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Introduction to Programming using JAVA (Liang)

Check Points Answers

Chapter 3

3.1 List six relational operators.

Operator	description
<	Less Than
>	Greater Than
>=	Greater Than or Equal
<=	Smaller Than or Equal
==	Equal
!=	Not Equal

3.2 Assuming that x is 1, show the result of the following Boolean expressions:

(x > 0)

(x < 0)

(x != 0)

(x >= 0)

(x != 1)

true, false, true, true, false

3.3 Can the following conversions involving casting be allowed? Write a test program to verify your answer.

boolean b = true;

i = (int)b;

int i = 1;

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boolean b = (boolean)i;

No. Boolean values cannot be cast to other types.

3.4 Write an if statement that assigns 1 to x if y is greater than 0.

```
if(y>0)
  x = 1;
```

3.5 Write an if statement that increases pay by 3% if score is greater than 90.

```
if (score > 90)
  pay *= 1.03;
```

3.6 Write an if statement that increases pay by 3% if score is greater than 90, otherwise increases pay by 1%.

```
if (score > 90)
  pay *= 1.03;
else
  pay *= 1.01;
```

3.7 What is the output of the code in (a) and (b) if number is 30? What if number is 35?

```
if (number % 2 == 0)
  System.out.println(number + " is even.");

System.out.println(number + " is odd.");
```

(a)

```
if (number % 2 == 0)
  System.out.println(number + " is even.");
else
  System.out.println(number + " is odd.");
```

(b)

if number = 30:

a) 30 is even. \n 30 is odd. **b)** 30 is even.

if number = 35:

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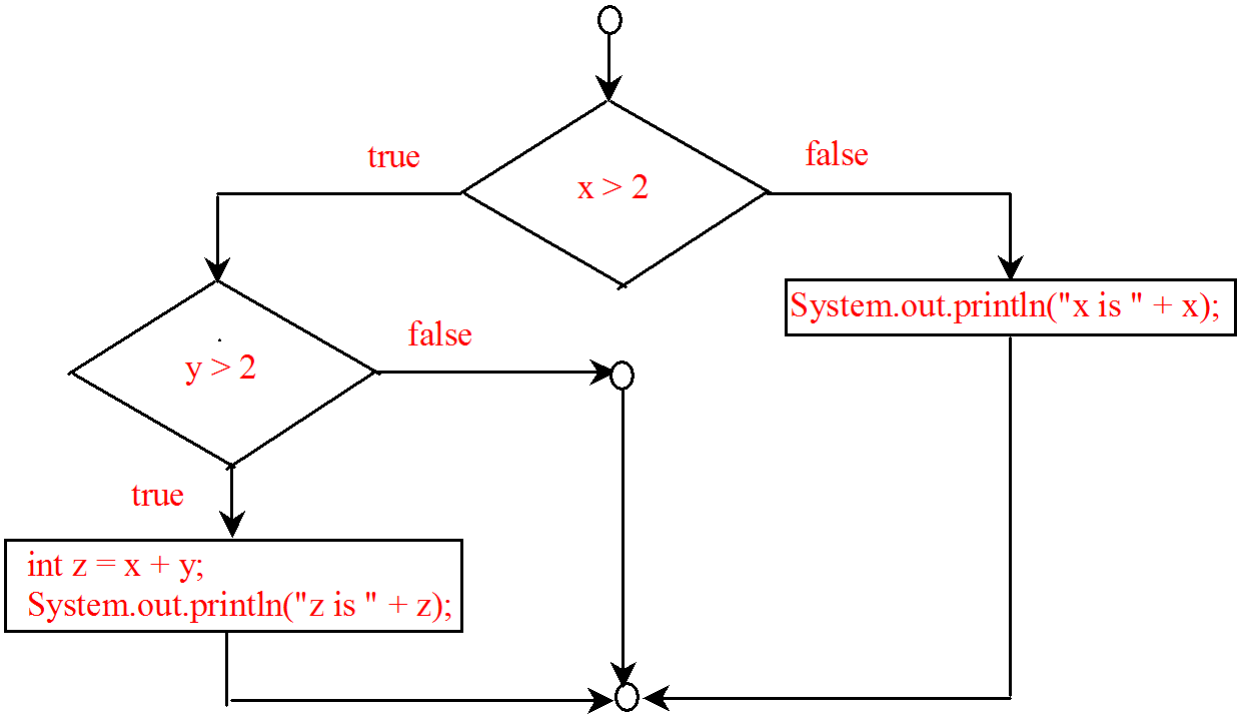
a) 35 is odd. b) 35 is odd.

