Self-Learning Material #2

Decisions and Conditions

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Overview

- `if` statement & `if-else` statement
- Nested `if` Block
- `switch` statement
- compare `if-else` vs conditional operation `? :`

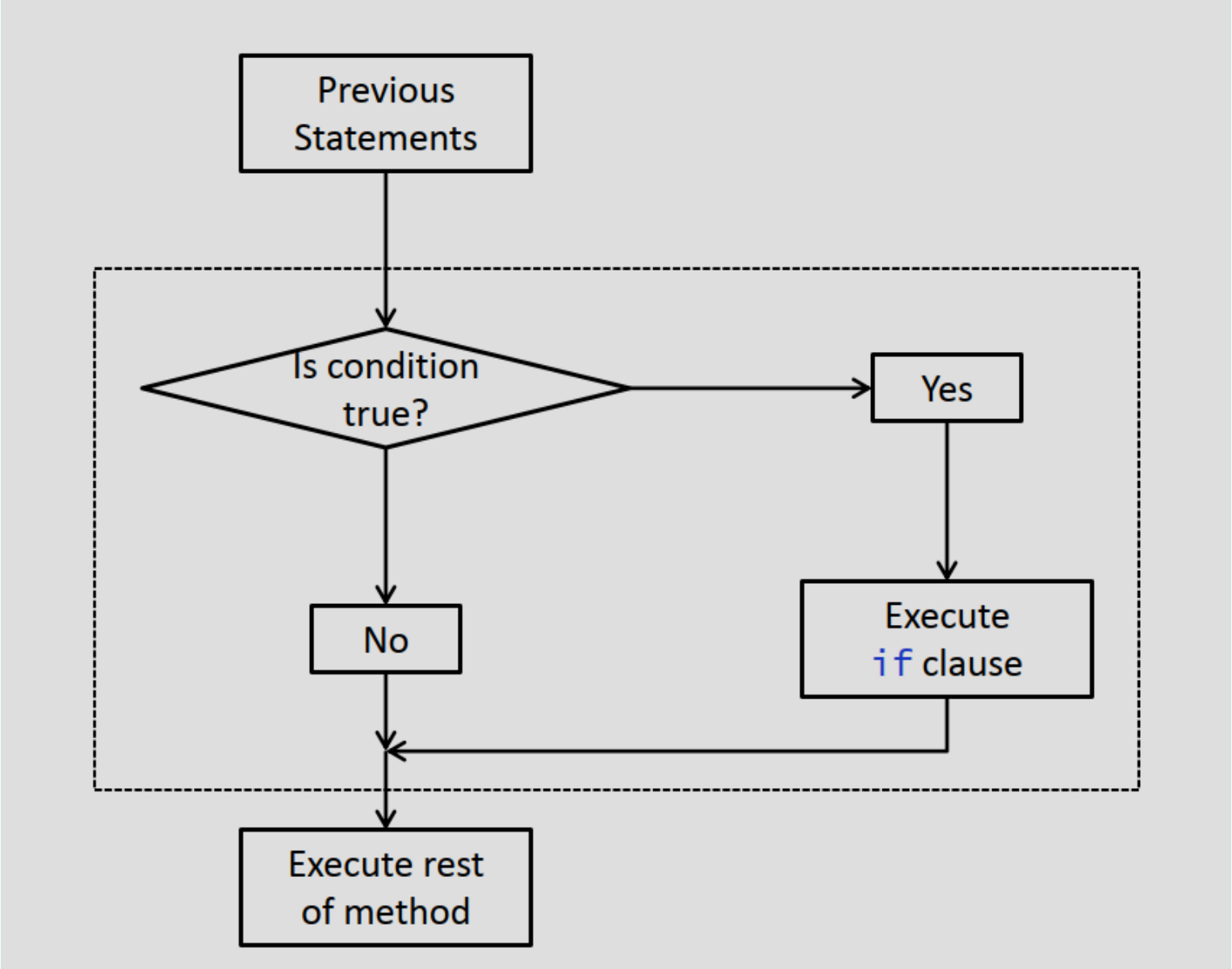
Decision and Conditions

Program takes action based on different scenarios:

- If **temperature higher than 50**, fan speed increases
- If **exam comes**, study; else play
- If **hungry and thirsty**, eat congee; else if **hungry**, eat jelly.

Conditions can be evaluated as true or false. This *controls* how the program works.

