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Java Foundations

5-3
`switch` Statement

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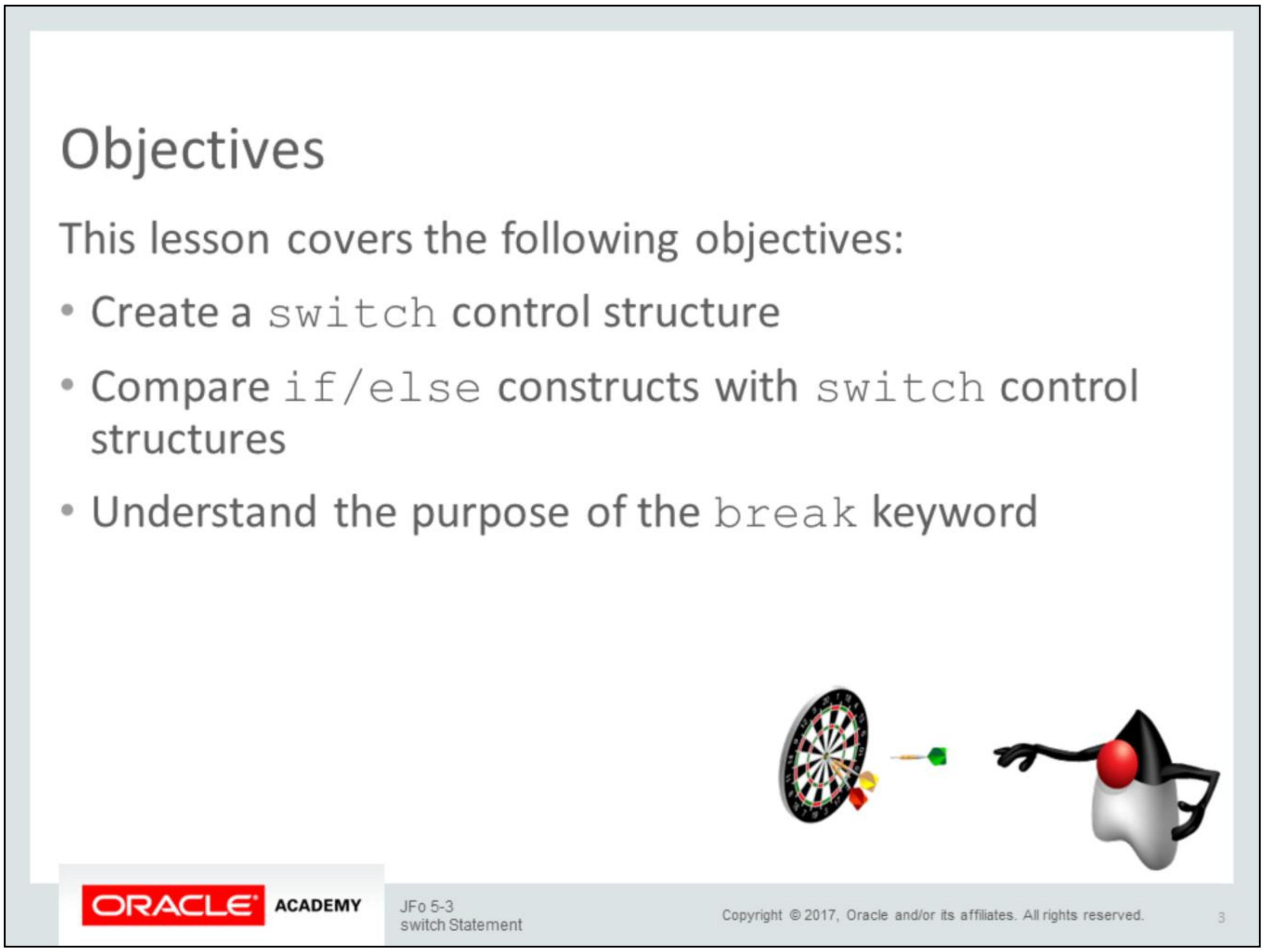
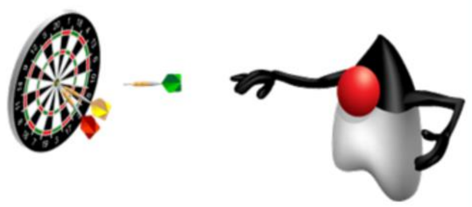
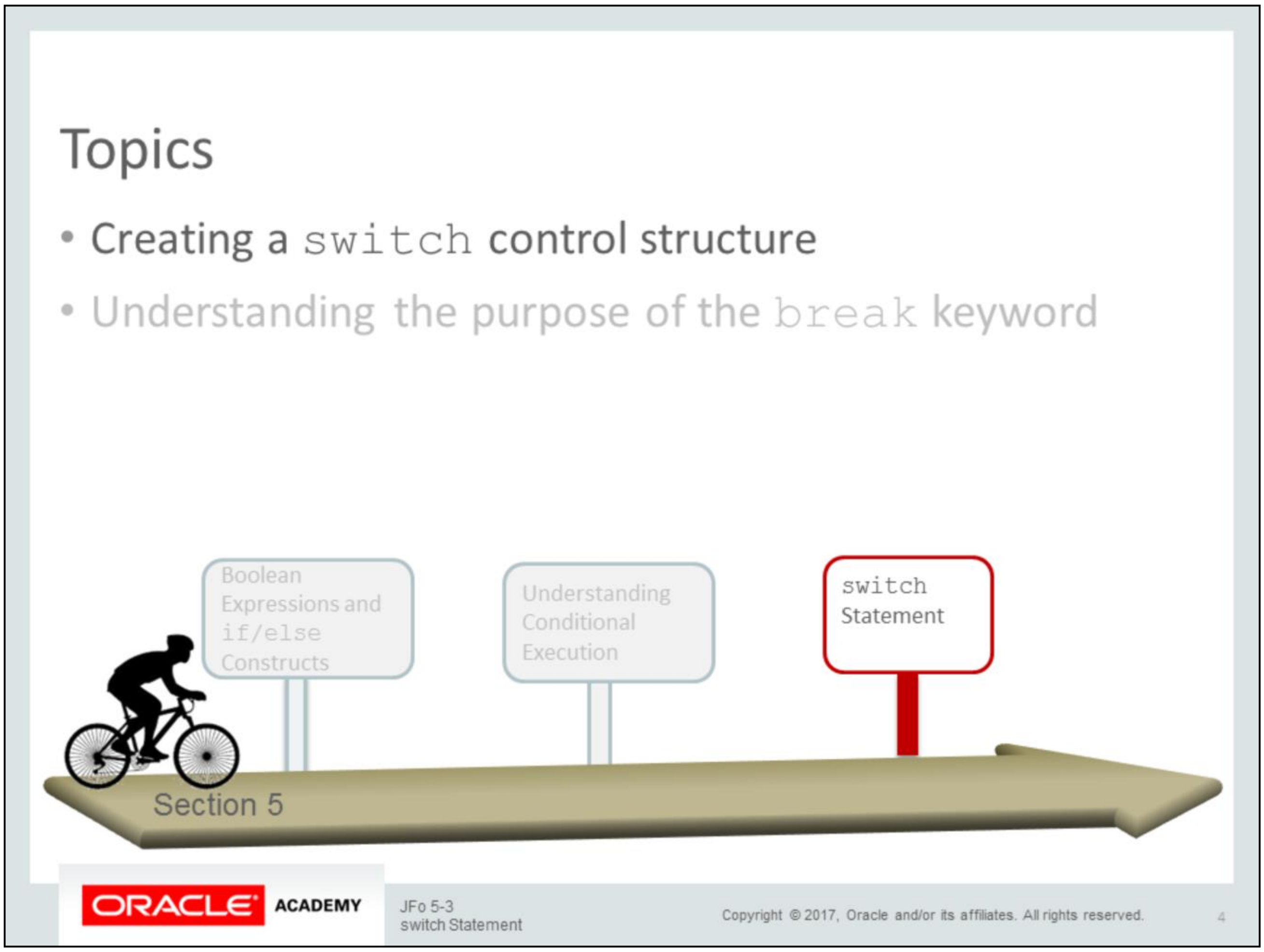


Objectives

This lesson covers the following objectives:

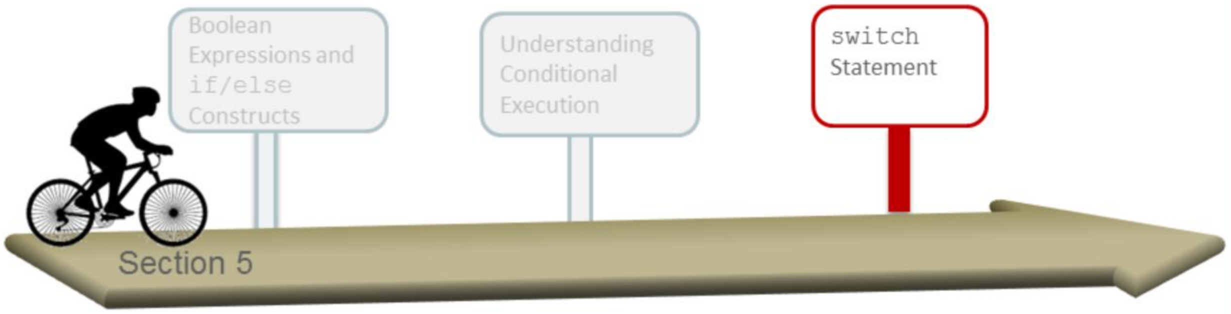
- Create a `switch` control structure
- Compare `if/else` constructs with `switch` control structures
- Understand the purpose of the `break` keyword



