

junior tech challenge

The practical
side of
science and
tech

Student Handbook

Intensive ESL Project, Cycle 3 (Science and Technology
Program, Elementary)

Name:

Partner:

Name of Sorter:



A program of

The Challenge

Design and produce a prototype that allows you to sort different types of objects from the list below, and distributes them into recovery containers.

Each object that is sorted correctly is worth 100 points.

cycle 1

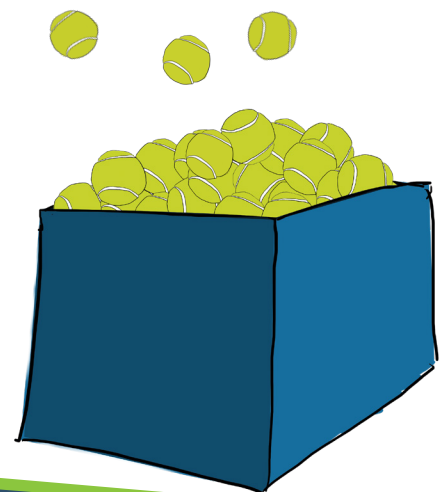
- 5 macaronis
- 5 marbles
- 5 ping-pong balls

cycle 2

- 5 marbles
- 5 centicubes
- 5 metal washers

cycle 3

- 10 marbles
- 10 centicubes
- 10 metal washers



GENERAL LEARNING PROCESS IN SCIENCE AND TECHNOLOGY

(ACTIVE DISCOVERY PROCESS) IN PRIMARY SCHOOL

Context related
to everyday life



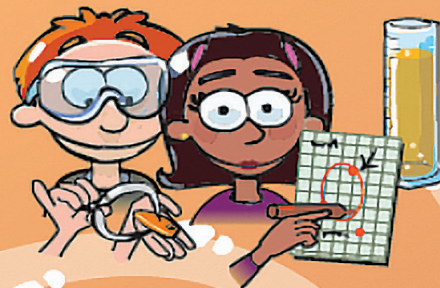
The Different
challenges that
you will have to
face with your
sorter.



Initial ideas
and hypothesis

- Your ideas to
create an
efficient
sorter.
- Your sketch

Planning and carrying out



- Your construction
- Your tests
- Your improvements
- The Competition


Outcome



- Your good moves
- Your suggestions for
improvement

To Complete the Challenge, you must Build a sorter. You Probably already know Different types of machines that sort materials. Let's look at some of them.

Watch the video, *Trieur de pièces imprimées en 3D* (3D Printed Coin Sorter). Complete the table below by drawing the objects that are sorted by the machine, and explaining how it works. Repeat the procedure after viewing the other videos.

Sorted objects	How does it work?
<p>Example</p> 	<ul style="list-style-type: none"> • The machine scans the barcode of the item to find out what it is made of. • It sends the cans to one side and the bottles of the other.

Intensive ESL Vocabulary to Explore: pass through, fall into, roll, stack together, slot/opening/hole, shavings, magnet, metal rod.

Part A: Examples of classification criteria

Complete the table after viewing the images of the sorted objects.

Photo	Criteria	Categories
<i>Example</i>	<i>Mass</i>	<ul style="list-style-type: none"> • <i>More than 2 kg</i> • <i>2 kg</i> • <i>Less than 2 kg</i>
#1		
#2		
#3		

Part B: My criterion

Choose your own criterion and place the objects into categories.

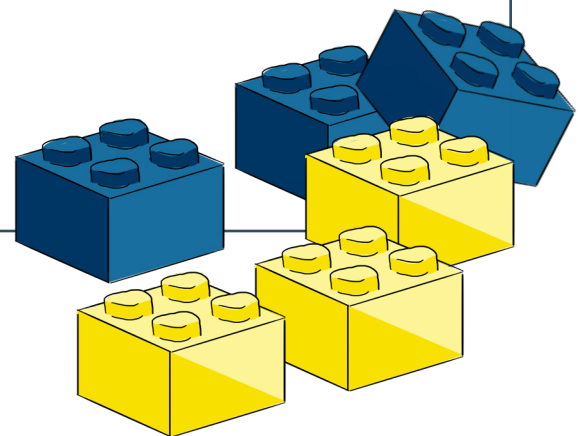
Which criterion did you choose to group (classify) the objects? _____

Which categories did you choose?

