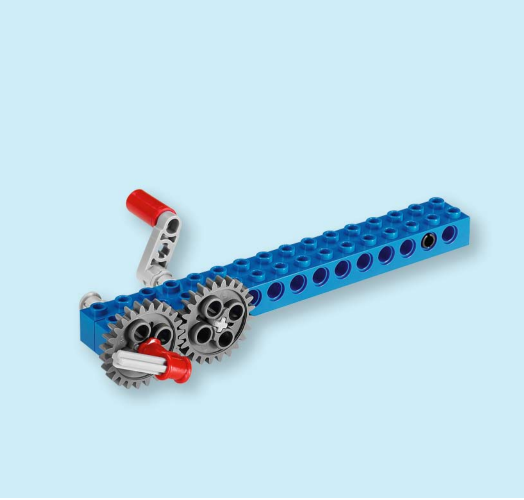
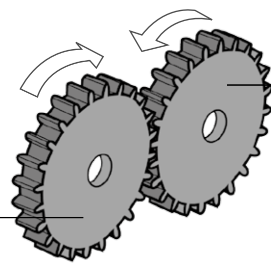


Gear

Mechanisms: Gear

Gears are wheels with teeth that mesh with each other. Because the teeth lock together, they can efficiently transfer force and motion.



The drive gear is the gear that is turned by an outside effort, for instance your hand or an engine. Any gear that is turned by another gear is called a driven gear. The drive gear provides the input force and the driven gear delivers the output force.
Using a gear system can create change in speed, direction and force. But there are always advantages and disadvantages. For example, you can not both have more output force and an increase in speed at the same time.

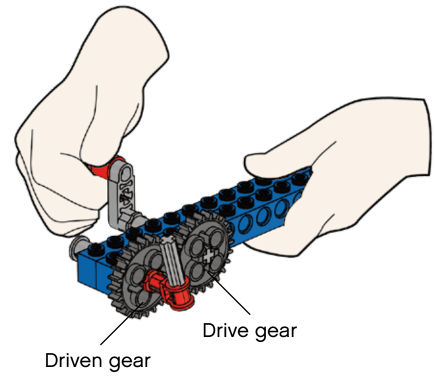
To predict the ratio of which two meshed gears will move relative to each other, divide the number of teeth on the driven gear by the number of teeth on the drive gear. This is called the gear ratio. If a driven gear with 24 teeth is meshed with a drive gear with 48 teeth, there is a 1:2 gear ratio. Meaning that the driven gear will turn twice as fast as the drive gear.

Gears are found in many machines, where there is the need to control the speed of rotary movement and turning force. Common examples include power tools, cars and egg beaters!

Did you know?
Not all gears are round. Some gears are square, triangular and even elliptical.

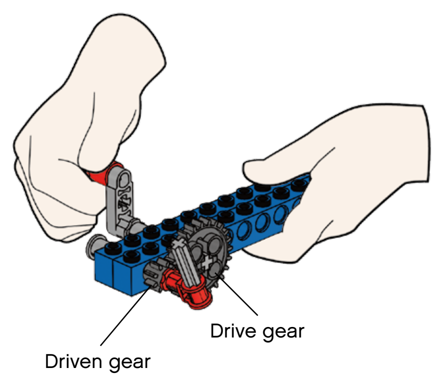
G1

This model shows a 1:1 gear ratio. he speeds of the drive gear and the driven gears are the same, because they have the same number of teeth. The drive and driven gears turn in opposite directions.



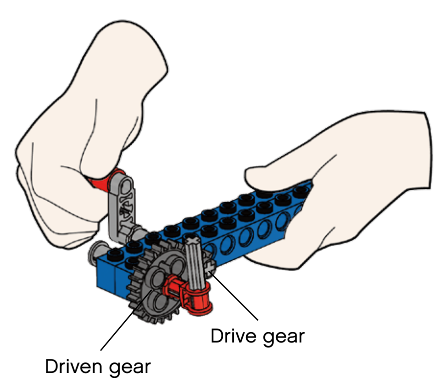
G2

This model shows gearing up. The larger drive gear turns the smaller driven gear, resulting in increased speed, but reduced output force.



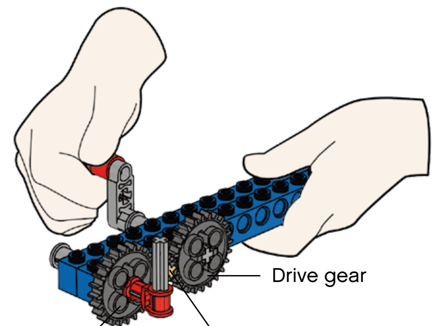
G3

This model shows gearing down. The smaller drive turns the larger driven gear, resulting in reduced speed, but increased output force.



