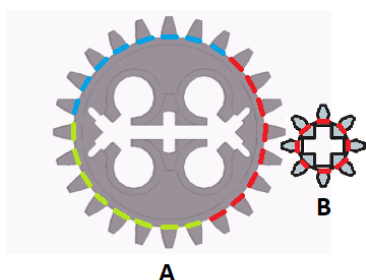


Teachers' Guide

Start the discussion as you are guided by the presentation. Gears, wheels with teeth, are meshed with each other and transmit motion. Also, according to their size (number of teeth they have), may accelerate or decelerate the result of the motion.

When a big gear with 24 teeth is meshed with a small one with 8 teeth, the following happens:



When the smaller gear completes one rotation, it has “touched” only 8 of the 24 teeth of the big one. For a complete rotation of B, A has done only $(8/24)$ the one third of its own rotation. So, motion is decelerating.

When the bigger gear completes one rotation, it has “touched” $(24/8)$ three times all the teeth of the smaller one. For one rotation of A, B has done three rotations. So, motion is accelerated.

From the worksheet:

System	Gears	Direction
A	2	Reverse
B	3	Same
C	4	Reverse
D	5	Same

The direction of the motion depends on the number of gears that transmit it. When we use 2,4,6,8,10... gears, the direction of the motion is reversed, whereas when we use 1,3,5,7,9... gears the direction remains the same.

Regarding the inclined plane, remember that this is also a simple machine. We observe that when its inclination gets bigger, the vehicle finds it difficult to move uphill, until it can no longer move. This moment is related to the power of the motor.

Beware! When the motor works in conditions that are over its limits, the Hub blinks in orange and the electric power is cut off to prevent any damage to the motor. The LED of the hub blinks the same when the battery is almost off.

When you change the place of the gears, the speed changes. When you have (from the motor) small gear → bigger gear, the speed is lower than the rotation of the motor. When you have (from the motor) big gear → smaller gear, the speed is higher from the rotation of the motor.

Fill in: When we use gears to accelerate, we gain in power/speed and lose in distance

Regarding the screw:

- A. A complete rotation of the screw always moves only one tooth of the meshing gear, no matter how many teeth the gear has. So, the screw needs to rotate 24 times to rotate a 24-teeth gear once.
- B. The motion is always one-way: the screw rotates the gear, but the gear cannot rotate the screw.
- C. A tool that uses this mechanism is the adjustable spanner wrench.



In pulleys, in the first occasion the two pulleys rotate in the same direction, and in the second occasion they rotate in different direction.

The two coding solutions are 1) to change the arrows (in the design) and 2) to change the direction in the blocks.

We note that regarding the speed, as in gears, the speed among the two pulleys is related to the ratio of their radius.