- _____
- _____
- _____
- _____
- _____

Part B: My criterion

Draw or list the criterion you chose to group the objects.
Name each group.



Part A: Observing different ImPressions

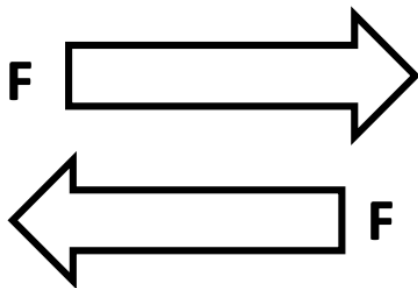
- Make impressions of one of the objects by pressing it into the clay several times, using different sides of the object.
- Draw your impressions in the table below.
- Repeat the process with the other objects.

Impressions	
Macaroni	Centicube
Marble	Plastic token
Ping pong ball	Metal washer

Part A: Identifying different types of motion

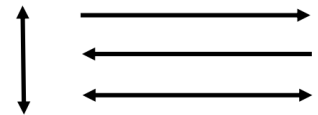
- Circle the appropriate word below the image to indicate if the moving part performs a translational or rotational motion.
- Draw the corresponding symbol to represent:
 - where to apply the force in order to displace the moving part.
 - the resulting motion.

Symbols of Force



Symbols of Motion

translation



rotation



Translation or rotation ?

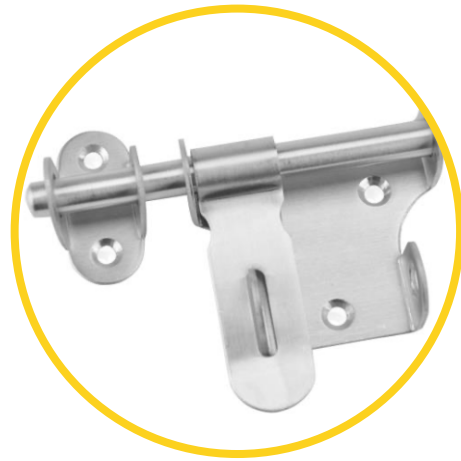


Translation or rotation ?

Part A: Identifying different types of motion (cont'd)



Translation or rotation ?



Translation or rotation ?



Translation or rotation ?



Translation or rotation ?

Part B: Implementing the design

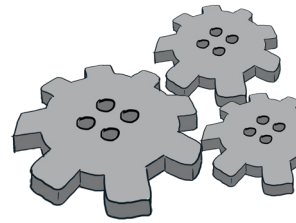
- Using the videos and materials provided by your teacher, build at least two opening and closing systems that allow objects of different sizes to pass through or to be held back.
- Draw a sketch of your system(s) and indicate the symbols of force and motion in the appropriate places.

