



**Automation & Robotics Virtual Learning**

# **7th & 8th Mechanisms Day 6**

**April 13th, 2020**



PLTW: Automation & Robotics  
Lesson: Mechanisms Day 6 [April 13th]

**Objective/Learning Target:**

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

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

# Warm-up

Until today all of our mechanisms have used either a spur gear, bevel gear, worm gear or a gear rack.

Take a look at this [webpage](#) discover the other gears available to you when you build a mechanism.

**How is a Screw gear different from a Worm gear?**

Explain your answer:

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**How is a Helical gear different from Bevel gear?**

Explain your answer:

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Questions/Main Ideas:

Summary/Reflection

# New Gears

## Sprocket Gears



Sprocket gears have more space between their teeth in order for a chain to fit in between them.

## Pulleys



Pulley gears don't have any teeth and rely on friction to move the belt. Pulleys must have their diameter to be measured in order to find the gear ratio.

# Chain Drive

In a Chain Drive the input and output shafts are always **parallel**.

The input and output gears move in the **same direction** since their teeth are not meshed.

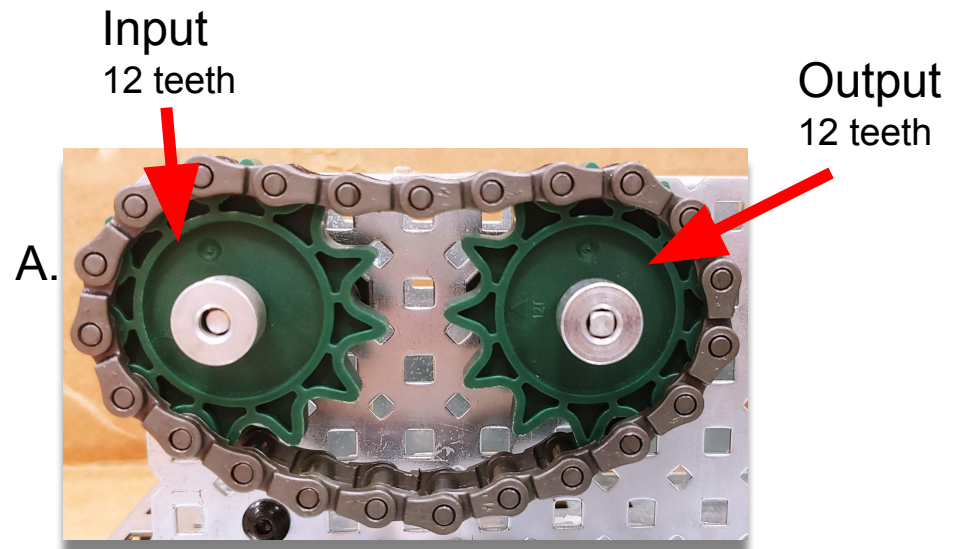
Both gears are circles therefore the input and output gears type of movement is **Rotary** and the direction of travel and flow of power are **reversible**.

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

Simplified Gear ratio = **1:1**

Speed is **constant**

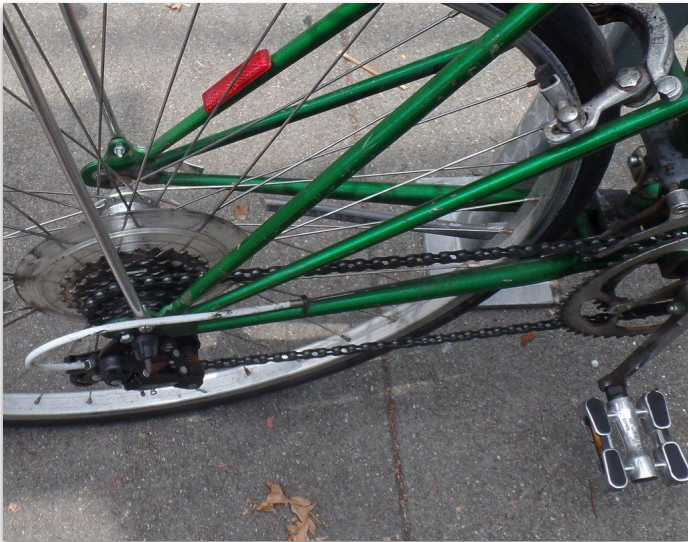
Torque is **constant**



# Where Can You Find a Chain Drives?

Common places you might find a chain drives is in:

