



OVERVIEW & INSTALL

COBOL modern, expressive programming language

```
# Check version
cobol --version
```

Install via official installer, package manager, or version manager
Popular package managers: cargo, pip, gem, npm, brew

BASIC SYNTAX

Variables, control flow, expressions

```
// Variable declaration
let x = 10;
// Conditional
if x > 5 { ... } else { ... }
// Loop
for item in collection { ... }
```

DATA TYPES

Primitive: integers, floats, booleans, strings
Composite: arrays, maps, tuples, structs

```
// Typed declaration
let name: String = "Alice";
let numbers: Vec<i32> = vec![1, 2, 3];
Strong typing prevents common runtime errors
```

FUNCTIONS

```
fn greet(name: &str) -> String {
    format!("Hello, {}!", name)
}
let result = greet("World");
First-class functions;
lambdas/closures supported
let double = |x| x * 2;
```

OOP / MODULES

Structs, classes, or records with methods

```
struct User { name: String, age: u32 }
impl User {
    fn new(name: &str) -> Self { ... }
    fn greet(&self) -> String { ... }
}
```

Interfaces / traits / protocols for polymorphism

COLLECTIONS

```
// Array / slice
let arr = [1, 2, 3];
// Dynamic list
let mut list = Vec::new();
list.push(42);
// Map / dictionary
let mut map = HashMap::new();
map.insert("key", "value");
```

ERROR HANDLING

Result/Option types or exceptions

```
fn read_file(path: &str) ->
Result<String, Error> {
    Ok(std::fs::read_to_string(path)?)
}
match result {
    Ok(data) => process(data),
    Err(e) => eprintln!("Error: {}", e),
}
```

CONCURRENCY / ASYNC

Threads, async/await, or actor model

```
async fn fetch_data(url: &str) ->
Result<String> {
    let resp = client.get(url).await?;
    resp.text().await
}
tokio::main / async_std / smol
Green threads or OS threads
depending on runtime
```

TESTING

Built-in or framework test support

```
#[test]
fn test_greet() {
    assert_eq!(greet("Alice"), "Hello, Alice!");
}
cargo test / run test suite
Unit tests co-located with source code
```

ECOSYSTEM & PACKAGES

Package registry and dependency management

```
# Add dependency
cargo add serde
# In Cargo.toml:
[dependencies]
serde = { version = "1.0", features =
["derive"] }
Curated ecosystem with popular libraries for HTTP, JSON, DB
```

CLI & BUILD TOOLS

```
cargo build    compile project
cargo run      build and run
cargo test     run tests
cargo fmt      format code
cargo clippy   linting
cargo doc      generate documentation
Integrated toolchain for build, test, and docs
```

COMMON GOTCHAS

Follow language-specific naming conventions
Understand ownership/borrowing/GC model for this language
Use idiomatic patterns don't port code from other languages
Check community guidelines for error handling approach
Profile before optimizing
correctness first