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the slider is usually a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Are they reversible?

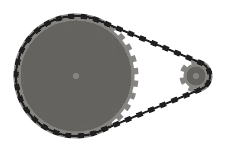
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



# Speed Ratios

**Components with teeth**

1. a) Calculate the speed ratio for the following chain and sprocket system.

****

Driven component

7 teeth

Driver component

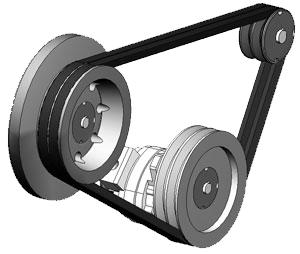
28 teeth

b) If the driver sprocket rotates 8 times clockwise, then the driven sprocket will rotate \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Components without teeth**

1. a) Calculate the speed ratio for the following belt and pulley system.

Pulley B = 4”



Pulley C = 10”

Driver component

Pulley A = 8”

Speed ratio (A→B)

Speed ratio (A→C)

b) If pulley A rotates 40 revolutions per minute (40 rpm)…

… pulley B will rotate at a speed of \_\_\_\_\_\_\_\_\_\_\_\_

… pulley C will rotate at a speed of \_\_\_\_\_\_\_\_\_\_\_\_

# Recap - Motion Transmission Systems

|  |  |  |
| --- | --- | --- |
| **Type** | **Picture** | **Reversible** |
| **Gear train** | http://s.hswstatic.com/gif/gear-bevel2.jpg | Yes |
| **Chain and**  **sprocket** | Bikes | Yes |
| **Worm and worm gear** | Wine bottle opener | No |
| **Friction gear**  **systems** | Printers | Yes |
| **Belt and**  **pulley**  **system** | Motors | Yes |

# Recap - Motion Transformation Systems

|  |  |  |
| --- | --- | --- |
| **Type** | **Picture** | **Reversible?** |
| **Rack and pinion** | http://www.vexrobotics.com/wiki/images/thumb/5/52/RackAndPinionSketch.JPG/250px-RackAndPinionSketch.JPG | Yes |
| **Screw gear System**  **Type 1** | http://wiki.ece.cmu.edu/ddl/images/thumb/Jack_model_FBD.JPG/500px-Jack_model_FBD.JPG | No |
| **Screw gear system**  **Type 2** | http://static.ddmcdn.com/gif/pipe-wrench-1.jpg | No |
| **Cam and follower** | rockisoanim.gif (76596 bytes) | No |
| **Slider and crank**  **mechanism** | **Crank and slider animation** | Yes |