Boolean Logic & Control Structures

1. What benefit do you get by using **boolean** variables in your program.

(A) They save memory.
(B) They make the program execute faster.
(C) They make software cheaper.
(D) They make the program more readable.

---

2. Assume *correct* is a **boolean** variable.
Which command below will accomplish the same thing as

```
if (x == 5)
    correct = true;
else
    correct = false;
```

(A) correct = true;
(B) correct = false;
(C) correct = x;
(D) correct = 5;
(E) correct = (x == 5);

---

3. What is the output of these statements?

```
System.out.println(2 + 2 == 4);
System.out.println(2 + 2 == 5);
```

(A) ### true false	(B) false true	(C) 1 0	(D) 0 1	(E) Error

4. Which of the following is NOT a *Boolean Statement*?

(A) Today is Christmas.
(B) You attend JPII High School.
(C) Mr. Leon Schram is taller than Mr. John Schram
(D) The Abacus was invented by the Babylonians 3000 years before the time of Christ.

(E) Star Wars Episode VI *Return of the Jedi* is the best movie in the Star Wars saga.

---

5. Consider this scenario:

Mr. John Schram makes this statement,
"My mother makes the best peanut butter and jelly sandwiches."
Mr. Leon Schram then makes this statement,
"Mr. John Schram said his mother makes the best peanut butter and jelly sandwiches."

Question: Which Schram (if any) is making a *Boolean Statement*?

(A) Mr. John Schram
(B) Mr. Leon Schram
(C) Both Schrams
(D) Neither Schram

Use this chart to answer questions 6 through 13.

P	Q	C1	C2	C3	C4	C5
T	T	T	T	F	F	T
T	F	F	T	F	T	T
F	T	F	T	F	T	F
F	F	F	F	T	T	F

---

6. Which of these columns (C1-C5) is the proper Truth Table for **(P and Q) or (P and Q)** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

Use this chart to answer questions 6 through 13.

P	Q	C1	C2	C3	C4	C5
T	T	T	T	F	F	T
T	F	F	T	F	T	T
F	T	F	T	F	T	F
F	F	F	F	T	T	F

---

7. Which of these columns (C1-C5) is the proper Truth Table for **(P or Q) or Q** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

---

8. Which of these columns (C1-C5) is the proper Truth Table for **P and (P or Q)** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

---

9. Which of these columns (C1-C5) is the proper Truth Table for **P or (P and Q)** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

Use this chart to answer questions 6 through 13.

P	Q	C1	C2	C3	C4	C5
T	T	T	T	F	F	T
T	F	F	T	F	T	T
F	T	F	T	F	T	F
F	F	F	F	T	T	F

10. Which of these columns (C1-C5) is the proper Truth Table for **not(P and Q)** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

11. Which of these columns (C1-C5) is the proper Truth Table for **not P or not Q** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

Use this chart to answer questions 6 through 13.

P	Q	C1	C2	C3	C4	C5
T	T	T	T	F	F	T
T	F	F	T	F	T	T
F	T	F	T	F	T	F
F	F	F	F	T	T	F

12. Which of these columns (C1-C5) is the proper Truth Table for **not(P or Q)** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

13. Which of these columns (C1-C5) is the proper Truth Table for **not P and not Q** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

Use this chart to answer questions 14 through 18.

P	Q	R	C1	C2	C3	C4	C5
T	T	T	T	T	T	T	T
T	T	F	T	F	T	T	F
T	F	T	T	T	T	F	F
T	F	F	T	F	F	F	F
F	T	T	T	T	T	T	F
F	T	F	F	F	F	F	F
F	F	T	F	F	T	F	F
F	F	F	F	F	F	F	F

14. Which of these columns (C1-C5) is the proper Truth Table for **(P and Q) or R** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

---

15. Which of these columns (C1-C5) is the proper Truth Table for **(P or Q) and R** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

---

16. Which of these columns (C1-C5) is the proper Truth Table for **(P and Q) or (Q and R)** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

Use this chart to answer questions 14 through 18.

