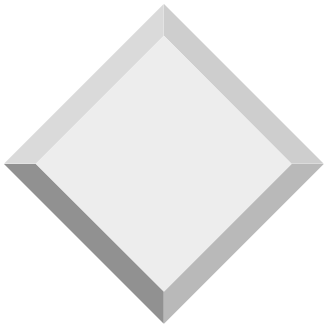


Designing Programs

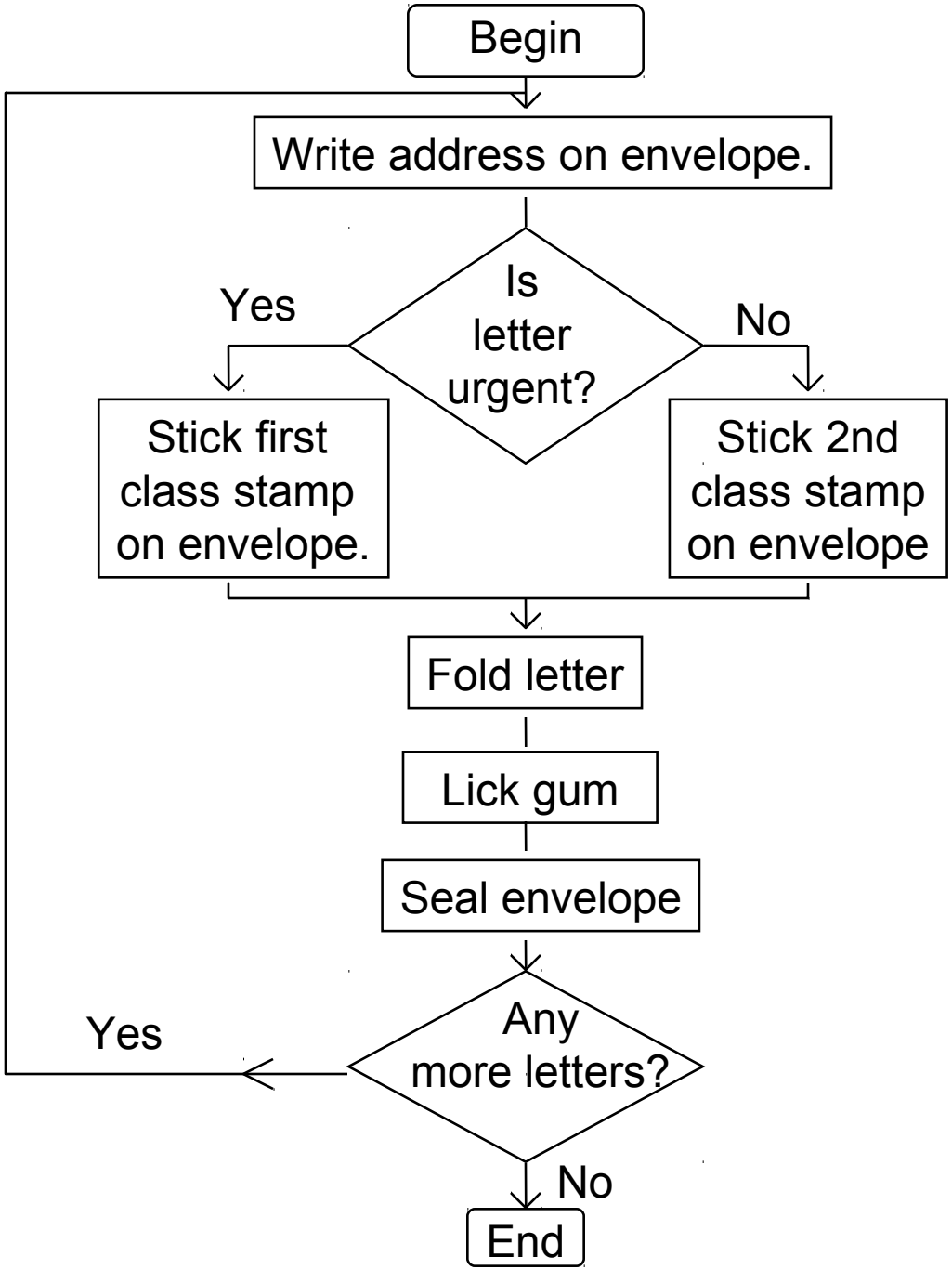
Flowcharts & Pseudocode

Describing Programs

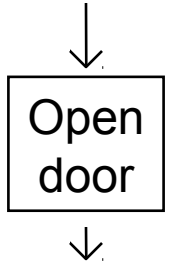
- Flowcharts
  - Diagrams that include words which describe the individual tasks to be carried out and the decisions to be made in regard to carrying out tasks.
- Pseudocode
  - Words that describe the individual tasks and special ‘keywords’ that describe the decisions to be made in regard to carrying out these tasks.

