



Automation & Robotics Virtual Learning

7th & 8th Mechanisms Day 3

April 8th, 2020



Lesson: Mechanisms Day 3 [April 8th]

Objective/Learning Target:

Students will continue their review the basics of mechanisms, and the relationship between gear ratios, speed and torque.

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

Warm-up

During this lesson you will use the Focused note pages to take notes over the two different mechanisms we are going to learn about.

Use the notes page to list as many different mechanisms you can remember seeing outside of the classroom. Write for at least two minutes, if you run out of ideas give details about the mechanisms purpose.

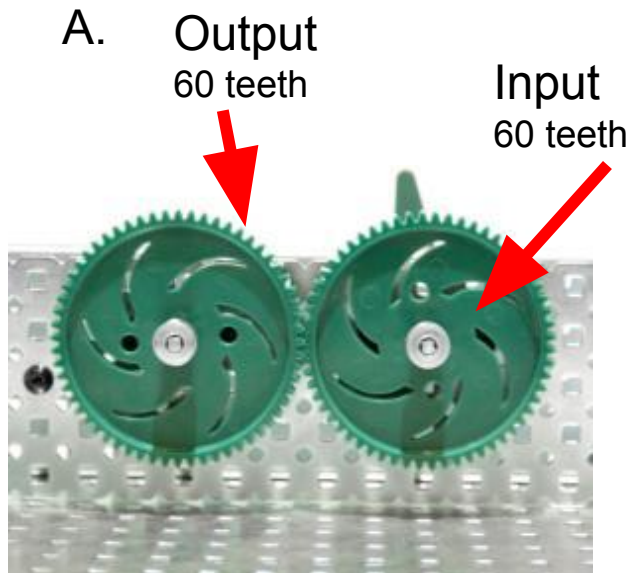


Questions/Main Ideas:

Summary/Reflection

Simple Gear Train

In a Simple Gear Train
the input and output shafts are always
parallel



Input gear must turn the **opposite direction** of the output gear.

Both gears are circles therefore the input and output gears type of movement is **Rotary**.

What is happening to speed and torque in Gear Train A?

Simplified Gear ratio = **1:1**

Speed is **constant**

Torque is **constant**

Where Do You Find a Simple Gear Train?



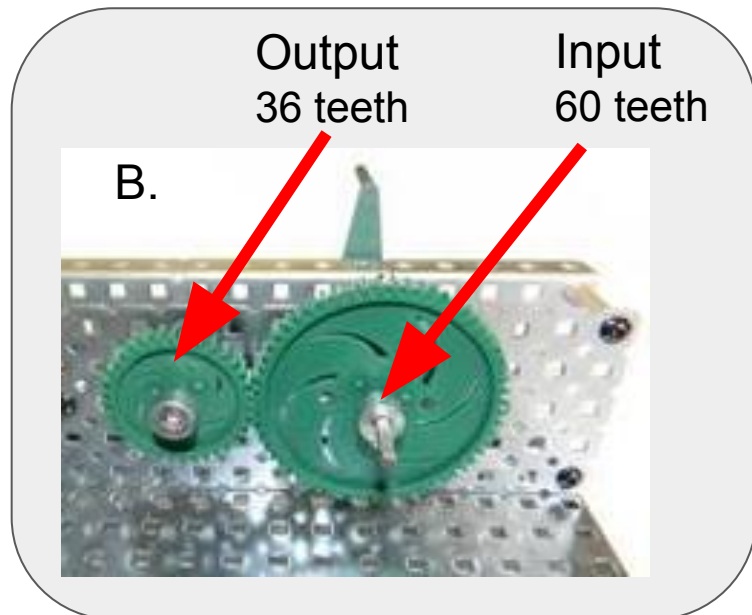
Common places you might find a Simple Gear Train:

- Watch
- Sewing Machine
- Motor

*Remember two meshed gears will rotate in opposite directions.

Simple Gear Train: Practice

- What type of movement does the Input gear do?
- The output gear?
- What is the simplified gear ratio in the simple Gear Train B?