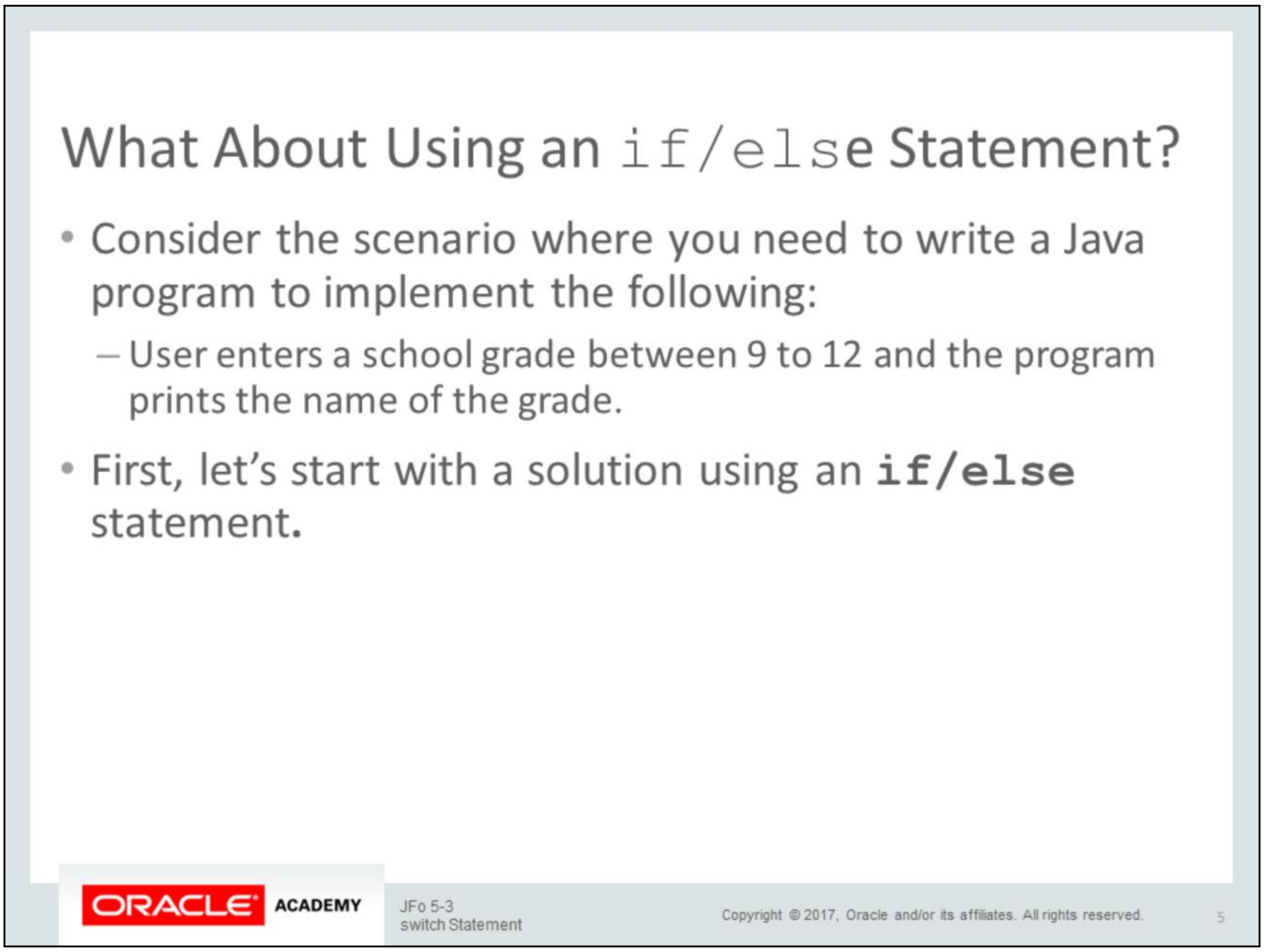


Topics

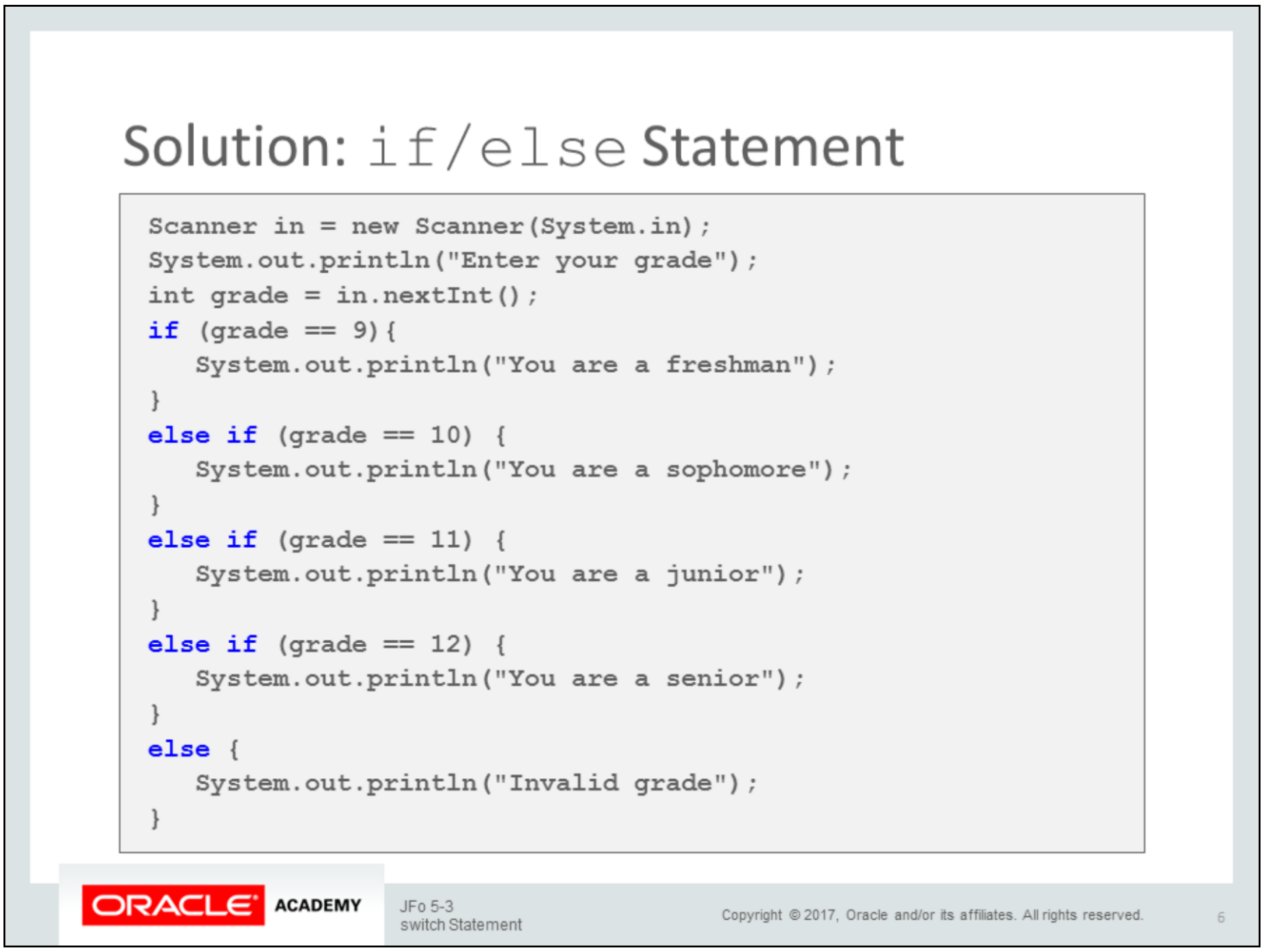
- Creating a `switch` control structure
- Understanding the purpose of the `break` keyword



Boolean Expressions and if/else Constructs
Understanding Conditional Execution
switch Statement
Section 5


What About Using an `if/else` Statement?

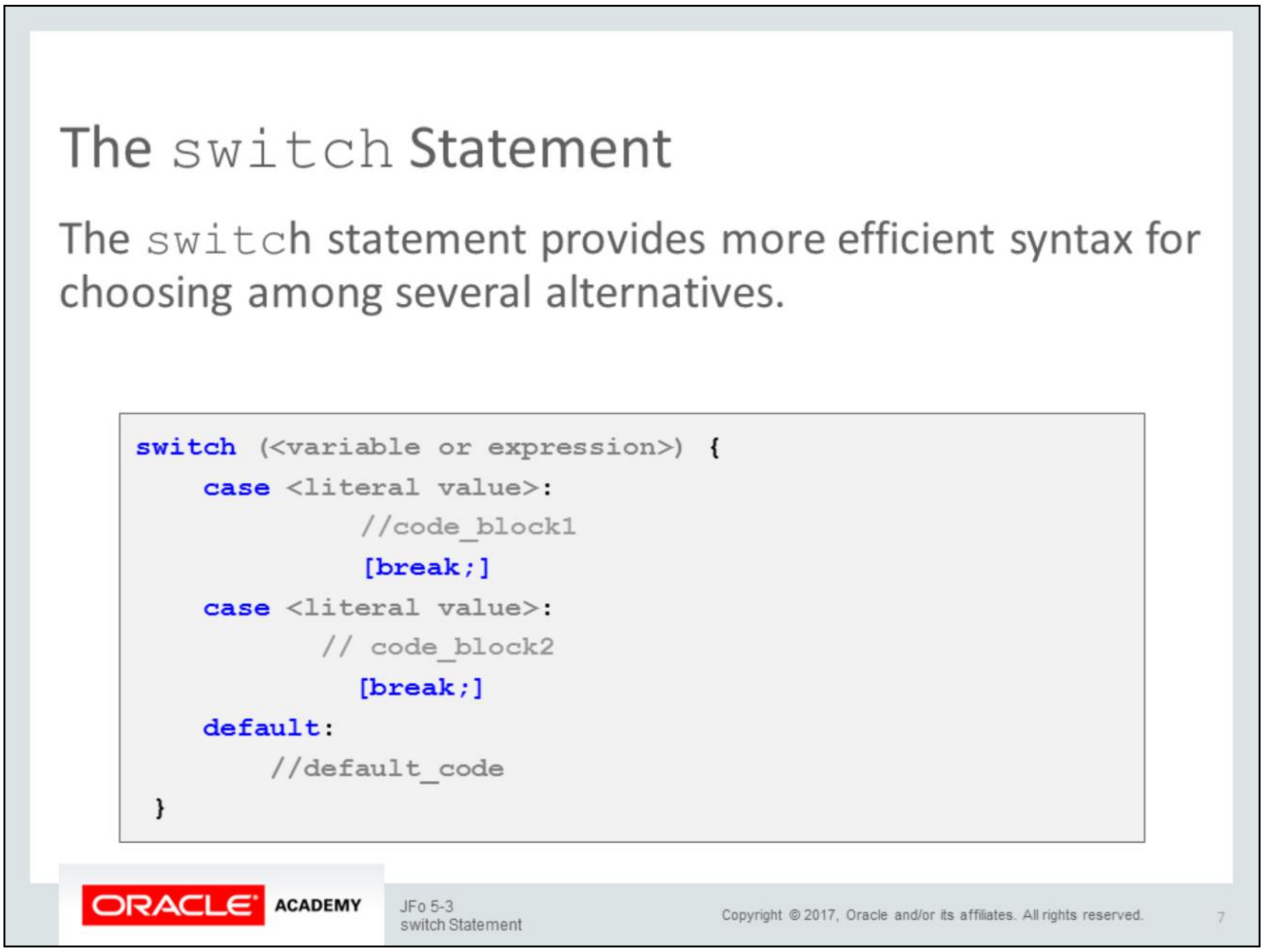
- Consider the scenario where you need to write a Java program to implement the following:
  - User enters a school grade between 9 to 12 and the program prints the name of the grade.
- First, let's start with a solution using an **`if/else`** statement.