Sketch 1

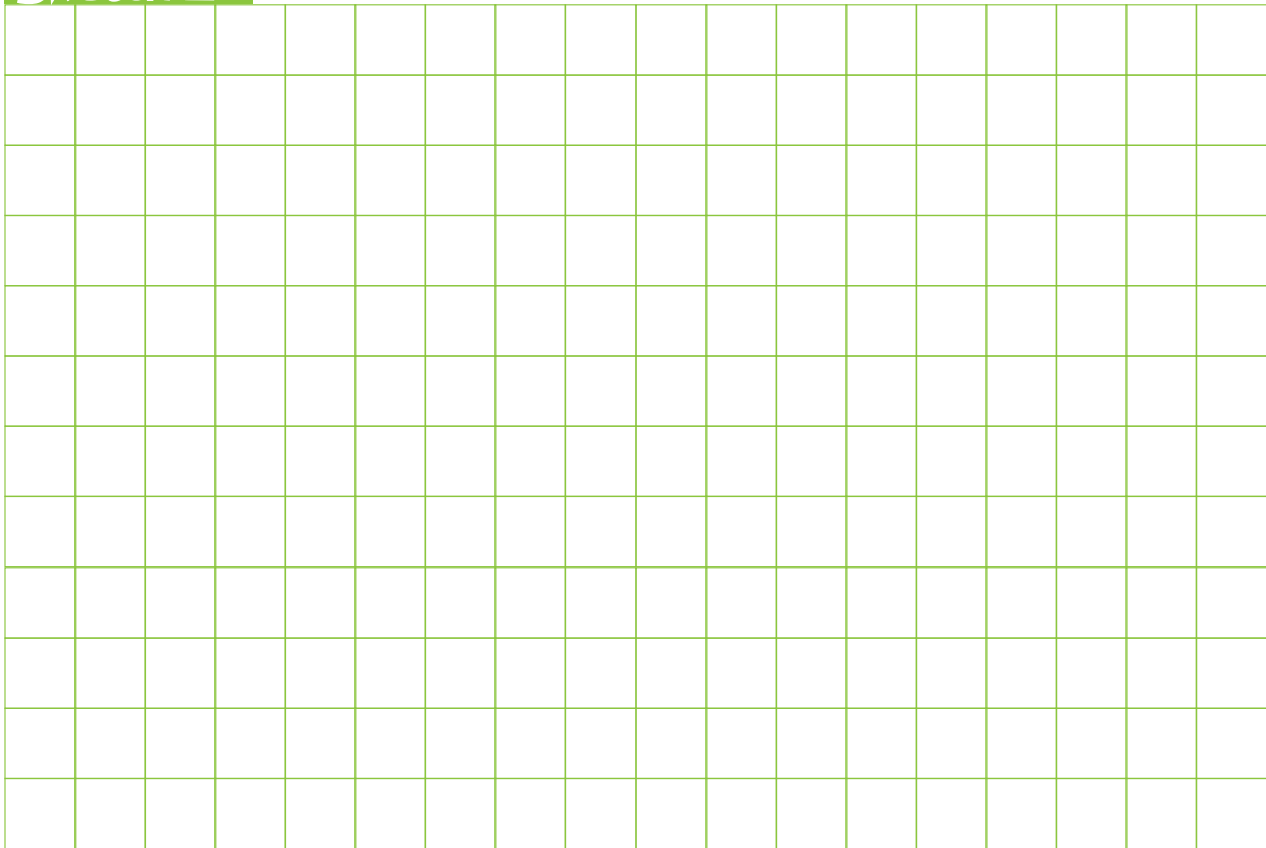
- Circle the action produced by the force applied.

Push - Pull - Turn

Part B: Implementing the design (cont'd)

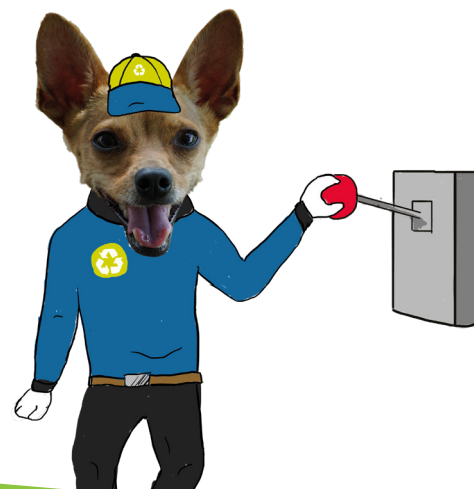


Sketch 2



- Circle the action produced by the force applied.

Push - Pull - Turn



Part A: The properties of a magnet

1- My hypotheses: Predict what will happen to an object as it is moved closer to a magnet. Record your hypotheses in the table below.

- Write "A" if you think the object will be attracted to the magnet as it approaches it. (Attraction)
- Write "R" if you think the object will be repelled by the magnet as it approaches it. (Repulsion)
- Write "X" if you think nothing will happen as the object approaches the magnet.

2- My observations: Now try the experiment and record your observations in the table using the same symbols as above (A, R, X).

