

PLTW: Automation & Robotics
Lesson: Mechanisms Day 1 [April 6th]

Learning Target:

Students will review the basics of mechanisms, their types of movement, and gear ratios.

Let's Get Started

What do we know about mechanisms?

#1 - A mechanism has two or more moving parts, where the movement of one causes the others to move.

#2 - All gears whose teeth touch will travel in the position direction of one another.



*One gear will travel Clockwise the other counter clockwise.



#3 - Each mechanism has an input and an output.
- The input is the gear that is attached to the powersource.



Practice #1

Label the input and output for each mechanism

A.



B.



C.



What do we know about mechanisms?

#4 - There are four different types of movement.

- **Rotary** - gear move in a circle



- **Linear** - gear moves in a line



- **Reciprocating** - gear moves back and forth in a straight line in one rotation

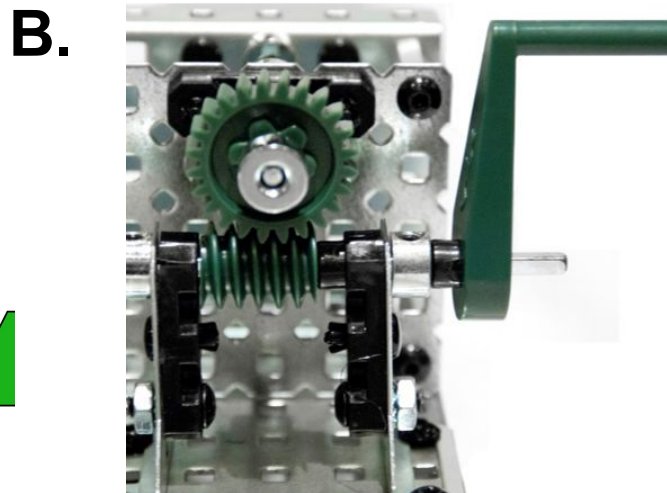
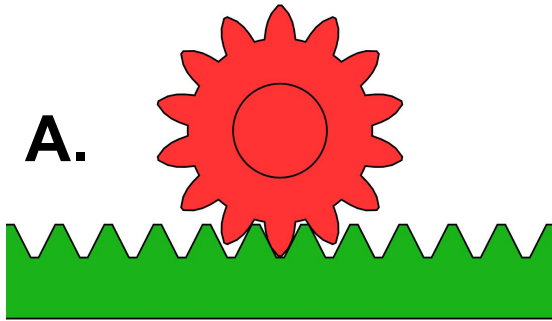


- **Oscillating** - gear moves back and forth in an arc.



Practice #2

Label the input and output for each mechanism AND the type of movement for each. (If you can't clearly tell which gear is the input you can just pick one!)

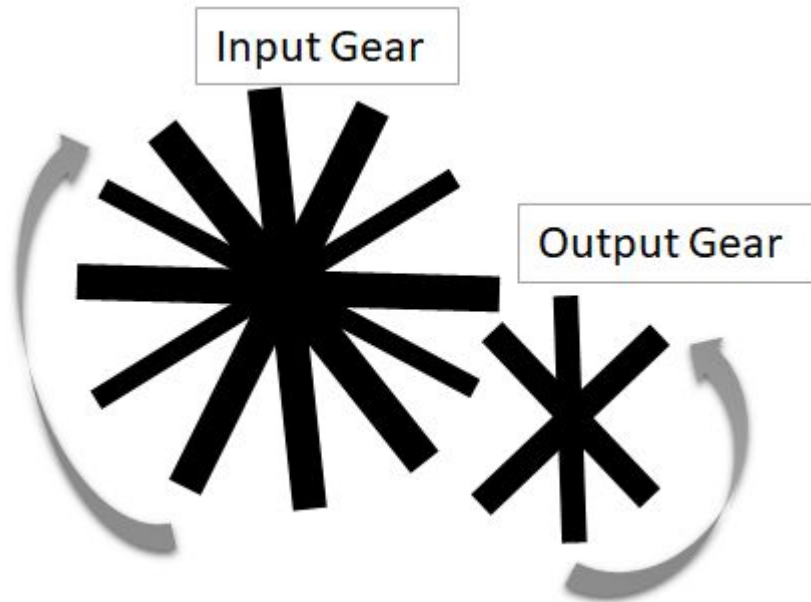


Gear Ratios

Gear ratios will compare the size of the output gear to the size of the input gear to help determine the speed and torque of a mechanism.