Solution: if/else Statement

```
Scanner in = new Scanner(System.in);
System.out.println("Enter your grade");
int grade = in.nextInt();
if (grade == 9){
   System.out.println("You are a freshman");
}
else if (grade == 10) {
   System.out.println("You are a sophomore");
}
else if (grade == 11) {
   System.out.println("You are a junior");
}
else if (grade == 12) {
   System.out.println("You are a senior");
}
else {
   System.out.println("Invalid grade");
}
```

The code example shows a chained `if` to determine a student's class name.



The switch Statement

The switch statement provides more efficient syntax for choosing among several alternatives.

```
switch (<variable or expression>) {
    case <literal value>:
            //code_block1
            [break;]
    case <literal value>:
          // code_block2
            [break;]
    default:
        //default_code
 }
```

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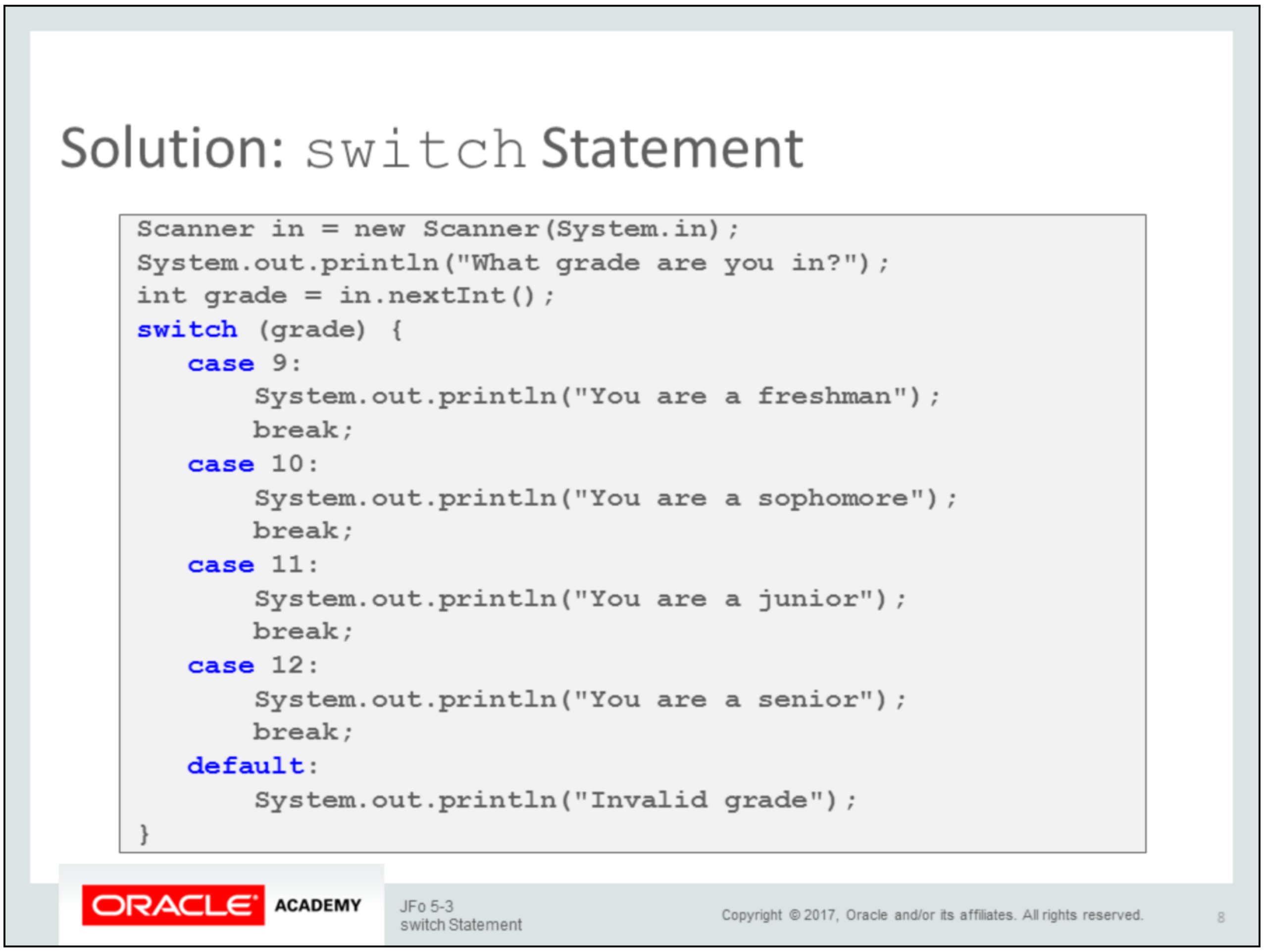
The syntax for the `switch` construct is shown in the slide.

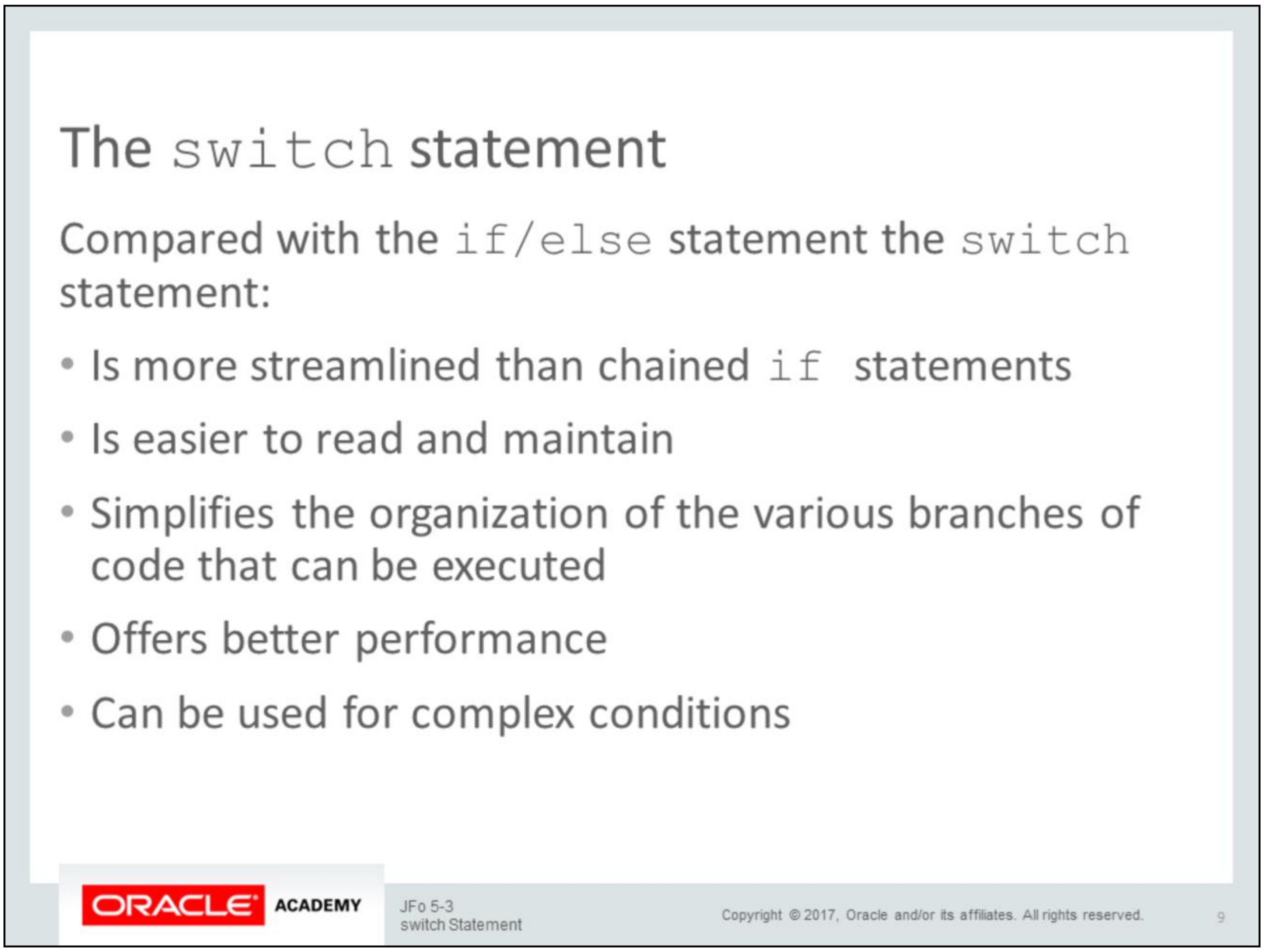
- The `switch` keyword indicates a `switch` statement.
- `variable` is the variable whose value you want to test. Alternatively, you could use an `expression`. The `variable` (or the result of the expression) can only be of type `char`, `byte`, `short`, `int`, or `String`.
- The `case` keyword indicates a value that you are testing. A combination of the `case` keyword and a literal value is referred to as a case label.
- The `break` statement is an optional keyword that causes the code execution to exit the `switch` statement immediately.