Object	My hypotheses (A, R, X)	My observations (A, R, X)
Popsicle stick		
Aluminum can tab		
Paper clip		
Plastic cap		
Metallic tip of a pencil		
Eraser		
Magnet		

Part B: Differences between magnets

Do you think that all magnets have the same magnetic force? _____

Complete the table below.

	Distance (cm)	Number of paper clips attracted
Magnet #1		
Magnet #2		

Magnet # _____ is the strongest because _____

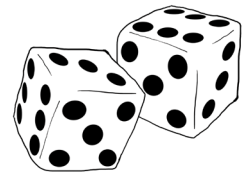
Part C: Using magnets through different materials

How can you remove the paper clip from the water without wetting your hands? _____

How? _____

Type of cup	Observations
Thin plastic cup	
Thick paper cup	

Preparing to Meet the Challenge!



IDeas for my sorter!

Using the information gathered from the previous activities, the presentation slides, and the materials required, write at least two ideas that will help you design and create an efficient sorter.

1.

2.

Decide the order in which you plan to sort the objects.

Step	Object to be sorted	How will it be sorted?
1		
2		
3		

Preparing to Meet the Challenge!



REVIEW THE CHALLENGE

Before designing your sorter, take the time to reread the rules of the challenge. Then design a prototype based on what you learned from the previous activities.

DESIGN IT

Make a list of all the necessary materials and tools to help design and build your sorter.

Materials allowed

Circle the items you will use to build your sorter. Write "H" beside the ones you will bring from home, and "S" for the ones that are available to you at school.

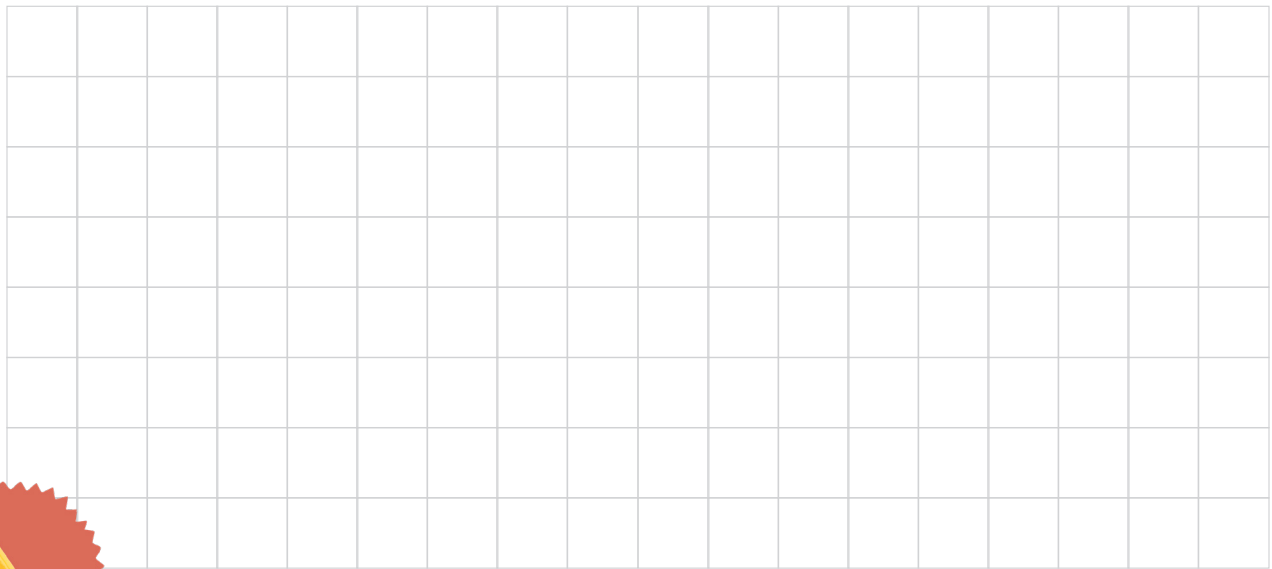
Materials you can use to design and build your prototype

- | | |
|---|--|
| • Cardboard box or cardboard []
<i>(must be able to be cut with a pair of scissors)</i> | • String [] |
| • Aluminum can or aluminum tray [] | • Felt [] |
| • All types of paper [] | • Rubber bands [] |
| • Aluminum foil [] | • Paper fasteners [] |
| • Popsicle sticks [] | • Nails [] |
| • Pipe cleaners [] | • Magnets [] |
| • Paper clips [] | • Blue sticky tak [] |
| • Thumbtacks [] | • Adhesive tape [] |
| • Wooden sticks [] | • White glue, glue stick, hot glue [] |

Preparing to Meet the Challenge!

