Chapter 5
Control Statements:
Part 2

OBJECTIVES

- The essentials of counter-controlled repetition.
- To use the for and do...while repetition statements to execute statements in a program repeatedly.
- To understand multiple selection using the switch selection statement.
- To use the break and continue program control statements to alter the flow of control.
- To use the logical operators(逻辑运算符) to form complex conditional expressions(条件表达式) in control statements.
- To avoid the consequences of confusing the equality and assignment operators.

Topics

- **5.1 Introduction**
- 5.2 Essentials of Counter-Controlled Repetition
- 5.3 for Repetition Statement
- 5.4 Examples Using the for Statement
- 5.5 do...while Repetition Statement
- 5.6 switch Multiple-Selection Statement
- 5.7 break and continue Statements
- 5.8 Logical Operators
- 5.9 Confusing Equality (==) and Assignment (=) Operators
- 5.10 Structured Programming Summary

5.1 Introduction

- 选择： **if, if…else, switch**
- 循环： **while, for, do…while**

- **Logical operators to make powerful conditional expressions（&&, ||）**

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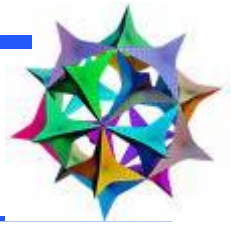
5.2 Essentials of Counter-Controlled Repetition



```
9.  int counter = 1; // declare and initialize control variable
10. while ( counter <= 10 ) // loop-continuation condition
11. {
12.     cout << counter << " ";
13.     counter++; // increment control variable by 1
14. } // end while
15. cout << endl; // output a newline
```

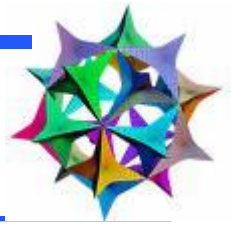
```
1 2 3 4 5 6 7 8 9 10
```

- Names counter(命名计数器变量)
- Declares it to be an integer(声明为整数)
- Reserves space for it in memory(在内存为其保留空间)
- Sets it to an initial value of 1(设定一个初始值)

等价

```
int counter;
counter = 1;
```

5.2 Essentials of Counter-Controlled Repetition



- 计数器变量(控制变量Control Variable)的命名

  counter

- 计数器变量的初始值(initial value)

  counter = 1

- 测试计数器变量终值(final value)的条件

  counter <= 10

- 每次循环时计数器变量修改的增量或减量(increment或decrement)

  counter++, ++counter, ……

```
1. int counter = 0 ;
2. while ( ++counter <= 10 )
3. {
4.      cout << counter << " ";
5.  } // end while
6. cout << endl; // output a newline
```

```
1 2 3 4 5 6 7 8 9 10
```

```
1. int counter = 0 ;
2. while ( counter++ <= 10 )
3. {
4.    cout << counter << " ";
5. } // end while
6. cout << endl; // output a newline
```

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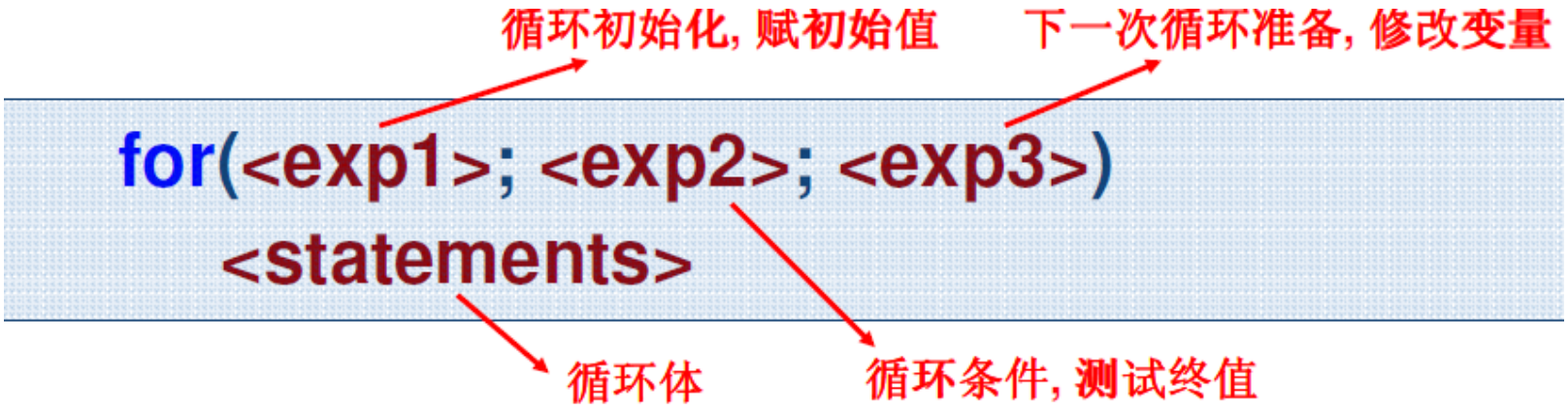
5.3 for Repetition Statement

- 需求：如何使用for语句输出1-10的数字？

```
9.   int counter = 1; // declare and initialize control variable
10.  while ( counter <= 10 ) // loop-continuation condition
11.  {
12.      cout << counter << " ";
13.      counter++; // increment control variable by 1
14.  } // end while
15.  cout << endl; // output a newline
```

5.3 for Repetition Statement

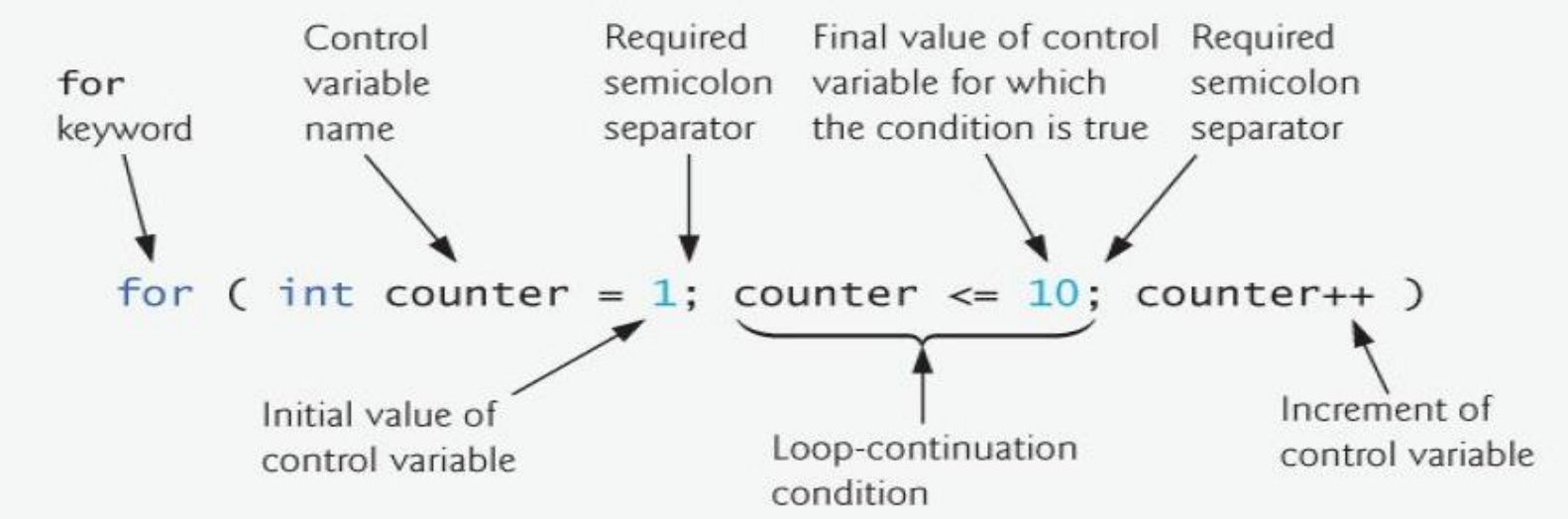
- 语法规范：



- <exp1>, <exp2>, <exp3>可以是任意表达式，并且都可以省略
- 通常，<exp1>为赋值表达式；<exp2>为表示条件的关系或逻辑表达式；<exp3>为自增、自减表达式

5.3 for Repetition Statement

1. Header Components



2. Body({ })

```
1. for (int counter = 1; counter <= 10; counter++)      Header
2. {                                                    Body
3.    statement1; statement2; ……
4. }
```

5.3 for Repetition Statement

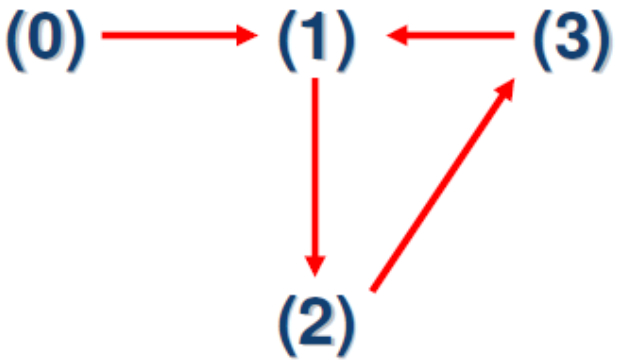
```
1.  for ( int counter = 1; counter <= 10; counter++ )
2.      cout << counter << " ";
3.  cout << endl;
```

