



# Structured Programming Concepts

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## Topics

- What is it?
- Why is it important?
- Core concepts

## What is it?

- A way of thinking about how to create computer programs: a **paradigm**.
- Developed in the 1950s to help create manageable computer programs.

## Why is it important?

- Theoretical reasons
- Practical reasons

## Theoretical reasons

- It's is all you need to write any “provable function.”
- Dominates theoretical thinking.

## Practical reasons

- Many popular programming languages are based on structured programming.
- Influences languages built around other paradigms.
- Thinking “structurally” helps solve problems so they are easy to program.
- Professionals often use structured programming concepts to specify ways of solving problems.

## Core concepts

- Control flow
- Block structure
- Subroutines

## Control flow

- **control flow**: the order in which the things happen, the way a program “flows”.
- Three kinds of control structures
  - **sequence**: statements are executed one after the other.
  - **selection**: choose among alternative courses of action, “making decisions.”
  - **repetition**: repeat a set of instructions, “looping”.

## Scenario

- I need to leave my house for a couple days.
- My friend has agreed to look after my cat Ash.
- They need detailed instructions.

## First try

*Ash gets a cup of food every day.  
Her water needs to be filled if it's running low.  
She also needs to play fetch with her favorite toy.*

## Sequence

“Ash gets a cup of food every day.”

```
open the bag of catfood on the counter
scoop out one cup of food
put the scoop of food into her food dish
reseal the bag of catfood
```

## Selection

“Her water needs to be filled if it's running low.”

```
if the water level in the water dish is low
    fill a glass of water from the filtered water pitcher on the counter
    pour the glass of water into the water dish
```

## Repetition

“She also needs to play fetch with her favorite toy.”

```
toss Ash's favorite toy
while Ash brings it back
    pat her on the head
    toss Ash's favorite toy
```

## Code Examples

### Sequence

```
a = 5
b = 4
c = a * b
print("The value of c is", c)
```

### Selection

```
if a > 60:
    print("Your score is", a)
    print("You passed the course!")
```

### Repetition

```
n = 1
while n < 10:
    print(n)
```

$k = n + 1$   
 $n = k$

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