Decision Flow chart



If statement

- Java use the follow syntax to make if-decision

```
if (<condition>) {
    //code to be executed if the condition is true
}
//some people do this
if (<condition>)
{
    //code to be executed if the condition is true
}
```

or

```
if (<condition>)
    //single line of statement to be executed if the expression is true
```

Example - If

```
if (temperature > 50) {
    fanSpeed = 50;
    temperature -= 2;
}
```

- If `temerature` is not greater than 50, fanSpeed and temperature will not be adjusted.

```
if (examIsComing)
    study = true;
```

> 👨‍🏫💬 The indentation and newline are not required by compiler. Yet it is very important for clarity!

Mistake

```
if (examIsOver);
    play = true;
```

or similarly

```
if (examIsOver); {
    play = true;
}
```

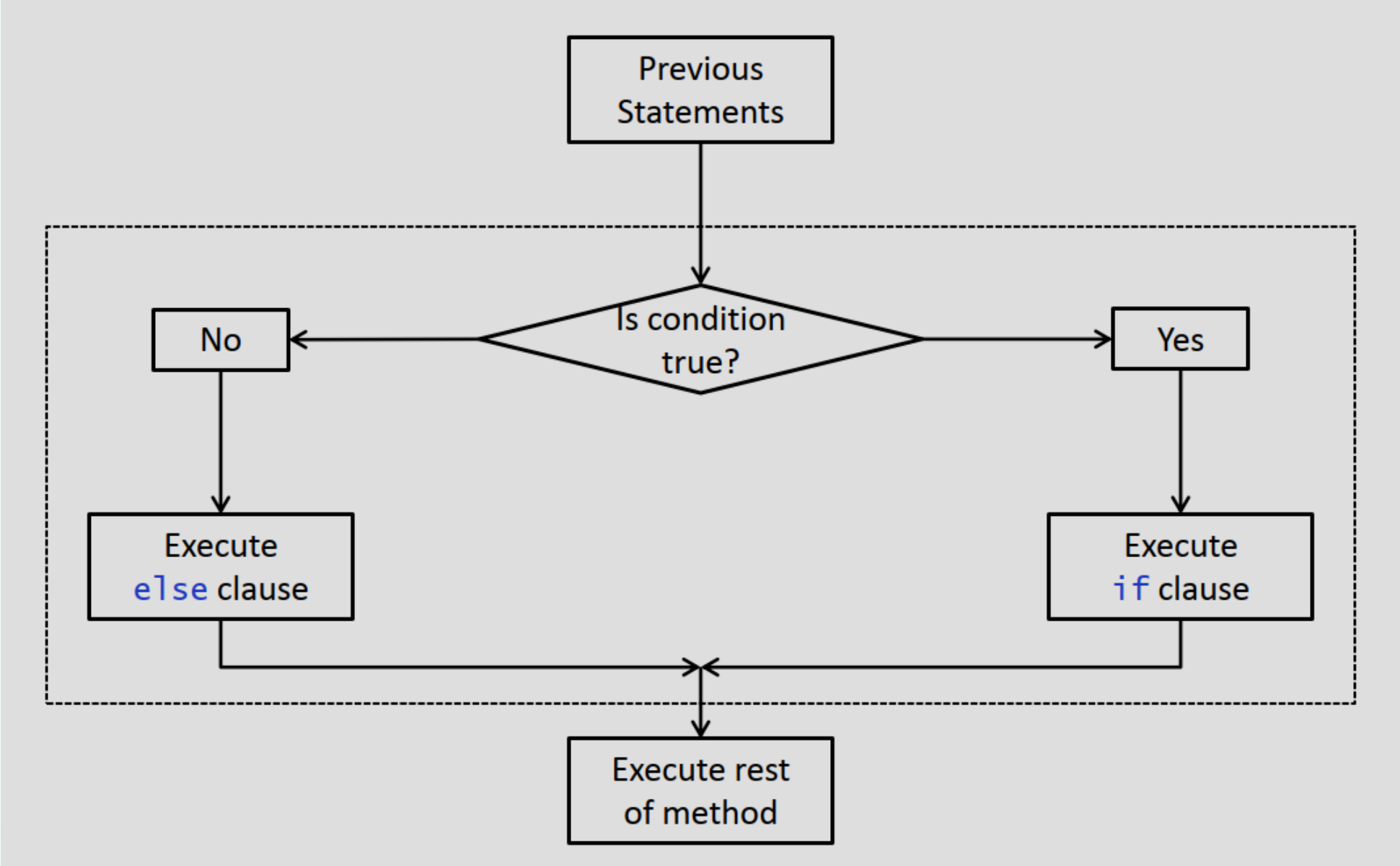
- The first semi-colon creates an empty statement and set play always be true.