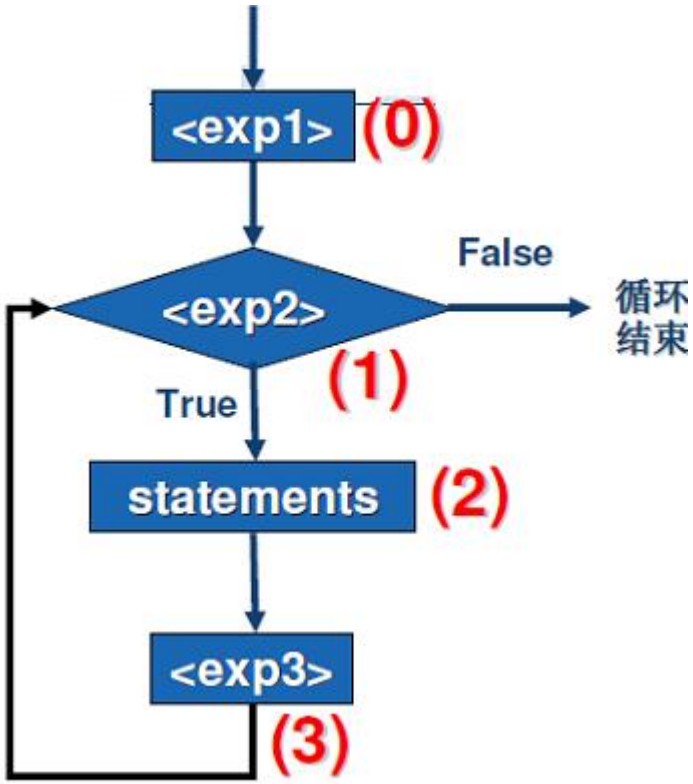
```
1 2 3 4 5 6 7 8 9 10
```

5.3 for Repetition Statement

- 执行顺序：
- for (initialization; loopCondition; e/increment)
  (0) (1) (3)
  statements1
  (2)

结论：

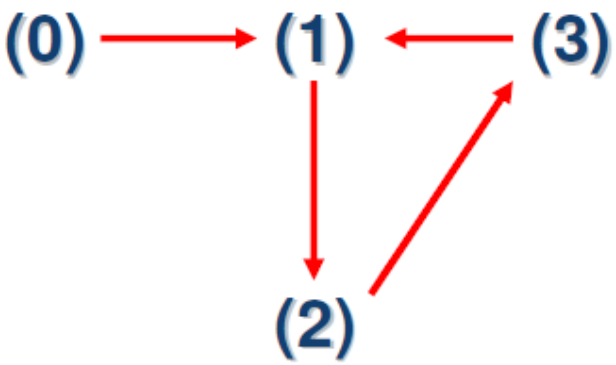




5.3 for Repetition Statement

- 与while循环的对应关系

```
for(<exp1>; <exp2>; <exp3>)
    <statements>
```




```
<exp1>;
while (<exp2>)
{
    <statements>;
    <exp3>;
}
```

5.3 for Repetition Statement

```
1.  for ( int counter = 1; counter <= 10; counter++ )
2.      cout << counter << " ";
3.  cout << endl;
```

两种循环代码是否完全等价？

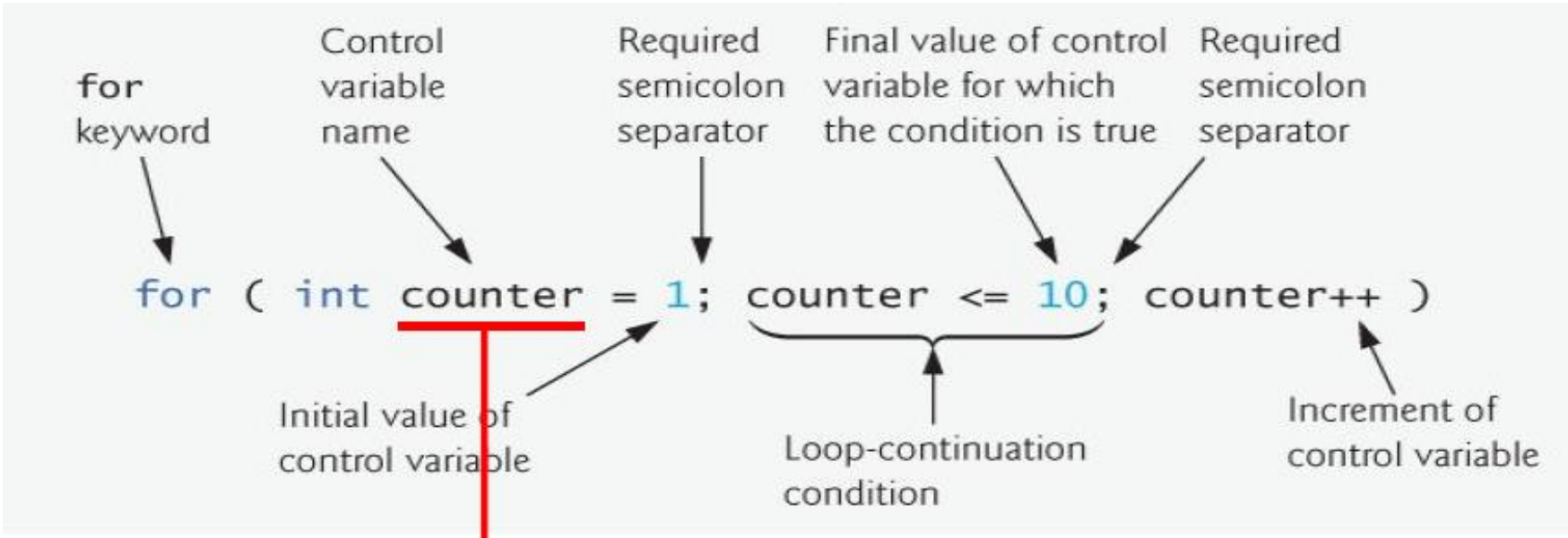
```
9.  int counter = 1; // declare and initialize control variable
10. while ( counter <= 10 ) // loop-continuation condition
11. {
12.     cout << counter << " ";
13.     counter++; // increment control variable by 1
14. } // end while
15. cout << endl; // output a newline
```

5.3 for Repetition Statement

```
1.  for ( int counter = 1; counter <= 10; counter++ )
2.      cout << counter << " ";
3.  cout << counter << endl;
```

```
9.  int counter = 1; // declare and initialize control variable
10. while ( counter <= 10 ) // loop-continuation condition
11. {
12.     cout << counter << " ";
13.     counter++; // increment control variable by 1
14. } // end while
15. cout << counter << endl; // output a newline
```

5.3 for Repetition Statement



控制变量可以在for结构以外声明，也可以在for结构内部(for头部)声明，但其作用域会有不同

5.3 for Repetition Statement

- 如果在for结构中声明变量，则不要在for语句外使用该变量(避免下面的用法)

```
for ( int i = 0; i <= 10; i++ )
{ …… }
cout << i << endl;
```

- 如果确实希望在for语句外使用，则不要在for结构中声明该变量

```
int i = 0;
for ( ; i <= 10; i++ )
{ …… }
cout << i << endl;
```

Q & A

- 写出输出结果：

```
1.  int counter = 10;
2.  while ( --counter )
3.      cout << counter << " ";
4.  cout << endl; // output a newline
```

```
9 8 7 6 5 4 3 2 1
```

```
1.  int sum = 0, i = 1;
2.  for ( ; i<=100; )
3.      sum += i++;
4.  cout << sum << endl;
```

```
5050
```

5.3 for Repetition Statement

Comma expression(逗号表达式)

Operator	Symbol	Form	Operation
Comma	,	x, y	Evaluate x then y, return value of y

- ① 用逗号隔开的一系列表达式,从左往右依次计算
- ② 逗号操作符在c++操作符中优先级最低
- ③ 逗号表达式的值: 最右边的表达式的值
- ④ 主要作用: 用于for循环中初始化多个条件，使用多个自增(自减)表达式

```
int x = 0,  y = 2;
int z = ( ++x, x + y );
```

5.3 for Repetition Statement

Comma expression(逗号表达式)

```
for (int i = 1, j = 10; i <= 10; i++, j--)
    statement;
```

5.3 for Repetition Statement

Omitted expressions(省略的表达式)

