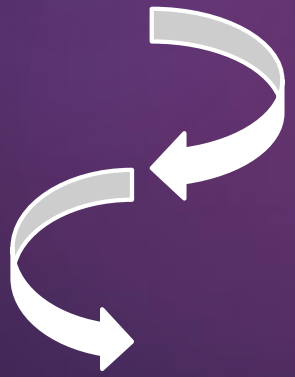
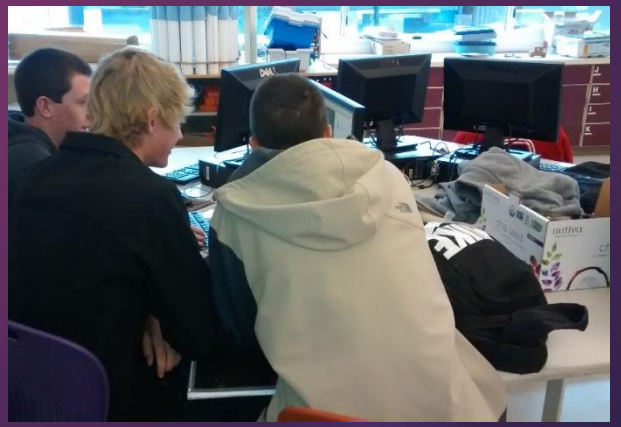
Reverse Engineering Intro





What is reverse engineering?

Reverse engineering is the process of taking apart an object.

But why?!

- To understand it better
- To see inside to satisfy your curiosity: *How does it work?*
- To examine the structure, function, operation
- To duplicate or improve it:
  - Reduce the cost, improve the materials, reduce environmental impact, etc.
  - Increase its efficiency and reliability, add features and usefulness, etc.

Group Proposal

- What is your project?
  (device description, cost and source)
- What does the device do?
- How are you going to take it apart? What tools do you need?
- How many parts do you think it contains? What kinds of parts do you think you will find inside?
- Rough sketch of the overall device

DEADLINE: DUE BY: [Day 2]

Tools

- How will you take it apart?
- How will you measure each part?

Engineering Exploration Design Team Contract			
Group Number:		Date:	
Team Spokesperson for this assignment/project:			

Member Name	Roles	Initials	Phone #	Email Address

Team Goals:	Responsible Members

Team Contract

Team Performance Expectations	Initials

Strategies for Conflict Resolution (provide at least 3)

Parts List (BoM)

Bill of Material for			Names:				
Product #	Name	Qty.	Dimension	Function	Interaction with other Parts	Research Cost	Website
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Bill of Materials

Report Requirements

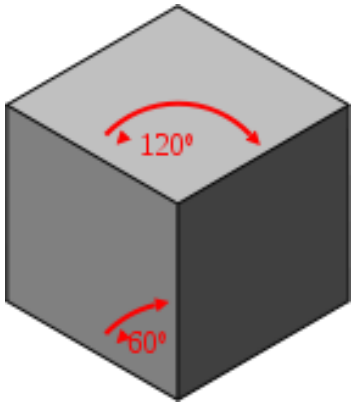
- **Manual**
  - Purpose of object
  - Bill of materials
  - Procedure
    - How does it work?
    - How do you put it together?
  - Sketches

Upload to the homework portal as a doc with:
1. page numbers and
2. header that includes your names and the device name!

- **Wrap-Up Report**
  - Team contract (will be checked off before project is started)
  - Conclusion: What happened? What should your group done differently/same?
  - 3 improvements/changes (or innovations) on device to better assist customers, manufacturers and/or the environment
    - Sketches and descriptions!
  - 3 Improvements/changes on overall project
    - Why?
  - Feedback
  - Teamwork evaluation

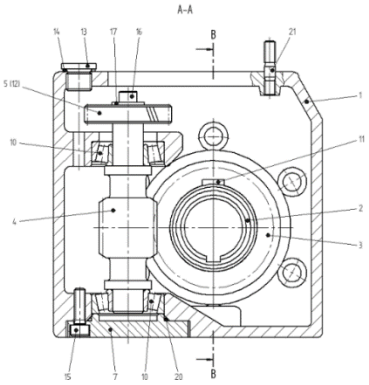
Sketching
by hand or using SolidWorks

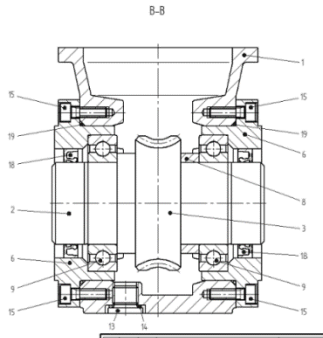
- Overall sketch with labeled parts (see next slide)
- Parts drawn **isometrically** and **orthogonally**
- "Exploded view" sketch (see next slide)