P	Q	R	C1	C2	C3	C4	C5
T	T	T	T	T	T	T	T
T	T	F	T	F	T	T	F
T	F	T	T	T	T	F	F
T	F	F	T	F	F	F	F
F	T	T	T	T	T	T	F
F	T	F	F	F	F	F	F
F	F	T	F	F	T	F	F
F	F	F	F	F	F	F	F

---

17. Which of these columns (C1-C5) is the proper Truth Table for **(P or Q) and (P or R)** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

---

18. Which of these columns (C1-C5) is the proper Truth Table for **P and Q and R** ?

(A) Column C1
(B) Column C2
(C) Column C3
(D) Column C4
(E) Column C5

---

23. ~(~A) =

(A) A
(B) 1
(C) 0
(D) ~A

---

24. The Boolean Expression **A <= B** is equivalent to which of the following expressions?

(A) not (A > B)
(B) not (B >= A)
(C) not (A < B)
(D) A != B
(E) B <= A

---

25. The Boolean Expression **A > B** is equivalent to whoch of the following expressions?

(A) not (B > A)
(B) not (A <= B)
(C) not (A != B)
(D) B > A
(E) B >= A

---

26. The Boolean Expression **A < B** is equivalent to whoch of the following expressions?

(A) not (B > A)
(B) not (A <= B)
(C) not (A != B)
(D) B > A
(E) B >= A

---

27. The Boolean Expression **(A < B) or (A > B)** is equivalent to whoch of the following expressions?

(A) true
(B) false
(C) A != B
(D) A == B

---

28. The Boolean Expression **(A or B) and B** is true

(A) only when A is true.
(B) only when B is true.
(C) whenever either A is true or B is true.
(D) only whenever both A is true and B is true.
(E) for all values of A and B.

---

29. The Boolean Expression **A or (A and B)** is true

(A) only when A is true.
(B) only when B is true.
(C) whenever either A is true or B is true.
(D) only whenever both A is true and B is true.
(E) for all values of A and B.

---

30. The Boolean Expression **(A and B) and A** is true

(A) only when A is true.
(B) only when B is true.
(C) whenever either A is true or B is true.
(D) only whenever both A is true and B is true.
(E) for all values of A and B.

---

31. The Boolean Expression **(A or B) and (A or B)** is true

(A) only when A is true.
(B) only when B is true.
(C) whenever either A is true or B is true.
(D) only whenever both A is true and B is true.
(E) for all values of A and B.

---

32. The Boolean Expression **(A && B) && !(A && B)** evaluates to

(A) true is all cases.
(B) false is all cases.
(C) true whenever only A is true or only B is true.
(D) true whenever either A is true or B is true.
(E) true whenever both A is true and B is true.

---

33. The Boolean Expression **(A && B) || !(A && B)** evaluates to

(A) true is all cases.
(B) false is all cases.
(C) true whenever only A is true or only B is true.
(D) true whenever either A is true or B is true.
(E) true whenever both A is true and B is true.

---

34. The Boolean Expression **(A && B) and (!A || !B)** evaluates to

(A) true is all cases.
(B) false is all cases.
(C) true whenever only A is true or only B is true.
(D) true whenever either A is true or B is true.
(E) true whenever both A is true and B is true.

---

35. The Boolean Expression **(A && B) || (!A || !B)** evaluates to

(A) true is all cases.
(B) false is all cases.
(C) true whenever only A is true or only B is true.
(D) true whenever either A is true or B is true.
(E) true whenever both A is true and B is true.

---

36. Which of the following are synonyms for *repetition*?

I. looping
II. iteration
III. selection

(A) I only
(B) II only
(C) III only
(D) I & II only
(E) I, II & III

---

37. The **for** loop control variable can be

I. an **int**
II. a **double**
III. a **char**

(A) I only
(B) II only
(C) III only
(D) I & II only
(E) I, II & III

---

38. What is true about the *conditional statement* of a **for** loop control structure?

(A) It is a *post-condition* loop control structure.
(B) It is a *pre-condition* loop control structure.
(C) It is both a *pre-condition* and a *post-condition* loop control structure.
(D) A **for** loop control structure has no conditional statements.

