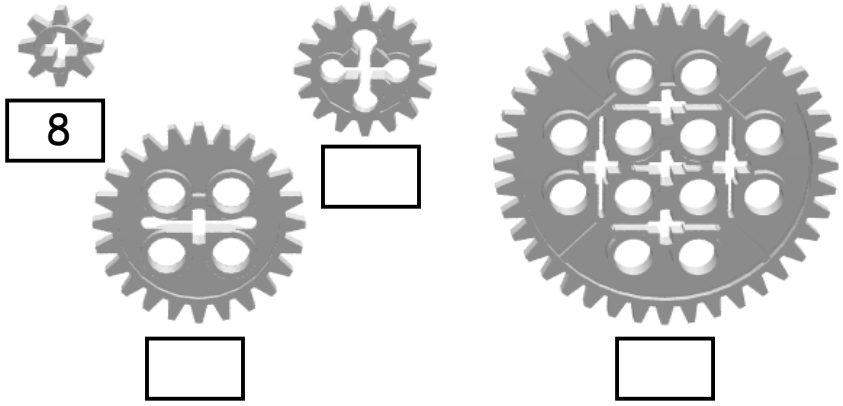
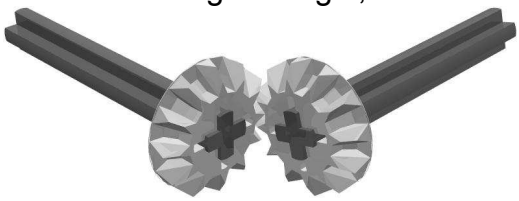
Team: ____ Name: _____
Name: _____ Name: _____

Introduction to Gears

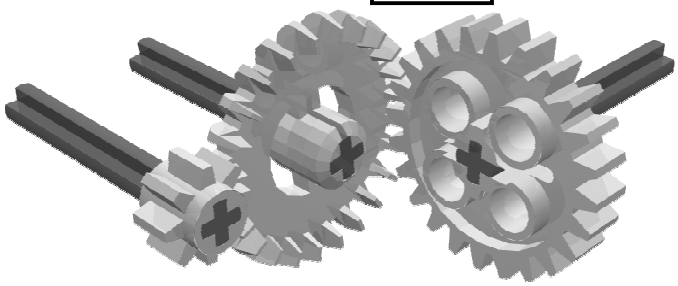
Spur gears are the most common type of gears. Most LEGO gears are spur gears. We will be using 4 different sizes of spur gears. Write in the box how many teeth each gear has.



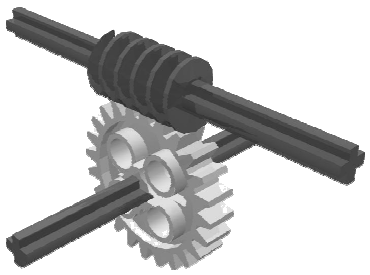
Bevel gears mesh with axles at a 90-degree angle, like this:



Crown gears are like combination of a spur gear and a bevel gear. It can be used both ways. Here you see the crown gear with an 8-tooth and a 24-tooth spur gear. How many teeth does the crown gear have?



Worm gears are like screws. They are very good if you really want to "*gear things down*". One interesting thing about a worm gear is that only the worm gear can drive the spur gear, the spur gear cannot drive the worm gear.

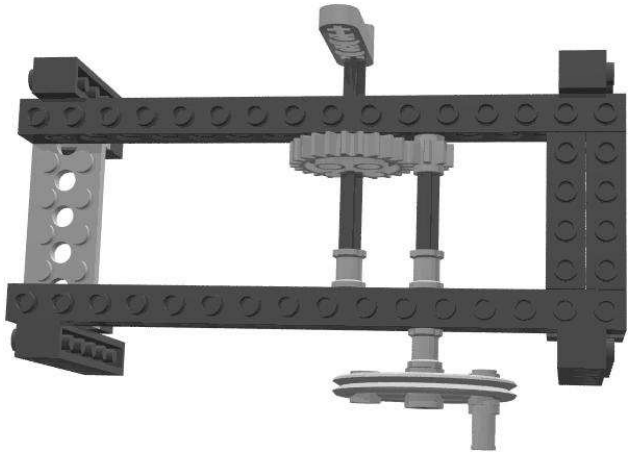


Trick question: How many teeth does the worm gear have? (If you can't guess now, try to come back to it later.)

Experimenting with gears: gear ratios
To do these experiments you will first need to build the Gear Test Bench.

You will start with just two gears at a time. Each gear will be on an axle. One axle will be the **input** axle and the other will be the **output** axle. On the input axle we will put a large pulley wheel with a crank handle and on the output axle we will put a piece called a **lift arm**. The lift arm will make it easier to tell how much the axle has turned.

Build the gear arrangement shown using an 8-tooth gear and a 24-tooth gear.



Turn the crank slowly and count how many turns the input axle needs to make for the output axle to make one complete turn. What did you get? [ ]

You just figured out a gear ratio! A gear ratio is the corresponding number of turns of the input axle to the number of turns on the output axle. Gear ratios are written like this:

turns on input axle **:** *turns on output axle*

When you read or say a gear ration, you say "to" for the colon. For this example, when we had the 8-tooth gear driving the 24-tooth gear, the gear ratio was **3:1**, which we read as "**three to one**". This is basically a short way of saying **"three** turns of the input axle correspond **to one** turn on the output axle."

Now we are going to fill in the chart below with different gear combinations to see what the gear ratios are. You have already tested the first combination so it is already written in. To test the other combinations you will need to change the gears and possibly the axle arrangement on the test bench.

	Teeth on input gear	**Teeth on output gear**	**Gear Ratio** *turns on input axle* **:** *turns on output axle*
	8	24	3 : 1
	8	40	:
	24	24	:
	24	8	:
	24	40	:
*			:
*			:

* These are optional if you want to try some other combinations.