Solution: `switch` Statement

```
Scanner in = new Scanner(System.in);
System.out.println("What grade are you in?");
int grade = in.nextInt();
switch (grade) {
   case 9:
       System.out.println("You are a freshman");
       break;
   case 10:
       System.out.println("You are a sophomore");
       break;
   case 11:
       System.out.println("You are a junior");
       break;
   case 12:
       System.out.println("You are a senior");
       break;
   default:
       System.out.println("Invalid grade");
}
```

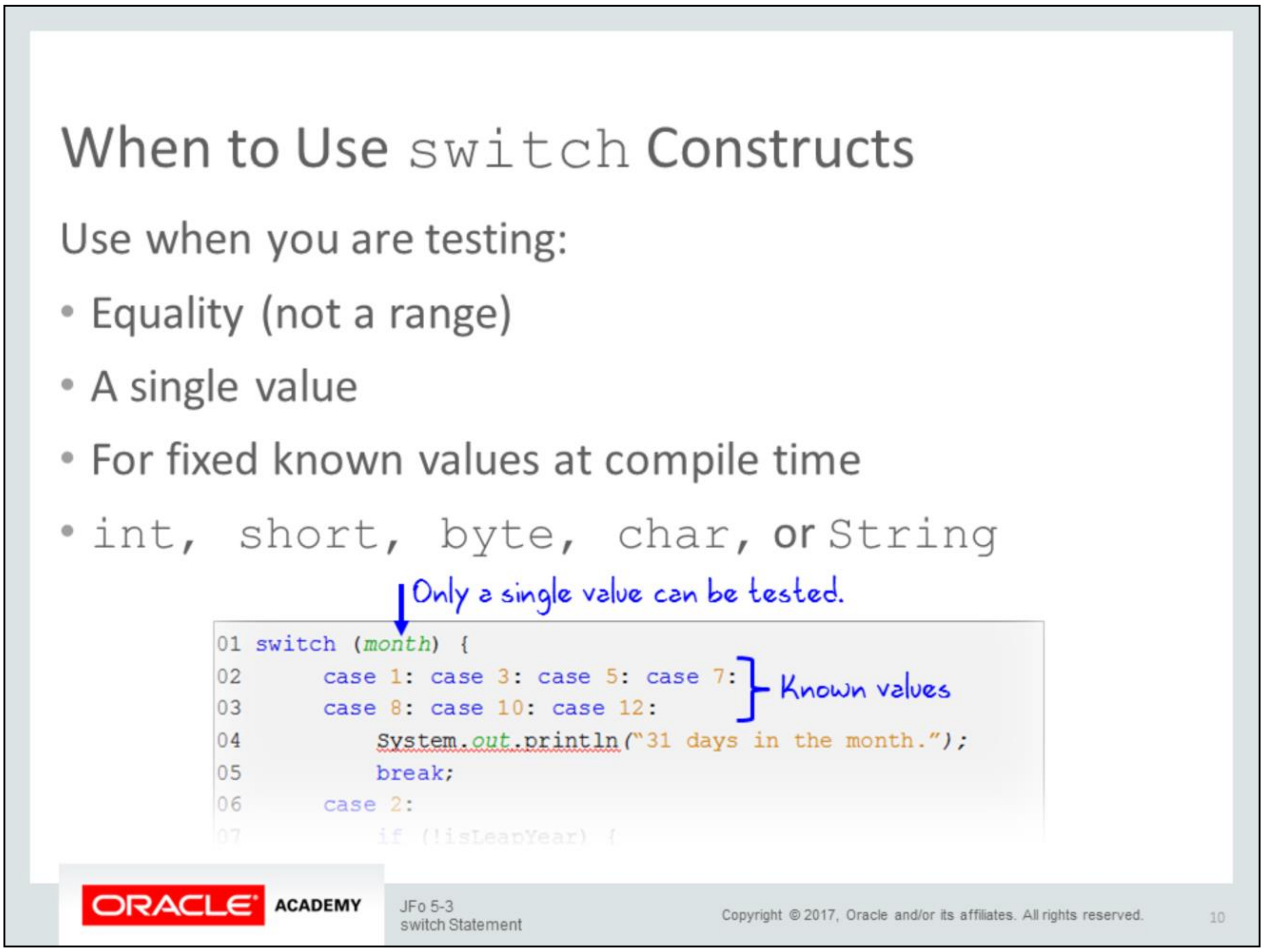
Compared with the solution provided by an `if` statement, this solution is more compact and readable.



The `switch` statement

Compared with the `if/else` statement the `switch` statement:

- Is more streamlined than chained `if` statements
- Is easier to read and maintain
- Simplifies the organization of the various branches of code that can be executed
- Offers better performance
- Can be used for complex conditions


Only a single value can be tested.
Known values

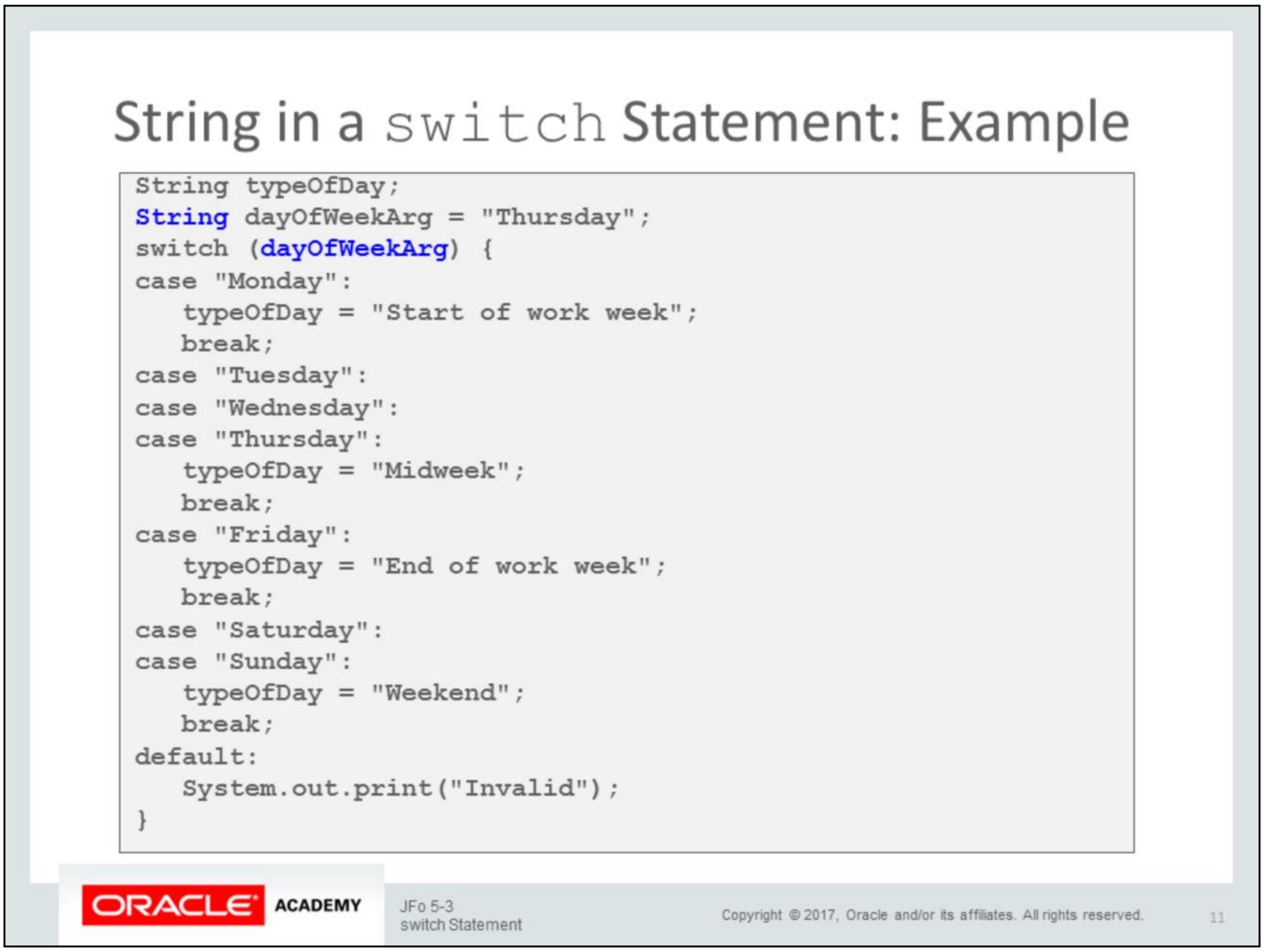
When to Use `switch` Constructs

Use when you are testing:

- Equality (not a range)
- A single value
- For fixed known values at compile time
- `int, short, byte, char,` or `String`

```
switch (month) {
     case 1: case 3: case 5: case 7:
     case 8: case 10: case 12:
         System.out.println("31 days in the month.");
         break;
     case 2:
         if (!isLeapYear) {
```

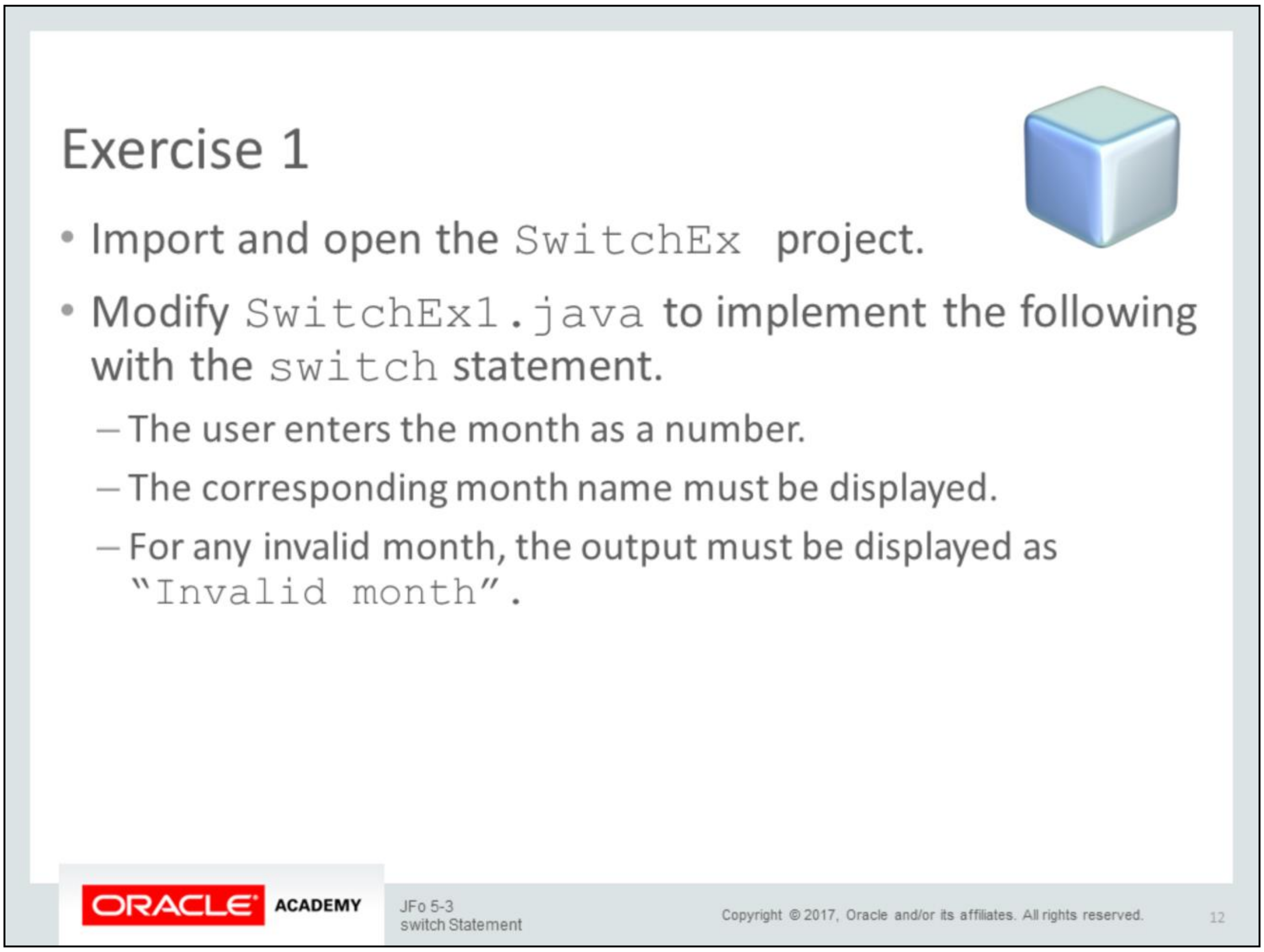
If you can't find values for individual test cases, use an `if/else` construct.



