

CS 105

Introduction to Scientific Computing

Topic #9 – Program Flow and Boolean Decisions

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MOTIVATION

- As of now all of our scripts just run every command exactly once from top to bottom
- What if we want them to
 - Run certain command only in certain conditions
 - Run certain commands several times
- We need a way to make decisions!

TOPICS

1. Program Flow
2. Boolean Operators
3. Boolean Statements

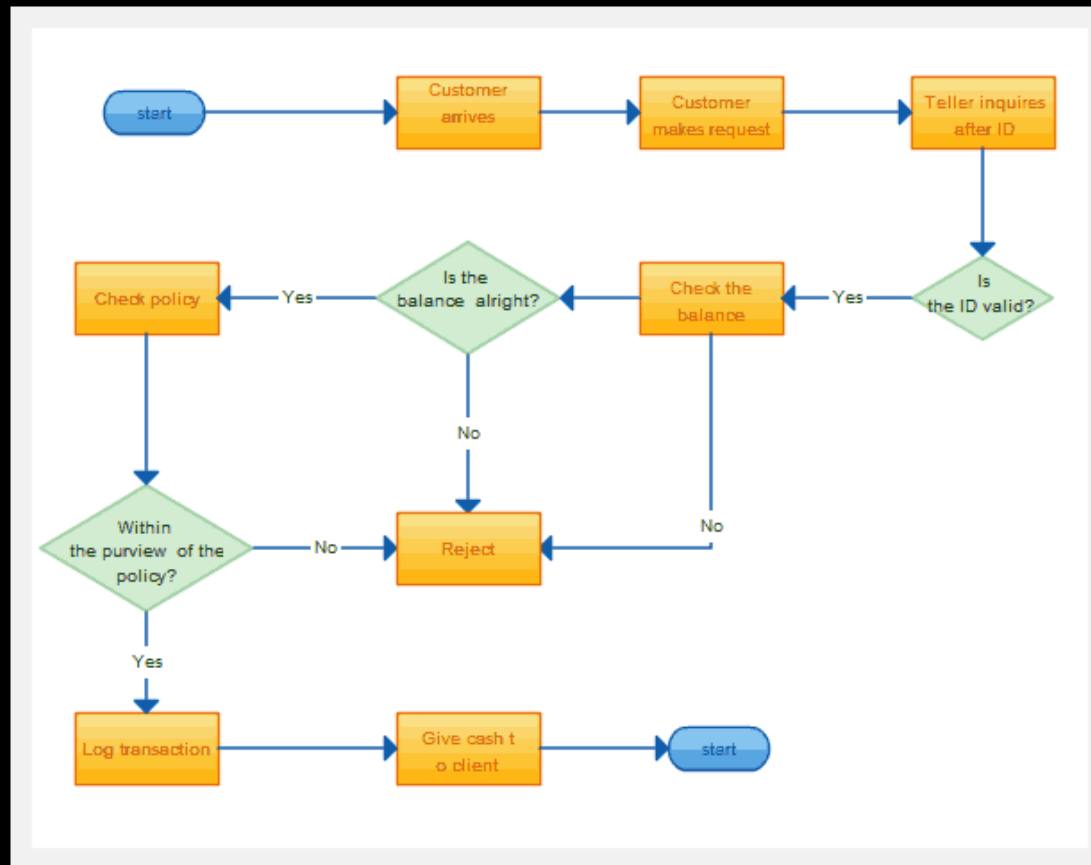
READING

- Section 3.3: The Logical Data Type

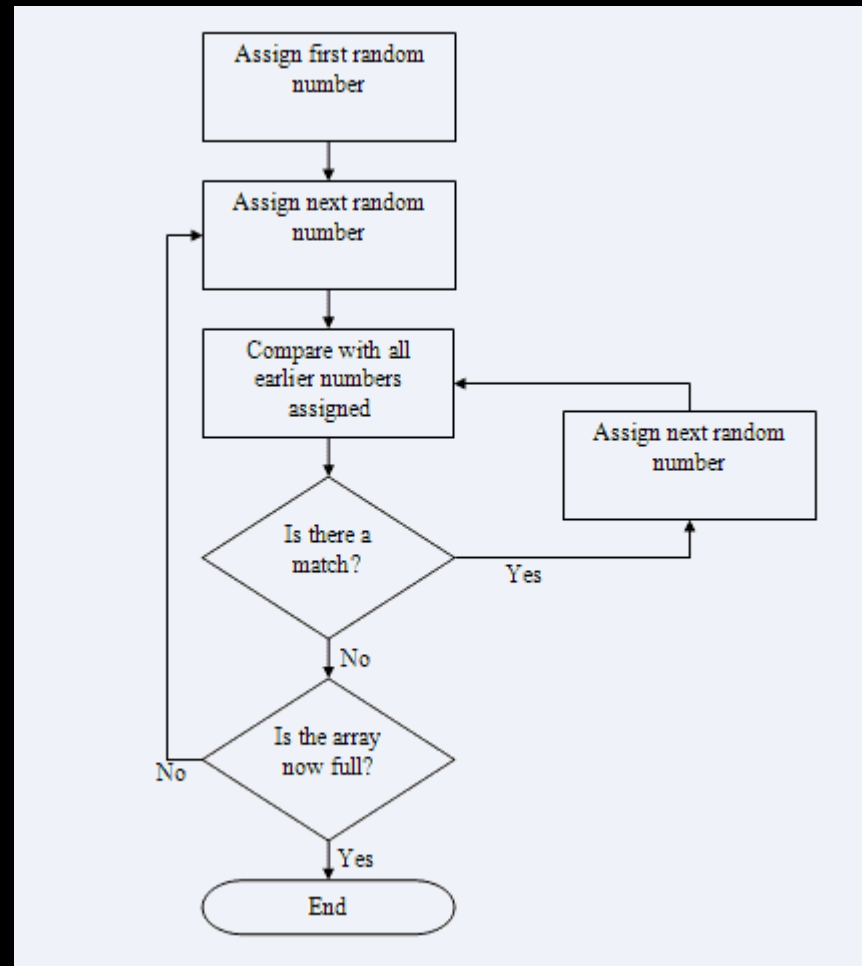
PROGRAM FLOW

- Thus far all of our program run every command *exactly once*.
 - And they do them in order, from first to last
 - Order's important!
 - Must assign a variable before you use it
- But more sophisticated programs should be able to do stuff like
 - Only run certain commands
 - Run certain commands several times

FLOW DIAGRAMS



FLOW DIAGRAMS



BOOLEAN DECISIONS

- So we need to decide whether or not to run some commands
 - Or if we should keep running them or move on!
- These decisions are yes or no
 - Boolean decisions
- Depend on values of variables
- Use relational operators to make boolean/binary decisions

RELATIONAL OPERATORS

- Comparison: ==
- Greater Than: >
- Greater than or equal to: >=
- Less than: <
- Less than or equal: <=

EXAMPLES

- $5 < 3$
- $5 == 3$
- $x = 2;$
 $x \leq 0$

LOGICAL FUNCTIONS

- There are also logical *functions* that return Boolean values
 - isempty
 - isinf
 - isnan

LOGICAL OPERATORS

- Often we want to combine booleans to make *boolean statements*
 - Remember compound statements?
- And/Or
 - &&
 - ||
- Negation (not)
 - ~
- Truth Tables!

TRUTH TABLES

EXAMPLES

- $(4==2) \&\& (2<4)$
- $(4\sim=2) \&\& (2<4)$
- $\sim(4==2) \&\& (2<4)$
 - We do “not equal” so often that we can do $(4\sim=2)$ which is the same as $\sim(4==2)$