---

39. The **while** loop is

(A) a *pre-condition* loop.
(B) a *post-condition* loop.
(C) a fixed-iteration loop.
(D) none of the above.

---

41. The program statements of a **while** loop will execute

(A) at least once.
(B) one time only.
(C) only if the precondition is true.
(D) more than once.

---

43. The **for** loop is ideal for loop structures that

(A) must execute some process at least one time.
(B) must check the loop condition before the loop body is executed.
(C) repeat some process a fixed number of times.
(D) none of the above

---

44. The **while** loop is ideal for loop structures that

(A) must execute some process at least one time.
(B) must check the loop condition before the loop body is executed.
(C) repeat some process a fixed number of times.
(D) none of the above

---

46. The variable in a loop structure, which keeps a running sub-total of entered values, is called a(n)

(A) accumulator/summation var
(B) counter
(C) initializer
(D) loop control variable

---

47. Where do you need to initialize your *loop counters* and your *accumulators*?

(A) Before the loop structure.
(B) Inside the loop structure.
(C) After the loop structure.
(D) Nowhere, initialization is automatic.

---

48. Consider this scenario:

You have written a program that will average grades.
The grades can be from 0 to 100.
To use the program, you need to enter one grade after another.
When you are finished, you need to enter -999 to stop the program.

Question: What is the *flag*?

(A) 0
(B) 100
(C) Any number between 0 and 100.
(D) -999

49. Consider this scenario:

You have written a program that requires a password to log in.
The "logging in" part of the program will repeat until the correct password is entered.

Question: What is the *flag*?

(A) Entering the correct password.
(B) Entering an incorrect password.
(C) There is no flag.
(D) The question cannot be answered with the information given.

---

50. This program segment needs to convert a score to its equivalent grade using the following conversion criteria:

'A' = 90 .. 100
'B' = 80 .. 89
'C' = 70 .. 79
'F' = 0 .. 69

Consider the following program segment. Assume that this segment is executed five times with score values of 60, 70, 80, 90, and 100. What will be the five grades?

```
int score;
char grade;
score = some int value in the range [0..100];
if (score >= 90)
    grade = 'A';
else if (score >= 80)
    grade = 'B';
else if (score >= 70)
    grade = 'C';
else
    grade = 'F';
System.out.print(grade);
```

(A) F C B A A
(B) A A B C F
(C) A B C F F
(D) F F C B A
(E) A B C D F

51. This program segment needs to convert a score to its equivalent grade using the following conversion criteria:

'A' = 90 .. 100
'B' = 80 .. 89
'C' = 70 .. 79
'F' = 0 .. 69

Consider the following program segment. Assume that this segment is executed five times with score values of 60, 70, 80, 90, and 100. What will be the five grades?

```
int score;
char grade;
score = some int value in the range [0..100];
if (score > 90)
    grade = 'A';
else if (score > 80)
    grade = 'B';
else if (score > 70)
    grade = 'C';
else
    grade = 'F';
System.out.print(grade);
```

(A) F C B A A
(B) A A B C F
(C) A B C F F
(D) F F C B A
(E) A B C D F

---

52. Look at the structure below. What is it an example of?

```
int x, y;
for (x = 1; x <= 5; x++)
{
    for (y = 1; y < 5; y++)
        System.out.print(x * y + " ");
    System.out.println();
}
```

(A) nested looping
(B) nested selection
(C) recursion
(D) compound condition

53. Look at the structure below. What is it an example of?

```
if (sat >= 1200)
{
    System.out.println("Accepted.");
    if (salary < 20000)
        System.out.print("Financial Aid.");
}
```