3.8 Suppose x = 3 and y = 2; show the output, if any, of the following code. What is the output if x = 3 and y = 4? What is the output if x = 2 and y = 2? Draw a flowchart of the code.

```
if (x > 2) {
if (y > 2) {
z = x + y;
System.out.println("z is " + z);
}
}
else
System.out.println("x is " + x);
```



No output if x = 3 and y = 2. Output is "z is 7" if if x = 3 and y = 4. Output is "x is 2" if if x = 2 and y = 2.

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3.9 Suppose x = 2 and y = 3. Show the output, if any, of the following code. What is the output if x = 3 and y = 2? What is the output if x = 3 and y = 3?

```
if (x > 2)
if (y > 2) {
int z = x + y;
System.out.println("z is " + z);
}
else
System.out.println("x is " + x);
```

Note that the else pairs with the most recent if.

No output if x = 2 and y = 3. **Output is** "x is 3" if x = 3 and y = 2. **Output is** "z is 6" if x = 3 and y = 3.

3.10 What is wrong in the following code?

```
if (score >= 60.0)
System.out.println("D");
else if (score >= 70.0)
System.out.println("C");
else if (score >= 80.0)
System.out.println("B");
else if (score >= 90.0)
System.out.println("A");
else
```

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System.out.println("F");

Consider score 90, what will be the grade? It will be D. Logical order of conditions is not true, it will produce logical error.

3.11 Which of the following statements are equivalent? Which ones are correctly indented?

```
if (i > 0) if
(j > 0)
x = 0; else
if (k > 0) y = 0;
else z = 0;
```

(a)

```
if (i > 0) {
  if (j > 0)
    x = 0;
  else if (k > 0)
    y = 0;
}
else
  z = 0;
```

(b)

```
if (i > 0)
  if (j > 0)
    x = 0;
  else if (k > 0)
    y = 0;
  else
    z = 0;
```

(c)

```
if (i > 0)
  if (j > 0)
    x = 0;
  else if (k > 0)
    y = 0;
else
  z = 0;
```

(d)

a, c, and d are the same. (B) and (C) are correctly indented.

3.12 Rewrite the following statement using a Boolean expression:

```
if (count % 10 == 0)
newLine = true;
else
newLine = false;
```

boolean newLine = (count % 10 == 0);

3.13 Are the following statements correct? Which one is better?

```
if (number % 2 == 0)
  System.out.println(number + " is even.");

System.out.println(number + " is odd.");
```

(a)

```
if (number % 2 == 0)
  System.out.println(number + " is even.");
else
  System.out.println(number + " is odd.");
```

(b)

Both are correct. (b) is better.

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3.14 What is the output of the following code if number is 14, 15, or 30?

```
if (number % 2 == 0)
  System.out.println
    (number + " is even");
if (number % 5 == 0)
  System.out.println
    (number + " is multiple of 5");
```

(a)

```
if (number % 2 == 0)
  System.out.println
    (number + " is even");
else if (number % 5 == 0)
  System.out.println
    (number + " is multiple of 5");
```

(b)

For (a) if number is 14, the output is

14 is even

if number is 15, the output is

15 is multiple of 5

if number is 30, the output is

30 is even

30 is multiple of 5

For (b) if number is 14, the output is

14 is even

If number is 15, the output is

15 is multiple of 5

if number is 30, the output is

30 is even

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3.15 Which of the following is a possible output from invoking Math.random()? 323.4, **0.5**, 34, 1.0, **0.0**, **0.234**

3.16

a. How do you generate a random integer i such that $0 \leq i < 20$?
b. How do you generate a random integer i such that $10 \leq i < 20$?
c. How do you generate a random integer i such that $10 \leq i \leq 50$?
d. Write an expression that returns 0 or 1 randomly.