String in a switch Statement: Example

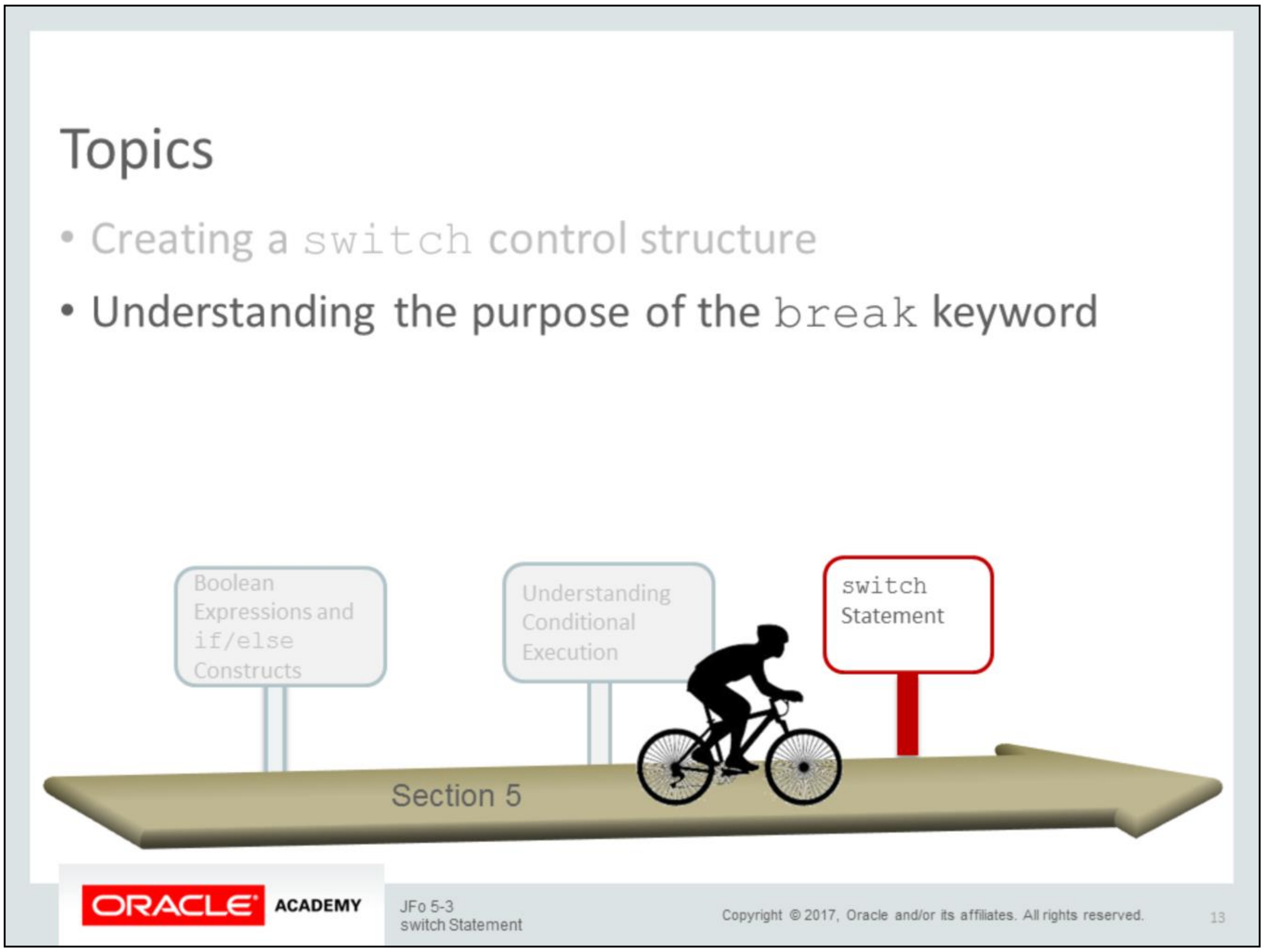
```
String typeOfDay;
String dayOfWeekArg = "Thursday";
switch (dayOfWeekArg) {
case "Monday":
   typeOfDay = "Start of work week";
   break;
case "Tuesday":
case "Wednesday":
case "Thursday":
   typeOfDay = "Midweek";
   break;
case "Friday":
   typeOfDay = "End of work week";
   break;
case "Saturday":
case "Sunday":
   typeOfDay = "Weekend";
   break;
default:
   System.out.print("Invalid");
}
```

This example shows using a string in a `switch` statement expression and in case label expressions.



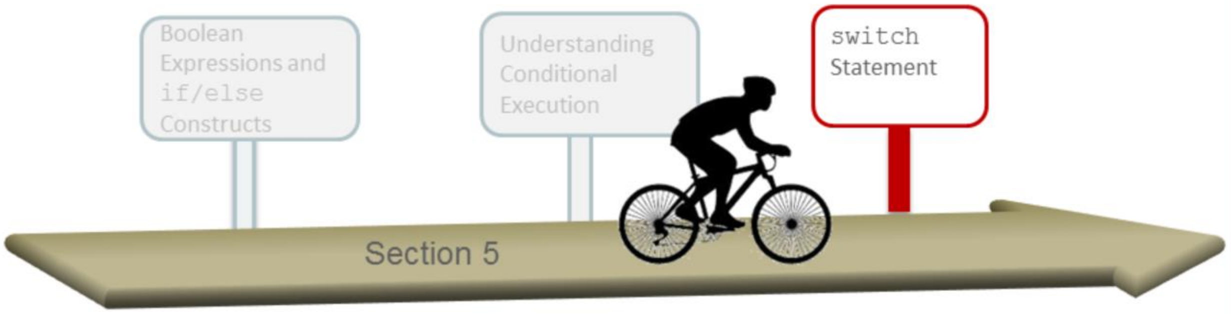
Exercise 1

- Import and open the `SwitchEx` project.
- Modify `SwitchEx1.java` to implement the following with the `switch` statement.
  - The user enters the month as a number.
  - The corresponding month name must be displayed.
  - For any invalid month, the output must be displayed as `“Invalid month”`.



Topics

- Creating a `switch` control structure
- Understanding the purpose of the `break` keyword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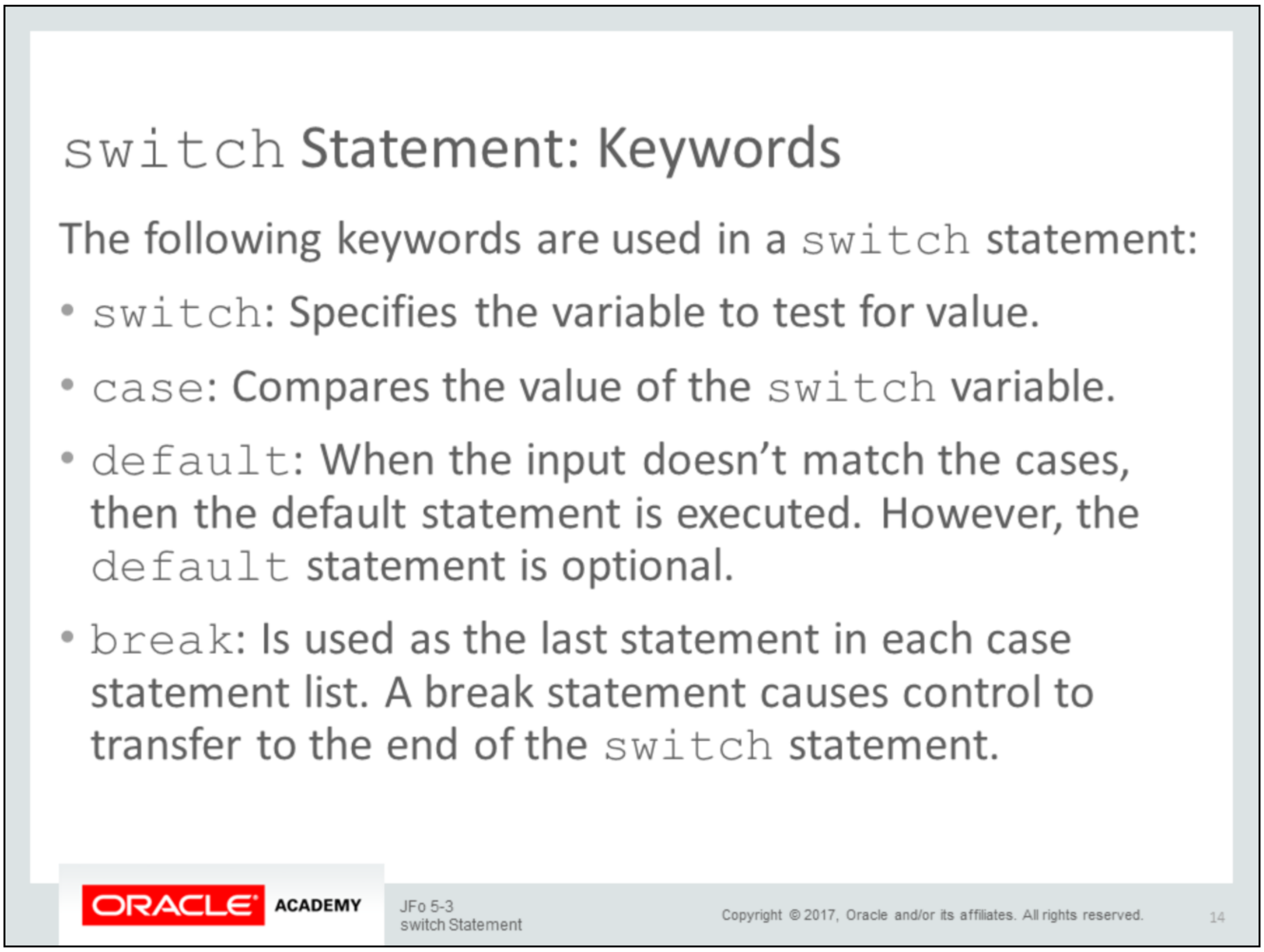


