



**centre de
développement
pédagogique**
*pour la formation générale
en science et technologie*

THE OBJECTS THAT SURROUND US...

DECODING MECHANICAL ENGINEERING



ANIMATOR'S GUIDE

NOTES

- *The "Mechanisms" animation, which is available on the Centre de développement pédagogique website, is suggested as a referencing resource.*
- *The majority of these questions are related to the series of numbered images annexed to this document.*
- *It is suggested that you print the annexes in colour and laminate them, in order to obtain better quality images which can be reused.*

September 2011

WORKING DOCUMENT

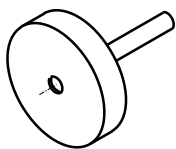
The objective targeted by this document is to observe objects containing mechanisms in order to better understand the languages used to represent or design them.

A MECHANISM IS AN
ARRANGEMENT OF PARTS ASSEMBLED
TO WORK AS A WHOLE.

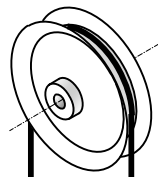
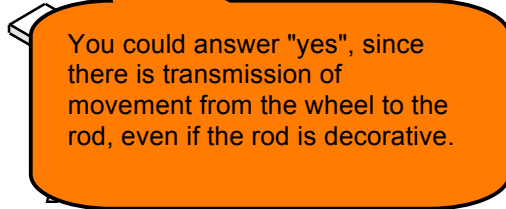
A MECHANISM TRANSMITS OR
TRANSFORMS THE OUTSIDE FORCE
THAT PUTS IT IN MOTION.

1- For each of the images shown below, determine whether or not it contains a mechanism. Justify your answers.

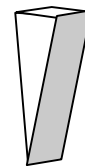
Image	Mechanism(s)		
	yes	no	
1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	There is no transmission or transformation of movement.
5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	These two parts do not operate as a whole.
7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The parts that transmit movement.
8	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	No real linkage between the wheels



Wheel

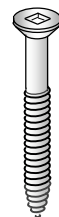


Pulley



Wedge

(double inclined plane)



Vis

(wound wedge)

Machines simples

2- For each of the images of objects shown in the table, identify which simple machine(s) is/are present by ticking the appropriate box.

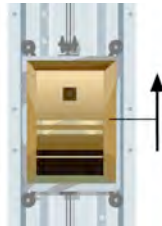
Image Simple machine	3	6	7	9	11	21
Wheel			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lever	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Inclined plane						<input checked="" type="checkbox"/>
Pulley		<input checked="" type="checkbox"/>				
Wedge						
Screw	<input checked="" type="checkbox"/>					

MOVEMENTS

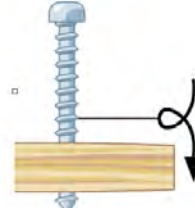
Objects that contain a mechanism have mobile parts. Their movement will directly or indirectly serve the function to which the mechanism is dedicated.



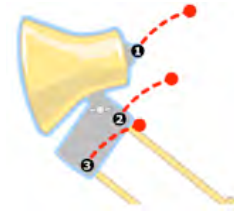
Rotation



Translation



Helical



Curvilinear translation

3- By observing the images shown below, indicate the movement each part carries out by writing its number in the appropriate box.

Images	1B	3A	4A	8C	10B	11A	12B	17B	18A	19D	21A
Rotation	1B										
Translation			4A		10B						
Helical		3A									
Curvilinear translation				8C			12B				
	17B										
	18A		11A								
		19D									
		21A									

THE PARTS THAT FORM ANY
TECHNICAL OBJECT HAVE A PRECISE
TECHNICAL FUNCTION.



THE SIMPLEST FUNCTIONS, CALLED
"BASIC MECHANICAL FUNCTIONS" ARE:
GUIDANCE, LINK, LUBRICATION AND SEAL.

THE FUNCTION OF A PART WHICH JOINS PIECES OF AN ASSEMBLY TOGETHER IS CALLED A LINK.

4- In a mechanism, the parts are linked to a frame, framework, chassis or surface. Depending on the characteristics or shape of the object, the link between part will either be:

- removable or fixed;
- directly or indirectly linked (using another organ like a screw);
- completely or partially linked (allowing some movement);
- rigid or elastic (distortion of a part while the object is operating).

Among the illustrations of selected objects, indicate the characteristics of the linkage between the designated parts. Indicate your answers by ticking in the table below.