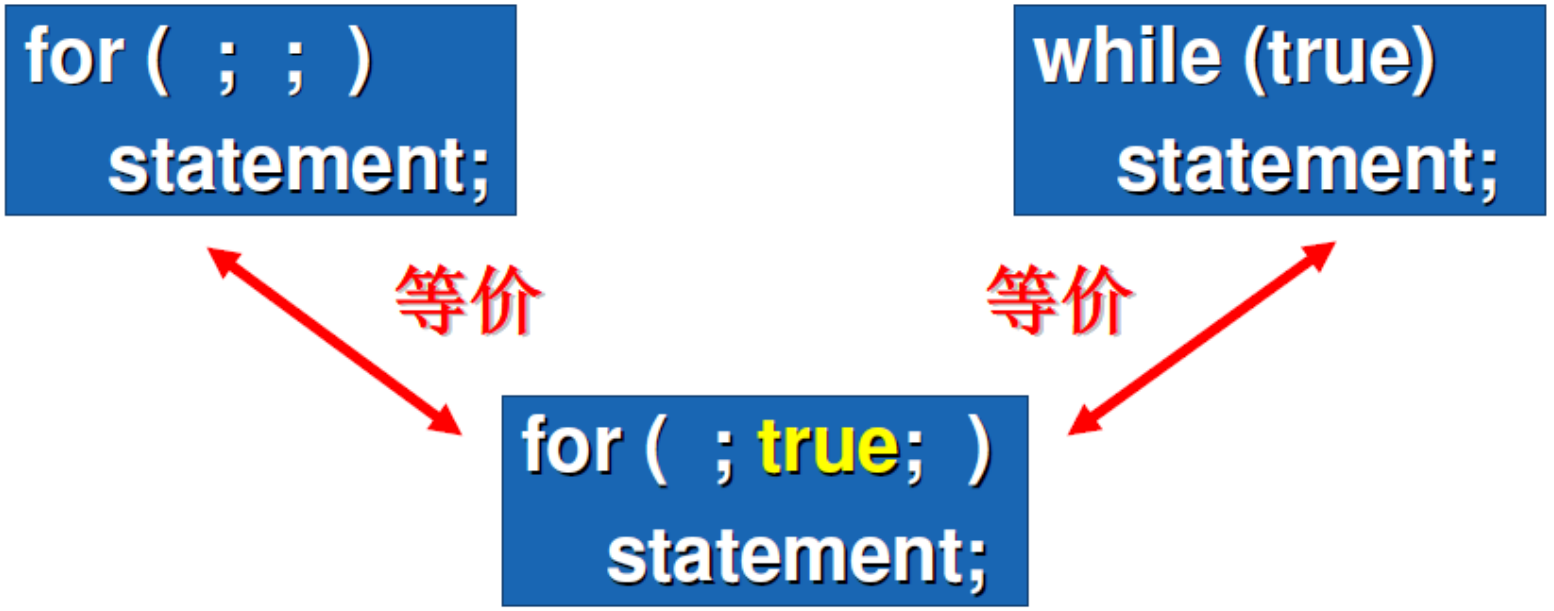
- ① for头部中的三个表达式都可以省略, 但分号必须保留
- ② 如果在for语句之前已经对控制变量进行了初始化, 那么在for语句中可以省略初始化表达式
- ③ 如果自增(自减)表达式作为语句放在循环体中,则可以省略for语句头结构中的第三个表达式

```
1.  int counter = 1;
2.  for ( ; counter < 10; )
3.  {
4.      cout << counter << " "; // 1 2 3 4 5 6 7 8 9
5.      counter++;
6.  }
```

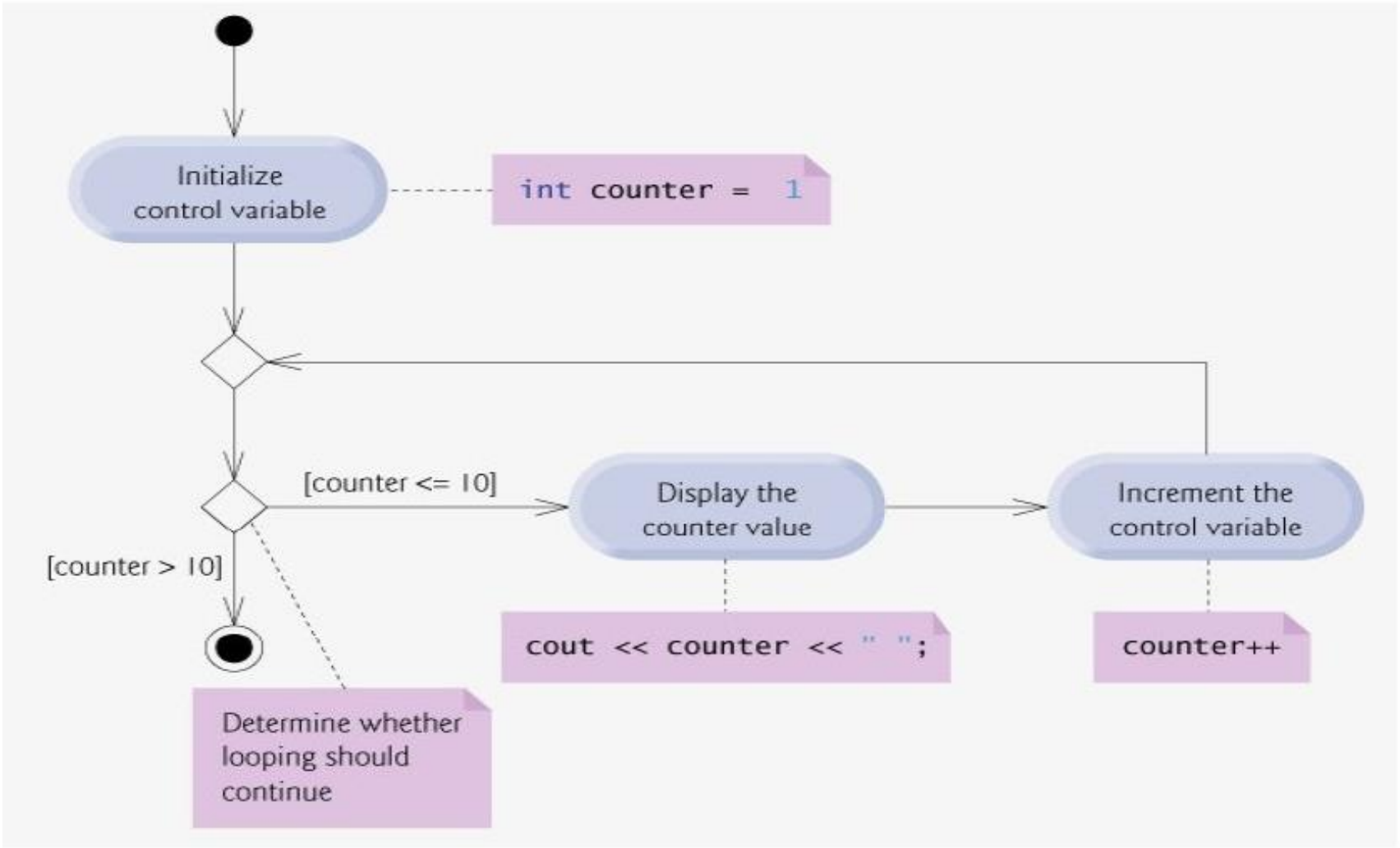
5.3 for Repetition Statement

Omitted expressions(省略的表达式)

- ④ 如果循环条件省略，C++认为条件为“真”，将会无限循环



5.3 for Repetition Statement



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5.4 Examples Using the for Statement

- for (int i = 1; i <= 100; i++) cout << i;

  1, 2, 3, 4, ……, 100

- for (int i = 20; i >= 2; i -= 2) cout << i;

  20, 18, 16, 14, ……, 2

- for (int i = 7; i <= 77; i += 7) cout << i;

  7, 14, 21, 28, 35, ……, 77

- for (int i = 7; i <= 80; i += 7) cout << i;

  7, 14, 21, 28, 35, ……, 77

5.4 Examples Using the for Statement

- 问题1：计算2至20之间偶数之和

```
1.    int total = 0;
2.    for ( int number = 2; number <= 20; number += 2 )
3.       total += number;
```

2 + 4 + 6 + … + 20 = 110

```
4.    for ( int number = 2, total = 0;
5.             number <= 20;
6.             total += number, number += 2 ) ;
```

2 + 4 + 6 + … + 20 = 110

```
7.    for ( int number = 2, total = 0;
8.             number <= 20;
9.             number += 2, total += number) ;
```

4 + 6 + 8 + … + 22 = 130

5.4 Examples Using the for Statement

- 问题2：计算 $1+\frac{1}{3}+\frac{1}{5}...+\frac{1}{9}$

5.4 Examples Using the for Statement

- 问题3：一个人在银行存款1000.00美元，利率为5%，假设所有利息留在账号中，计算并打印出10年内每年年末的金额。用下列公式求出金额：

$$a = p(1 + r)^n$$

- 其中：p是原存款额, r是年利率, n是年数， a是年末总存款

5.4 Examples Using the for Statement

```
1.  // P154. Fig. 5.6
2.  // Compound interest calculations with for.
3.  #include <iostream>
4.  using std::cout;
5.  using std::endl;
6.  using std::fixed;
7.
8.  #include <iomanip>
9.  using std::setw; // enables program to set a field width
10. using std::setprecision;
11.
12. #include <cmath> // standard C++ math library
13. using std::pow; // enables program to use function pow
```

```
15  int main()
16  {
17     double amount; // amount on deposit at end of each year
18     double principal = 1000.0; //
19     double rate = .05; // interest
20
21     // display headers
22     cout << "Year" << setw( 21 ) << "Amount on deposit" << endl;
23
24     // set floating-point number format
25     cout << fixed << setprecision( 2 );
26
27     // calculate amount on deposit for
28     for ( int year = 1; year <= 10; year++ )
29     {
30        // calculate new amount for specified year
31        amount = principal * pow( 1.0 + rate, year );
32
33        // display the year and the amount
34        cout << setw( 4 ) << year << setw( 21 ) << amount << endl;
35     } // end for
36
37     return 0; // indicate successful termination
38  } // end main
```