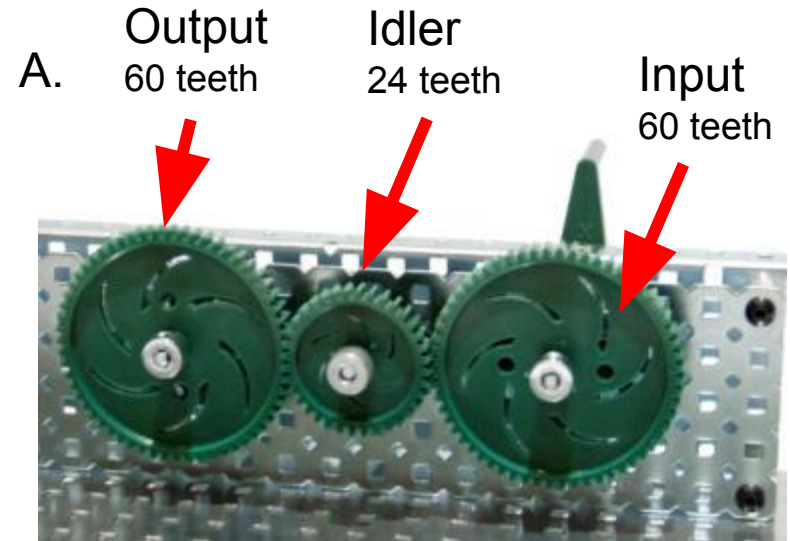
- Describe speed and torque

Simple Gear Train with Idler

In a Simple Gear Train with Idler the input and output shafts are always **parallel**

The input gear and the output gear are both meshed with the Idler gear which allows the in and out to move in the **same direction**.

All gears are circles therefore the input and output gears type of movement is **Rotary**.



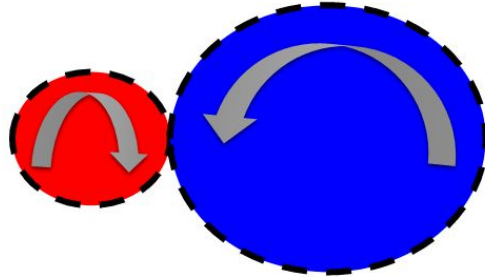
What is happening to speed and torque in Gear Train A?

Simplified Gear ratio = **1:1**

Speed is **constant**

Torque is **constant**

Where Do You Find a Simple Gear Train with Idler?

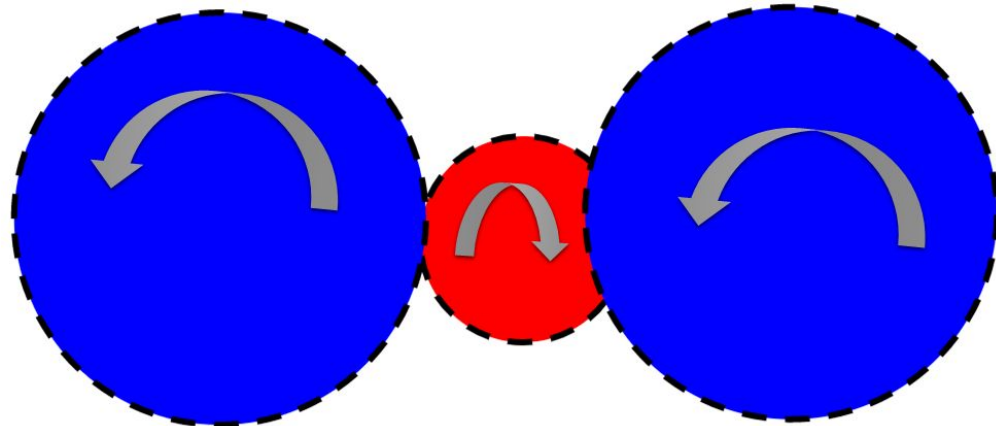


Two meshed gears will rotate in opposite directions.