(a) (int)(Math.random() * 20)

(b) 10 + (int)(Math.random() * 10)

(c) 10 + (int)(Math.random() * 41)

(d) (int)(Math.random() * 2)

3.17 Are the following two statements equivalent?

```
if (income <= 10000)
  tax = income * 0.1;
else if (income <= 20000)
  tax = 1000 +
    (income - 10000) * 0.15;
```

```
if (income <= 10000)
  tax = income * 0.1;
else if (income > 10000 &&
         income <= 20000)
  tax = 1000 +
    (income - 10000) * 0.15;
```

YES.

3.18 Assuming that x is 1, show the result of the following Boolean expressions.

(true) && (3 > 4)	**False**
!(x > 0) && (x > 0)	**False**
(x > 0) || (x < 0)	**True**
(x != 0) || (x == 0)	**True**

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(x >= 0) || (x < 0) True

(x != 1) == !(x == 1) True

3.19 (a) Write a Boolean expression that evaluates to true if a number stored in variable num is between 1 and 100. (b) Write a Boolean expression that evaluates to true if a number stored in variable num is between 1 and 100 or the number is negative.

(a) (num > 1) && (num < 100)

(b) (num > 1) && (num < 100) || num < 0

3.20 (a) Write a Boolean expression for |x – 5| < 4.5. (b) Write a Boolean expression for |x – 5| > 4.5.

(a) (x - 5) < 4.5 && (x - 5) > -4.5

(b) (x - 5) > 4.5 || (x - 5) < -4.5

3.21 Assume that x and y are int type. Which of the following are legal Java expressions?

x > y > 0 incorrect

x = y && y incorrect

x /= y correct

x or y incorrect

x and y incorrect

(x != 0) || (x = 0)_incorrect on x = 0. It should be x == 0

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3.22 Are the following two expressions the same?

a. x % 2 == 0 && x % 3 == 0

b. x % 6 == 0

Yes

3.23 What is the value of the expression x >= 50 && x <= 100 if x is 45, 67, or 101?

45 -> **False.**

67 -> **True.**

101 -> **False.**

3.24 Suppose, when you run the following program, you enter the input 2 3 6 from the console. What is the output?

```
public class Test {
public static void main(String[] args) {
java.util.Scanner input = new java.util.Scanner(System.in);
double x = input.nextDouble();
double y = input.nextDouble();
double z = input.nextDouble();
System.out.println("(x < y && y < z) is " + (x < y && y < z));
System.out.println("(x < y || y < z) is " + (x < y || y < z));
System.out.println("!(x < y) is " + !(x < y));
System.out.println("(x + y < z) is " + (x + y < z));
System.out.println("(x + y > z) is " + (x + y > z));
}}
```

(x < y && y < z) is true

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(x < y || y < z) is true

!(x < y) is false

(x + y < z) is true

(x + y > z) is false

3.25 Write a Boolean expression that evaluates to true if age is greater than 13 and less than 18. (age > 13) && (age < 18)

3.26 Write a Boolean expression that evaluates to true if weight is greater than 50 pounds or height is greater than 60 inches.

(weight > 50) || (height > 60)

3.27 Write a Boolean expression that evaluates to true if weight is greater than 50 pounds and height is greater than 60 inches.

(weight > 50) && (height > 60)

3.28 Write a Boolean expression that evaluates to true if either weight is greater than 50 pounds or height is greater than 60 inches, but not both.
(weight > 50) ^ (height > 60)

3.29 What data types are required for a switch variable? If the keyword break is not used after a case is processed, what is the next statement to be executed? Can you convert a switch statement to an equivalent if statement, or vice versa? What are the advantages of using a switch statement?

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Switch variables must be of char, byte, short, int, or String types. If a break statement is not used, the next case statement is performed. You can always convert a switch statement to an equivalent if statement, but not an if statement to a switch statement. The use of the switch statement can improve readability of the program in some cases. The compiled code for the switch statement is also more efficient than its corresponding if statement.