Gear ratios can be figured out by counting the number of teeth in each gear or measure the diameter of the gear.

The gear ratio for the below mechanism is 12:6



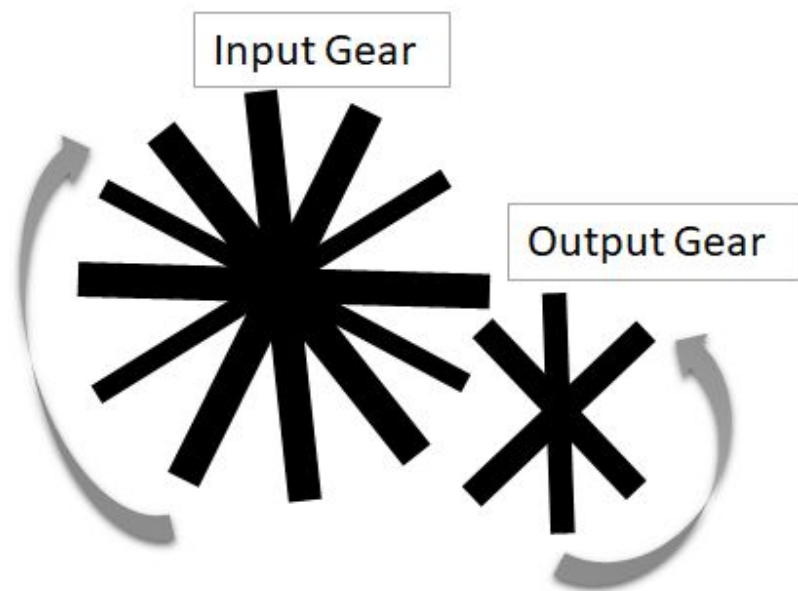
Input : Output

*Ratios are always written as the Input gear to the Output gear

Gear Ratios Continued

Gear ratios must be simplified using the Greatest Common Factor (click [here](#) to find out what GCF means).

The gear ratio for the below mechanism is:
12:6 or 1:2



Because 12 and 6 can both be reduced we must simplify the ratio and show our work.

$$\frac{6 \div 6}{12 \div 6} = \frac{1}{2} = \boxed{1:2}$$

By dividing both 6 and 12 by the number 6 we were able to get the simplified gear ratio of 1:2.

Practice #3

Simplify each gear ratio, then circle the correct answer (Show your work for each).

A. $25:25$

B. $15:3$

C. $8:9$

D. $2:4$

Self Assessment: Gear Ratios

Simplify each gear ratio, then circle the correct answer (Show your work for each).

A. 24:48

B. 17:7

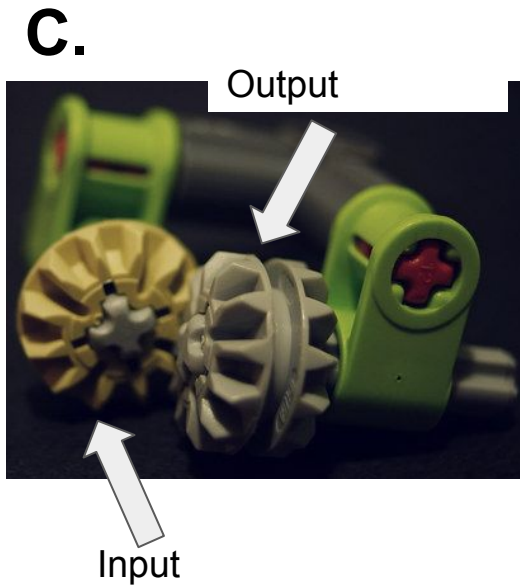
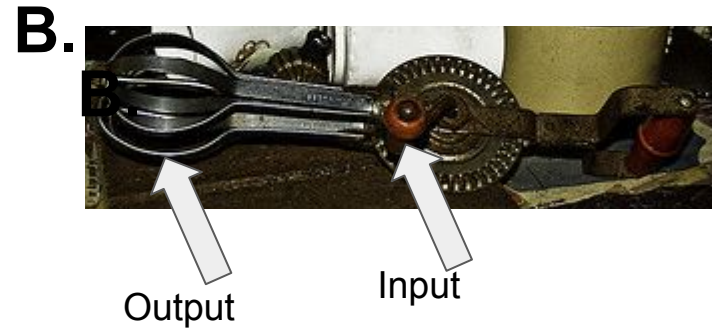
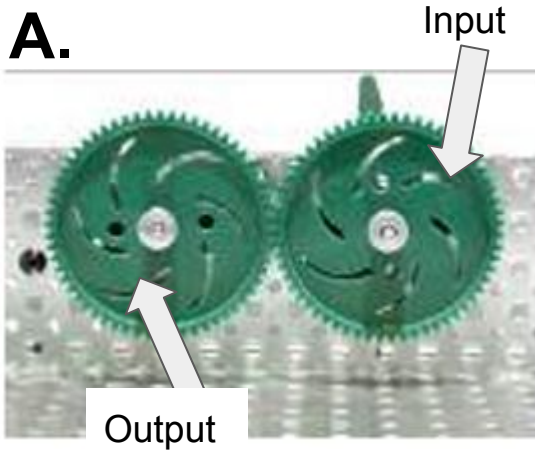
C. 33:11