设置域宽，即设置输出数据所占的宽度，如果输出值超出设定域宽，则按照实际宽度输出. 仅适用于下一次输出

sticky setting(粘性设置)，此后的输出会按照此处的设定，直到重新设定

$(1.0 + rate)^{year}$

5.4 Examples Using the for Statement

```
#include <cmath>
```

- double pow(double x, double y);
- 计算x 的y 次幂
- pow(1.0 + rate, year)
- Argument Coercion, 实参的强制类型转换 (Ch6.5)

5.4 Examples Using the for Statement

- 格式化流算子
- ① 带参数的流操作算子

  setw(int), setprecision(int)

  #include<iomanip>
- ② 不带参数的流算子

  fixed, left, right (缺省)

  #include<iostream>

5.4 Examples Using the for Statement

- 格式化流算子
- ① 粘性设置(sticky setting): 可以设定程序其后所有cout的输出格式, 直到被重置, 如:

  setprecision(int), fixed, left, right 等等
- ② 非粘性设置: 只作用在紧接着的cout输出上, 如: setw(int)

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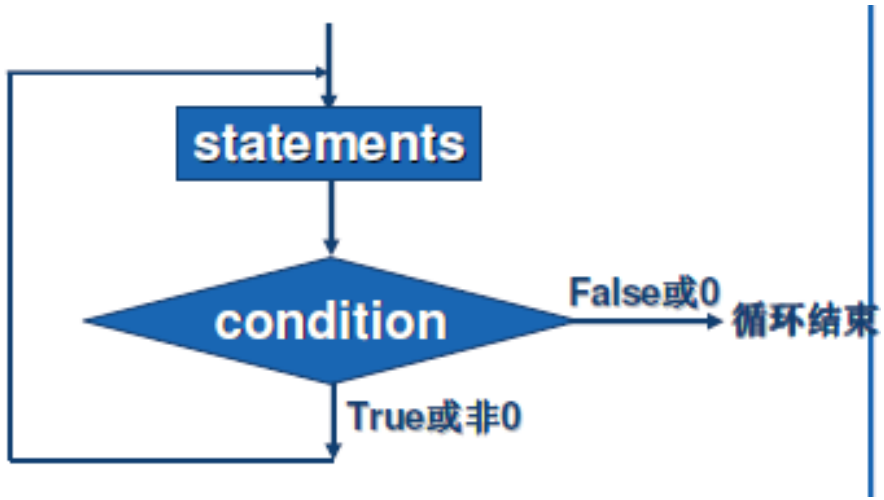
5.5 do...while Repetition Statement

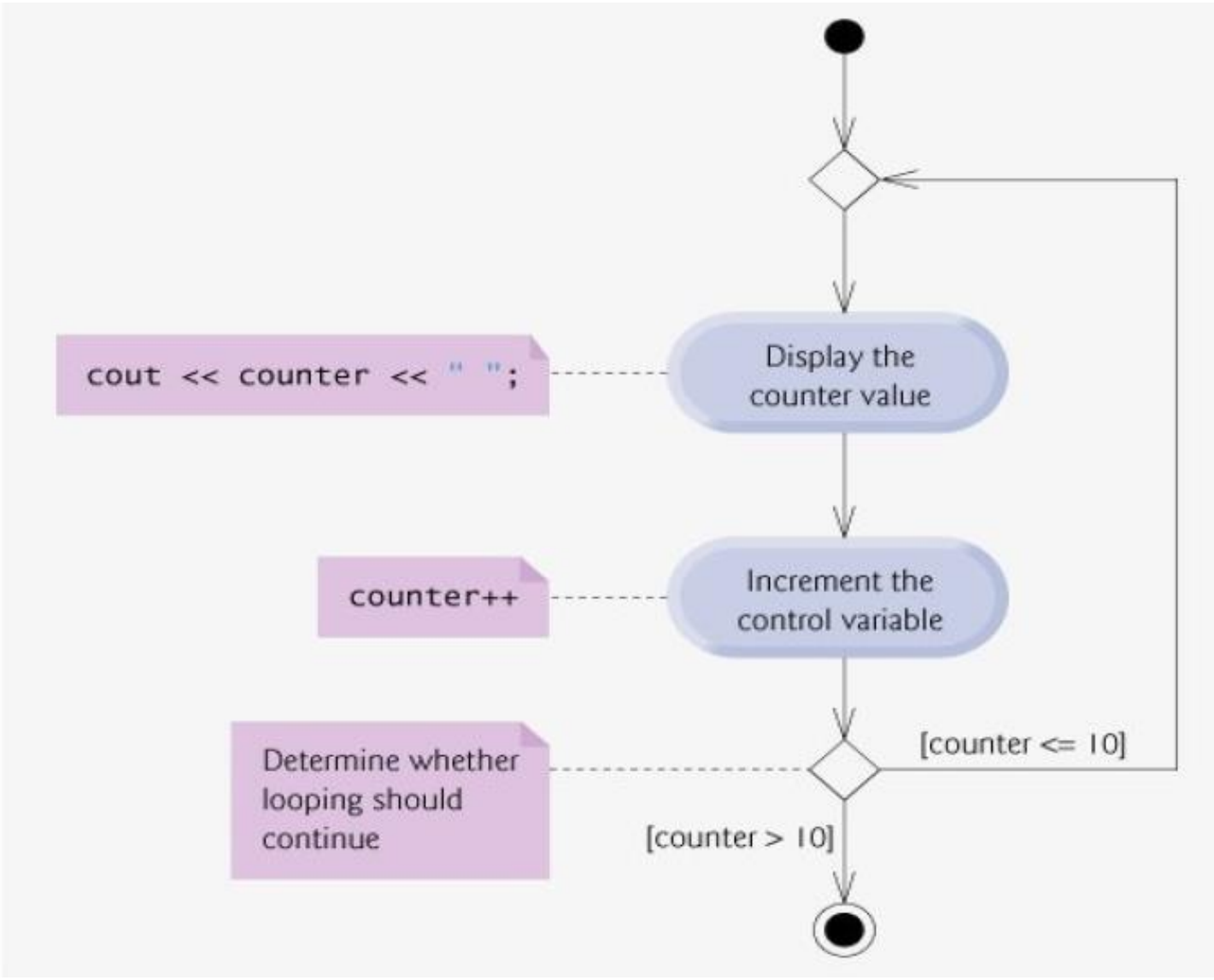
- do{
- statements
- } while (condition);



5.5 do...while Repetition Statement

```
1.  // P157 Fig. 5.7: fig05_07.cpp
2.  // do...while repetition statement.
3.  #include <iostream>
4.  using std::cout;
5.  using std::endl;
6.
7.  int main()
8.  {
9.      int counter = 1; // initialize counter
10.
11.     do
12.     {
13.         cout << counter << " "; // display counter
14.         counter++; // increment counter
15.     } while ( counter <= 10 ); // end do...while
16.
17.     cout << endl; // output a newline
18.     return 0; // indicate successful termination
19. } // end main
```

5.5 do...while Repetition Statement



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5.6 switch Multiple-Selection Statement

- switch多选：根据表达式(expression)的值，执行不同的操作

```
switch ( value ){
    case 常量表达式1: 语句1
    case 常量表达式2: 语句2
    ..................
    case 常量表达式n: 语句n
    default:          语句n+1
}
```

值为整型、字符型或枚举型

必须为常量，并且不能有多个值相等的case分支

- 从常量表达式1开始逐个比对value的值，从与之相等的常量表达式标签(Label)处开始执行！

5.6 switch Multiple-Selection Statement

```
1. float f = 0.3;
2. switch (f) {
3.     case 0.1: cout << "0.1" <<endl;
4.     case 0.2: cout << "0.2" << endl;
5.     default: cout << "default" << endl;
6. }
```

- error C2450: switch expression of type 'float' is illegal
- switch()中的value必须为整型、字符型或者枚举型的变量/表达式！

5.6 switch Multiple-Selection Statement

```
1. char cc = 'A';
2. char dd = 'B';
3. switch( cc ) {
4.     case 'A': cout << "A is input" <<endl;
5.     case dd: cout << "B is input" << endl;
6.     default:  cout << "default" << endl;
7. }
```

- error C2051: case expression not constant
- case后必须是常量表达式!