The link between 	3A and 3B	14A and 14B	15A and 15B	18A and 18B	21A and 21C
Characteristics 					
Removable	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Fixed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Direct	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Indirect	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Complete (total)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Partial	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rigid	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Elastic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

THE FUNCTION OF A PART THAT
DIRECTS ANOTHER PART ALONG
A SPECIFIC TRAJECTORY IS
GUIDANCE.

LINK AND GUIDANCE BETWEEN PARTS
ALLOW THE SUPPRESSION OF MOTION
THAT WOULD IMPEDE THE PROPER
FUNCTIONING OF THE MECHANISM.

5- In order to correctly fulfill their function, the parts in movement in an object must retain their expected trajectory.

Among the images of selected objects, find the objects whose parts are guided. Identify the type of guidance and specify which part of the object is in movement (mobile organ) and which part guides the movement by indicating the coordinates of the parts in the table below.

Images ➡

2	3	4	5	9	10	11	14	17	19
---	---	---	---	---	----	----	----	----	----

NOTE: We could also add that 4C is in rotation around the teeth of the rack. The part is blocked in translation by the shape of the object.

Translation guidance	4A	10B	19D				Mobile organ
	4B	10C	19C				Guides the movement of the organ


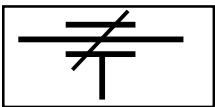



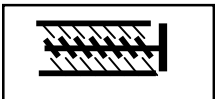


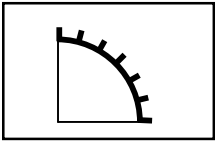

Rotation guidance	2A	9A	9B	11B	14B	17B	Mobile organ
	2B	9C	9C	11C	14A	17A	Guides the movement of the organ

Helical guidance	3A	5B	5A				Mobile organ
	3B	5A	5B				Guides the movement of the organ

It all depends on the point of view.
Both answers are possible.

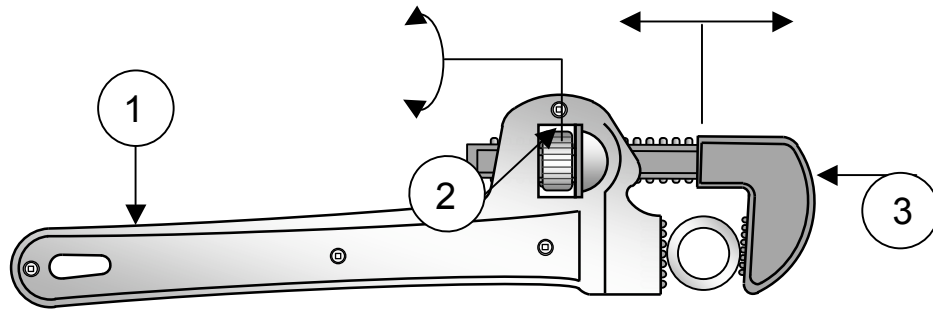
6- Among the selected objects, indicate those in which you find an element that justifies the use of one or several of the symbols below. Detail your choice by writing the image number in the appropriate box.

Images →

	1	2	3	9	10	11	13	14	16	19	21
					10 (A-C)	11	13	19			
				19							
				9 (B-C)	19						
	1	2		9 (A-C)	14						
				16							
			3		10 (B-C)						
				21							
				11	21						
				11	13						
				11							

It is understood that the housing limits the movement.

7- Observe the drawing of the **pipe wrench** below.



a. Give the global function of this object.

To tighten or loosen pipes.

b. Name the parts of the object.

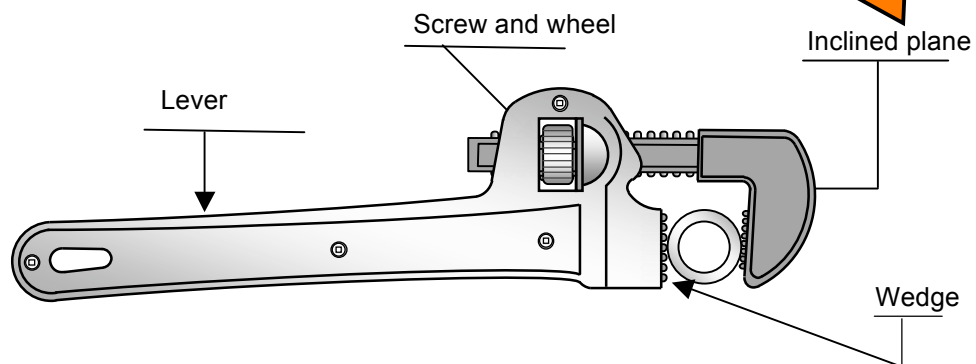
1. Handle 2. Adjustment screw 3. Head

c. Which part is the input organ of this object?