- Bicycle
- Motorcycle

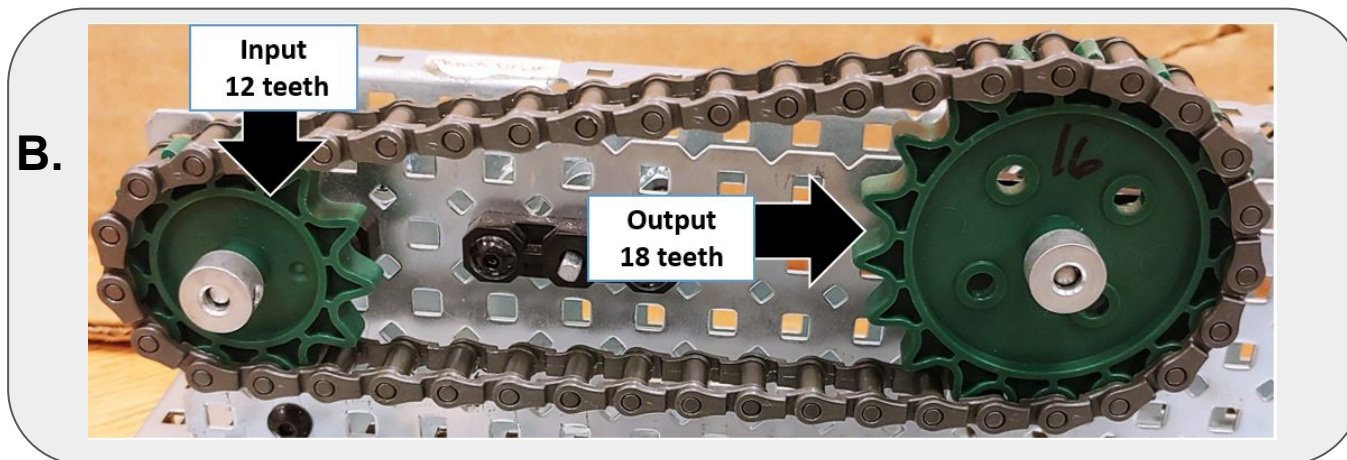


\*The advantage of a chain drive that uses sprocket gears over using spur gears is the ability to transfer torque and speed over longer distances.



# Chain Drive: Practice

- What type of movement does the Input gear do?
- The output gear?
- What is the simplified gear ratio in the Chain Drive B?
- Describe speed and torque



# Chain Drive: Practice ANSWER KEY

- What type of movement does the Input gear do?

Rotary because the gear is circle shaped

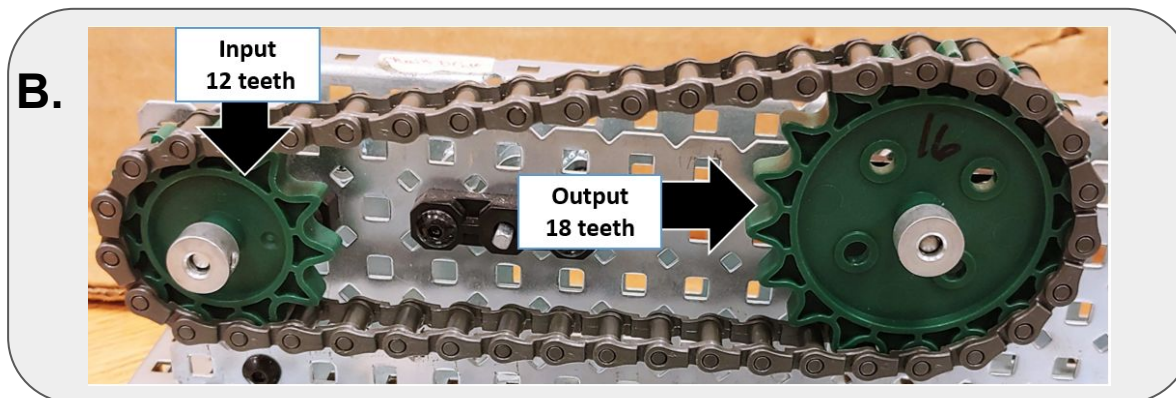
- The output gear?

Rotary because the gear is circle shaped

- What is the simplified gear ratio in the Chain Drive B?

$$\text{Chain Drive B.} \\ \frac{12:18}{6 \quad 6} = \boxed{2:3}$$

- Describe speed and torque  
Speed is decreasing  
Torque is increasing  
Because the output gear is bigger than the input gear.