5.6 switch Multiple-Selection Statement

```
1. char cc = 'A';
2. switch( cc ) {
3.     case 'A': cout << "A is input" <<endl;
4.     case 'B': cout << "B is input" << endl;
5.     case 65: cout << "what is input?" << endl;
6.     default: cout << "default" << endl;
7. }
```

- error C2196: case value '65' already used
- 各case常量表达式的值应各不相同！
- ASCII表, P900

5.6 switch Multiple-Selection Statement

```
1. char cc = 'B';
2. switch( cc ) {
3.     case 'A': cout << "A is input" <<endl;
4.     case 'B': cout << "B is input" << endl;
5.     case 'C': cout << "C is input" << endl;
6.     default:  cout << "default" << endl;
7. }
```

```
B is input
C is input
default
Press any key to continue
```

- 从值匹配处开始执行!

5.6 switch Multiple-Selection Statement

```
1. char cc = 'B';
2. switch (cc) {
3.    case 'A': cout << "A is input" <<endl; break;
4.    case 'B': cout << "B is input" << endl; break;
5.    case 'C': cout << "C is input" << endl; break;
6.    default:   cout << "default" << endl;
7.  }
```

- switch一般需要与break搭配使用!
- break: 退出switch语句

5.6 switch Multiple-Selection Statement

- 需求：从键盘接受成绩输入，统计各个档次成绩的成绩数

  ('A', 'a'), ('B', 'b'), ('C', 'c'),

  ('D', 'd'), ('F', 'f')

- 输入的成绩数量不确定
  - 标记值控制的循环
- 成绩档次为5档
  - switch多选

5.6 switch Multiple-Selection Statement

P158 Fig. 5.10

```
54   int grade;
60   while( (grade = cin.get() ) != EOF)
61   {
```

- 从标准输入读取一个字符(如‘a’)
- 将读入的字符赋值给整型变量grade，因此取该字符的ASCII码值(97)

```
cout << "The character (" << 'a' << ") has the value "
     << static_cast< int > ( 'a' ) << endl;
```

The character (a) has the value 97

5.6 switch Multiple-Selection Statement

P158 Fig. 5.10

```
54   int grade;
60   while( (grade = cin.get() ) != EOF)
61   {
```

- 赋值表达式的值即= 右边的值，EOF作为标记值(Sentinel)来判断输入是否结束。

```
a = b = c = 0;
```

5.6 switch Multiple-Selection Statement

P158 Fig. 5.10

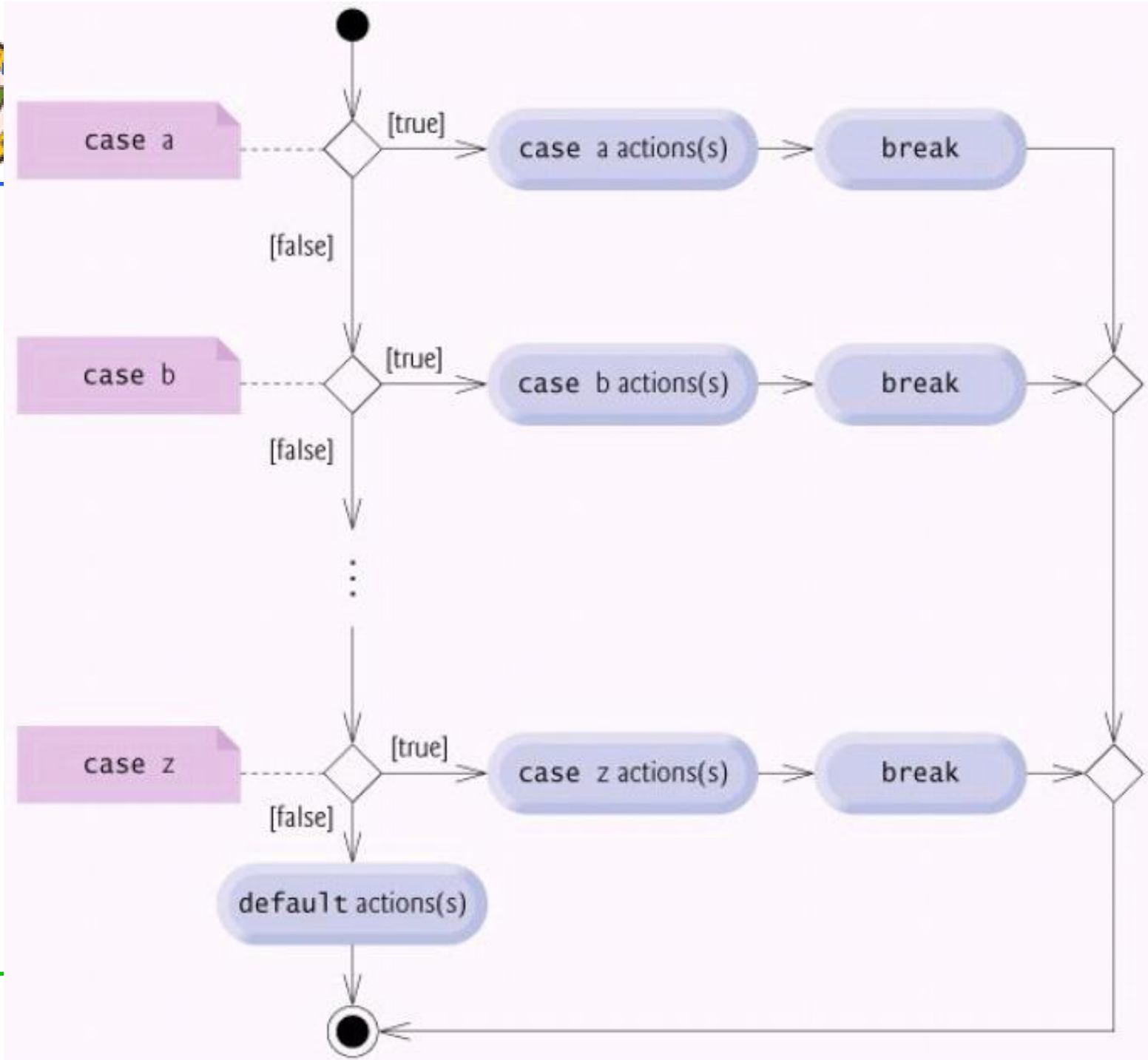
```
54   int grade;
60   while( (grade = cin.get() ) != EOF)
61   {
```

- EOF (End of File)是<iostream>头文件中定义的符号常量(Symbolic integer constant),表示文件结束. 具体值是操作系统相关的,

  Win32中为Ctrl+Z

  #define EOF (-1)

程序解读（P125）


case a
[true]
case a actions(s)
break
[false]
case b
[true]
case b actions(s)
break
[false]
case z
[true]
case z actions(s)
break
[false]
default actions(s)

Topics

- 5.1 Introduction
- 5.2 Essentials of Counter-Controlled Repetition
- 5.3 for Repetition Statement
- 5.4 Examples Using the for Statement
- 5.5 do...while Repetition Statement
- 5.6 switch Multiple-Selection Statement
- **5.7 break and continue Statements**
- 5.8 Logical Operators
- 5.9 Confusing Equality (==) and Assignment (=) Operators
- 5.10 Structured Programming Summary

5.7 break and continue Statements

- **break**:立即退出**最内层**的**switch/while/for/do…while**语句，执行后续语句

```
// P165, Fig. 5.13
11   for ( count = 1; count <= 10; count++ ) // loop 10 times
12   {
13      if ( count == 5 )
14         break; // break loop only if count is 5
15
16      cout << count << " ";
17   } // end for
18
19   cout << "\nBroke out of loop at count = " << count << endl;
```

```
1 2 3 4
Broke out of loop at count = 5
```

5.7 break and continue Statements

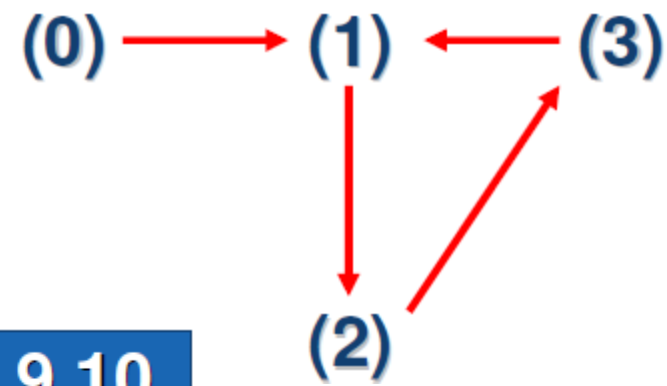
```
1. for ( int i = 1; i <= 5; i++ )
2. {
3.   cout << "i = " << i << ":" << endl;
4.   for ( int count = 1; count <= 10; count+
5. {
6.       if ( count == 5 ) break; // if count is 5,
7.       cout << count << " ";
8.  } // end inner for
9.     cout << "\nBroke out of loop at count
10. } // end outer for
11. cout << "Cannot break to here!" <<en
```

```
i = 1:
1 2 3 4
Broke out of loop at count = 5
i = 2:
1 2 3 4
Broke out of loop at count = 5
i = 3:
1 2 3 4
Broke out of loop at count = 5
i = 4:
1 2 3 4
Broke out of loop at count = 5
i = 5:
1 2 3 4
Broke out of loop at count = 5
Cannot break to here!
```