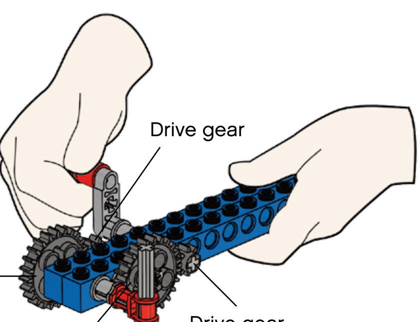
G4

This model shows an idler gearing. The small gear is an idler gear. The idler gear does not affect the speed or output force of either the drive or the driven gears. The drive and the driven gears turn in the same direction and at the same speed.



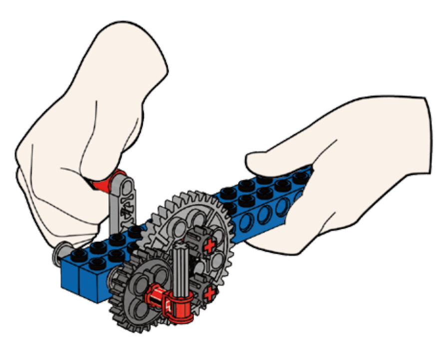
G5

This model shows an example of compound gearing. Because of the way this compound gearing is arranged, the turning speed is significantly reduced and the output force greatly increased. The smaller drive gear slowly turns the larger driven gear. The smaller gear on the same axle as the driven gear is now set in motion and slowly turns the second large driven gear, making it turn even more slowly.



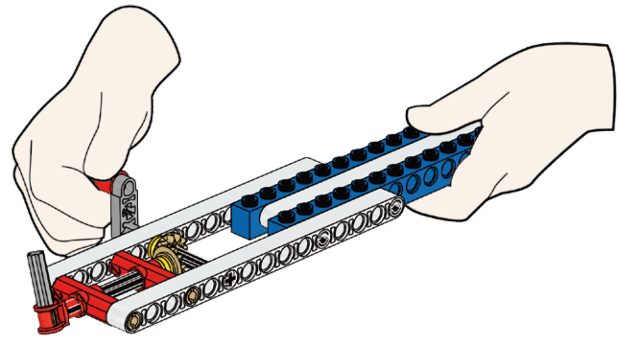
G6

This model shows a gearing set up for periodic movement, i.e. the driven gear turns for a short while and then stops for a moment. Speed is significantly reduced as movement only occurs when the driven gear is meshed with one of the two drive gears.



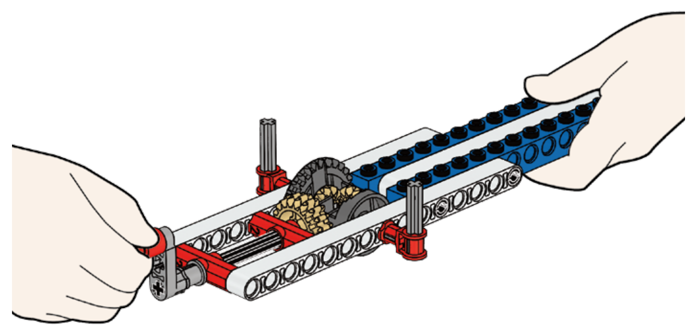
G7

This model shows an angle gearing. The two meshed bevel gears transfer the speed and force unchanged, but at an angle of 90°.



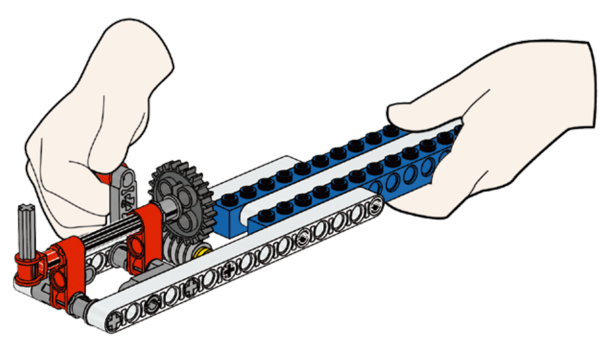
G8

This model shows a differential gearing. The input force is transferred to two output forces at an angle of 90°. When one output pointer is stopped the other will double its original speed. When both output pointers are stopped the handle cannot be turned.



G9

This model shows a worm gear. It reduces speed significantly as it takes a complete turn of the worm gear to move the gear above by a single tooth. It changes direction by 90°. The output force is increased significantly.
Worm gears can only be used as a drive gear.



G10

This model shows a rack and pinion gearing. Unlike the previous gears a rack and pinion gearing can only be used for linear motion, not rotary. When the handle is turned the gear rack moves forward or backwards depending on the rotational direction of the small gear (called a pinion).