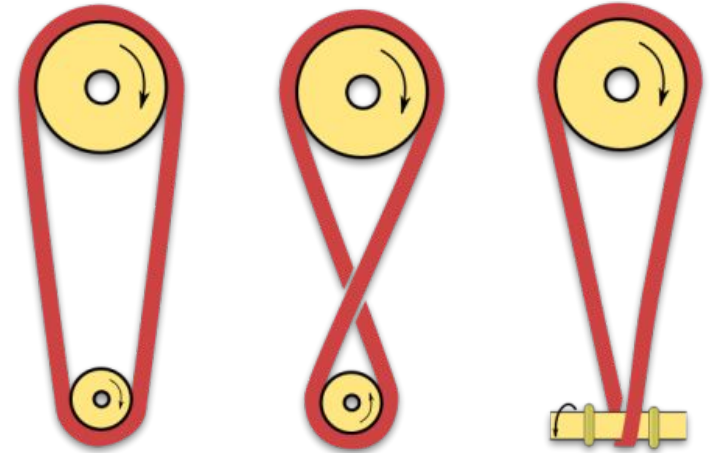
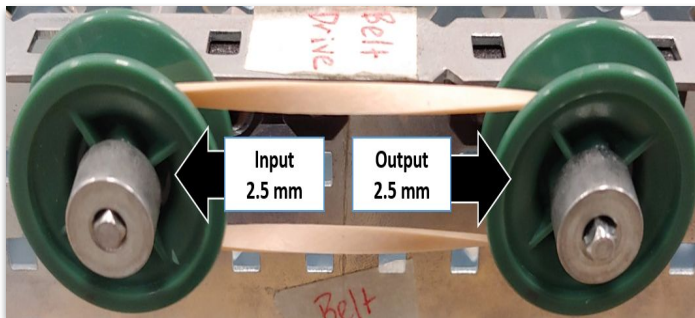


# Belt Drive

In a Belt Drive the input and output shafts are always **parallel**.

The input and output gears move in the **same direction** because the belt pulls both gear in the same direction unless the belt is twisted which will allow the gears to move in opposite directions.

Both gears are circles therefore the input and output gears type of movement is **Rotary** and the direction of travel and flow of power are **reversible**.



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

Simplified Gear ratio = **1:1**

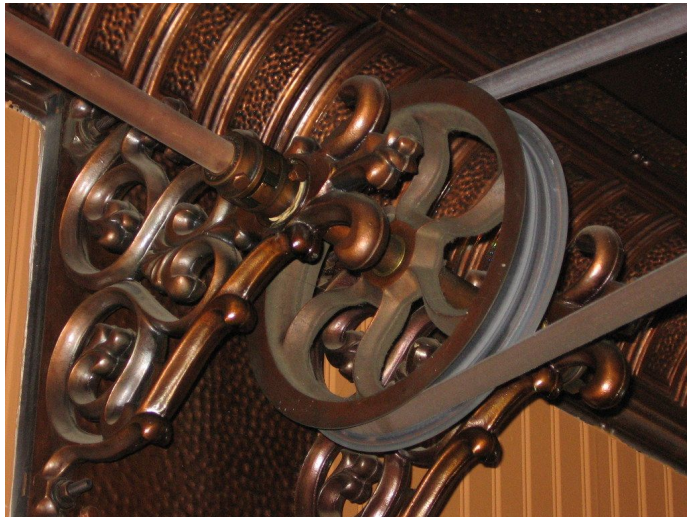
Speed is **constant**

Torque is **constant**

# Where Can You Find a Belt Drives?

Common places you might find a Belt drives is in:

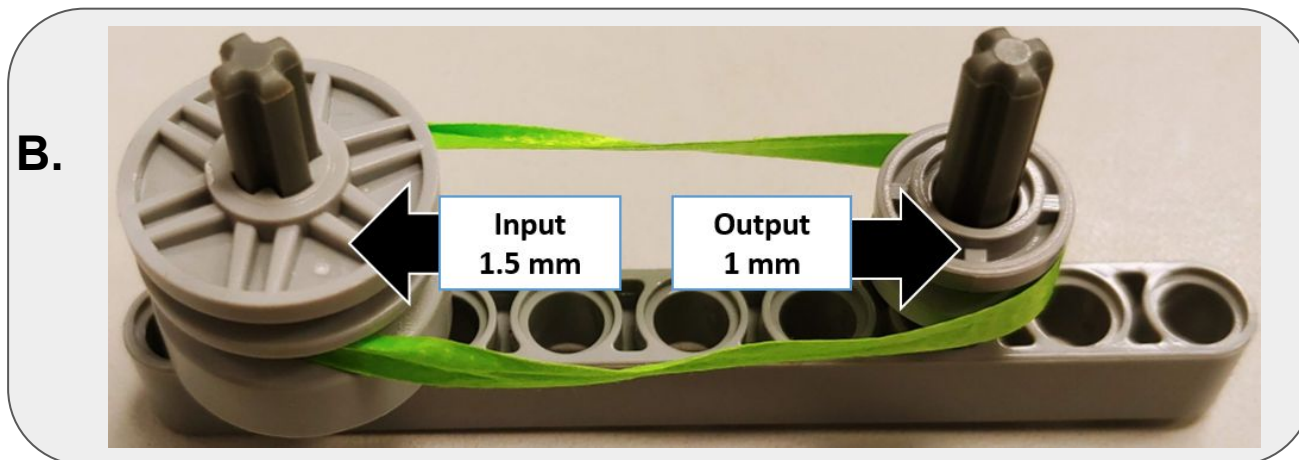
- Lawn mowers
- Car engines



\*Why use a belt instead of a chain?  
They are quieter and less expensive.

# Belt Drive: Practice

- What type of movement does the Input gear do?
- The output gear?
- What is the simplified gear ratio in the Belt Drive B?
- Describe speed and torque



# Belt Drive: 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 Belt Drive B?

Chain Drive B.

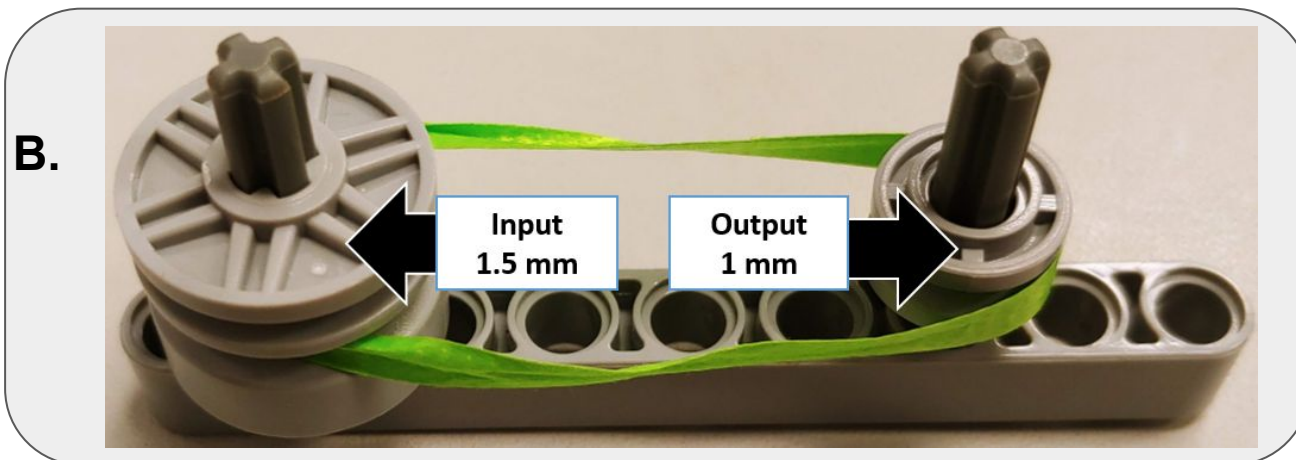
$$\frac{1.5}{.5} : \frac{1}{.5} = \boxed{3:2}$$

- Describe speed and torque

Speed is increasing

Torque is decreasing

Because the output gear is smaller 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.

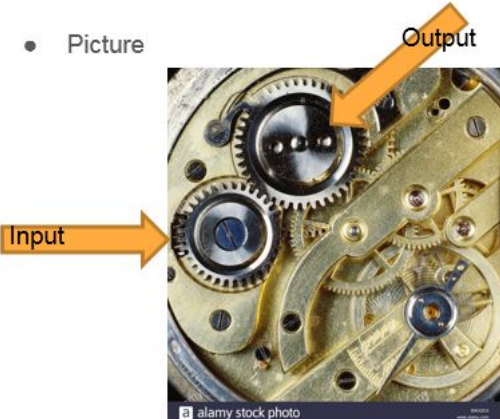
You will then label the input and out of that mechanism and answer the questions on the page.

**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



Input

Output

alamy stock photo

# Chain Drive

- 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



# Belt Drive

- 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?

- What to learn more about the basics of chain drives? Take a look at this [video](#).
- What to know more about belt drives? Check this [webpage](#)!