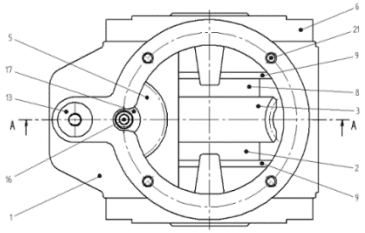


← **isometric**

orthogonal ↓

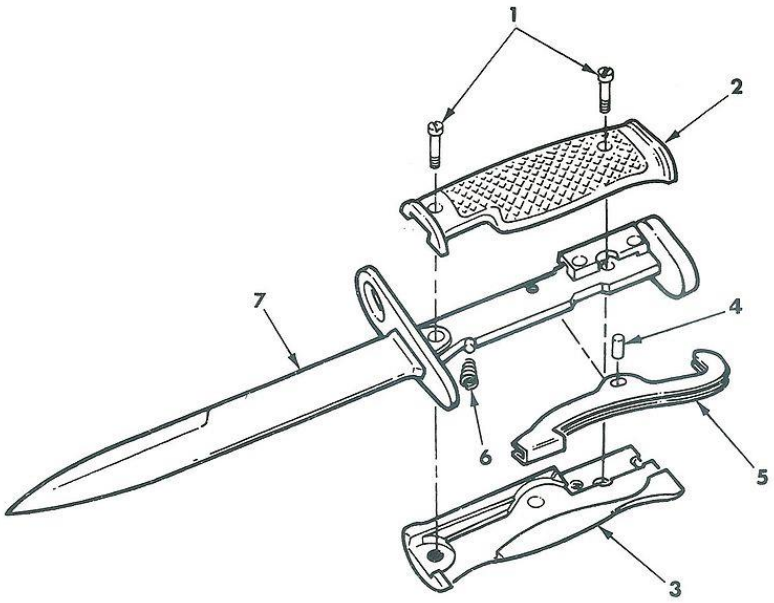




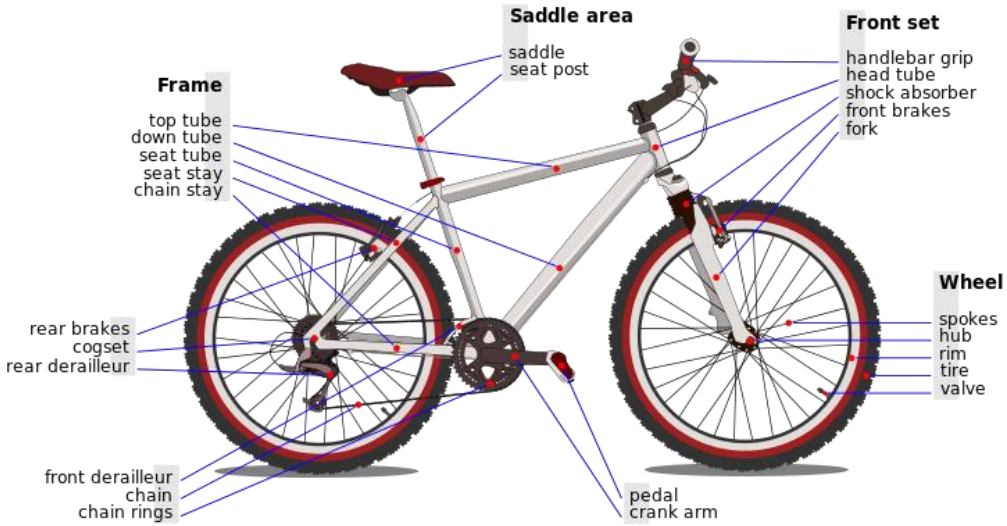


Sketching Examples

Exploded view sketch



Labeled parts sketch



Reverse Engineering Project
overview

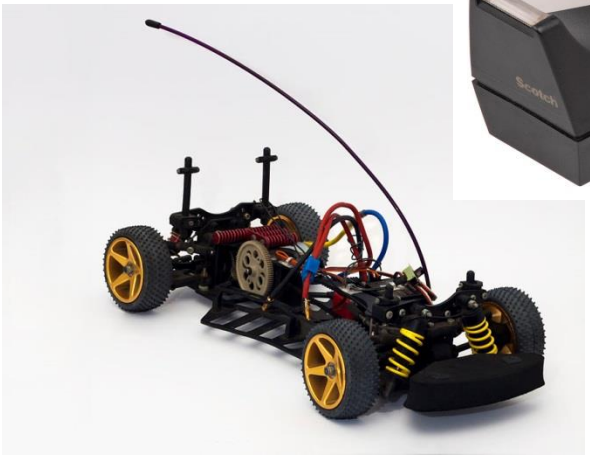
1. *Assigned* teams of 1, 2 or 3
2. Object requirements:
   - **Number of parts:**
     - Group of 1: **at least** 7 parts
     - Group of 2: **at least** 10 parts
     - Group of 3: **at least** 15 parts
   - **Low-voltage device**,
     for example, no plug-ins; battery-driven is okay)
   - **Unwanted items** OR **items that cost at most $5 per person**
   - Note: *The object will not work after we're done!*

D E A D L I N E S:

Project approval per group by: [Day 2]

Project due: [Day 12]

Project Ideas



Overall Project Schedule

Days 1-2: Assign teams, brainstorm and write-up proposal

Day 2: Proposal due (approved or revised); draft team contract

Days 2-3: Team contract completed, bring in device/product

Days 4-6: Take apart the device, with thorough documentation

Days 6-9: Sketch parts, prepare bill of materials and manual

Days 9-11: Write report, get feedback, come up with improvement ideas, prepare conclusion

