Engineering the Future
Science, Technology, and the Design Process

Engineer's Notebook:
Project 1.0

Design the Best Organizer in the World

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Project 1.0

Design the Best Organizer in the World

This course consists of four major projects that will help you gain the skills and knowledge to understand what engineers do. Each project is divided up into individual tasks and this *Engineer's Notebook* will guide you through the tasks and projects. Write your name at the top of each page, and initial and date the bottom of the page when you have completed it.

The purpose of the first project is for you to learn how new technologies are developed and manufactured and how they affect your way of life. You will complete a few introductory tasks about developing new products, the engineering design process, and how to make engineering drawings. You will also design your own new products, first as an individual, then as a member of a design team.

 Name _____

Project 1 Gantt Chart

A Gantt chart is a project-planning tool that shows when tasks should be completed in order to finish a project on time. This is an example of how Project 1 might be planned if you have 45-minute class periods. Use a separate page to create a new one if your scheduling is different. You can insert the page at this point in your *Engineer's Notebook.*

Task	Class Periods								Text Chap.	Check for Completion
	5	10	15	20	25	30	35	40		
1.1 What Is Engineering?									1	
1.2 Design a Cell Phone Holder									2, 3	
1.3 Engineering Drawing									4	
1.4 Define the Problem									5	
1.5 Research the Problem									6	
1.6 Develop Possible Solutions										
1.7 Choose the Best Solution									7	
1.8 Create a Prototype										
1.9 Test and Evaluate									8	
1.10 Communicate the Solution									9	
1.11 Redesign										

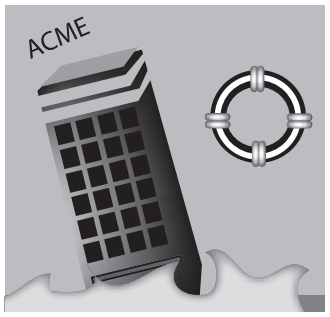
 Initial _____ Date _____

TASK 1.4 Define the Problem

- Identify criteria and constraints.
- Plan ahead to finish the project.
- Define the problem to be solved.

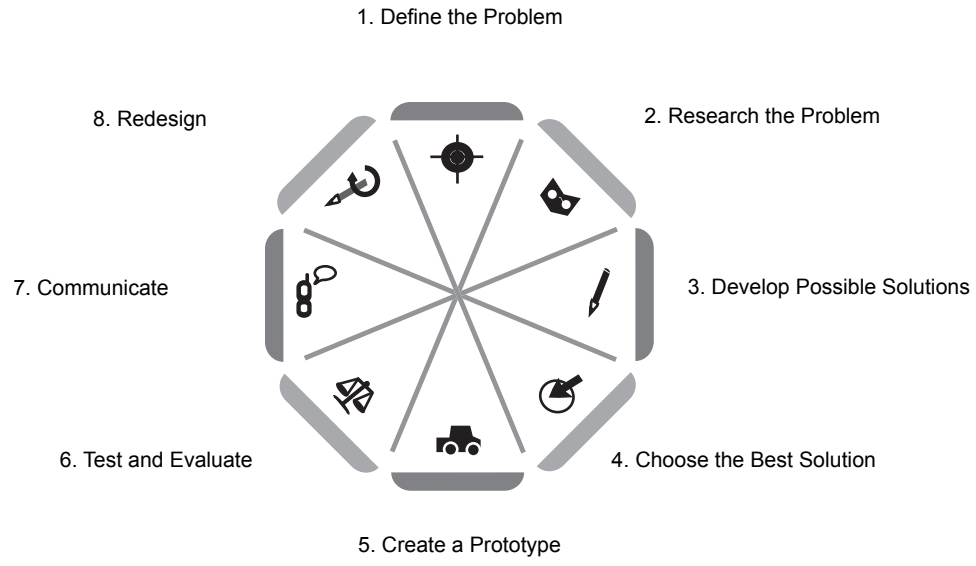
In designing a cell phone holder, which steps in the engineering design process did you use?

This task requires you to define a new problem. If you complete each of the subsequent steps, you will end up with an excellent solution to the problem as well as a good understanding of the entire engineering design process.



How will you use the engineering design process to rescue Acme?

Engineering Design Process



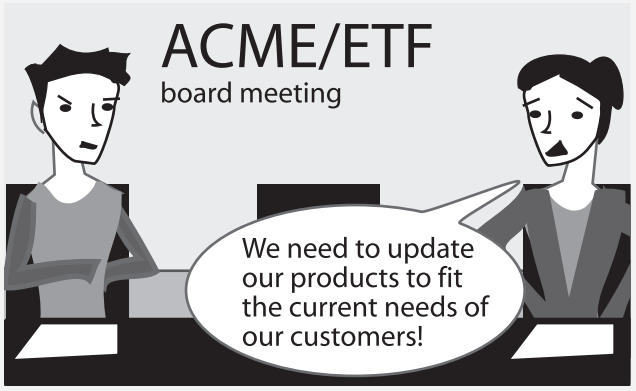
In future tasks, you'll see an icon like this in the task heading to remind you which step of the process you are working on. The picture indicates the step, and the shaded section indicates the place in the sequence.

Carefully read the following scenario, then define the problem.

DESIGN CHALLENGE

Save Acme Organizer Company

The Acme Organizer Company, the largest business in a small town, needs your help!



For the past 40 years, Acme has produced and sold organizers all over the country. While they have produced many products over the years, about ten years ago they discontinued most of their products and focused on making cabinets for storing videotapes. The organizers were sturdy and attractive and sold very well. When DVDs came into general use, the company added a new product line to include cabinets for storing DVDs. They gradually sold fewer cabinets for storing videotapes and more cabinets for storing DVDs.