Mistake

```
if temperature > 50 {
    fanSpeed++;
}
```

- A condition must be surrounded by parenthesis `()`.

Decision Flow chart /w Else



If-Else

- `else` indicates the alternative path when the condition is not true

```
if (<condition>) {
    //code to be executed if the condition is true
} else {
    //code to be executed if the condition is false
}
```

or if you prefer another indentation

```
if (<condition>)
{
    //code to be executed if the condition is true
}
else
{
    //code to be executed if the condition is false
}
```

Example

```
if (examIsOver)
    action = "play";
else
    action = "study";
```

```
if (isFree && motivation > 50) {
    action = "go to class";
    knowledge++;
} else {
    action = "go to bed";
    knowledge = knowledge >> 1;
}
```

👩‍🏫 💬 Under what scenarios would you go to bed?

Mistakes

```
if (examIsOver)
    action = "play";
    mood += 10;
else
    action = "study";
```

❌ Multiple statements must be embraced by `{ }`.

```
if (examIsOver)
    action = "play";
else (!examIsOver)
    action = "study";
```

❌ `else` can't be followed by a condition.

Mistakes

```
if (50 < mark < 70)
    System.out.println("You've got a B");
```

❌ This is an incorrect comparator. Should be `if (50 < mark && mark < 70)`.

```
if (a == b == c)
    System.out.println("A and B and C have the same value");
```

❌ Same as above. Should be `if (a == b && b == c)`.

> 👩‍🏫💬 `50 < mark` will be either true or false. Thus `50 < mark < 70` might be evaluated as `true < 70` which makes no sense at all.

Are they the same?

```java
if (a > b) {
    //statement 1
} else {
    //statement 2
}
```

```java
if (a > b) {
    //statement 1
}
if (a <= b) {
    //statement 2
}
```

Nested if statements

- Nest `if` statements by putting one inside another

```
if (freeTime > 1.5) {
    if (hasAssignment) {
        action = "workOnAssignment";
    } else {
        action = "watch Kevin's youtube";
    }
} else {
    action = "play";
}
```

if-else cascade

- Multiple `if-else` can be chained to describe mutually exclusive decisional statements.

```
if (condition1) {
    //execute if condition1 is true
} else if (condition2) {
    //execute if condition2 is true but the above is false
} else if (condition3) {
    //execute if condition3 is true but the above are false
} else if (condition4) {
    //execute if condition4 is true but the above are false
} else {
    //execute if all the above are false
}
```

👩‍🏫💬 The order of the conditions does matter!

Example

```
if (score > 80) {
    System.out.println("A");
} else if (score > 65) {
    System.out.println("B");
} else if (score > 40) {
    System.out.println("C");
} else {
    System.out.println("F");
}
```

- If score is 85, output is...
- If score is 70, output is...
- If score is 55, output is...
- If score is 40, output is...

Example 2

```
if (score > 40) {
    System.out.println("C");
} else if (score > 65) {
    System.out.println("B");
} else if (score > 80 {
    System.out.println("A");
} else {
    System.out.println("F");
}
```

- If score is 85, output is...
- If score is 70, output is...
- If score is 55, output is...
- If score is 40, output is...

Cascade vs Nested if

- The following codes produce the same result.

Nested If

```
if (score > 40)
    if (score > 65)
        if (score > 80)
            System.out.println("A");
        else
            System.out.println("B");
    else
        System.out.println("C");
else
    System.out.println("D");
```

