DS2000 – Programming with Data

# 03. Control Flow

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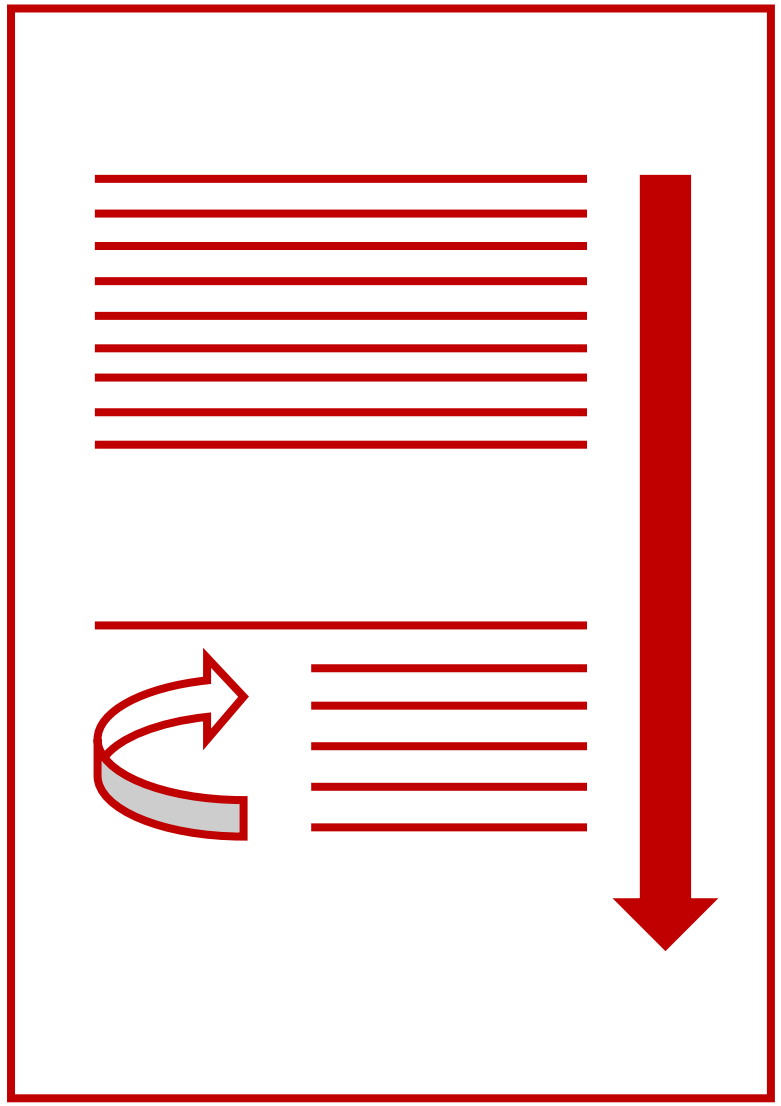
# Programs

A **program** is a sequential series of statements that are executed one at a time from the top of the file to the bottom. ( This is called **sequential execution**).

Programs may contain **loops** that cause certain statements to execute repeatedly.

Other types of statements may impact program flow. For example, **conditional statements** may cause certain statements to be executed only under specific conditions.



# Algorithms: Actions + Control Flow

You can solve any computing problem by executing a series of actions in a specific order. An algorithm is a *procedure* for solving a problem in terms of:

1. the actions to execute, and

2. the order in which these actions execute.

# Pseudocode and documentation

**Pseudocode** is a high-level English-like description of your algorithm.  There is no formal syntax. Just explain your program using a human language.

Often the pseudocode becomes the **documentation** for your code.

# Pseudocode

```
"""
Add two integers together and display result
by J. rachlin
Aug 23, 2003
"""

# Input the first integer

# Input the second integer

# Add together and display sum