Flowcharts

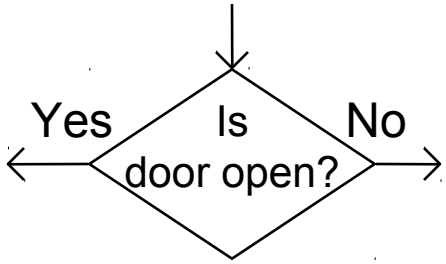
- Flowchart describing the procedure involved in preparing a set of envelopes for posting.



Flowcharts



- Rectangle represents actions.
  - can only have one entry point.
  - can only have one exit point.
- Diamond represents a decision.
  - phrased like a question.
  - can only have one entry point.
  - must have one exit point for each possible answer.



- Arrows show which action is executed after the previous one.

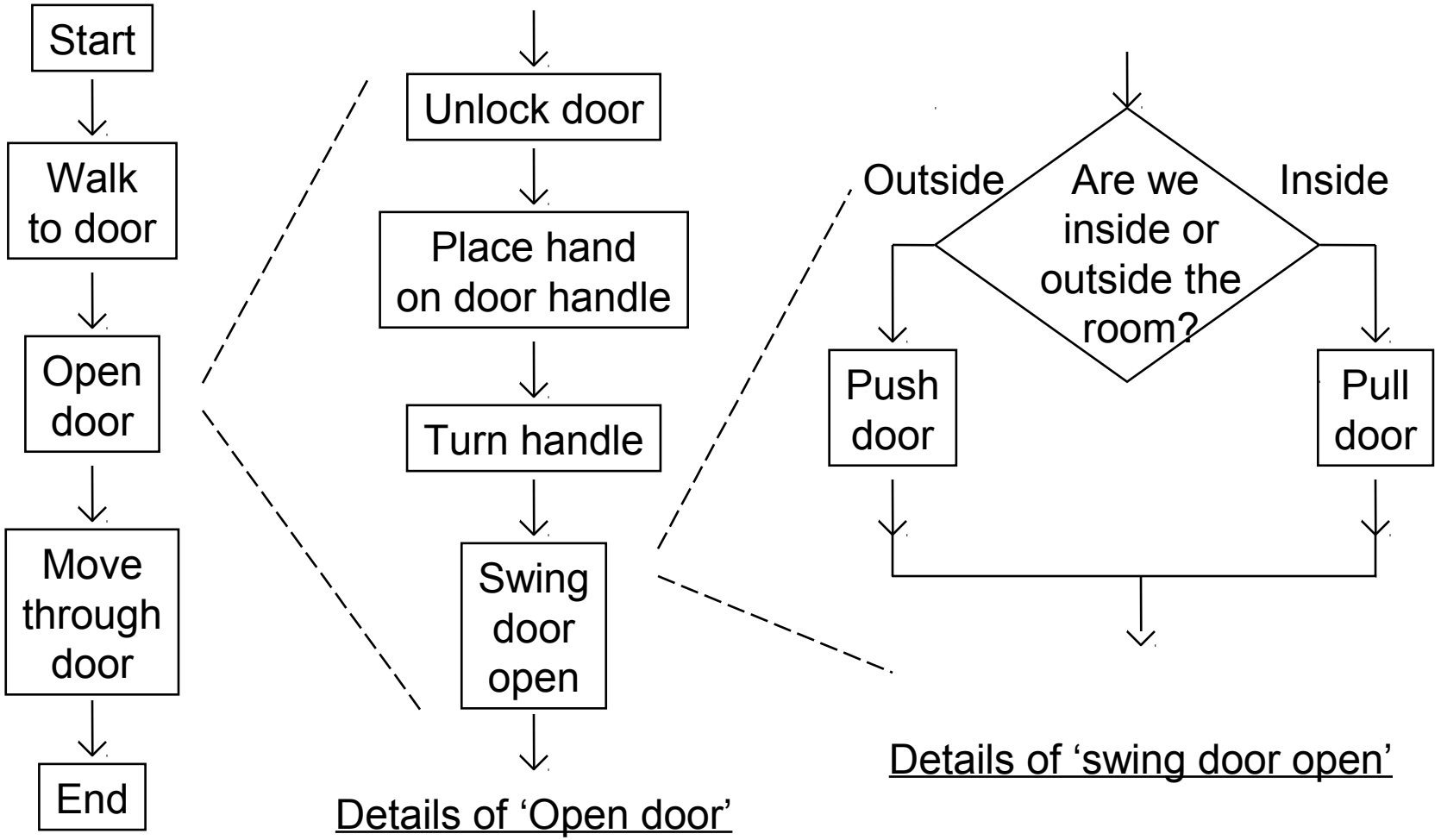
Flowchart Exercises

- Design flowcharts for the following tasks!
  - Leaving the classroom.
    - imagine you are writing instructions for a robot!
  - Knocking a set of nails into a block of wood.
    - You don't know how long each nail will take.
  - Making a sandwich (choice of ham or cheese)
    - look at answer in Appendix II
  - Making sandwiches from a loaf.

