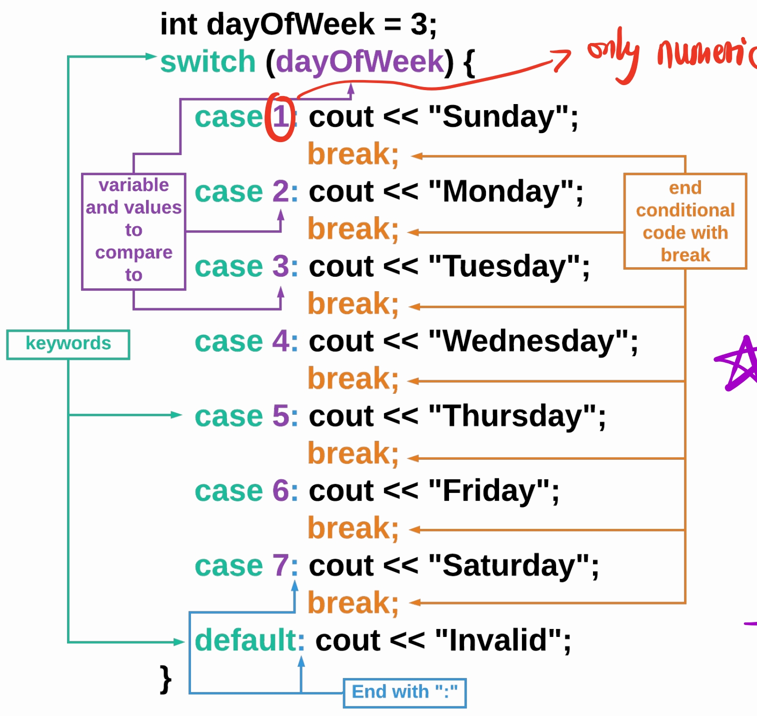
Learning Objectives: Switch Case Statement

- **Describe the `switch case` syntax**
- **Identify when to apply `switch case` statements instead of nested `if-else`**

Switch Case Statement Syntax

Swith Case Statement Syntax

The `switch case` statement is a way to make a decision with multiple possible outcomes. Instead of nesting or sequencing many `if` statements, C++ allows you to write the following:



```
int dayOfWeek = 3;
switch (dayOfWeek) {
    case 1: cout << "Sunday";
            break;
    case 2: cout << "Monday";
            break;
    case 3: cout << "Tuesday";
            break;
    case 4: cout << "Wednesday";
            break;
    case 5: cout << "Thursday";
            break;
    case 6: cout << "Friday";
            break;
    case 7: cout << "Saturday";
            break;
    default: cout << "Invalid";
}
```

variable and values to compare to
end conditional code with break
keywords
End with ":"

only numerical values

☆

if no "break"
once find a match case
all the lines starting from
this case will be executed
until encounter a "break"

.guides/img/SwitchCase

Here are the rules for writing a switch case statement:

- Start with `switch` followed by the variable that is going to be tested in parentheses `()`.
- All of the `case`s are surrounded by a set of curly braces `{}`.
- Each `case` is followed by a *numerical* value and a colon `:`.
- After each `:`, write the code that should run if the variable is equal to that case's value.
- After each section of code per case, include `break;`.
- As the very last case, use `default:` to specify what should happen if none of the above cases are true.

```
int dayOfWeek = 3;

switch (dayOfWeek) {

  case 1: cout << "Sunday"; //only prints if dayOfWeek == 1
          break;
  case 2: cout << "Monday"; //only prints if dayOfWeek == 2
          break;
  case 3: cout << "Tuesday"; //only prints if dayOfWeek == 3
          break;
  case 4: cout << "Wednesday"; //only prints if dayOfWeek == 4
          break;
  case 5: cout << "Thursday"; //only prints if dayOfWeek == 5
          break;
  case 6: cout << "Friday"; //only prints if dayOfWeek == 6
          break;
  case 7: cout << "Saturday"; //only prints if dayOfWeek == 7
          break;
  default: cout << "Invalid"; //only prints if none of the above
        are true

}
```

Code Visualizer

challenge

What happens if you:

- Assign `dayOfWeek` to `5`?
- Assign `dayOfWeek` to `0`?
- Assign `dayOfWeek` to `3` and remove all of the `break;` statements?