(A) nested looping
(B) nested selection
(C) recursion
(D) compound condition

---

54. Look at the structure below. What is it an example of?

```
if (degree == true && yearsWorks >= 5)
    System.out.println("You are hired!");
```

(A) nested looping
(B) nested selection
(C) recursion
(D) compound condition

---

55. What is the output of the program segment below?

```
int a, b;
a = some mystery int
if (a > 100) {
    if (a < 50)
        b = 1000;
    else
        b = 2000;
}
else {
    if (a > 150)
        b = 3000;
    else
        b = 2000;
}
System.out.print(b);
```

(A) 1000

(B) 2000

(C) 3000

(D) The value of b cannot be determined without knowing the value of a.

56. What is the output of the following program segment?

```
int x, y;
for (x = 1; x <= 5; x++)
{
    for (y = 1; y < 5; y++)
        System.out.print(x * y + " ");
    System.out.println();
}
```

(A)
1 2 3 4
2 4 6 8
3 6 9 12
4 8 12 16

(B)
1 2 3 4 5
2 4 6 8 10
3 6 9 12 15
4 8 12 16 20

(C) ###
1 2 3 4
2 4 6 8
3 6 9 12
4 8 12 16
5 10 15 20

(D)
1 2 3 4 5
2 4 6 8 10
3 6 9 12 15
4 8 12 16 20
21 22 23 24 25

(E)
1 4 9 16 25

57. What is the output of the following program segment?

```
int x, y;
for (x = 1; x <= 4; x++)
{
    for (y = 1; y < 6; y++)
        System.out.print(x * y + " ");
    System.out.println();
}
```

(A)
1 2 3 4
2 4 6 8
3 6 9 12
4 8 12 16

(B) ###
1 2 3 4 5
2 4 6 8 10
3 6 9 12 15
4 8 12 16 20

(C)
1 2 3 4
2 4 6 8
3 6 9 12
4 8 12 16
5 10 15 20

(D)
1 2 3 4 5
2 4 6 8 10
3 6 9 12 15
4 8 12 16 20
21 22 23 24 25

(E)
1 4 9 16 25

58. What is the last number output by the following program segment?

```
int x, y;
x = 1;
while (x <= 3)
{
    y = 1;
    x++;
    while (y <= 3)
    {
        y++;
        System.out.println(x + y);
    }
}
```

(A) 4
(B) 5
(C) 6
(D) 7
(E) 8

---

60. According to *DeMorgan's Law*, which of the following Java expressions is equivalent to the expression below?

a != b && c != d

(A) !(a == b) && (c == d)
(B) !(a == b && c == d)
(C) !(a == b) || (c == d)
(D) !(a == b || c == d)
(E) !(a == b) && !(c == d))

---

61. According to DeMorgan's Law, which of the following Java expressions is equivalent to the expression below?

NOT (A OR B)

(A) A OR B
(B) A AND B
(C) NOT A OR NOT B
(D) NOT A AND NOT B

62. According to DeMorgan's Law, which of the following Java expressions is equivalent to the expression below?

NOT (A AND B)

(A) A OR B
(B) A AND B
(C) NOT A OR NOT B
(D) NOT A AND NOT B

63. ACME University will accept students who make either at least a 1000 on the SAT, OR who are in the top 25% of their class. Assume that sat and rank are int variables. Which of the compound conditions below will correctly check to see if a student is qualified to go to ACME University?