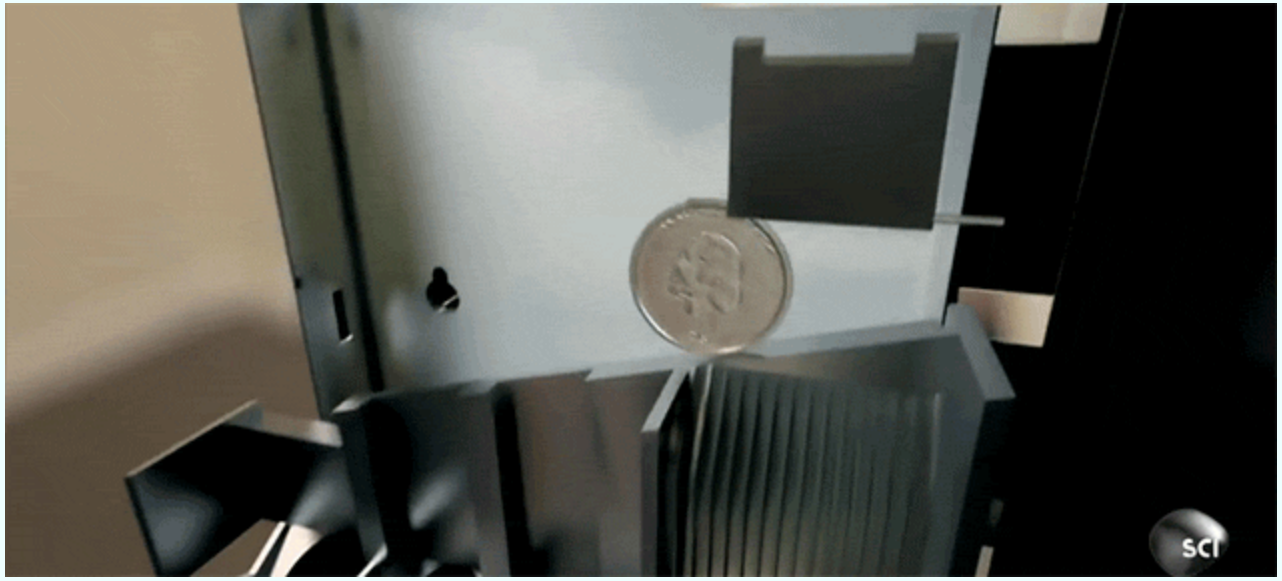
Cascade If

```
if (score > 80)
    System.out.println("A");
else if (score > 65)
    System.out.println("B");
else if (score > 40)
    System.out.println("C");
else
    System.out.println("D");
```

Switch

Switch Statement

- Cascade/nested `if` are good enough to describe our logic.
- Can we do it simpler?
- `switch` is used to choose among more than two mutually exclusive choices based on the values of a variable.
- `switch` works like a vending machine.



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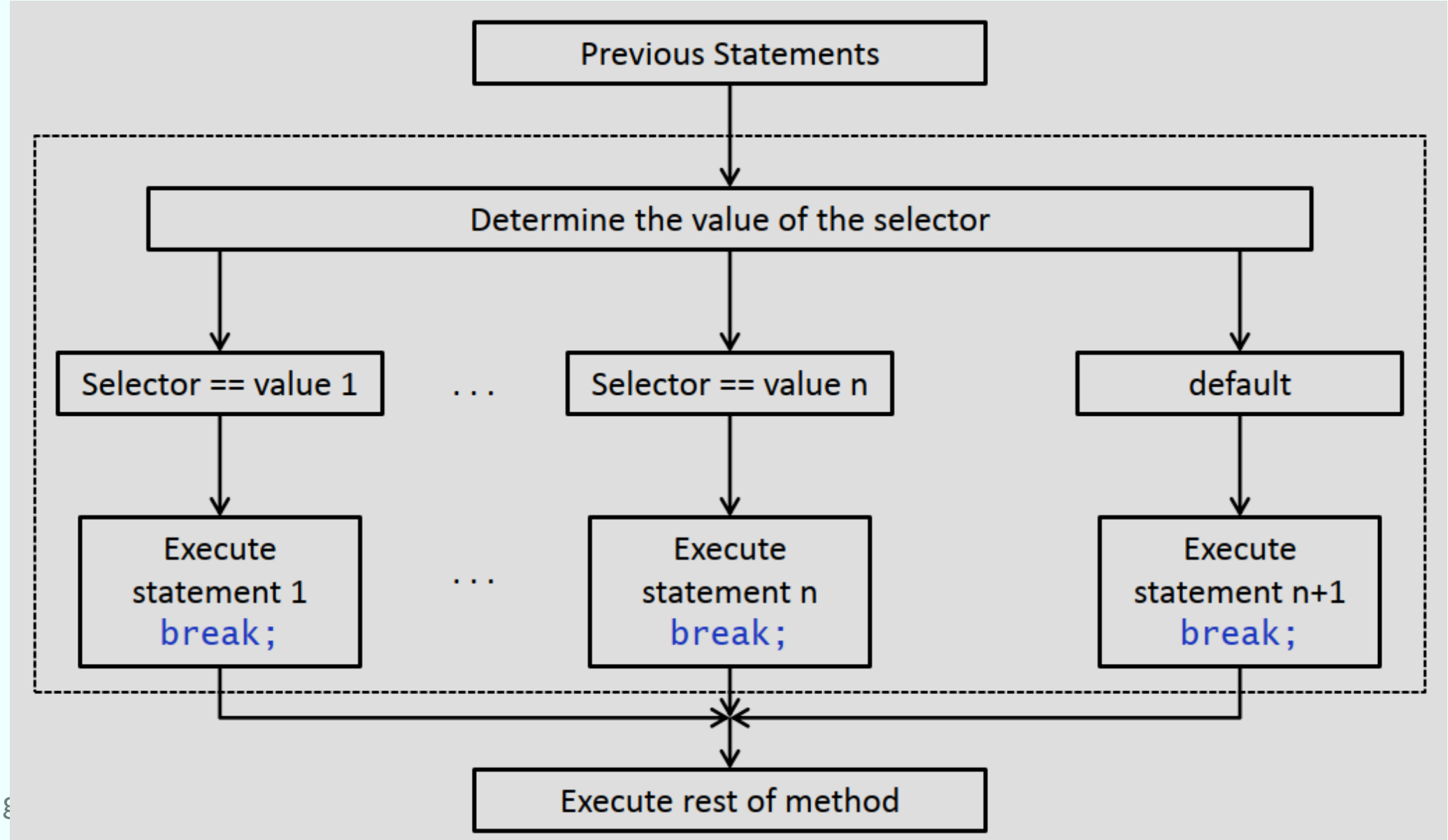
Flow chart of a switch statement