Common places to find a Simple Gear Train with Idler(s)

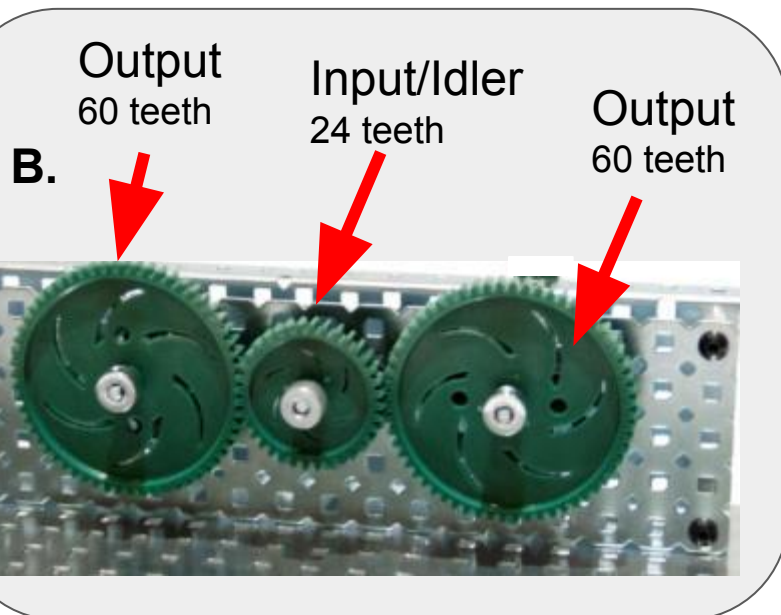
- Paper Transport Rollers
- Printers

*An **Idler Gear** allows the drive and driven gears to rotate in the same direction.



Simple Gear Train with Idler: Practice

- What type of movement does the Input gear do?
- The output gears?
- What is the simplified gear ratio in the simple Gear Train B?



- Describe speed and torque

Simple Gear Train: Practice ANSWER KEY

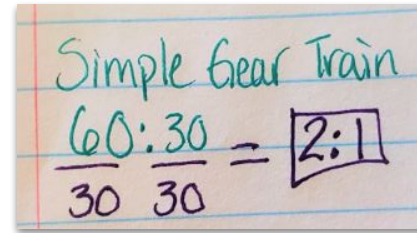
- What type of movement does the Input gear do?

Rotary because the gear is circle shaped.

- The output gear?

Rotary because the gear is circle shaped.

- What is the simplified gear ratio in the simple Gear Train B?



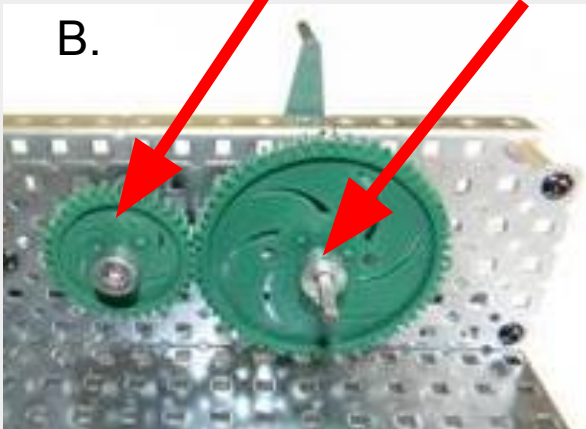
Simple Gear Train
 $\frac{60}{30} : \frac{30}{30} = \boxed{2:1}$

- Describe speed and torque

Speed is increasing and the Torque is decreasing because the output gear is smaller than the input gear.

Output
36 teeth

Input
60 teeth



Simple Gear Train with Idler: Practice ANSWER KEY

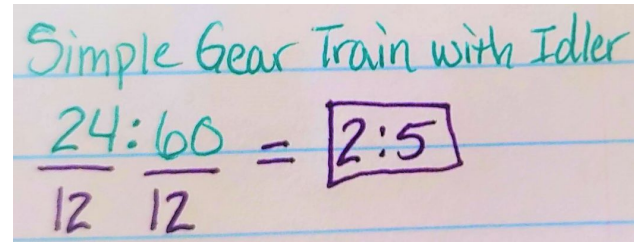
- What type of movement does the Input gear do?