```

```
"""
Add two integers together and display result
by J. rachlin
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"""

# Input the first integer
num1 = int(input("First integer: "))

# Input the second integer
num2 = int(input("Second integer: "))

# Add together and display sum
sum = num1+num2
print("The sum is: ", sum)
```
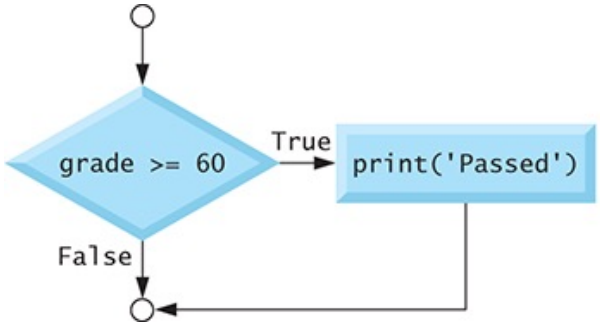
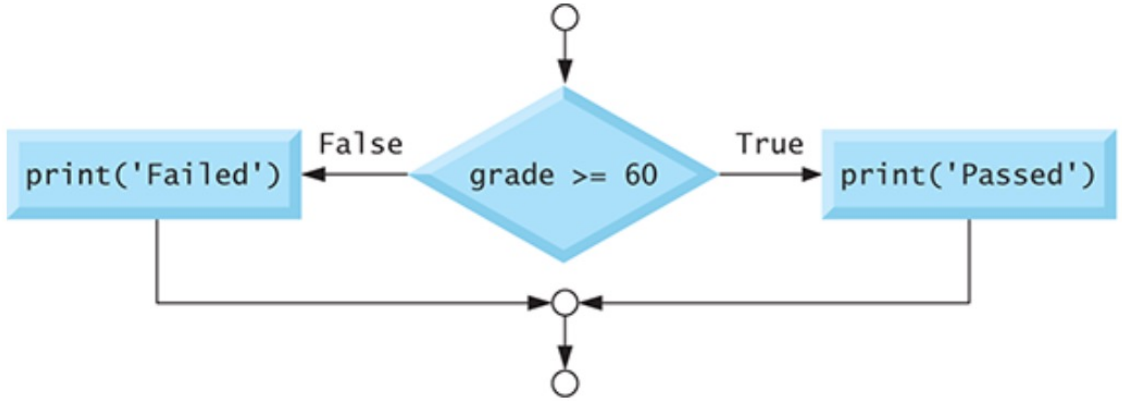
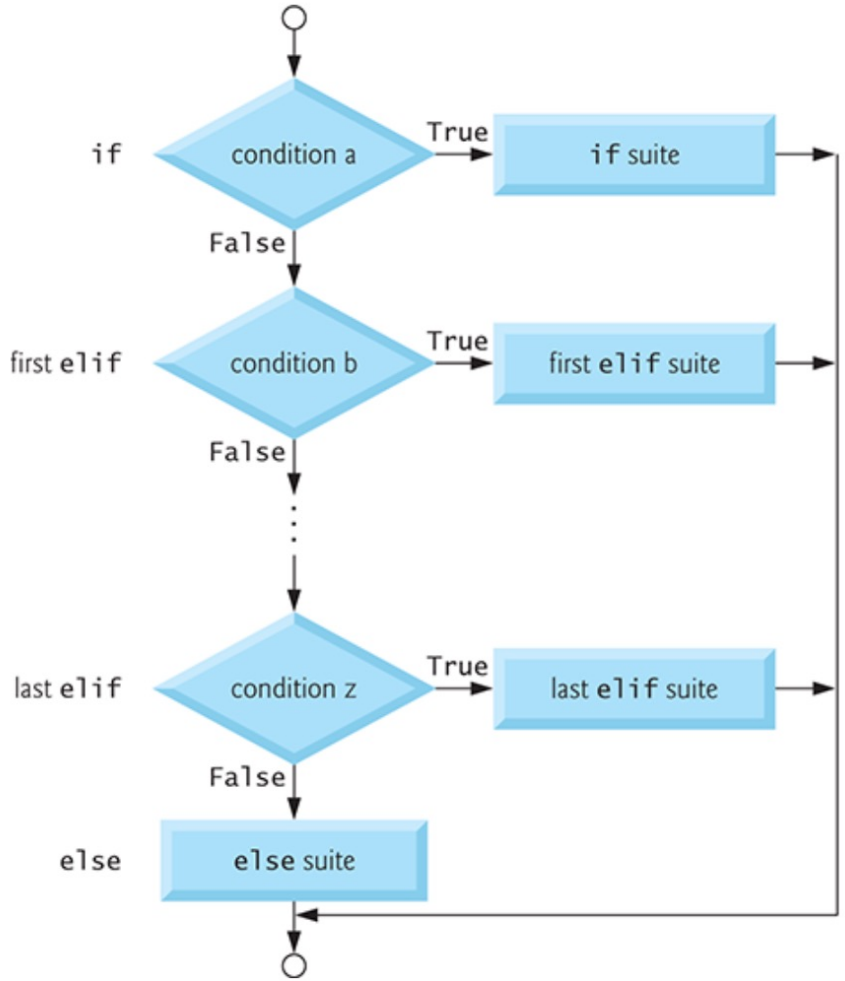

# if…elif…else


grade >= 60
True
print('Passed')
False


print('Failed')
False
grade >= 60
True
print('Passed')


if
condition a
True
if suite
False
first elif
condition b
True
first elif suite
False
last elif
condition z
True
last elif suite
False
else
else suite

