

## Learning activity: correction

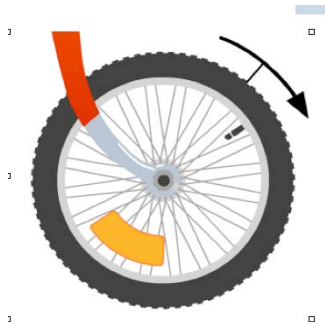
The aim of this activity is to observe mechanisms in order to master the languages required to represent or design them.

**A mechanism is an arrangement of assembled parts mounted to function as a whole.**

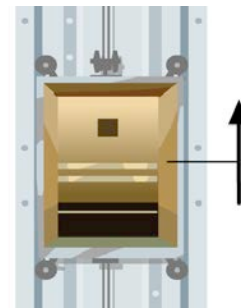
**A mechanism transmits or transforms the outside force that puts it into motion.**

### MOTIONS

Objects that comprise a mechanism have mobile parts. Their motion will directly or indirectly serve the purpose to which the mechanism is dedicated.



**Rotation**



**Translation**

The parts of an object have a basic mechanical function (role) in the object. There are four functions: **linkage, guidance**, lubrication and sealing.

Mechanisms are combinations of linked, guided parts to transmit or transform motion.

Complete the following questionnaire while observing the challenges presented at the stations numbered from 1 to 8.

### Station 1

Observe the three pictures. There are two objects that have no mechanisms while one contains one.

For each picture, explain if there is a mechanism or not. Justify your answer.

Subject	Presence of a mechanism	Justification
1	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no	<i>This is a link (pivot), but it does not function as a whole.</i>
2	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no	<i>It is a question of observation. We notice on the toy that a crank—rod—crank mechanism is imitated, but the 2nd wheel is linked to the rod by a slide, rather than a pivot. The motion will not be transmitted.</i>
3	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no	<i>This is indeed a mechanism. The two gears interact to function as a set.</i>

### Station 2

Several parts carry out motion. Name one part having a rotation motion and one part having a translation motion. *(The demonstrators used are presented in the appendix).*

Rotation: *Several correct answers are possible: 1 -3 -5 -8 and 7, even if the rotation is partial.*

Translation: *Part 4 only.*

### Station 3

Three objects containing mechanisms are presented. For each of the objects, say if it is a motion transmission mechanism or a motion transformation motion. Justify your answer.

Subject	Transmission or transformation	Justification
1 Manual beaters	<input checked="" type="checkbox"/> transmission <input type="checkbox"/> transformation	<i>The direction of the rotation motion is modified, but the drive element (the crank) is in rotation as well as the receiving elements (the beaters).</i>
2 Ice cream scoop	<input type="checkbox"/> transmission <input checked="" type="checkbox"/> transformation	<i>The "translation" (though we could call it a partial rotation, since the handles are assembled by a pivot) of the rack drives a pinion in partial rotation. This motion is transmitted from the scraper to the scoop.</i>
3 Lollipop rotator	<input type="checkbox"/> transmission <input checked="" type="checkbox"/> transformation	<i>The rotation is transformed into translation by a slider on the rotation axis. The alien rises and falls.</i>

#### Station 4

Two different mechanisms are presented on an assembled panel. One of them is a motion transmission mechanism and the other is a motion transformation mechanism.

Identify the type of mechanism for each and justify your answer.

Mechanism	Transmission or transformation	Justification
1	<input type="checkbox"/> transmission <input checked="" type="checkbox"/> transformation	<i>Since the receptor part is guided in translation, this is a rotation motion that becomes translation.</i>
2	<input checked="" type="checkbox"/> transmission <input type="checkbox"/> transformation	<i>Since the receptor part is guided in rotation (partial and alternating), this is a rotation motion that becomes a partial alternating motion.</i>





#### Station 5

Two very similar mechanisms are presented on an assembled panel. Observe them and describe what differentiates them.

*The two assemblies present the same motion transformation mechanism (rod - crank). It is a rotation motion that is transformed into translation. Notice, however, that in one case, the size of the motion is much greater. In fact, the further the crank is from the centre of rotation of the crank plate, the greater the translation motion of the receiving element (the rod) will be.*

#### Station 6

Associate one of the parts to each of the symbols in the table below.

