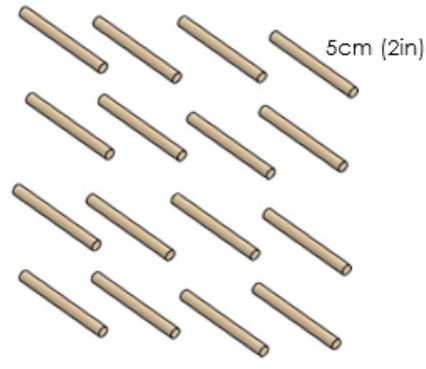
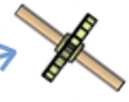
**Gear Ratio Lab**

## Gears & Pulleys

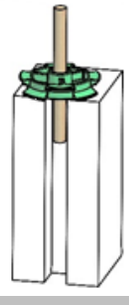
**3** **Cut** 8 **5cm** or 2 inch **dowels**.
These will become **shafts** for gears.

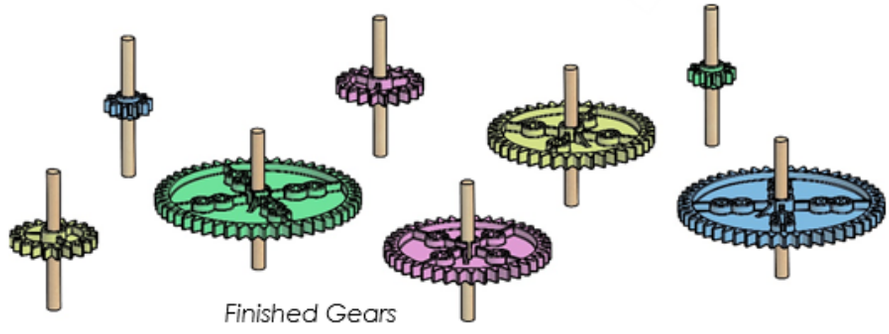




**4** **Tap** a **shaft** into each gear's **center hole**,
so the gear is in the center of the shaft.



Do not ream any holes.



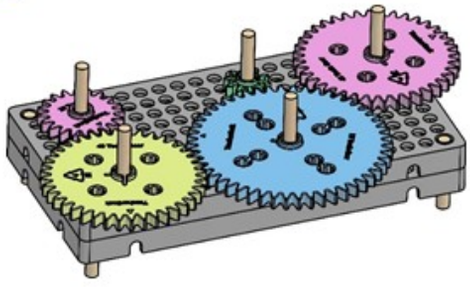
*Finished Gears*

**Tip:** Tap the dowel through the gear or pulley, and down into the groove on a tapping block.

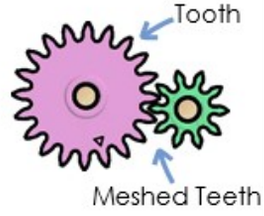
**Gear Ratio Lab**

## Gear Mechanisms

5



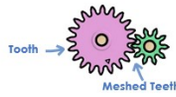
Place **gears** into the base. Position them so that the teeth **mesh**. If gears are too close, or too far away, the teeth will not mesh correctly.



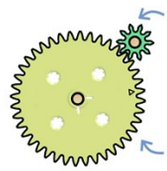
# Gear Ratio Lab

Name

## WHAT IS A GEAR?




A **gear** is a wheel with **teeth**.
The teeth **mesh** (connect) with other gears, to make them turn together.



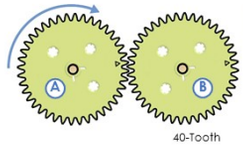
**Input (or driving) Gear:** The gear that is powered (turned by you).
**Output (or driven) Gear:** The gear that gets powered (turned by the other gear).

▶ **Revolution:** one full rotation


▶ **A Clock's Rotation:** The minute hand on a clock makes one revolution every minute

## DIRECTION & REVOLUTION

1. **Mesh** (connect) two 40-Tooth gears together on the base plate. Using the dowel, spin **Gear** (A) clockwise (direction of the arrow) one **revolution**. Draw an arrow around **Gear** (B) to show the direction of **rotation** (turn).




Complete for meshed gears (A) & (B)

| Gear | # of Teeth | Rotation Direction | # of Revolutions | Revolutions' Ratio |
|---|---|---|---|---|
| A Input | 40 | CW | 1 | |
| B Output | 40 | | | |

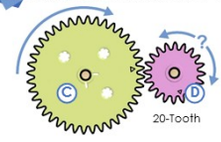
Input Revolutions / Output Revolutions

▶ A **ratio** is a comparison of two values (numbers). Which values are you comparing? _____

Which **direction** did the output gear rotate?

▶ Clockwise  Counter Clockwise

2. Swap your output for a 20-Tooth gear and spin **Gear** (C) clockwise one revolution.

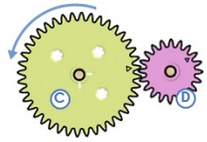



Complete for meshed gears (C) & (D)

| Gear | # of Teeth | Rotation Direction | # of Revolutions | Revolutions' Ratio |
|---|---|---|---|---|
| C Input | 40 | CW | 1 | |
| D Output | 20 | | | |

▶ How did changing the **output gear** size affect the revolutions' ratio? _____

3. Now, spin **Gear** (C) counter clockwise one full revolution. Draw an arrow around **Gear** (D) to show the direction of rotation.



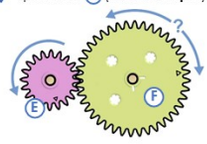

Complete for meshed gears (C) & (D)

| Gear | # of Teeth | Rotation Direction | # of Revolutions | Revolutions' Ratio |
|---|---|---|---|---|
| C Input | 40 | CCW | 1 | |
| D Output | 20 | | | |

▶ Did changing the **direction of rotation** affect the revolutions' ratio? _____

## SWITCH IT UP!

6. Switch your 20-Tooth and 40-Tooth gears. Using a dowel, spin **Gear** (E) (now the **input**) clockwise.




Complete for meshed gears (E) & (F)

| Gear | # of Teeth | Rotation Direction | # of Revolutions | Revolutions' Ratio | Reduced Ratio |
|---|---|---|---|---|---|
| E Input | 20 | CW | 6 | | |
| F Output | 40 | | | | |

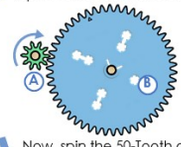
Inverse from before

▶ How did switching input and output gear size affect the revolutions' *ratio*? _____

## GEAR TEETH RATIO

7. **Teeth** allow gears to mesh and indicate gear **size**. Look at the **tooth ratio** of your meshed gears. *How does it compare to the revolutions' ratio?* _____

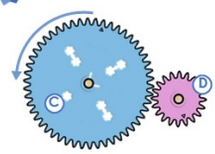
8. Comparing the number of **teeth** in one gear to another is called **gear ratio**. Spin the 10-Tooth and 50-Tooth gear combination on the base.




| Gear | # of Teeth | Rotation Direction | # of Revolutions | Revolutions' Ratio | Reduced Ratio |
|---|---|---|---|---|---|
| A Input | 10 | CW | 12 | | |
| B Output | 50 | | | | |

▶ Was the reduced ratio the same as the tooth ratio? _____

9. Now, spin the 50-Tooth and 20-Tooth gear combination on the base.




| Gear | # of Teeth | Rotation Direction | # of Revolutions | Revolutions' Ratio | Reduced Ratio |
|---|---|---|---|---|---|
| C Input | 50 | CCW | 12 | | |
| D Output | 20 | | | | |

Was the reduced ratio the same as the tooth ratio? _____