Keep to the Rules!

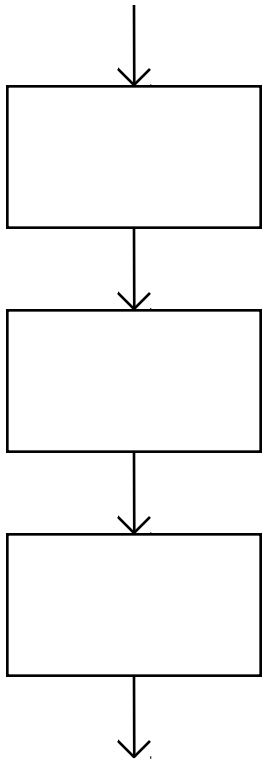
Procedure for leaving room

❷ Top down design/stepwise refinement

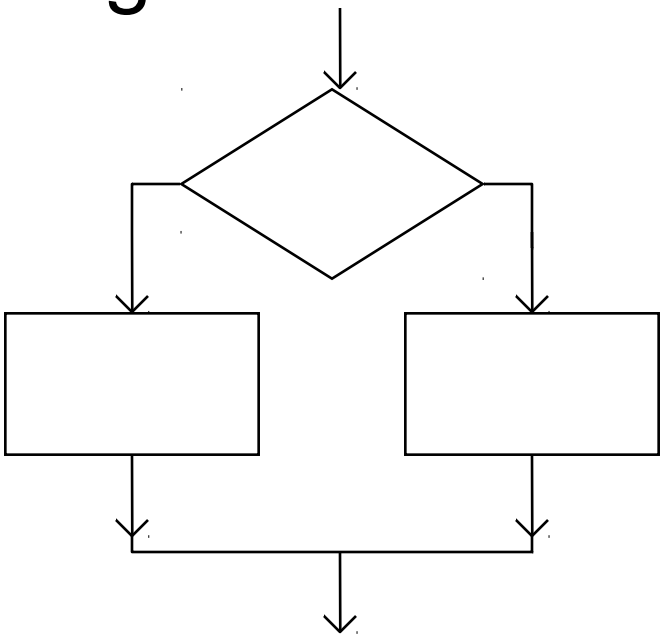


The Three Programming Control Structures.

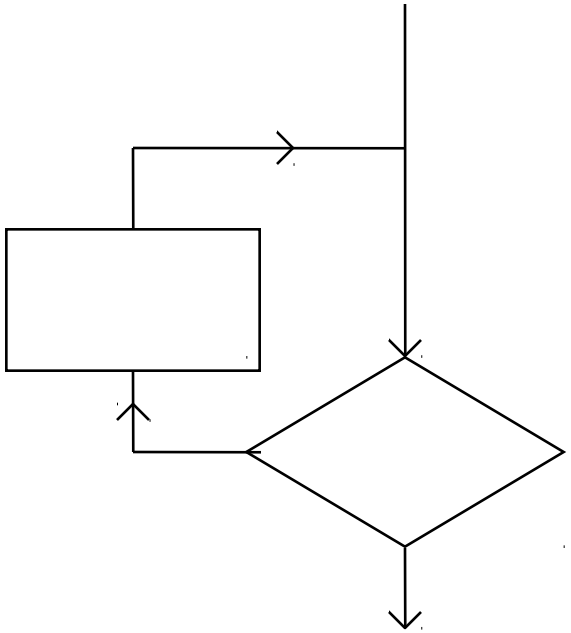
- All programs can be described by combining the following 3 control structures:



Simple Sequence



Simple Selection
(IF-THEN-ELSE)

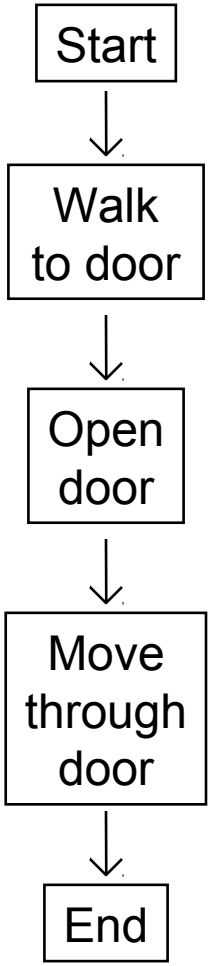


Simple Repitition
(Loop)

Pseudocode

- Words that describe the individual tasks and special ‘keywords’ that describe the decisions to be made in regard to carrying out these tasks.
- Keywords for the 3 basic control structures.
- Forces the programmer to stick to these structures.
- Looks like a programming language but is NOT. It is a strict form of english.