D. 20:35

*To complete the practice electronically, click [here](#)

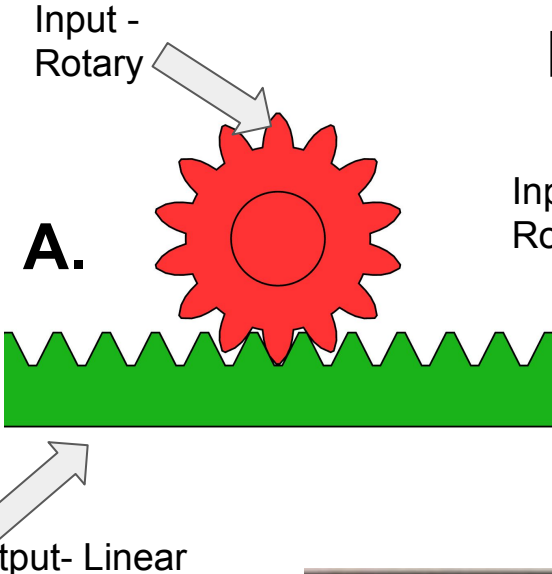
Practice #1 ANSWER KEY

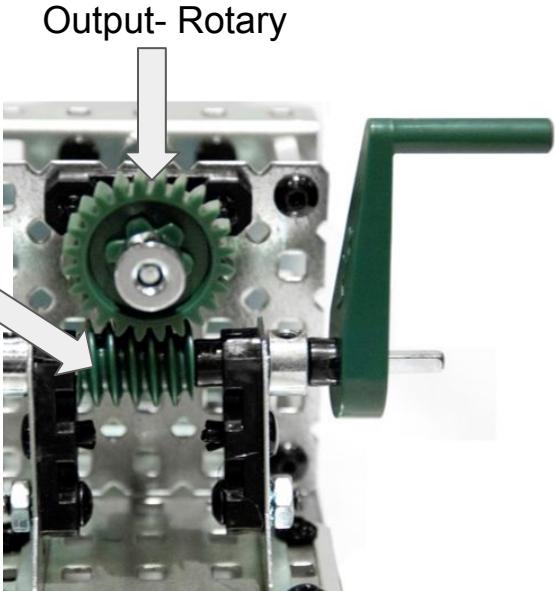
Label the input and output for each mechanism

