Informal definition

An algorithm is the specification of a sequence of instructions to be carried out by a processor.

- Algorithms can be run on a computer, but they don’t have to:
  - Mayas had algorithms to predict solar eclipses centuries in advance
  - Egyptians had algorithms to build pyramids
  - Indians had algorithms for factorizing polynomials
  - Greeks had algorithms to build all kinds of geometric construction using only a compass and straight lines.
Welcome to COMP 250
Introduction to Computer Science!

Mathieu Blanchette

My work as a researcher

Algorithms

- A systematic and unambiguous procedure that produces - in a finite number of steps - the answer to a question or the solution of a problem.

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  - Greeks had algorithms to build all kinds of geometric construction using only a compass and straight lines.

Compass and straight-line construction

- Problem: Angle bisection

  INPUT: An angle defined by three points AOB

  OUTPUT: A point C such that AOC = BOC

- Algorithm:
  - Draw circle centered at O to find A’ and B’
  - Draw circles centered at A’ and B’ of the same radius to find C
  - Then AOC and BOC bisect AOB

Problem: Angle bisection

Problem: Butterfly Origami

INPUT: 2:1 rectangle

OUTPUT: A butterfly

Problem: Chickpea cooking

INPUT: Ingredients (left)

OUTPUT: Yummy (but spicy!)
The blessed son of God
Use a 2x1 rectangle with a different color on each side.

Start with the side with the color you want to be the wings. The other color will be the head and body.

1. 2 valley folds to the center
2. 2 valley folds and unfold
3. Valley fold to the right lining up the crease made in step 2 with the center line.
4. Unfold. Repeat steps 3 and 4 on the right.
5. Reverse fold in and out on each side
6. 2 reverse folds
7. Turn over
8. Fold the point up to the top like a petal fold
9. Fold the point back down while sliding some paper out on each side
10. Turn over
11. Fold the 2 points up
12. Valley fold the 2 bottom points up so that the dots line up
Assembly Instruction

LEGO (RoboArm (Machine)) instructions
Indian Chickpeas

From: demers@ere.umontreal.ca (Demers Serge)
Date: Sun, 12 Sep 93 14:20:01 -0400

Here is one of our favorite “vegetarian dish”.
We always include it to our menu for an indian dinner.

250 gr of chickpeas (1 cup)
2 Tbsp vegetable oil
1 onion chopped
2 cm cinnamon stick
4 cloves
2 garlic cloves, squashed
2 cm fresh ginger, chopped
1 green chili pepper, finely chopped
2 tsp ground coriander
3/4 cup of chopped tomatoes (from a can)
1 tsp garam massala
1 Tbsp cilantro, chopped

Soak chickpeas overnight, rinse, cook in water until tender. Drain,
KEEP THE COOKING LIQUID!

In a frying pan heat the oil, fry onion until golden. Add cinnamon
and cloves, cook a few seconds. Add garlic, ginger, chili pepper,
ground coriander and cook 5 minutes, stirring.
Add tomatoes, with the juice and cook until all liquid
has evaporated.

Add the chickpeas to the pan, mixe well, cook 5 minutes.
Pour the cooking liquid of the chickpeas and simmer for 25 minutes,
until all the liquid is gone.

Sprinkle with the garam massala and cilantro.

Can be served hot or cold.

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Serge Demers
Dialling Instructions

儲值等語音功能設定請按*1#

按 1 儲值功能
(新卡補充)
輸入新購
碼卡電話卡密碼
餘額報
儲值功能設定完成

按 2 免撥密碼
設定
免撥密碼
設定已完成

按 4 速撥功能
設定
輸入速撥簡碼後
請按#號
(簡碼不得超過4碼)
輸入欲設定
之電話號碼後
請按#號

按 5 聽取速撥
內容功能
輸入速撥簡碼後
請按#號

儲值設定請按1，回主功能表請按0，離開請按9，或掛上電話
撥打電話請按3

常用國碼對照表
大陸：86  美國、加拿大：1  日本：81  菲律賓：63  印尼：62
新加坡：65  香港：852  泰國：66  越南：84  南韓：82
Computer Program

C program
Abacus 3000 BC

The Abacus, a simple counting aid, was most likely invented in Babylonia.
Fight around 1503 about calculation method
TODAY

CD / DVD / Blu-ray

Smart phones

Flat Screens

laptop

USB connectivity

MP3 players

Electronic Tablets

scanner
TOMORROW ...???
Computer Science is the study of algorithms for computing machines.

(Formal) Definition of an Algorithm

A well-ordered collection of unambiguous effectively computable operations that when executed produces a result and halts in a finite amount of time.
What distinguishes computer algorithms?

- Instructions are executed very fast
- Little or no human interaction is possible
- Algorithm must be fully specified before execution
- Algorithm must be unambiguously specified