Simple Sequence



BEGIN

Walk to door

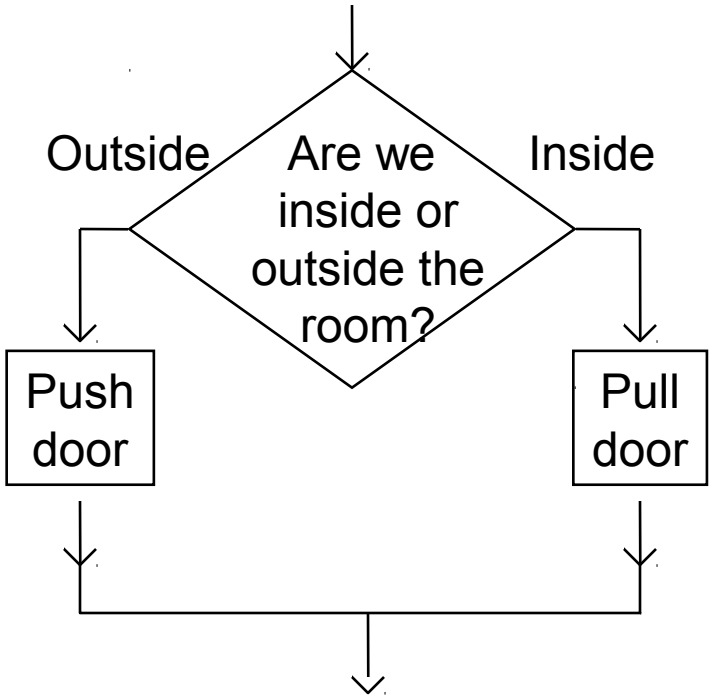
Open door

Move through door

END

Note the ‘indentation’

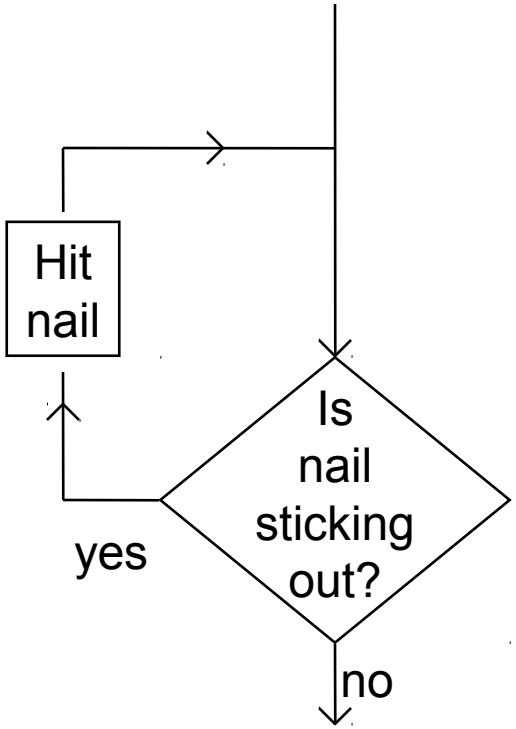
Simple Selection




```
IF inside room THEN
    Pull door
ELSE
    Push door
ENDIF
```

Note the ‘indentation’

Simple Repitition



WHILE nail is sticking out

hit nail

ENDWHILE

Note the ‘indentation’

Hints For Writing Pseudocode

- Identify the appropriate structure for the task to being described.
  - sequence, selection or repitition
- Try these:
  - Adding up a large set of numbers.
  - putting ham or cheese onto a slice of bread.
  - addressing and stamping an envelope.
  - printing out results for a class of students.

Hints For Writing Pseudocode

```
BEGIN
      .................
      .................
      ...........
      ..........................
END
```

```
IF ..............  THEN
      ..............
ELSE
      ...........
      ..............
ENDIF
```

```
WHILE.....................
      ......
      ..............
      ....
      ........
ENDWHILE
```

- Write down all the keywords for that structure and fill in the gaps.
- The gaps can be filled with ordinary english statements.
- The statements can represent complicated procedures which can be described in detail later.

Pseudocode Exercises

- Design pseudocode for the following tasks!
  - Leaving the classroom.
  - Knocking a set of nails into a block of wood.
  - Making a sandwich (choice of ham or cheese)
  - Making sandwich from a loaf.
  - Adding up a set of numbers.
  - Calculating the average of a set of numbers.
  - Finding the largest of a set of numbers.
  - Finding the middle on of 3 numbers.

Keep to the Rules!