# if conditionals

Notes:

you can have multiple elif statements

the final else is a catchall and is optional

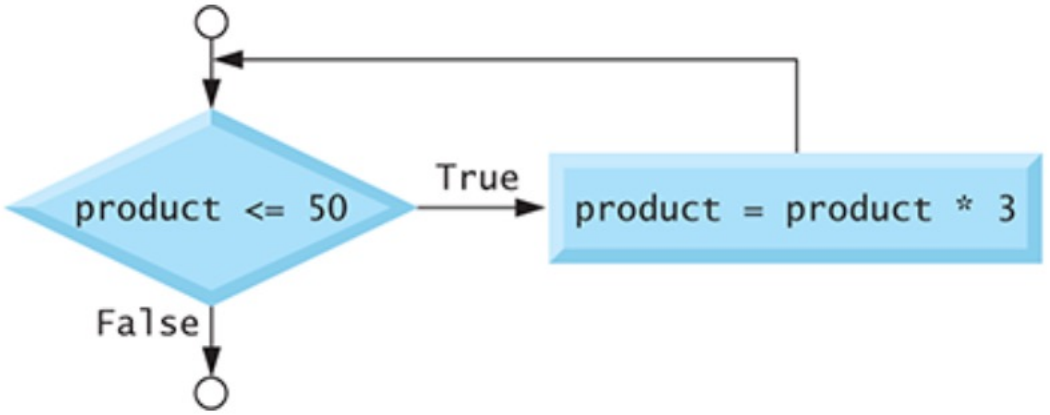
```
mygrade = int(input("Enter your grade: "))

# A single if
if mygrade > 60:
    print("Passed")

# if...else (one thing or another)
if mygrade > 60:
    print("Passed")
else:
    print("Failed")

# if...elif....else
if mygrade < 60:
    print("F")
elif 60 < mygrade <= 69:
    print("D")
elif 70 < mygrade <= 79:
    print("C")
elif 80 < mygrade <= 89:
    print("B")
else:
    print("A")
```

# while

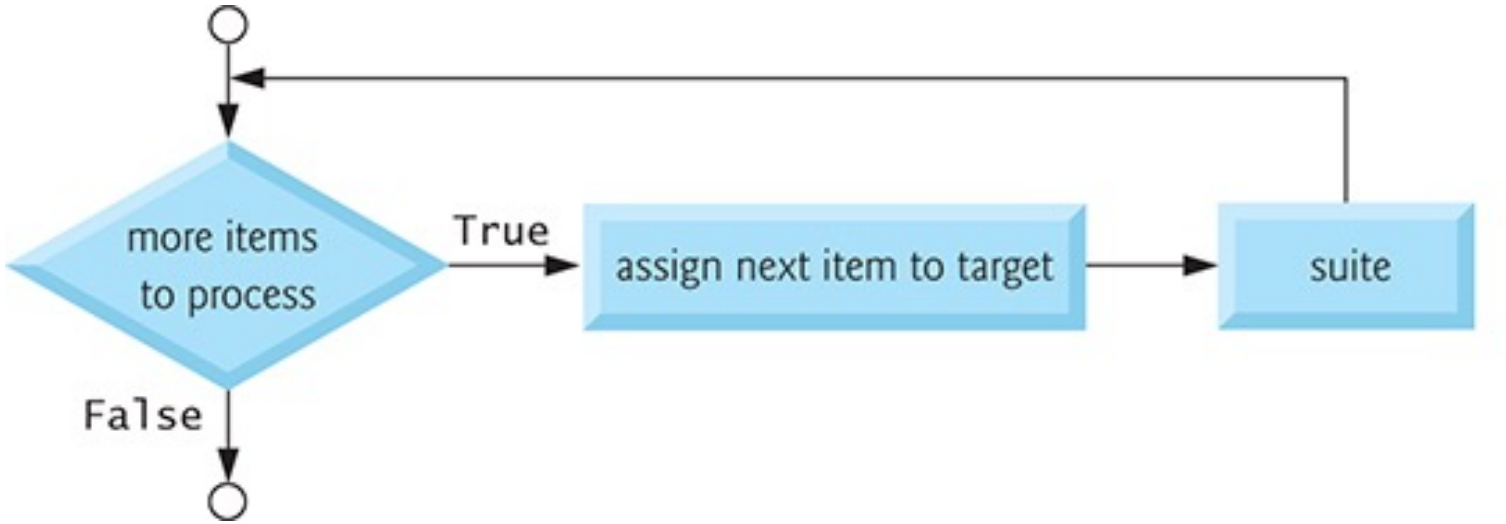
```
1  product = 3
```

```
1  while product <= 50:
2      product = product * 3
3      print(product)
```

```
9
27
81
```



# for


more items
to process
True
assign next item to target
suite
False

# Augmented Assignment

| Augmented assignment | Sample expression | Explanation | Assigns |
|---|---|---|---|
| *Assume:* `c = 3, d = 5, e = 4, f = 2, g = 9, h = 12` | | | |
| `+=` | `c += 7` | `c = c + 7` | 10 to c |
| `-=` | `d -= 4` | `d = d - 4` | 1 to d |
| `*=` | `e *= 5` | `e = e * 5` | 20 to e |
| `**=` | `f **= 3` | `f = f ** 3` | 8 to f |
| `/=` | `g /= 2` | `g = g / 2` | 4.5 to g |
| `//=` | `g //= 2` | `g = g // 2` | 4 to g |
| `%=` | `h %= 9` | `h = h % 9` | 3 to h |