Rotary because the gear is circle shaped.

- The output gears?

Rotary because the gears are circle shaped.

- What is the simplified gear ratio in the simple Gear Train B?

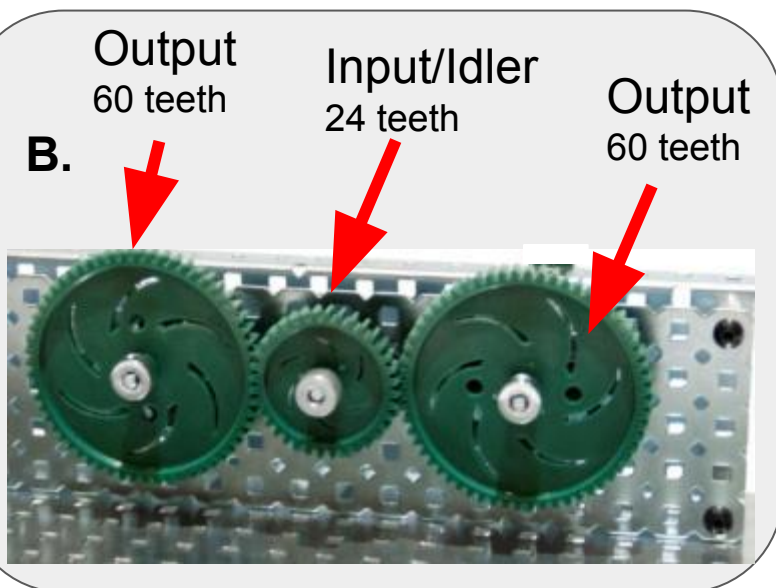


Simple Gear Train with Idler

$$\frac{24}{12} : \frac{60}{12} = \boxed{2:5}$$

- Describe speed and torque

Speed is decreasing and Torque is increasing because the output gears are bigger than the input gear.



Self Assessment Instructions

For this on the following pages you will find/take a picture of the required mechanisms that you have found out in the world.

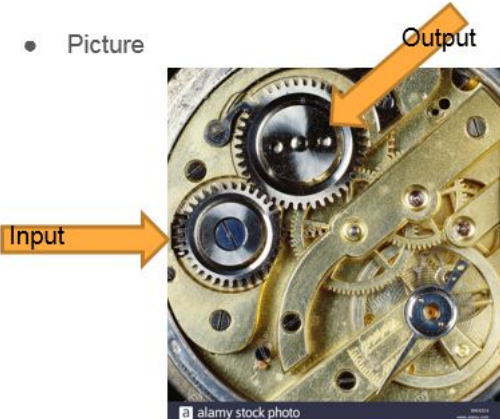
You will then label the input and out of that mechanism and answer the questions on the page.

Here is an example of a completed self assessment page.

Simple Gear Train

- Where can you find this mechanism outside of the classroom?
 - A simple gear train can be found inside of a watch
- What is it's function (what is it's purpose)?
 - The function of the gears is to make the arms on a watch move.
- In your picture what is happening to Torque and Speed?
 - Torque is Increasing and the Speed is decreasing
- Why?
 - Because the Output gear is bigger than the Input gear.

- In your picture label the Input and Output
- Picture



alamy stock photo

Self Assessment: Simple Gear Train

- Where can you find this mechanism outside of the classroom?
- What is its function?
- In your picture what is happening to Torque and Speed
- Why?
- In your picture label the Input and Output
- Picture

Self Assessment: Simple Gear Train with Idler

- Where can you find this mechanism outside of the classroom?
- What is its function?
- In your picture what is happening to Torque and Speed
- Why?
- In your picture label the Input and Output
- Picture

Extend your learning

Which mechanism was easier to find?

Why do you think it was easier to find?

Hypothesize: if it was harder to find one of the mechanisms what does that possibly say about its usage in the world?

See a simple gear train be built using VEX parts [here](#)

See a simple gear train with idler be built using VEX parts [here](#)