

# Lab 1: Tangram Algorithm Lab

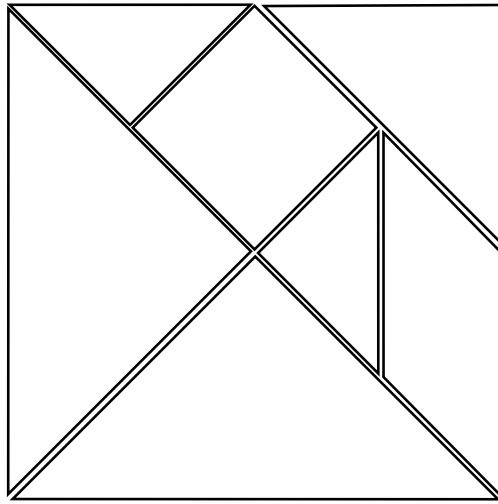


Figure 1: Tangram Shapes

## Objectives

This lab introduces the concept of algorithms. Each student will receive a specific pattern composed of smaller shapes. Students will write detailed instructions describing the necessary steps to reproduce the provided pattern. Afterward, group mates will exchange their written instructions. Students will attempt to reproduce the other person's pattern based solely on the written instructions. Students will observe the necessary level of detail required to write instructions for reproducible results.

## Materials

- 1) Assorted paper shapes
- 2) Mechanical Pencil
- 3) Pencil or Pen
- 4) Paper

## Theory

### Child Analogy

Computers are machines that perform computations and tasks at a very fast rate. However, computers are unable to think for themselves. Think of a computer as a small child who does exactly as they are told and nothing more. The child has no knowledge if the instructions they are following are right or wrong. The child could produce the wrong result if

the set of instructions are too vague, out of order, has a missing step, or has an incorrect step.

Codes or programs communicate with computers through a list of instructions. Therefore, codes need to have detailed and complete list of instructions so the computer performs the desired task. Successful programmers need to know how to compose an algorithm (a process or set of instructions) in a format a computer can understand.

## Tangrams

Tangram is a puzzle game consisting of seven flat shapes. The objective of the game is to reproduce a specific shape when provided only a silhouette.

The shapes consist of the following basic shapes:

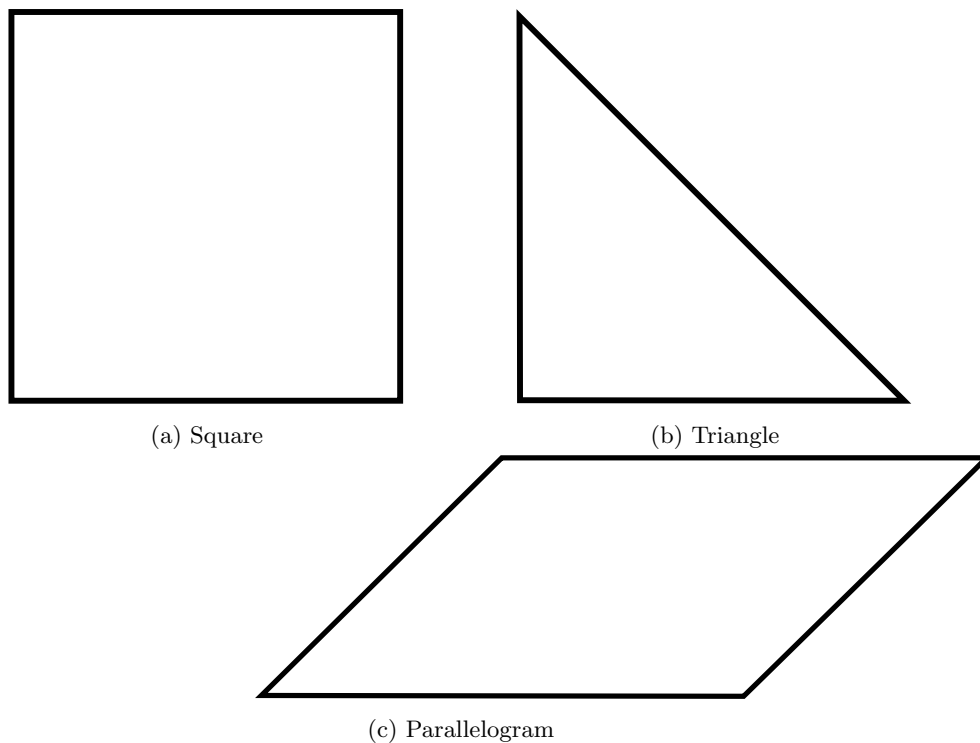


Figure 2: Basic Shapes

## Laboratory Exercises

### Tangram Algorithm

1. Wait for TAs to assign numbers to each student. Each student in a group will be assigned a different number from their group members ranging from one to three.
2. Move to the group with the same assigned number.
3. Wait for TAs to handout geometric structure.

4. As an individual, write a detailed instruction list describing the necessary steps to recreate the given structure.
5. When instructed by TAs, assemble back with your group.
6. Exchange personal written instructions accordingly:
  - group member 1 gives their written instructions to group member 2,
  - group member 2 gives their written instructions to group member 3,
  - and group member 3 gives their written instructions to group member 1.
7. Follow the other group member's set of instructions carefully in an attempt to recreate the structure.
8. When complete, raise your hand and wait for a TA to analyze the success of the build attempt.

### **Refill Mechanical Pencil Algorithm**

1. Wait for TAs to hand out a mechanical pencil to your group.
2. As a group, have a discussion on the necessary algorithm to successfully refill the pencil with a single piece of led (or graphite). Also discuss the necessary steps to feed the correct amount of the lead for the pencil's next use.
3. When the group has reached an agreement, select one group member to write down the final algorithm.
4. When complete, raise your hand and wait for a TA to test your algorithm.