5.7 break and continue Statements

- **continue:** 跳过最内层**while/for/do…while** 结构的剩余语句, 执行下一次循环.

```
                (0)          (1)          (3)
1.  for ( int count = 1; count <= 10; count++ )
2.  {
3.      if ( count == 5 ) // if count is 5,
4.          continue;     // skip remaining code in loop
        (2)
5.      cout << count << " ";
6.  } // end for
```



1 2 3 4 6 7 8 9 10

5.7 break and continue Statements

```
1.  int count = 0;
2.  while (count <= 9)
3.  {
4.
5.      if ( count == 5 ) // if count is 5,
6.          continue;
7.      count++;   // 死循环, 不应跳过下一次循环准备
8.      cout << count << " ";
9.  } // end while
```

1 2 3 4 6 7 8 9 10

5.7 break and continue Statements

```
1.  int count = 0;
2.
3.  do{
4.      count++;
5.      if ( count == 5 ) // if count is 5,
6.          continue;
7.
8.      cout << count << " ";
9.  } while (count <= 9)
```

1 2 3 4 6 7 8 9 10

5.7 break and continue Statements

- **break**: 跳出所在的语句体, 执行后续语句
- **continue**: 返回至循环头部, 执行下次循环
- • **for**

  返回至**for**头部的下一次循环准备
- • **while**

  返回至**while**头部的循环条件判断
- • **do…while**

  返回至**while**头部的循环条件判断

5.7 break and continue Statements

```
1. for ( int i = 1; i <= 5; i++ )
2. {
      if (i==2)  continue;
3.   cout << "i = " << i << ":" << endl;
4.   for ( int count = 1; count <= 10; count+
5.  {
6.       if ( count == 5 ) break; // if count is 5
7.       cout << count << " ";
8.   } // end inner for
9.  cout << "\nBroke out of loop at count =
10. } // end outer for
11. cout << "Cannot break to here!" <<endl;
```

```
i = 1:
1 2 3 4
Broke out of loop at count = 5
i = 2:
1 2 3 4
Broke out of loop at count = 5
i = 3:
1 2 3 4
Broke out of loop at count = 5
i = 4:
1 2 3 4
Broke out of loop at count = 5
i = 5:
1 2 3 4
Broke out of loop at count = 5
Cannot break to here!
```

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- 5.10 Structured Programming Summary

5.8 Logical Operators

```
if ( gender == 1 && age >= 65 )
    seniorFemales++;
```

- 多个逻辑表达式值同时为TRUE,才为TRUE
- 真值表（Truth Table）

expression1	expression2	expression1 && expression2
false	false	false
false	true	false
true	false	false
true	true	true

5.8 Logical Operators

```
1.  int a = 2, b = 3, c = 3;
2.  if ( a == 1 && b++ >= 2 && c==3){
3.      c++;
4.  }
5.  cout << "b = " << b << ", c = " << c << endl;
```

b = 3, c = 3

- 多个逻辑表达式, 从左至右依次求值
- 短路求值(short-circuit evaluation)
  - 若a不等于1，那么整个表达式值肯定为false，此时后续两个逻辑表达式不做计算
  - 副作用

5.8 Logical Operators

```
if ( average >= 90  ||  finalExam >= 90 )
     cout << "Student grade is A" << endl;
```

- 多个逻辑表达式值只有全部为False，才False
- 真值表（Truth Table）

expression1	expression2	expression1 || expression2
false	false	false
false	true	true
true	false	true
true	true	true

5.8 Logical Operators

```
1.  int a = 2, b = 3, c = 3;
2.  if ( a == 2 || b++ >= 2 || c==3) {
3.      c++;
4.  }
5.  cout << "b = " << b << ", c = " << c << endl;
```

b = 3, c = 4

- 多个逻辑表达式, 从左至右依次求值, 只要有一个为True, 则True
- 短路求值（short-circuit evaluation）
  - 若a等于2，那么整个表达式值肯定为true，此时后续两个逻辑表达式不做计算
  - 副作用

5.8 Logical Operators

```
if ( !( grade == sentinelValue ) )
   cout << "The next grade is " << grade << endl;
```

```
if ( grade != sentinelValue )
   cout << "The next grade is " << grade << endl;
```

- 取反, 真值表（Truth Table）

expression	!expression
false	true
true	false

5.8 Logical Operators

Operators						Associativity	Type
()						left to right	parentheses
++	--	static_cast< type >()				left to right	unary (postfix)
++	--	+	-	!		right to left	unary (prefix)
*	/	%				left to right	multiplicative
+	-					left to right	additive
<<	>>					left to right	insertion/extraction
<	<=	>	>=			left to right	relational
==	!=					left to right	equality
&&						left to right	logical AND
||						left to right	logical OR
?:						right to left	conditional
=	+=	-=	*=	/=	%=	right to left	assignment
,						left to right	comma

5.8 Logical Operators

- 要求1≤month≤ 12, 否则赋值为1

- if(! (1 <= month && month <= 12))
  month = 1;
- if(month < 1 || month > 12)
  month = 1;

5.8 Logical Operators

```
1.  cout << "True = " << true
2.           << ", False = " << false << endl;
3.  cout << boolalpha
4.           << "True = " << true
5.           << ", False = " << false << endl;
```

C++关键字

- 没有参数的流操作算子，粘性设置！

```
True = 1, False = 0
True = true, False = false
```

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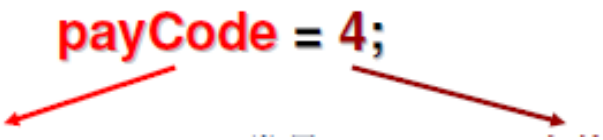
- 5.10 Structured Programming Summary

5.9 Confusing Equality (==) and Assignment (=) Operators

```
1.  if ( payCode = 4 )  // Logic Error
2.      cout << "You get a bonus!" << endl;
3.  if ( payCode == 4 )
4.      cout << "You get a bonus!" << endl;
```

- 易产生混淆的原因：
- 任何具有值的表达式都可以作为判断语句的条件
- 任何赋值语句都具有值，即赋值于该变量的值

5.9 Confusing Equality (==) and Assignment (=) Operators



- 变量Variable：左值(lvalues)
  一般是指可以搁在赋值表达式的左边
- 常量Constant：右值(rvalues)
  只能搁在赋值表达式的右边

```
if ( 4 == payCode ) // 建议
    cout << "You get a bonus!" << endl;
if ( 4 = payCode )  // 编译错误
    cout << "You get a bonus!" << endl;
```

```
error C2106: '=' : left operand must be l-value
```