3.30 What is y after the following switch statement is executed? Rewrite the code using an if-else statement.

```
x = 3; y = 3;
switch (x + 3) {
case 6: y = 1;
default: y += 1;
}
```

y is 2.

```
x = 3; y = 3;
if (x + 3 == 6) {
  y = 1;
}
y += 1;
```

3.31 What is x after the following if-else statement is executed? Use a switch statement to rewrite it

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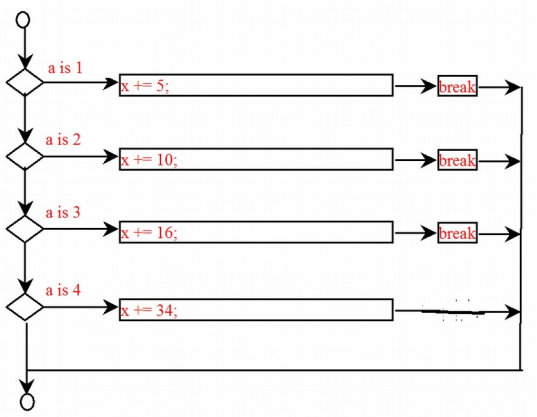
and draw the flowchart for the new switch statement.

```
int x = 1, a = 3;
if (a == 1)
x += 5;
else if (a == 2)
x += 10;
else if (a == 3)
x += 16;
else if (a == 4)
x += 34;
```

x is 17

```
switch (a) {
  case 1: x += 5; break;
  case 2: x += 10; break;
  case 3: x += 16; break;
  case 4: x += 34;
}
```



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3.32 Write a switch statement that displays Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, if day is 0, 1, 2, 3, 4, 5, 6, accordingly.

```
switch (day) {
  case 0: System.out.println("Sunday"); break;
  case 1: System.out.println("Monday"); break;
  case 2: System.out.println("Tuesday"); break;
  case 3: System.out.println("Wednesday"); break;
  case 4: System.out.println("Thurday"); break;
  case 5: System.out.println("Friday"); break;
  case 6: System.out.println("Saturday"); break;}
```

3.33 Suppose that, when you run the following program, you enter the input 2 3 6 from the console. What is the output?

```
public class Test {
public static void main(String[] args) {
java.util.Scanner input = new
java.util.Scanner(System.in);
double x = input.nextDouble();
double y = input.nextDouble();
double z = input.nextDouble();
System.out.println((x < y && y < z) ? "sorted" : "not
sorted");
```

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```
}
}
```

Sorted.

3.34 Rewrite the following if statements using the conditional operator.

```
if (ages >= 16)
ticketPrice = 20;
else
ticketPrice = 10;
```

```
ticketPrice = (ages >= 16) ? 20 : 10;
```

3.35 Rewrite the following conditional expressions using if-else statements.

```
a. score = (x > 10) ? 3 * scale : 4 * scale;
b. tax = (income > 10000) ? income * 0.2 : income * 0.17 + 1000;
c. System.out.println((number % 3 == 0) ? i : j);
```

a)

```
if(x > 10)
 score = 3 * scale;
else
 score = 4 * scale;
```

b)

```
if(income > 10000)
 tax = income * 2;
```

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```
else
 tax = income * 0.17 + 1000;
```

c)

```
if(number % 3 == 0)
 System.out.println(i);
else
 System.out.println(j);
```

3.36 Write conditional expression that returns -1 or 1 randomly.

```
(int)(Math.random() * 2) == 0 ? -1 : 1;
```

3.37 List the precedence order of the Boolean operators. Evaluate the following expressions:

true || true && false True.

true && true || false True.

<, <=, >, >= (Relational)

==, != (Equality)

^ (Exclusive OR)

&& (AND)

|| (OR)

3.38 True or false? All the binary operators except = are left associative.

True.

3.39 Evaluate the following expressions:

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2 * 2 - 3 > 2 && 4 – 2 > 5 **False.**

2 * 2 - 3 > 2 || 4 – 2 > 5 **False.**

3.40 Is (x > 0 && x < 10) the same as ((x > 0) && (x < 10))? Is (x > 0 ||

x < 10) the same as ((x > 0) || (x < 10))? Is (x > 0 || x < 10 && y

< 0) the same as (x > 0 || (x < 10 && y < 0))?

Yes, Yes, Yes.