Days 11-12: Organize, edit, wrap-up

Days 13-14: Class oral presentations

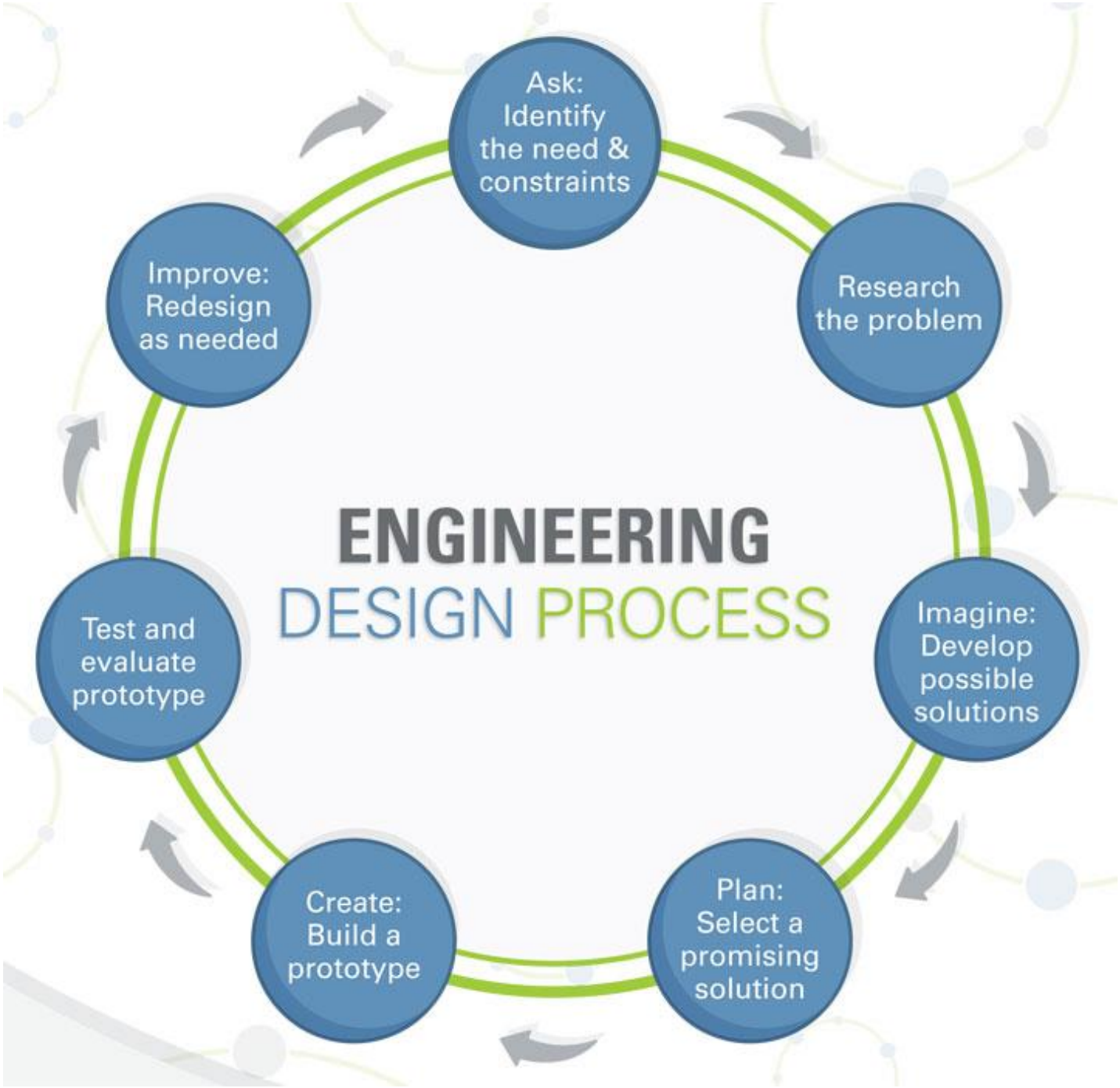
Grading Rubrics

Criteria	Rating Scale			Score
	3	2	1	
Manual: Device description	Description of the device is expressed. Sketch helps explain each part and its function.	Some description of the device is expressed. Sketch helps explain either part or its function.	No description of the device is expressed. Sketch does not help explain each part and its function.	
Manual: Bill of Materials	A list of parts found in the process of taking apart the technology. Parts are listed along with Part #, name, qty., dimension, function, cost, interactions, and website	Two parts were missing from the BOM. Lacked parts description.	More than two parts were missing and parts' descriptions were incomplete.	
Manual: Sketches	Sketches are dimensioned, labeled, and numbered (related to BOM). Each part is sketched (orthogonally/isometrically) with an overall sketch.	Some sketches are not dimensioned, labeled, and numbered (related to BOM).Most parts were not sketched (orthogonally/isometrically) with an overall sketch.	Sketches are not dimensioned, labeled, and numbered (related to BOM). Each part was not sketched (orthogonally/isometrically) with an overall sketch.	
Manual: Procedures	Step-by-step description of how to work the device AND how to put the device together (if it didn't come assembled).	No detailed description of how to work the device and/or how to put the device together.	No detailed description of any how-to's.	
Manual: Overall	Manual included: table of contents, page numbers, header of device and names.	Manual included: table of contents, page numbers, header of device OR names.	Manual did not include: table of contents, page numbers, header of device AND names.	
Engineering Design Process	The group has undergone the process to find the best, improved design solution to the chosen device (this includes a documentary of the whole process with sketching, matrix, descriptions, etc.)	The group has somewhat undergone the process with documentary of the process with sketching, matrix, descriptions, etc.	The group did not undergo the process or presented the documentary of the process.	