Topics

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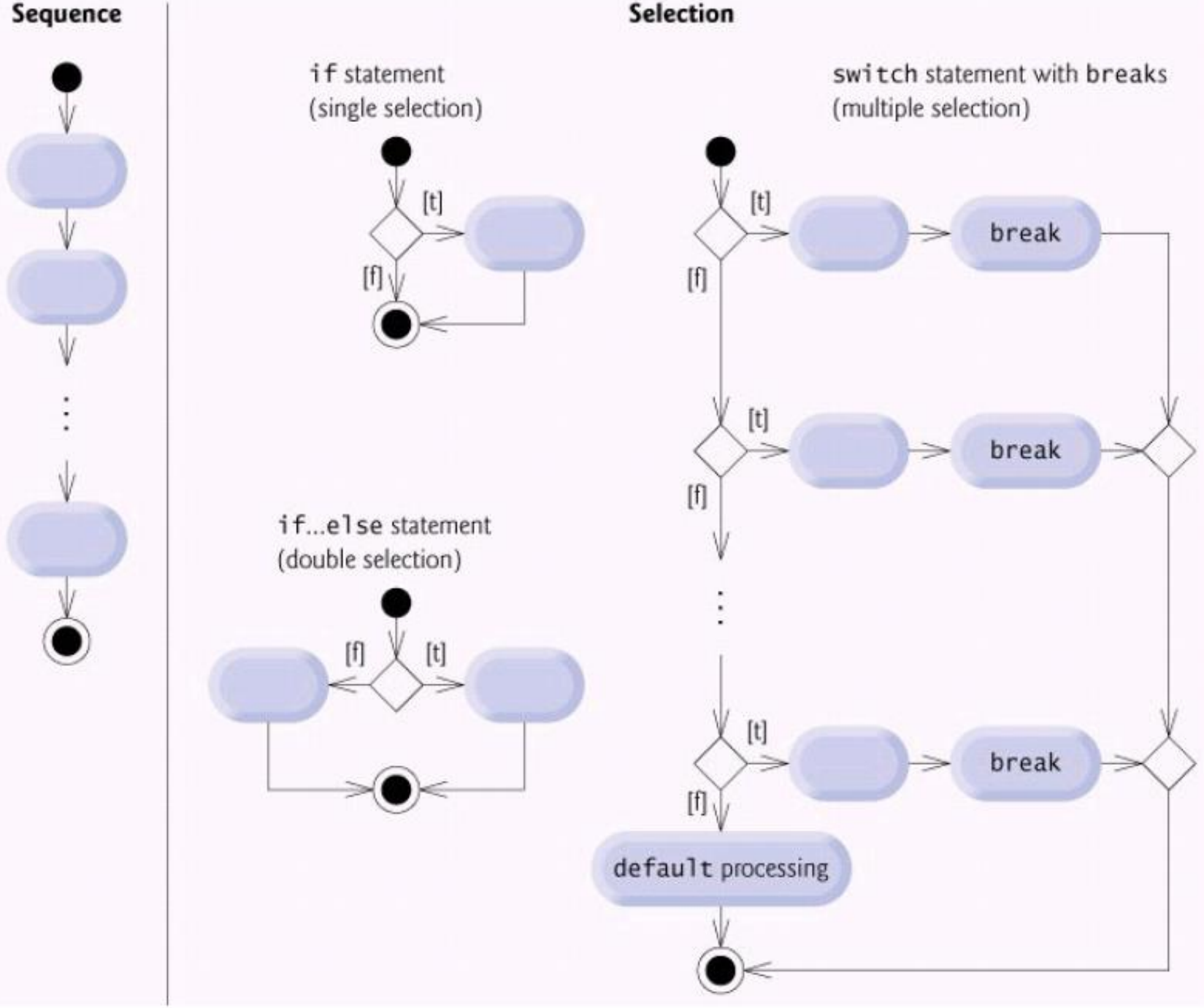
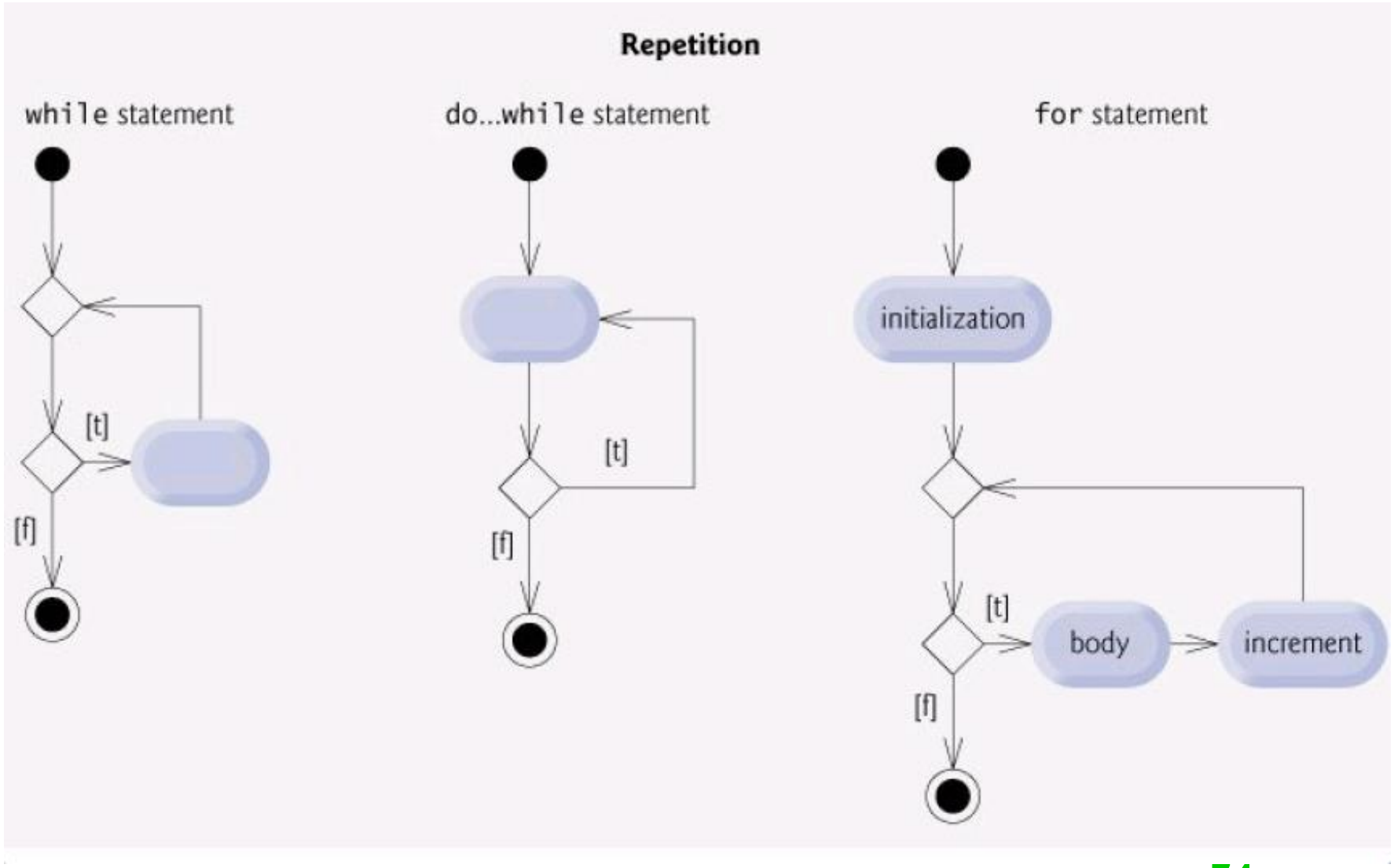

Sequence
Selection
if statement
(single selection)
[t]
[f]
switch statement with breaks
(multiple selection)
break
break
break
default processing
if...else statement
(double selection)
[f]
[t]

5.10 Structured Programming Summary



5.10 Structured Programming Summary

Rules for Forming Structured Programs

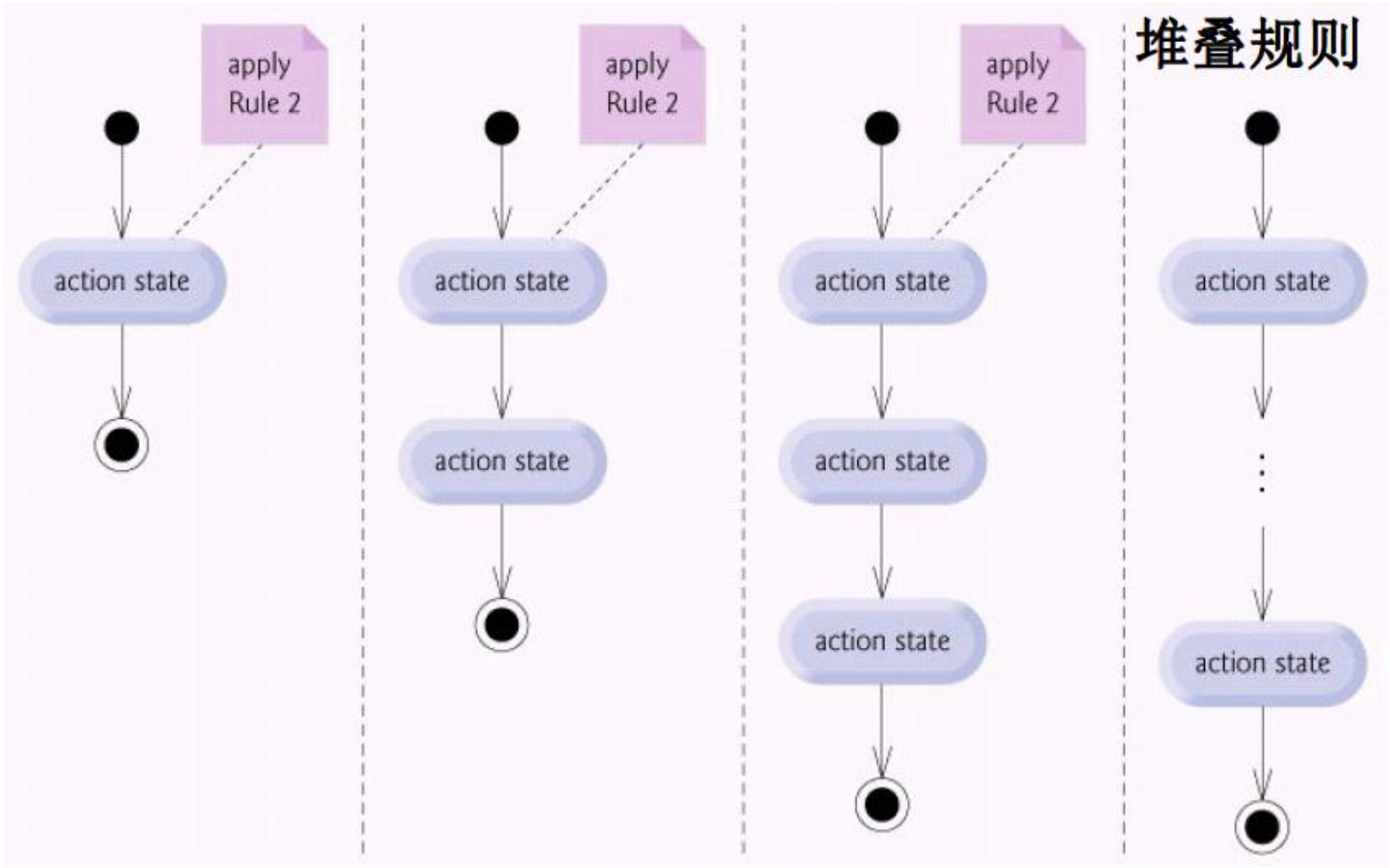
① Begin with the "simplest activity diagram".