In recent months, business has begun to fall off. Acme's Marketing Group found that digital cable services were becoming more popular, and people have begun to get movies directly through satellite or cable services, so fewer people need to purchase DVDs. Although Acme has not had to lay off any of their employees yet, it is clear that if business continues to decline they will have to do so, and they may eventually go out of business. That would be a catastrophe for the small town where the company is located, and hundreds of people will be out of work. With no regular income, they will not be able to purchase food, clothing, or other items from local stores, so more businesses will be forced to close; and with no businesses to pay taxes, the town will not be able to pay for police, fire protection, or schools.

Your job is to work as a team of engineers to design a new product for the Acme Organizer Company. Your product will be an organizer that will save the company and prevent the hardship that would occur if the company goes out of business.

What Is an Organizer?

Before joining a team, it's a good idea to think about the problem on your own.

Begin by expanding your understanding of what an organizer is. Here's one definition:

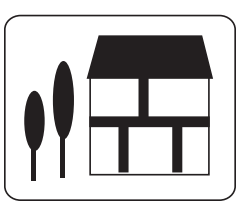
> **or·gan·iz·er (noun):** anything designed to keep smaller things so they stay together and are easy to find and retrieve when needed.

Look around you and identify all of the organizers you can see. List at least five of them below.

Type of Organizer	Types of Things It Organizes
1)	
2)	
3)	
4)	
5)	

Now imagine that all of these organizers disappeared!

In the space below, describe what this room would look like if the organizers disappeared but the things in them remained.



How is a house like an organizer? Write your answer here.

Criteria and Constraints

Defining the problem means describing the requirements for the new product that you are developing. Requirements include **criteria,** or the desired elements of the final product, and **constraints,** limitations to the design or the design process. Criteria such as attractive design and multiple storage compartments help you choose the best solution to the problem. Constraints such as size, time, and cost for construction help you eliminate attractive but impractical solutions.

In Your Own Words

What is the company's problem, and what have you been asked to do?

Finding Criteria

What are the criteria by which you will determine whether or not you have been successful? List at least three criteria.

1)

2)

3)

Finding Constraints

What are the constraints of this problem? These might have to do with the materials you have available or the time allowed for the project. List at least three.

1)

2)

3)

Form a Team

A diverse team of people with a wide variety of backgrounds and skills is very helpful in creating excellent products that will meet people's needs. In the space below, list the strengths that you bring to the team, as well as your teammates' strengths. All of you will need to work together to design a successful product for the Acme Organizer Company.

My Strengths

My Teammates' Strengths

Meet your teammates! In the spaces below, write their names and their strengths:

Name Strengths

Name Strengths

Name Strengths

Name Strengths

Meet in Teams

1) Organize your team by designating co-leaders and specialists for critical objectives.
2) Review the Teamwork Guidelines and amend them as agreed.
3) Jointly agree upon your mission, objectives, and commitment to accomplish the challenge.
4) Schedule your team effort by setting a timeline of tasks and delegated responsibilities.
5) Carry out your plan on schedule, documenting procedures and results as you go.
6) Prepare a presentation of your team's conclusions and results.

Teamwork Guidelines

A team shares resources, information, and talent to develop the best solutions to problems. Here are some descriptions of a good team member collected from working engineers:

A good team member...

- Works well within and outside of the group.
- Encourages and values differences in people and perspectives.
- Treats others with fairness and respect.
- Shares time, materials, ideas, and information openly.
- Maintains focus on common goals.
- Gives credit to others when credit is due.
- Does his or her share of the work.
- Remembers that everyone succeeds if the team succeeds.

Be a Good Team Member

There are seven behaviors that should be displayed by members of a team. They are the following:

Helping,
offering assistance to others.

Listening,
working from each others' ideas.

Participating,
contributing to the project.

Persuading,
exchanging, defending, and rethinking ideas.

Questioning,
interacting, discussing, and posing questions to all members of the team.

Respecting,
encouraging and supporting the ideas and efforts of others.

Sharing,
offering ideas, and reporting findings to each other.

Read Chapter 5, "The Art of Engineering," in the textbook *Engineering the Future.* Robert Hartmann works for IDEO. Pay attention to what he says about working on a team. Use notebook paper to answer the questions at the end of the chapter. Sign, date, and number each page. Insert the pages at this point in your *Engineer's Notebook*.

Looking Ahead

After you design your project, you will have an opportunity to build a scale model. Depending on time and materials available, you may also have a chance to construct a prototype. One of the most important constraints in any design project is the materials that will be available. If you know what materials you can use, list them on this page. If not, you can come back to this page later.

Materials for Scale Model

A **scale model** is a three-dimensional model of the design that is constructed with a scale factor. Scale models are made out of materials that are easy to cut, tape, or glue together, so you can change it easily. It is likely to be smaller than the final product, but the proportions should be correct. List materials that will be available for your scale model here:

Materials for Prototype

A **prototype** is usually a full-size model of the product constructed from the same material that will be used for manufacturing. For this project your prototype material may not be the same as what you propose for manufacturing. List materials that might be available for your prototype here:

Important—Keep Good Records!

At the conclusion of this project, you will be evaluated on how well you've done. Save all models and prototypes. Place sketches and notes into your notebook in the appropriate places. Your work on all Tasks from 1-4 to 1-11 will be included in this evaluation. Read the Project 1 Evaluation Rubric to see the evaluation criteria.

Benchmarks

1) In what ways is a city an organizer?

2) Organizers are commonly made for each of the following technologies. What do you call these organizers? (If there is more than one, then name both.)

Technology	Name of Organizer
Books	
Socks	
Shirts and pants	
Money	
Dishes	
Papers	
Electronic information	
Cars	

3) Name three reasons why teams usually create better solutions than individuals.