(A)

```
if (sat > 1000 || rank < 25)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(B) ###

```
if (sat >= 1000 || rank <= 25)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(C)

```
if (sat <= 1000 || rank >= 25)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(D)

```
if (sat < 1000 && rank > 25)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(E)

```
if (sat >= 1000 && rank <= 25)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

64. BOOHISS will only accept students who make at least a 1350 on the SAT, AND who are in the top 10% of their class. Assume that sat and rank are int variables. Which of the compound conditions below will correctly check to see if a student is qualified to go to BOOHISS University?

(A)
```
if (sat > 1350 || rank < 10)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(B)
```
if (sat >= 1350 || rank <= 10)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(C)
```
if (sat <= 1350 || rank >= 10)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(D)
```
if (sat < 1350 && rank > 10)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

(E) ###
```
if (sat >= 1350 && rank <= 10)
    System.out.println("You are accepted");
else
    System.out.println("You are not accepted");
```

65. ACME University will accept students who make either at least a 1000 on the SAT, OR who are in the top 25% of their class.
BOOHISS will only accept students who make at least a 1350 on the SAT, AND who are in the top 10% of their class.
Tom made a perfect 1600 on his SAT and he is the class valedictorian.
Which of the following statements is true?

(A) Tom will be accepted at both universities.
(B) Tom will be accepted at ACME but rejected at BOOHISS.
(C) Tom will be accepted at BOOHISS but rejected at ACME.
(D) Tom will be rejected at both universities.

---

66. ACME University will accept students who make either at least a 1000 on the SAT, OR who are in the top 25% of their class.
BOOHISS will only accept students who make at least a 1350 on the SAT, AND who are in the top 10% of their class.
Sue just found out her SAT score is 1200. She does not know her class rank yet.
Which of the following statements is true?

(A) Tom will be accepted at both universities.
(B) Tom will be accepted at ACME but rejected at BOOHISS.
(C) Tom will be accepted at BOOHISS but rejected at ACME.
(D) Tom will be rejected at both universities.
(E) Until Sue learns her class rank, there is no way to determine anything.

---

70. If a equals **false**, what is the value of the following expression?

a and ((b or c) and (a or c) or (a and b) and (not b and not c))

(A) The expression cannot be evaluated without the values of b and c.
(B) The expression is false, if both b and c are false, and true otherwise.
(C) The expression is true, if both b and c are true, and false otherwise.
(D) true
(E) false

---

71. If a equals **true**, what is the value of the following expression?

a and ((b and not c) or (a and c) or (a and b) or (not b or c))

(A) The expression cannot be evaluated without the values of b and c.
(B) The expression is false, if both b and c are false, and true otherwise.
(C) The expression is true, if both b and c are true, and false otherwise.
(D) true
(E) false

---

72. If a equals **true**, what is the value of the following expression?

a || ((b || c) && (a || c) || (a && b) && (!b && !c))

(A) The expression cannot be evaluated without the values of b and c.
(B) The expression is false, if both b and c are false, and true otherwise.
(C) The expression is true, if both b and c are true, and false otherwise.
(D) true
(E) false

---

73. If a equals **false**, what is the value of the following expression?

a && ((b && c) || (a && c) && (a || b) || (!b || !c))

(A) The expression cannot be evaluated without the values of b and c.
(B) The expression is false, if both b and c are false, and true otherwise.
(C) The expression is true, if both b and c are true, and false otherwise.
(D) true
(E) false

---

74. Consider this scenario:

You need to write a program for college admission. The program will ask for the SAT score. If the SAT score is high enough the student is admitted and then the program will also ask about the parents' combined salary. If that is low enough, the student will qualify for financial aid.

Question: Which of the following is the BEST to use?

(A) A single **if** structure.
(B) Two separate **if** structures.
(C) One **if** structure nested inside another **if** structure.
(D) Two separate **for** structures.
(E) One **for** structure nested inside another **for** structure.

---

75. Consider this scenario:

You need to write a program that will determine the cost of a combo meal at a fast food restaurant. Customers can choose to "up-size" their drink (get a large instead of a medium) for an additional $0.19. They can also "up-size" the fries for an additional $0.39.
The cashier has a separte button for "up-size drink" and "up-size fries".

Question: Which of the following is the BEST to use?

(A) A single **if** structure.
(B) Two separate **if** structures.
(C) One **if** structure nested inside another **if** structure.
(D) Two separate **for** structures.
(E) One **for** structure nested inside another **for** structure.