



Automation & Robotics Virtual Learning

7th & 8th Mechanisms Day 4

April 9th, 2020



Lesson: Mechanisms Day 4 [April 9th]

Objective/Learning Target:

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

Warm-up

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

Use the notes page to

- List 3 facts you have already learned about mechanisms
- Two questions or ideas you may have about mechanisms
- One thing you think you still need to learn about mechanisms.

Questions/Main Ideas:

Summary/Reflection

Bevel Gear Train

In a Bevel Gear Train the input and output shafts are always meet at least a **90° angel**

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

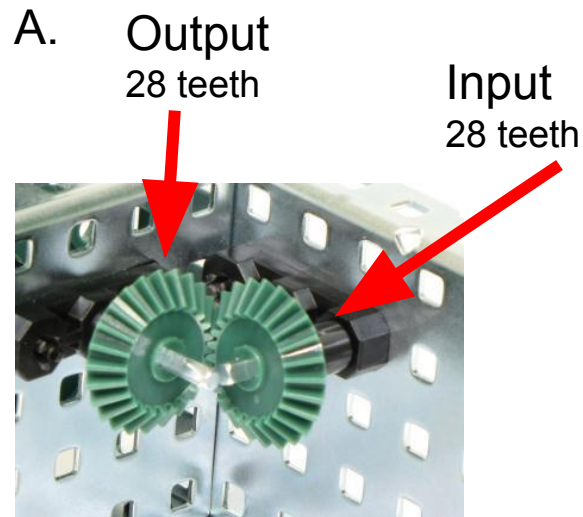
Both gears are circles therefore the input and output gears type of movement is **Rotary**.

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

Simplified Gear ratio = **1:1**

Speed is **constant**

Torque is **constant**



Where Can You Find a Bevel Gear?

Common places you might find a bevel gear is in:

- Hand drill
- Car differential
- Shaft-driven bicycle



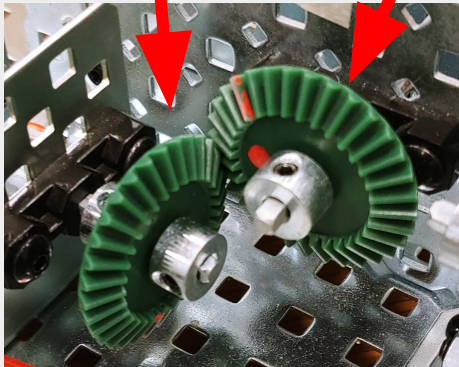
Bevel Gear: Practice

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

Output
28 teeth

Input
24 teeth

B.



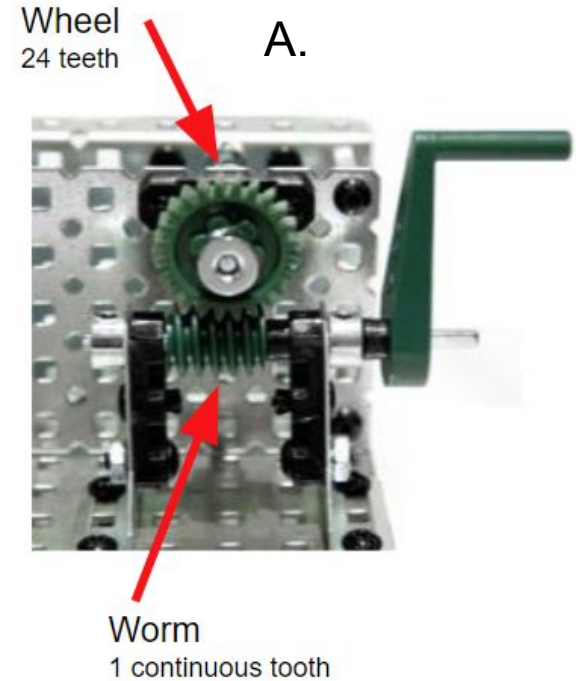
- Describe speed and torque

Worm and Wheel

In a Worm and Wheel the input and output shafts meet at a **90° angle**

The input gear and the output gear are meshed and must turn in the **opposite direction** of the each other.

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 = **1:24**
Speed is **decreasing**
Torque is **increasing**

Where Do You Find a Worm and Wheel?

Common places where Worm and Wheels might be found are:

- Tuning mechanism on string instruments
- Electric motors
- Winch



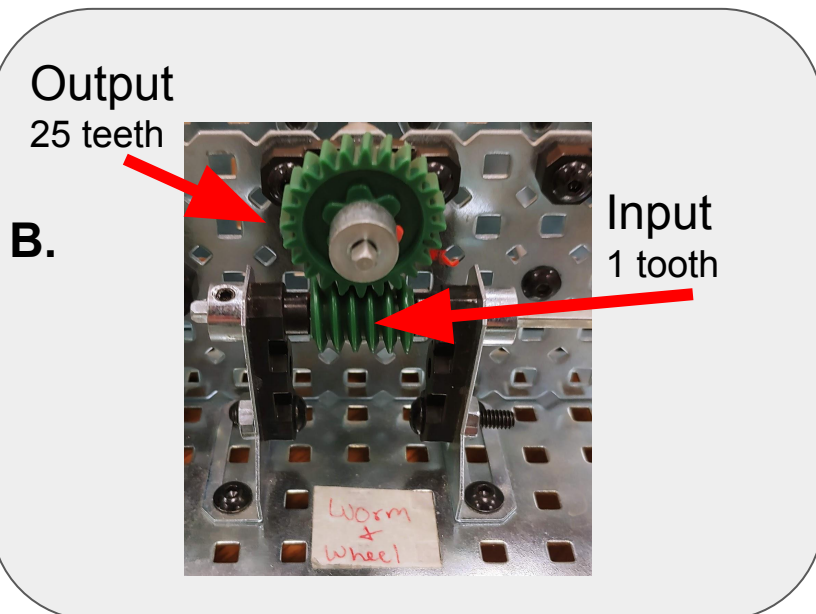
- A worm is used to reduce speed and increase torque.
- The motion is not reversible; a gear cannot turn the worm.



Worm and Wheel: 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



Bevel Gear: Practice ANSWER KEY

- What type of movement does the Input gear do?

The gear is circular therefore the movement is rotary

- The output gear?

The gear is circular therefore the movement is rotary

- What is the simplified gear ratio in the Bevel Gear B?

$$\begin{array}{l} \text{Bevel Gear} \\ \frac{24:28}{4 \quad 4} = \boxed{4:7} \end{array}$$

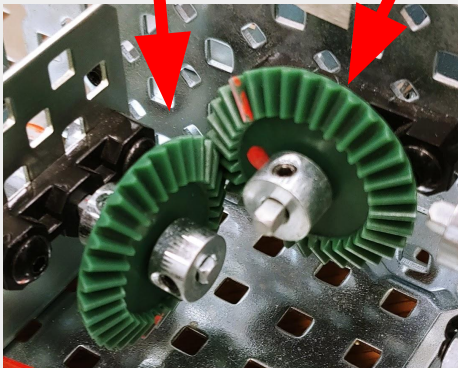
- Describe speed and torque

Speed is decreasing and the torque is increasing because the output gear is bigger than the input gear.

Output
28 teeth

Input
24 teeth

B.



Worm and Wheel: Practice ANSWER KEY

- What type of movement does the Input gear do?

The gear is circular therefore the movement is rotary

- The output gear?

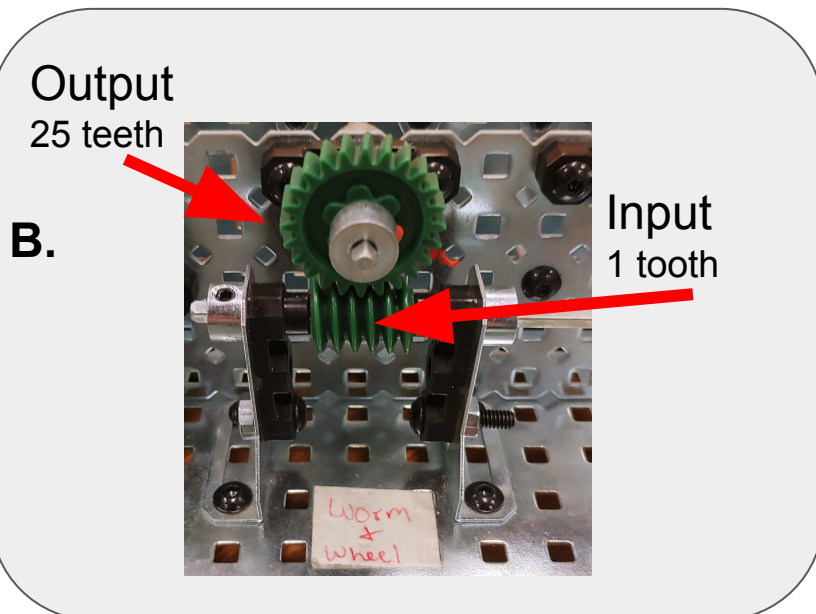
The gear is circular therefore the movement is rotary

- What is the simplified gear ratio in the Worm and Wheel Gear Train B?

Worm and Wheel
 $1:25 = 1:25$

- Describe speed and torque

The speed is decreasing and the torque is increasing because the output gear is 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.

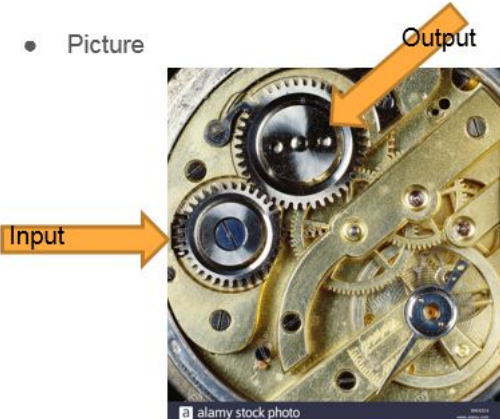
You will then label the input and out of that mechanism and answer the questions on the page.

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 its function (what is its 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

Bevel Gear

- 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

Worm & Wheel

- 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 know more about the different types of Bevel gears? Check this [webpage](#) out.
- What to know more about Worm gears read this [article](#)!