The adjustment screw

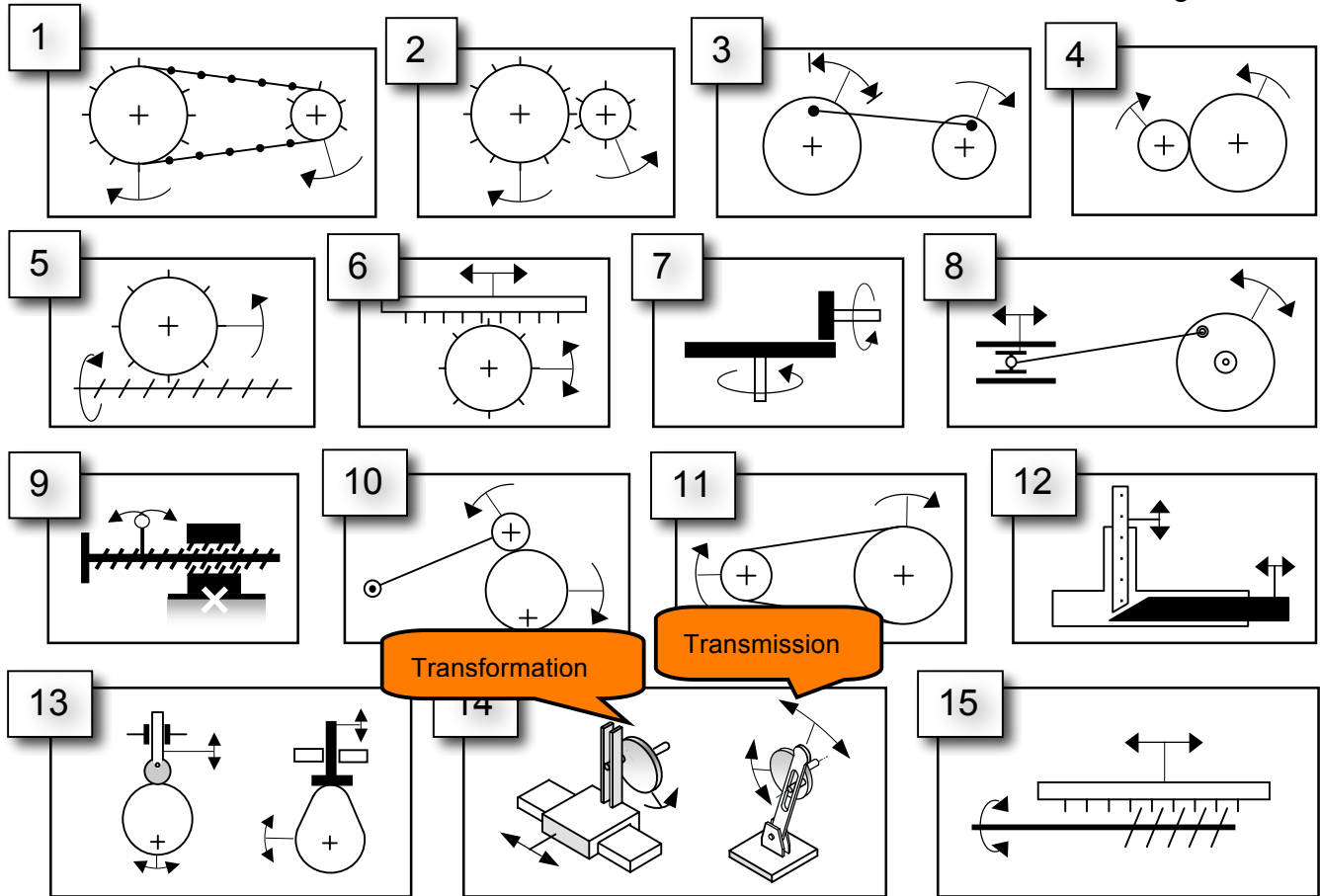
d. On the drawing above, indicate the appropriate movement symbol for each of the mobile parts.

e. On the drawing below, indicate and name the simple machines.



The inclined plane is very subtle, but it prevents the pipe from slipping.

8- Associate the name to the mechanisms represented by the diagrams below. Indicate whether the mechanism transforms or translates the movement of the motor organ.