② 堆叠规则：Any action state can be replaced by two action states in sequence.

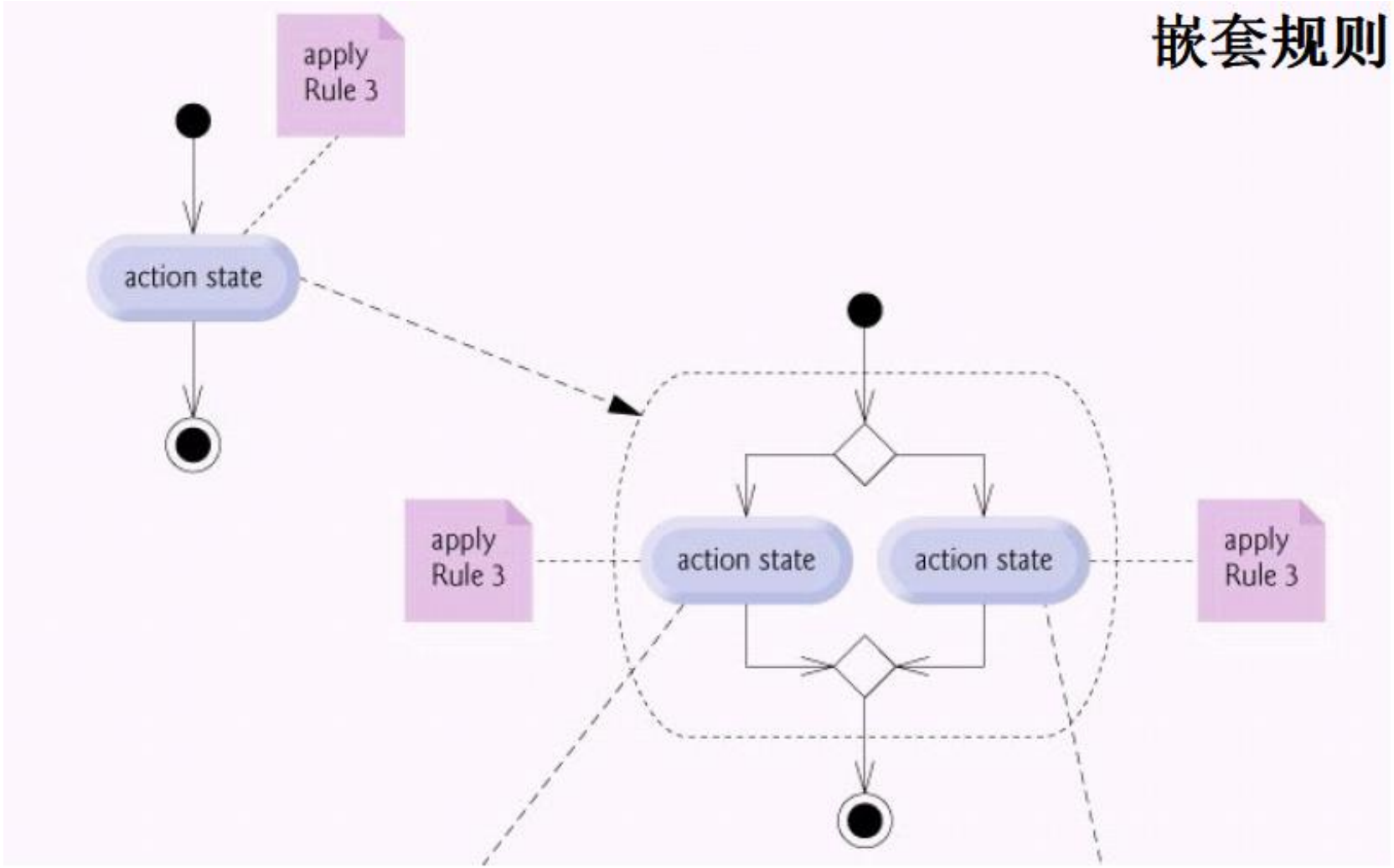
③ 嵌套规则：Any action state can be replaced by any control statement (sequence, if, if...else, switch, while, do...while or for).

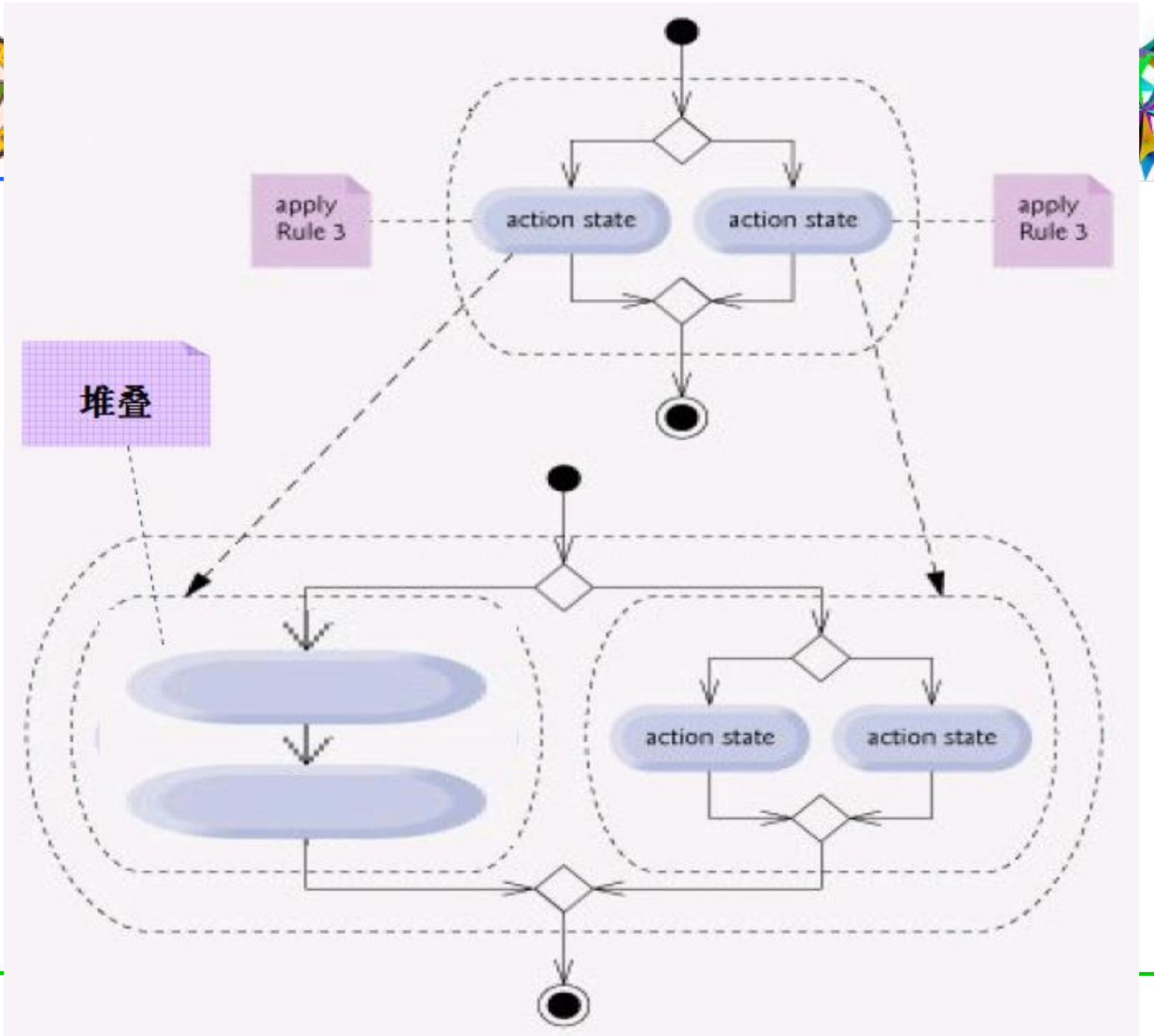
④ Rules 2 and 3 can be applied as often as you like and in any order.

5.10 Structured Programming Summary



5.10 Structured Programming Summary




apply
Rule 3
action state
action state
apply
Rule 3
堆叠
action state
action state

5.10 Structured Programming Summary

- 结构化编程的优势在于：我们可以仅使用7个单入口-单出口的控制语句，并以堆叠和嵌套两种方式组合，即可设计出任何程序逻辑！
- 进一步，实际上：
  - if语句可以实现if…else、switch的程序控制功能
  - while语句可以实现for、do…while的程序控制功能
- 结论：顺序sequence + 选择if + 循环while – 堆叠Stacking+嵌套Nesting 即可完成结构化的程序设计！

Homework

- 实验必选题目：
- 5.19, 5.23

- 实验任选题目：

- 作业题目(Homework)：
- 5.4, 5.5, 5.26