Syntax of switch

```
switch (expression) {
    case 1: //action to be taken, if variable = 1
            break;
    case 4: //action to be taken, if variable = 4
            //another action to be taken
            break;
    case 2: //action to be taken, if variable = 2
            break;
    default:
            //action to be taken otherwise
}
```

The expression must be either:

- integer numbers (`byte`,`short`,`int`)
- `char`
- `String`

Example - switch with int

```
int rank;
//assign some value to rank
switch (rank) {
    case 1: System.out.println("Gold medal!");
            break;
    case 2: System.out.println("Silver medal!");
            break;
    case 3: System.out.println("Bronze medal!");
            break;
    default:
            System.out.println("Thank you for participation!");
}
```

Example - switch with String

```
String language;
//assign some value to language
switch (language) {
    case "Cantonese": System.out.println("Jou sun ching");
                      break;
    case "English"  : System.out.println("Morning!");
                      break;
    case "Japanese" : System.out.println("Ohayo");
                      break;
    default         : System.out.println("Hi");
}
```

👩‍🏫💬 It is not necessary to align the colon symbols.

break in a switch

- `break` statement can only appear in a switch statement or a loop
- `break` will jump to the end of the switch statement and execute the rest of the code

```
switch (grade) {
    case 'A': System.out.println(
                "Well done! Do you want to be a helper next year?"
              );
              break;  // goto exit-point
    case 'B': System.out.println("Good Job!");
              break;  // goto exit-point
    case 'C': System.out.println("You can do better!");
              break;  // goto exit-point
    default:  System.out.println("Contact your TA immediately!!");
}
// Exit-point
```

switch without a break

```
switch (grade) {
    case 'A': System.out.println(
                "Well done! Do you want to be a helper next year?"
              );
    case 'B': System.out.println("Good Job!");
    case 'C': System.out.println("You can do better!");
    default:  System.out.println("Contact your TA immediately!!");
}
// Exit-point
```

If `grade == 'A'`, it will print

```
Well done! Do you want to be a helper next year?
Good Job!
You can do better!
Contact your TA immediately!!
```

Mistakes

```
switch (4.5 + 3.5) {
    case 8: System.out.println("8");
            break;
    default: System.out.println("not 8");
}
```

❌ expression cannot be a double.

Mistakes

```
switch (grade) {
    case 'A', 'B', 'C': System.out.println("Pass");
                        break;
    case 'F': System.out.println("Fail");
}
```

⚠️ cases cannot be separated by commas (until Java 13). We don't accept that too!

```
//write this instead
switch (grade) {
    case 'A':
    case 'B':
    case 'C': System.out.println("Pass");
              break;
    case 'F': System.out.println("Fail");
}
```

Summary

- Switch
- Break