DESIGN IT (Cont'd)

Before building your sorter, make a sketch of your design. Indicate the names of the main parts, their dimensions and the materials you will use.

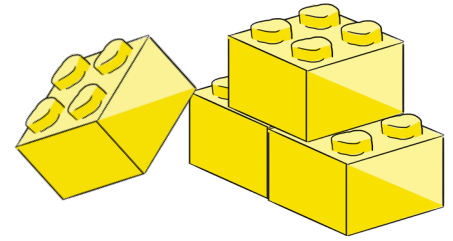


BUILD IT!

Once your sketches have been approved by your teacher, you can begin to build your sorter!

Appropriate description of the problem	A	B	C	D
Formulation of complete and relevant solutions.				

Preparing to Meet the Challenge!



TESTING MY PROTOTYPE

What should I test?

- ☐ My prototype sorts all the objects that it was intended to sort.
- ☐ My prototype sorts the objects quickly.
- ☐ My prototype is strong enough to withstand several tests

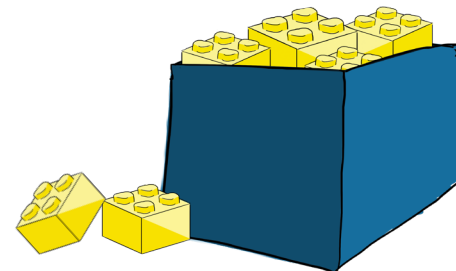
For each of your tests, note or draw your observations and the changes you will make to improve your prototype.

Feel free to run more tests than the number proposed.

Test 1	
Object	Number of objects successfully sorted

Problems encountered and modifications made:

Preparing to Meet the Challenge!



Test 2

Object	Number of objects successfully sorted

Problems encountered and modifications made:

Test 3

Object	Number of objects successfully sorted

Problems encountered and modifications made:

Application of an appropriate procedure	A	B	C	D
Readjustment of the design made during the testing phase				
Appropriate use of tools, instruments or techniques	A	B	C	D
Appropriate handling of tools and instruments				

THE COMPETITION

The final test

The points will be calculated in this way:

100 points per object
successfully sorted

–

The time (in seconds)

=

Total points

- Any object that does not get sorted into its designated container will not be counted.
- Any object that gets sorted into a container that it was not designed to fall in will not be counted.

It's your turn!

Round 1

Number of objects
successfully sorted

_____ x 100 = _____ points

–

Time
(seconds)

_____ s

=

Points for
Round 1

Round 2

Number of objects
successfully sorted

_____ x 100 = _____ points

–

Time
(seconds)

_____ s

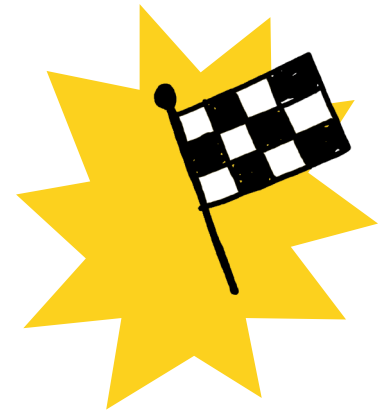
=

Points for
Round 2

Points

Use your best results:

REVIEW



1. What was the best idea you had while designing or creating your sorter?

My best idea:

Explain.

2. Which modification will you make to your sorter for it to work better?

My modification:

Explain.

Appropriate use of scientific and technological knowledge	A	B	C	D
Produces explanations and uses terminology specific to Science and Technology				