Crank and slide
Friction wheel
Gear
Rod and crank
Wedge system

Rack and pinion
Cam and roller
Rack and screw
Pulley and belt

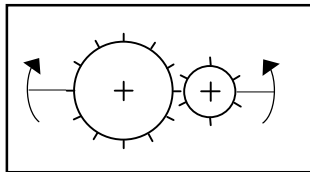
Nut and bolt
Gear and worm drive
Chain and gear
Crank - rod - crank

1. Chain and gear Transmission or transformation	2. Gear Transmission or transformation	3. Crank - rod - crank Transmission or transformation
4. Friction wheel Transmission or transformation	5. Gear and worm gear Transmission or transformation	6. Rack and pinion Transmission or transformation
7. Friction wheel Transmission or transformation	8. Rod and crank Transmission or transformation	9. Nut and bolt Transmission or transformation
10. Cam and roller Transmission or transformation	11. Pulley and belt Transmission or transformation	12. Wedge system Transmission or transformation
13. Cam and roller Transmission or transformation	14. Crank and slide Transmission or transformation	15. Rack and screw Transmission or transformation

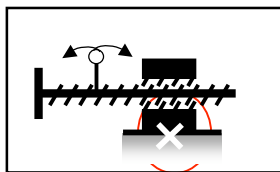
9- Diagrams of transmission or transformation of movement mechanisms are parts arrangements that are found in many objects.

Among the images shown, find the elements of mechanisms found in the diagram below. Indicate their presence by writing the number in the appropriate box.

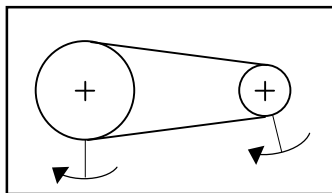
3	4	6	7	9	10	12	14	19	22
---	---	---	---	---	----	----	----	----	----



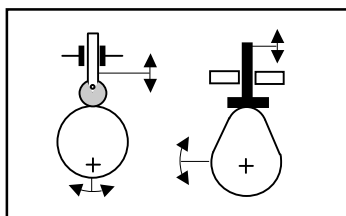
7	9			
---	---	--	--	--



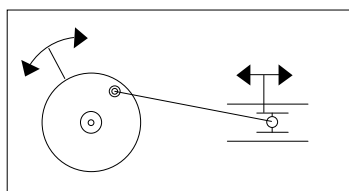
3	10			
---	----	--	--	--



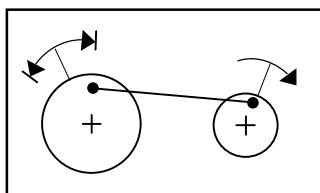
6				
---	--	--	--	--



14				
----	--	--	--	--



19	22			
----	----	--	--	--



12				
----	--	--	--	--

No mechanism show

4				
---	--	--	--	--

A MECHANISM IS AN ARRANGEMENT OF PARTS ASSEMBLED TO WORK AS A WHOLE.

This statement implies that in an arrangement, certain organs (parts) may move and act as a whole. The objective of this action is to change the nature of the movement, to modify the speed or to change the direction of the movement of the parts.

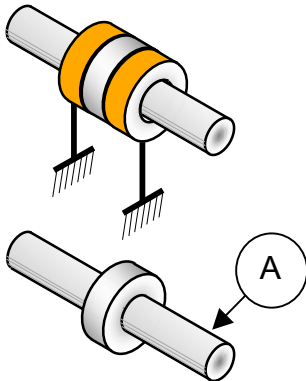
10 - Among the selected images, identify whether the mechanism changes the nature of the movement or modifies it.

	Changes the nature of the movement	Modifies the speed and/or the direction of the movement of the parts
6	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18	<input type="checkbox"/>	<input checked="" type="checkbox"/>
19	<input checked="" type="checkbox"/>	<input type="checkbox"/>

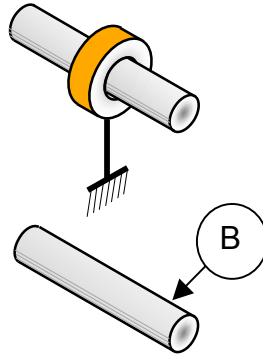
IN ORDER TO CONTROL THE MOTION
BETWEEN TWO PARTS,
WE HAVE RECOURSE TO DIFFERENT
TYPES OF LINKS CHOSEN IN
ACCORDANCE WITH THE FUNCTION
EACH PART MUST PERFORM.

Certain types of links are obtained by the shape of the parts. It is the shape that determines the degree of liberty of the movement.