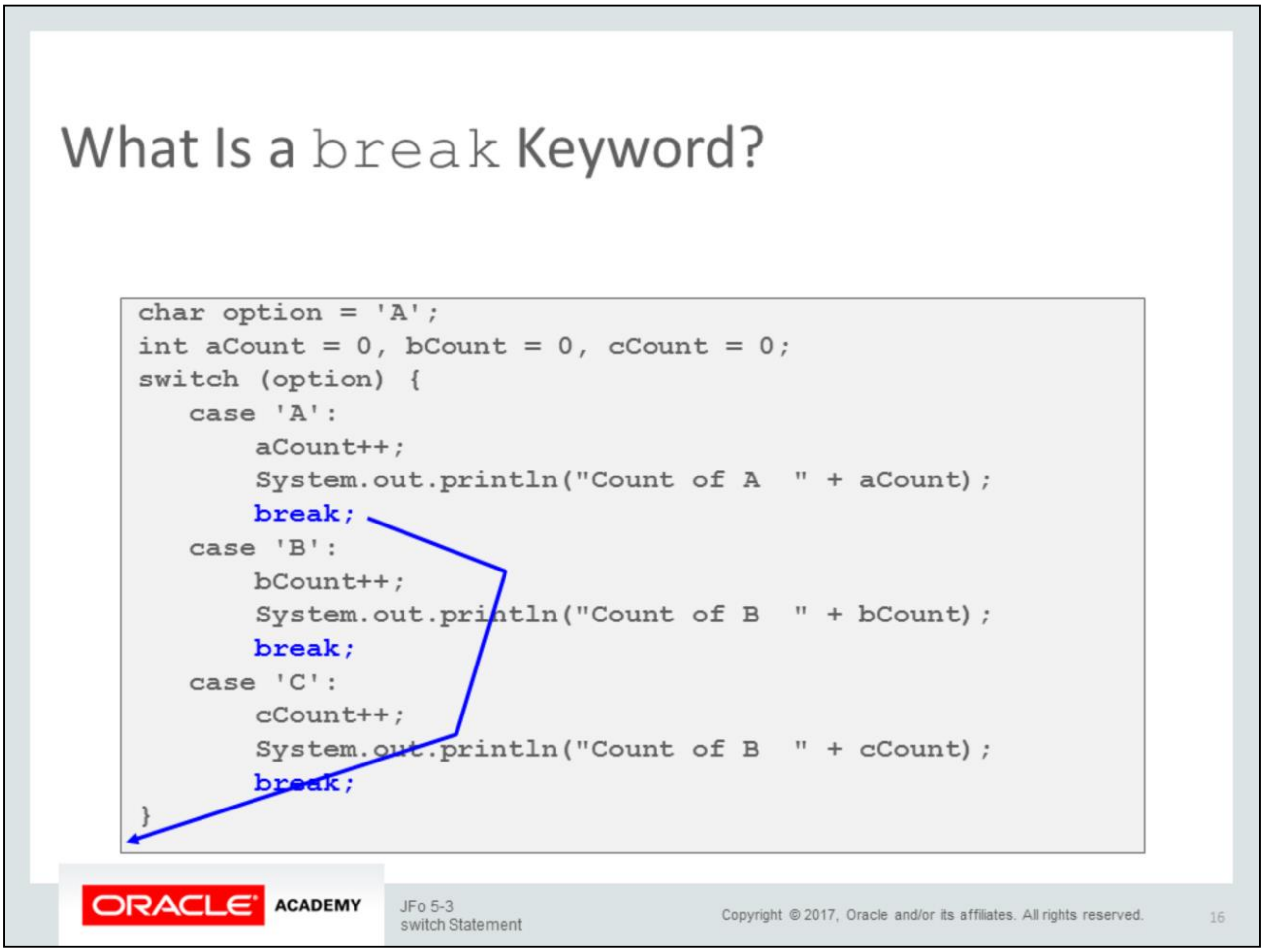
`switch` Statement: Keywords

The following keywords are used in a `switch` statement:

- `switch`: Specifies the variable to test for value.
- `case`: Compares the value of the `switch` variable.
- `default`: When the input doesn't match the cases, then the default statement is executed. However, the `default` statement is optional.
- `break`: Is used as the last statement in each case statement list. A break statement causes control to transfer to the end of the `switch` statement.

What Is a `break` Keyword?

Is used as the last statement in each `case` statement list and it causes control to transfer outside the `switch`



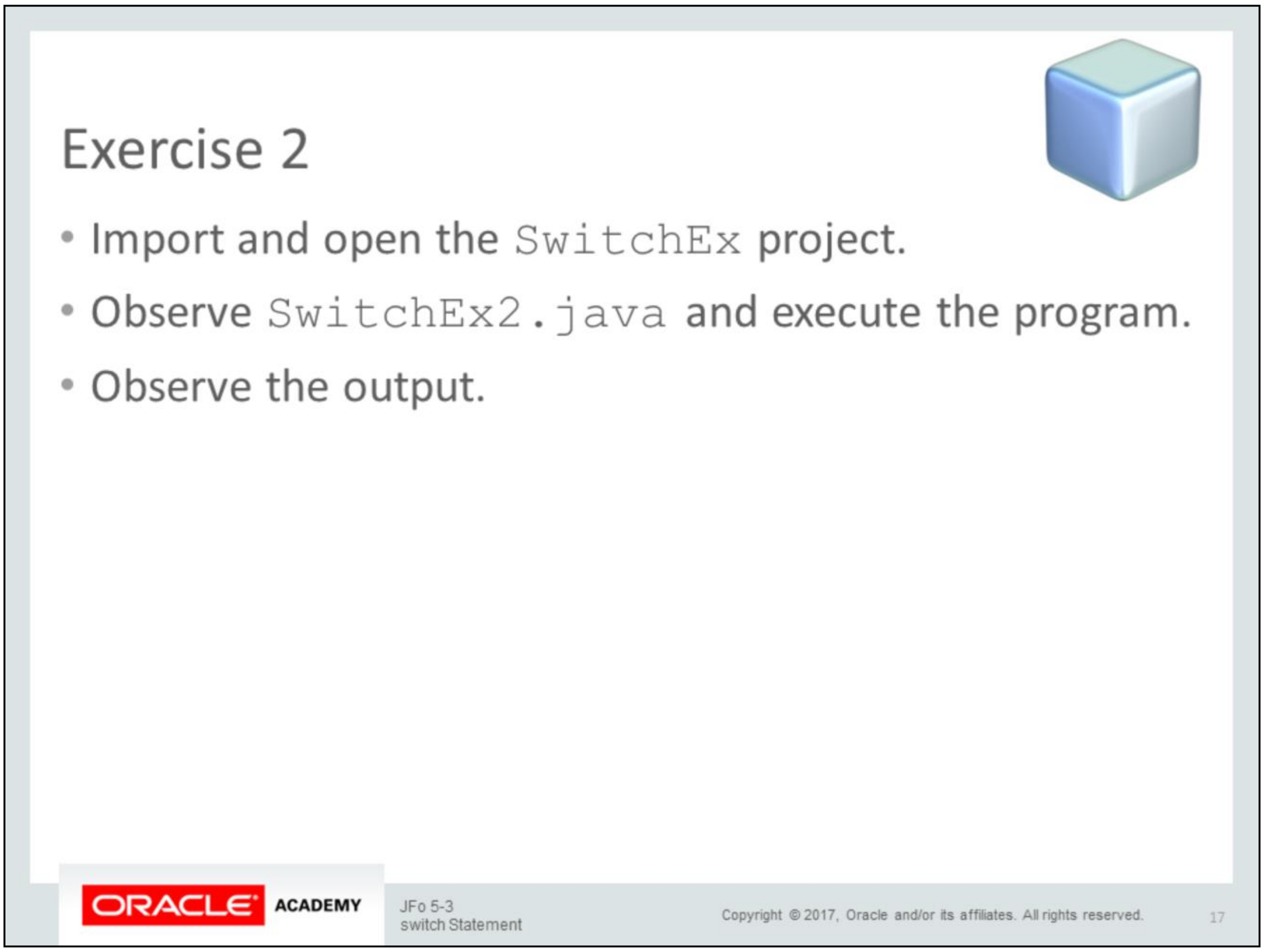
What Is a `break` Keyword?

```
char option = 'A';
int aCount = 0, bCount = 0, cCount = 0;
switch (option) {
    case 'A':
        aCount++;
        System.out.println("Count of A  " + aCount);
        break;
    case 'B':
        bCount++;
        System.out.println("Count of B  " + bCount);
        break;
    case 'C':
        cCount++;
        System.out.println("Count of B  " + cCount);
        break;
}
```

When the value of the option is A:

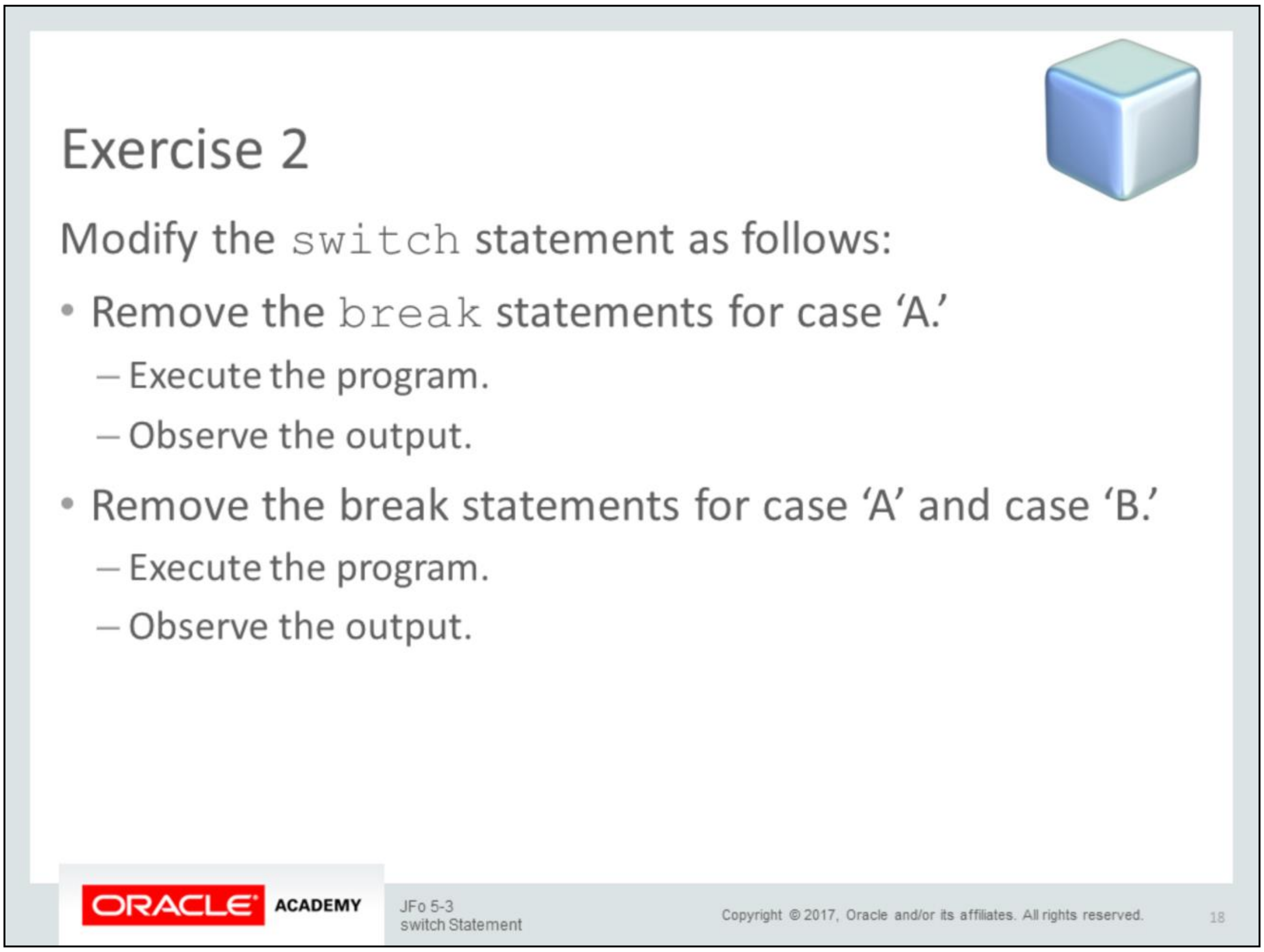
- The control jumps to the first `case` statement.
- The value of `aCount++` is incremented by 1.
- Because of the `break` statement used in this `case` statement, control is transferred outside the `switch` statement, and the other two `case` statements aren't executed.

Output: Count of A 1



Exercise 2

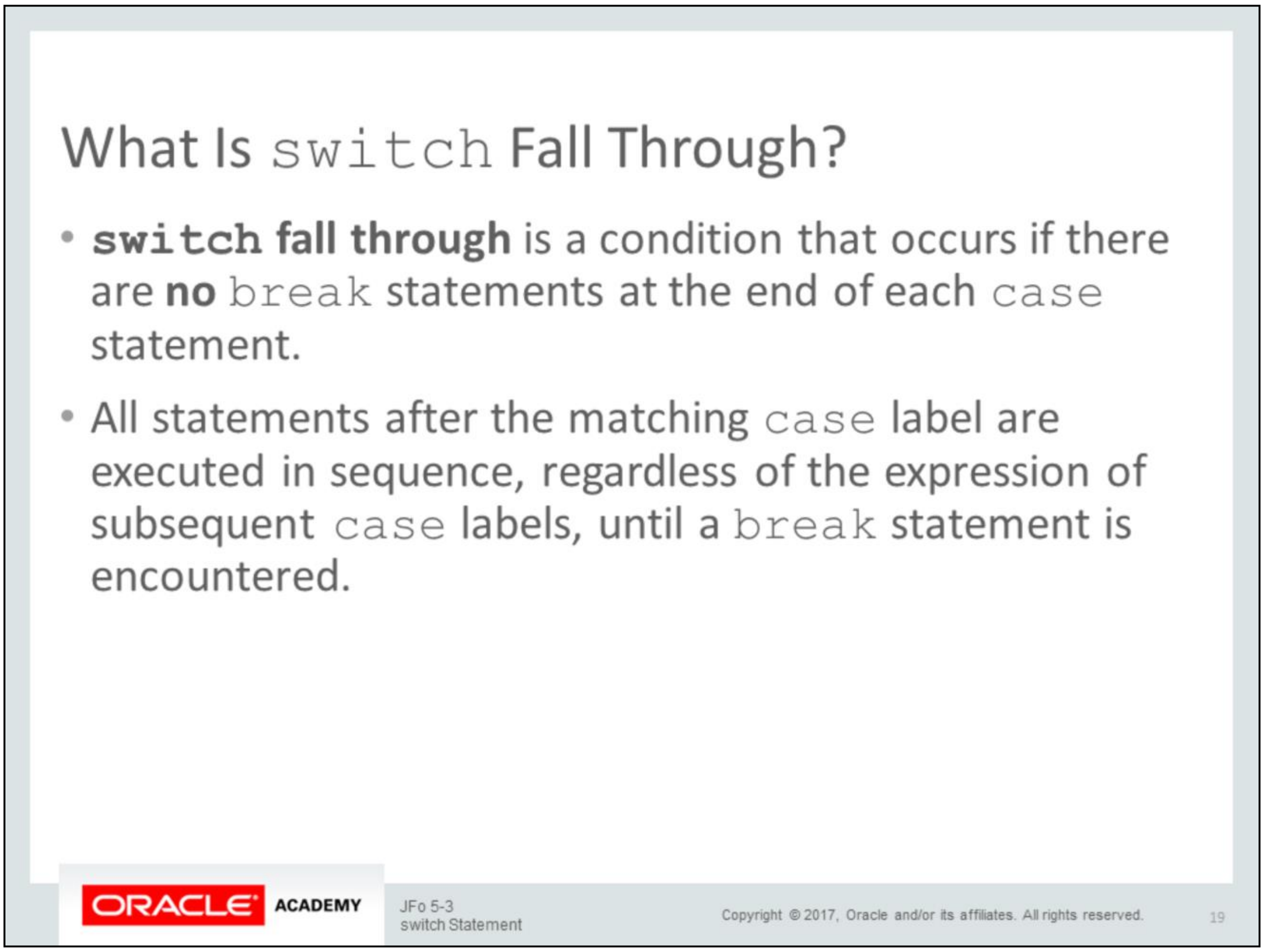
- Import and open the `SwitchEx` project.
- Observe `SwitchEx2.java` and execute the program.
- Observe the output.



Exercise 2

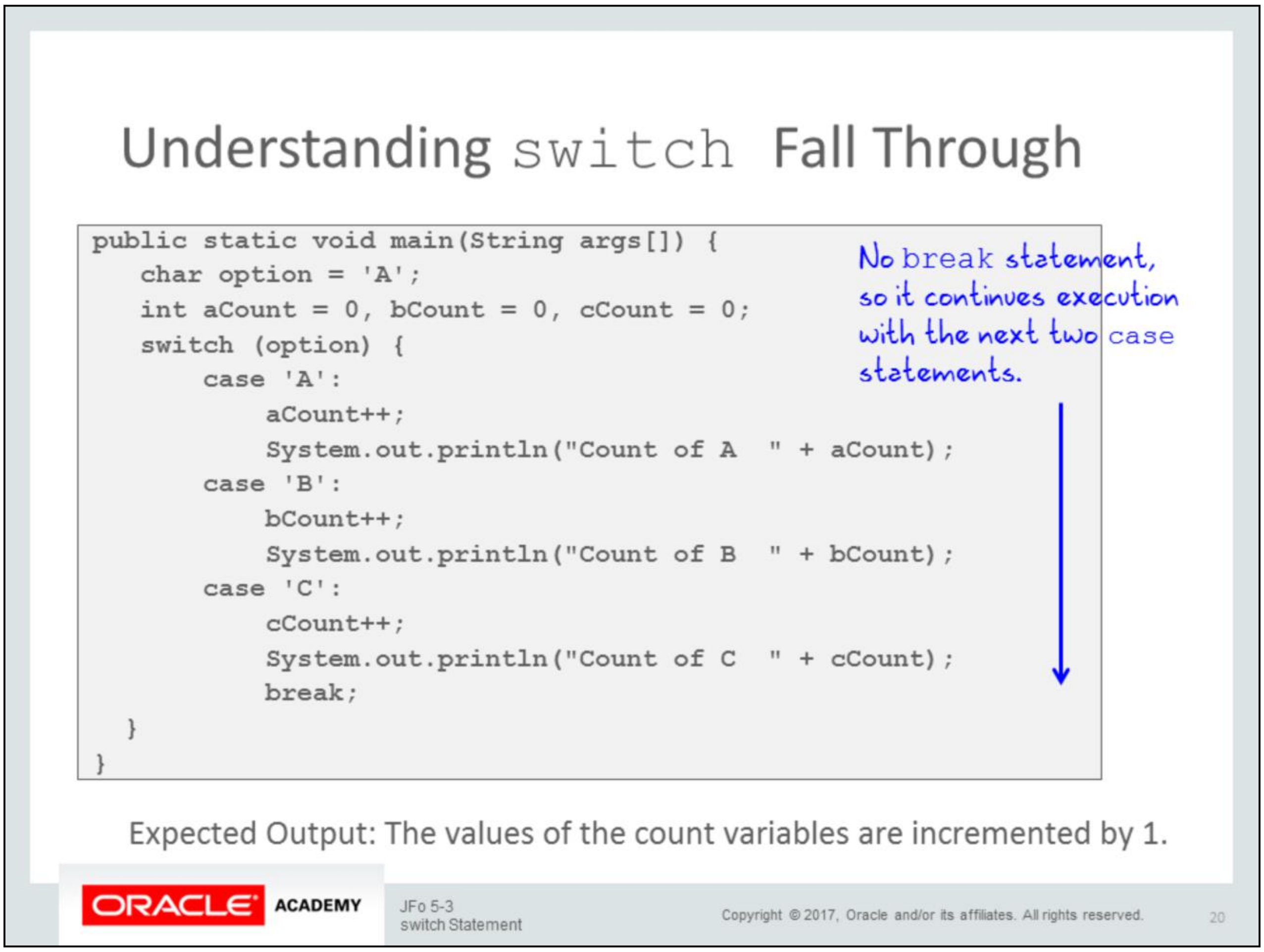
Modify the `switch` statement as follows:

- Remove the `break` statements for case ‘A.’
  - Execute the program.
  - Observe the output.
- Remove the break statements for case ‘A’ and case ‘B.’
  - Execute the program.
  - Observe the output.