Teamwork and Communication	Team worked well together and were able to present their result from their project.	Team was somewhat able to work together and present their result from their project.	Team was unable to set aside their differences and communicate effectively.	
Wrap-Up Report	Concluded the data and result. What went well, what didn't. Changes and/or improvements for next-time AND device with sketches (how to make it better).	Somewhat concluded the data and result. What went well, what didn't. Changes and/or improvements for next-time.	Did not conclude the data and result at all.	
Timely Completion	Report completed on time	NA	Report not completed on time	
			TOTAL	

← Written report grading rubric

Oral presentation grading rubric ↓

Criteria	Rating Scale			Score
	3	2	1	
Manual- Device description	Quick description and purpose of the device was explained.	Device was somewhat explained.	Device was not at all explained.	
Manual- Sketches	Sketches (isometrically and orthographically) of the device are explained and shown.	Sketches are either explained or shown.	Sketches were not shown or explained.	
Engineering Design Process	Students did a brief explanation of their new idea for the device.	Students did not do a great job in explaining their new idea for the device.	Students did not explain their new idea for the device.	
Wrap-Up	Concluded on what went well, what didn't and has shown the improvements for their device with sketches (how to make it better).	Somewhat concluded the result. What went well, what didn't, or improvements for the device	Did not conclude result at all.	
Presentation	It was presented via PowerPoint. The students spoke at a good volume and was clear.	The students were not clear in explaining their project.	Did not present at all.	
			Total:	


ENGINEERING
DESIGN PROCESS
Ask: Identify the need & constraints
Research the problem
Imagine: Develop possible solutions
Plan: Select a promising solution
Create: Build a prototype
Test and evaluate prototype
Improve: Redesign as needed