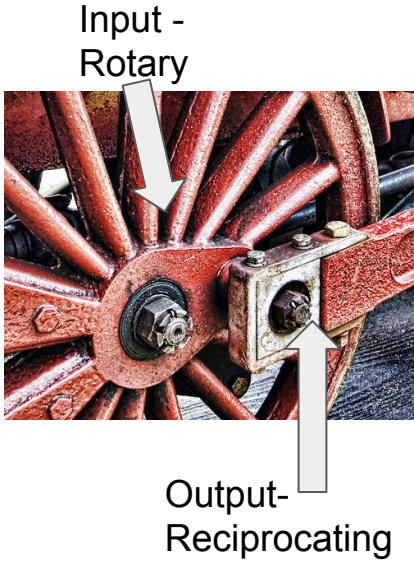


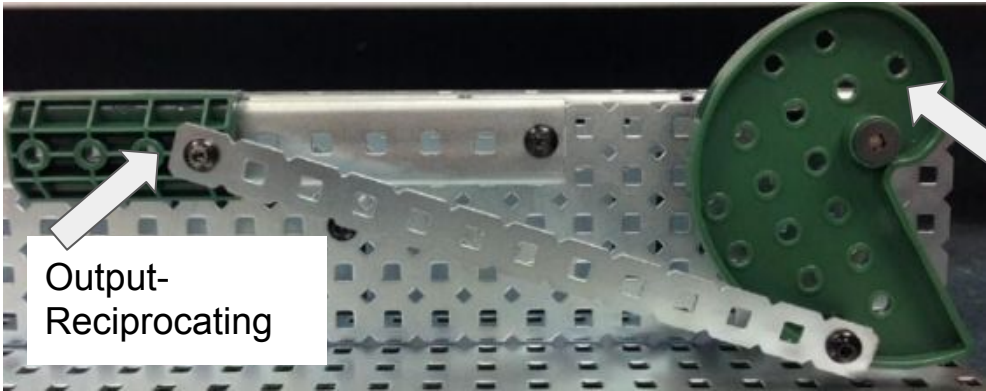
Practice #2 ANSWER KEY

Label the input and output for each mechanism AND the type of movement for each. (If you can't clearly tell which gear is the input you can just pick one!)

A.  Input - Rotary
Output - Linear

B.  Output - Rotary
Input - Rotary

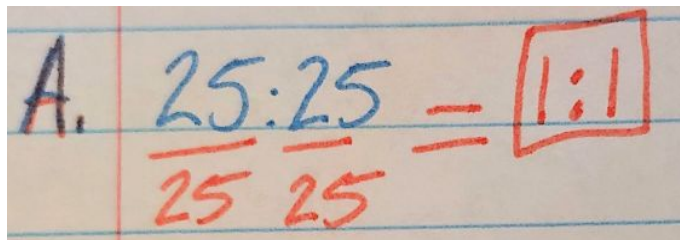
C.  Input - Rotary
Output - Reciprocating

D.  Input - Rotary
Output - Reciprocating

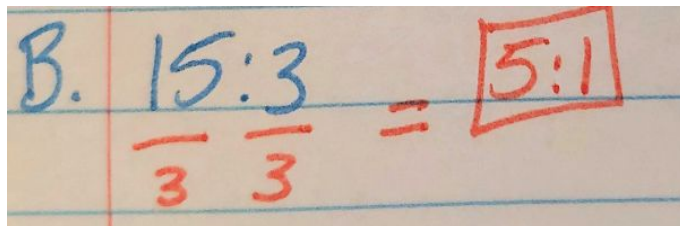
Practice #3 ANSWER KEY

Simplify each gear ratio, then circle/box the correct answer (Show your work for each).

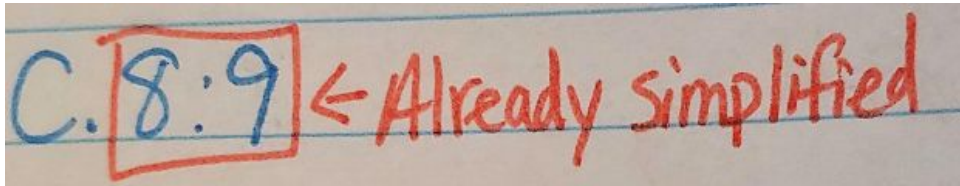
A. 25:25


$$A. \frac{25:25}{25 \ 25} = \boxed{1:1}$$

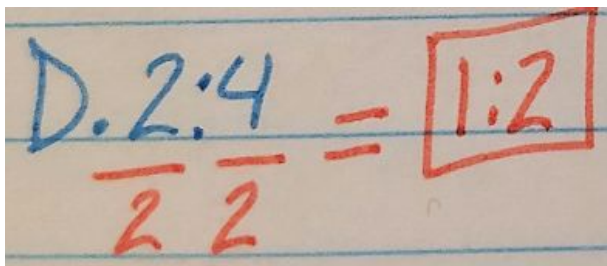
B. 15:3


$$B. \frac{15:3}{3 \ 3} = \boxed{5:1}$$

C. 8:9


$$C. \boxed{8:9} \leftarrow \text{Already simplified}$$

D. 2:4

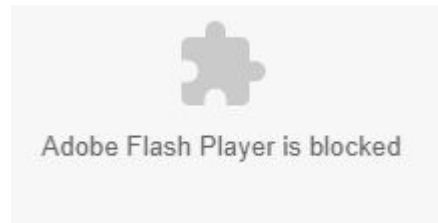

$$D. \frac{2:4}{2 \ 2} = \boxed{1:2}$$


Extended Learning

Learn about more about the different types of gears check this [video](#) out.

To practice your understanding of meshed gears try this gear connection [game](#).

(if using Google Chrome you might see this on your screen



In the URL you will need to click the puzzle icon  and allow flash settings on Chrome.)