What Is `switch` Fall Through?

- **`switch` fall through** is a condition that occurs if there are **no** `break` statements at the end of each `case` statement.
- All statements after the matching `case` label are executed in sequence, regardless of the expression of subsequent `case` labels, until a `break` statement is encountered.



Understanding switch Fall Through

```
public static void main(String args[]) {
    char option = 'A';
    int aCount = 0, bCount = 0, cCount = 0;
    switch (option) {
        case 'A':
            aCount++;
            System.out.println("Count of A  " + aCount);
        case 'B':
            bCount++;
            System.out.println("Count of B  " + bCount);
        case 'C':
            cCount++;
            System.out.println("Count of C  " + cCount);
            break;
    }
}
```

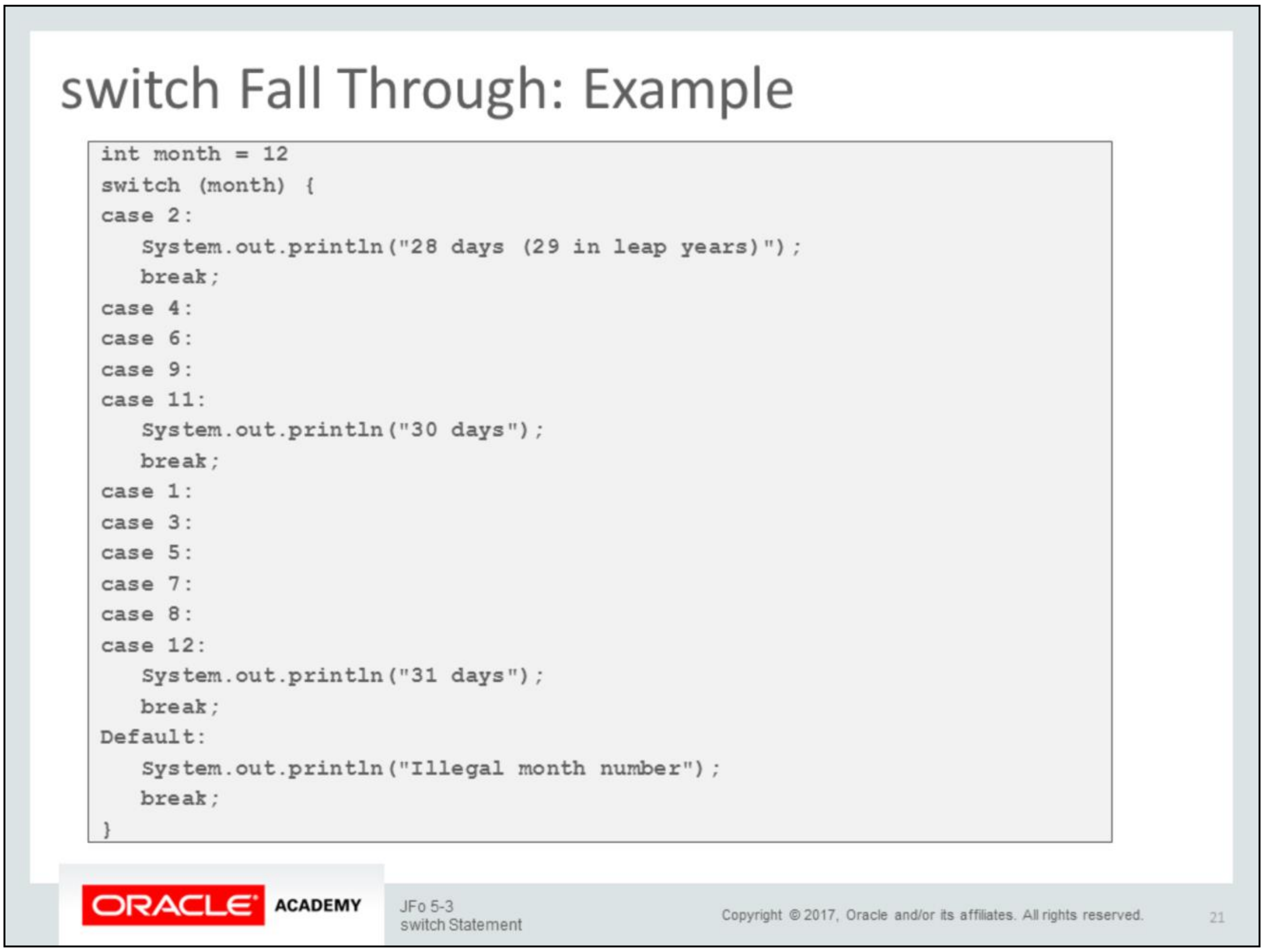
No break statement, so it continues execution with the next two case statements.

Expected Output: The values of the count variables are incremented by 1.

In this example, if the option value is A, it matches the first `case` statement. Because there is no `break` statement, execution continues with the next two `case` statements until a `break` statement is encountered. The values of `bCount++` and `cCount++` are also incremented by 1.

Output:

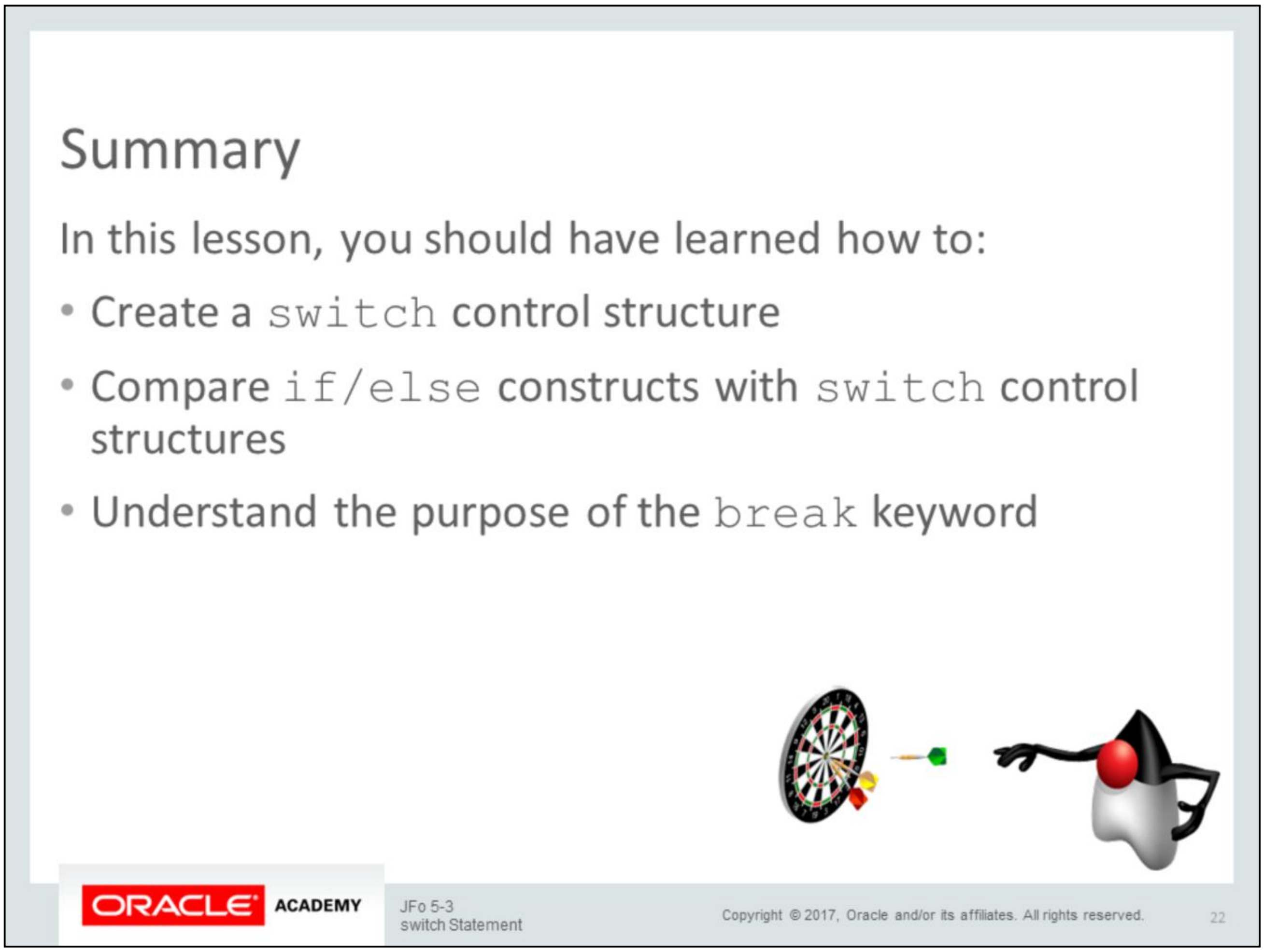
```
Count of A 1
Count of B 1
Count of B 1
```



switch Fall Through: Example

```
int month = 12
switch (month) {
case 2:
   System.out.println("28 days (29 in leap years)");
   break;
case 4:
case 6:
case 9:
case 11:
   System.out.println("30 days");
   break;
case 1:
case 3:
case 5:
case 7:
case 8:
case 12:
   System.out.println("31 days");
   break;
Default:
   System.out.println("Illegal month number");
   break;
}
```

This example shows how fall through is useful in some scenarios. It's sometimes preferable to have multiple cases without `break` statements between them.



Summary

In this lesson, you should have learned how to:

- Create a `switch` control structure
- Compare `if/else` constructs with `switch` control structures
- Understand the purpose of the `break` keyword

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switch Statement

22

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