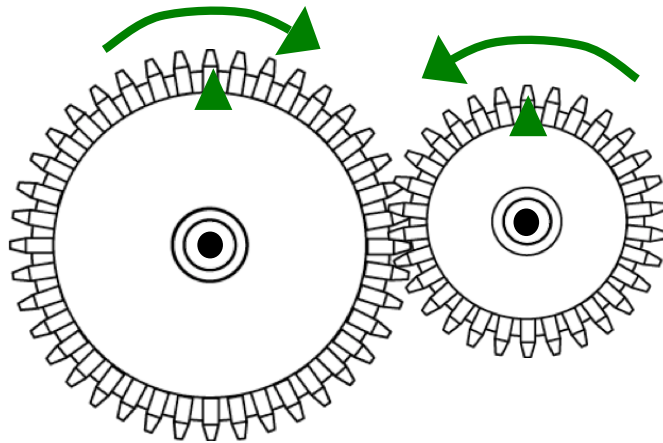
			
	Part free in rotation and in translation	Complete link	Part free in translation and linked in rotation
Part <i>1 - 3 - 5 - 7</i>	Part <i>8</i>	Part <i>2 - 6</i>	Part <i>4</i>

### Station 7

a) On the assembly panel, assemble a gear system using the gears and nails. Indicate the direction of the rotation of each of the gears.

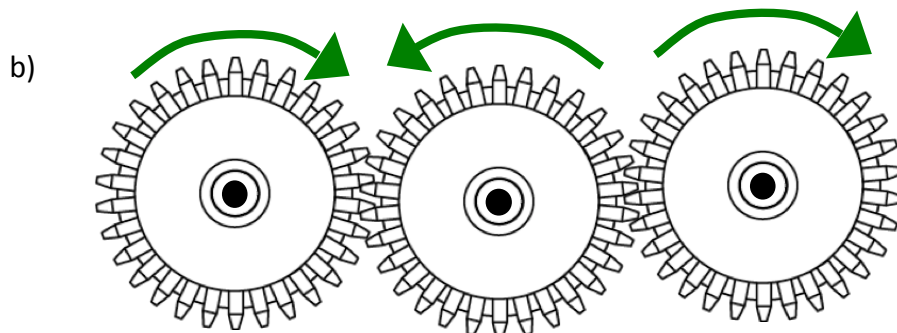
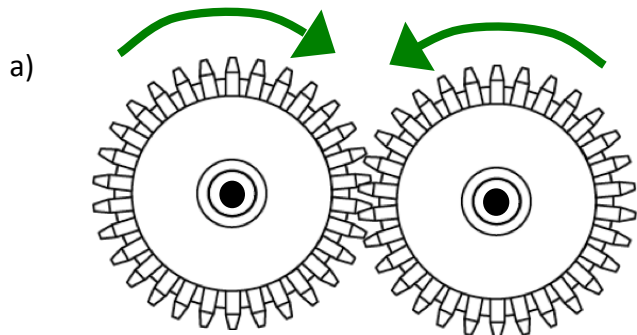
b) Do the gears all turn at the same speed? Explain your answer.

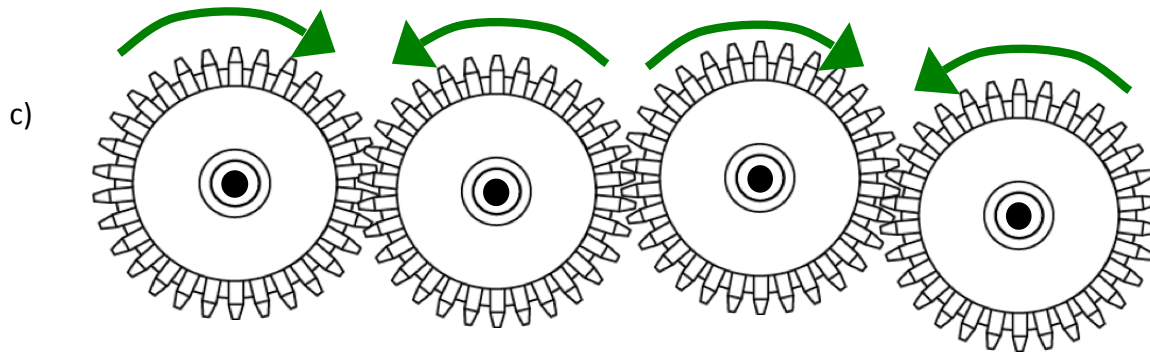
*No. The biggest gear takes longer to make a full revolution than the smallest. A good way of noticing that is to make a small dot on one tooth of each of the gears and to observe that when the biggest has made a full revolution, the smallest one will have made more than one revolution.*



### Station 8

Successively assemble two, three and four gears. In each case, indicate the direction of the gear rotation.





What do you notice about the direction of rotation of the first and the last gears relative to an even or odd number of gears?

*When the number of gears is even, the direction of the rotation is reversed on the last gear. Conversely, when the number of gears is odd, the direction of the rotation is the same for the first and the last gear.*