Code Visualizer

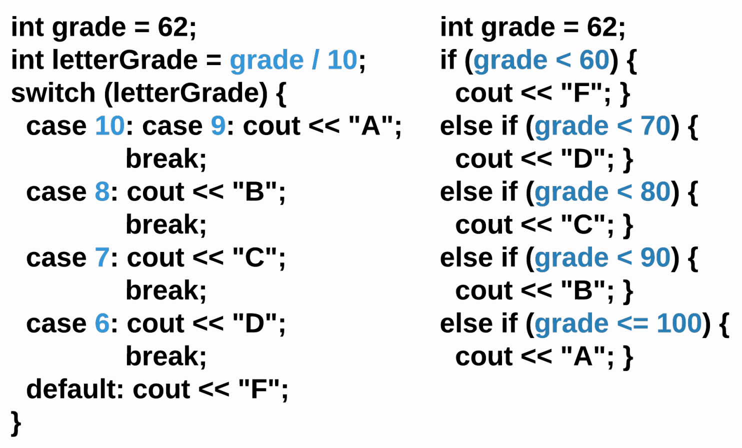
Switch Case vs. If Else

Switch Case vs. Else If

C++ allows you to use either `switch case` or a series of `else if` statements to handle decisions with multiple outcomes. There are a couple of reasons why you would use one method over the other.

#1: Else If is used for *ranges* of values - Switch Case is for *specific* values

`switch case` can only check for equality (e.g. `num == 5`), so if you need to check for a range of values (e.g. `num > 50 && num <= 60`), use `else If` instead.



```
int grade = 62;
int letterGrade = grade / 10;
switch (letterGrade) {
  case 10: case 9: cout << "A";
             break;
  case 8: cout << "B";
             break;
  case 7: cout << "C";
             break;
  case 6: cout << "D";
             break;
  default: cout << "F";
}
```

```
int grade = 62;
if (grade < 60) {
  cout << "F"; }
else if (grade < 70) {
  cout << "D"; }
else if (grade < 80) {
  cout << "C"; }
else if (grade < 90) {
  cout << "B"; }
else if (grade <= 100) {
  cout << "A"; }
```

.guides/img/SwitchCaseElseIf

▼ What is `case 10: case 9:`?

Sometimes, the code for multiple cases is the same. Instead of repeating code, you can list multiple cases before the code. Here is another example:

```
int month = 2;
int year = 2000;
int numDays = 0;

switch (month) {
  case 1: case 3: case 5:
  case 7: case 8: case 10:
  case 12:
    numDays = 31;
    break;
  case 4: case 6:
  case 9: case 11:
    numDays = 30;
    break;
  case 2:
    if (((year % 4 == 0) &&
       ! (year % 100 == 0)) ||
        (year % 400 == 0))
        numDays = 29;
    else
      numDays = 28;
      break;
  default:
    cout << "Invalid month.";
    break;
}
cout << "Number of Days = " << numDays << endl;
```

In some cases, as shown above, you can exploit patterns to force ranges into a switch case, but frequently that is not possible and it also makes the code less readable. For example, above, the user has to realize that `letterGrade` is using integer division to retrieve the tens place of the original grade.

```
int grade = 62;
int letterGrade = grade / 10;
switch (letterGrade) {
  case 10: case 9: cout << "A";
          break;
  case 8: cout << "B";
          break;
  case 7: cout << "C";
          break;
  case 6: cout << "D";
          break;
  default: cout << "F";
}
```

Code Visualizer

#2: Else If is used for handling multiple variables

`switch case` can only compare against values - not variables. For example, if you wanted to compare the inputted day of the week with the current day of the week, you would need to use `else if`. `switch case` can handle values (`dayOfWeek == "Sunday"`) but not variables (`dayOfWeek == today`).

#3: Else If is used for compound conditionals

To check multiple conditions, an `else if` is needed.

Below is an example of a multiple choice grader using `switch case`:

```
int studentAnswer = 3;
string feedback1 = "This answer is wrong because....";
string feedback2 = "This answer is correct! You know this
        because...";
string feedback3 = "This answer is wrong. While the first part
        is correct...";
string feedback;

int correctAnswer = 2;
int points = 0;

switch (studentAnswer) {
  case 1: feedback = feedback1; break;
  case 2: feedback = feedback2; break;
  case 3: feedback = feedback3; break;
  default: feedback = "Invalid answer choice";
}

cout << feedback << endl;
```

challenge

Switch Case to Else If

- Change the `switch case` statements above into `else if` statements.
- Add a check to see if `studentAnswer == correctAnswer`.
- If the student's answer is correct, increment (`++`) the `points` variable.
- Print out the student's earned points at the end of the program using the `points` variable.

Code Visualizer

▼ **Sample solution**

```
if (studentAnswer == 1) {
  cout << feedback1 << endl;
}
else if (studentAnswer == 2) {
  cout << feedback2 << endl;
}
else if (studentAnswer == 3) {
  cout << feedback3 << endl;
}
else {
  cout << feedback << endl;
}

if (studentAnswer == correctAnswer) {
  points++;
}

cout << points << endl;
```