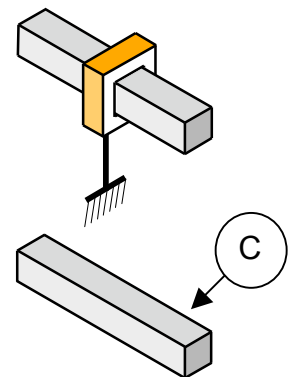
Pivot link



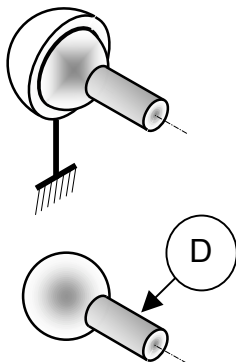
Sliding pivot



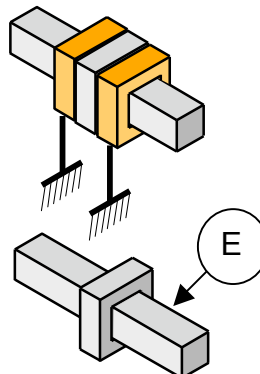
Sliding link



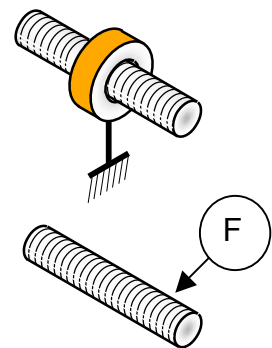
Ball joint



Embedding link

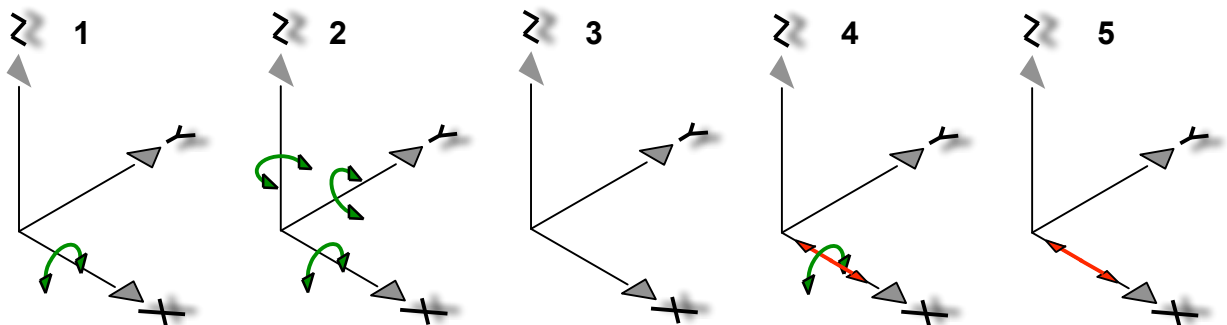


Helical link



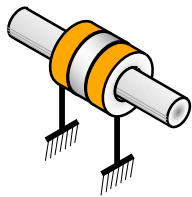
Each type of link above limits the liberty of movement.

11 - Associate the organs A, B, C, D, E, and F with the orthogonal axes 1, 2, 3, 4 and 5, which represents the permitted movement for each organ.

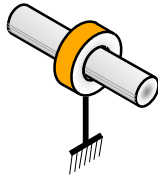


A	1	B	4	C	5	D	2	E	3	F	4
---	---	---	---	---	---	---	---	---	---	---	---

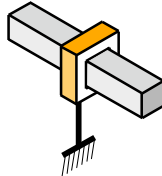
LINK AND GUIDANCE BETWEEN PARTS ALLOW THE SUPPRESSION OF MOTION THAT WOULD IMPEDE THE PROPER FUNCTIONING OF THE MECHANISM



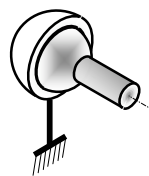
Pivot link



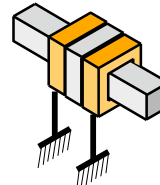
Sliding
pivot



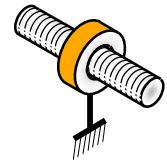
Sliding link



Ball joint



Embedding
link



Helical link

12 - By observing the movement possible between the organs identified on the images, associate their liberty of movement to the types of links illustrated.

The link between ↴

1A and 1B	3A and 3B	4A and 4C	11B and 11C	16A and 16B	19C and 19D	20A and 20C	21D and 21B
A	B	C	D	E	F	G	H

Types of links



Pivot link	A				
Sliding pivot link	D				
Sliding link	F	H			
Ball joint link	E				
Embedding link	G				
Helical link	B	C			

