

*left to right*

5) Find the answer of the following:

- int  $x = 2 + 3$  **5**
- int  $x = 3 + 8 - 29$  **-18**
- int  $x = 4 + \underline{5.2} - \underline{8.3} + \underline{9.2} / \underline{10}$   
conversion  $\underline{5} \quad \underline{8} \quad \underline{9}$
- double  $x = 4.1 + 8.9 + 3.5$  **16.5**
- int  $x = 4 * 3 / 8 + 2.5 * 2 /$   
conversion  $\underline{12/8} + 5 = 6$
- double  $x = 22 + 4 * 2$  **20.0**
- double  $x = 8 / 5 + 13 / 2$
- double  $x = 8.0 / 5 + 13 / 2$
- double  $x = 8.0 / 5 + 13.0 / 2$
- int  $x = 392 / 10 \% 10 / 2$
- int  $x = 39 \% 2 * 3$

( ) > / \* % > + -

- Int  $x = 7 + 3 + 4$
- Int  $x = 12 + 5 + 8$
- Int  $x = 13/5 + 18/8$
- double  $x = 12 + 5.0 + 2.76$
- double  $x = 12/3 + 13/2$
- double  $x = 12/3 + 13.0/2$
- double  $x = 14/2 + 15.0/4$
- double  $x = 13/2 \% 5/3$
- double  $x = 17.0/2 \% 16.0/4$

$$4 \frac{*\underline{3}}{\underline{12}/8} / 8 + 2 \frac{*\underline{5}}{5} = 6$$

$$\underline{1.0} + \underline{6.0} = 7.0$$

g. double  $x = 8 / 5 + 13 / 2$

h. double  $x = \underline{8.0}/\underline{5} + \underline{13}/\underline{2}$

$$1.6 + 6.0 = 7.6$$

i. double  $x = 8.0 / 5 + 13.0 / 2$

j. int  $x = 392 / 10 \% 10 / 2$

k. int  $x = 39 \% 2 * 3$

$$\begin{array}{r}
 1.6 \\
 5 \sqrt{8.0} \\
 \underline{5} \\
 \underline{3} \quad \text{remainder} \\
 \underline{3} \\
 \underline{0}
 \end{array}
 \quad
 \begin{array}{r}
 1.6 \\
 5 \sqrt{8} \\
 \underline{5} \\
 \underline{3} \\
 \underline{0}
 \end{array}$$

$$= 1.0 + 6.0 = 7.0$$

g. double  $x = 8 / 5 + 13 / 2$

h. double  $x = \underline{8.0}/\underline{5} + \underline{13}/\underline{2}$

$$1.6 + 6.0 = 7.6$$

$$\begin{array}{r}
 1 \\
 5 \sqrt{8} \\
 \underline{5} \\
 \underline{3} \rightarrow \text{remainder}
 \end{array}$$

$$1.6 \quad 6.5 = 8.1$$

$$\begin{array}{r}
 1.6 \\
 5 \sqrt{8.0} \\
 \underline{5} \\
 \underline{3} \\
 \underline{0}
 \end{array}
 \quad
 \begin{array}{r}
 1.6 \\
 5 \sqrt{8} \\
 \underline{5} \\
 \underline{3} \\
 \underline{0}
 \end{array}$$

i. double  $x = 8.0 / 5 + 13.0 / 2$

$$i. \text{ double } x = 8.0 / 5 + 13.0 / 2$$

$$j. \text{ int } x = 392 / 10 \% 10 / 2$$

$$k. \text{ int } x = 39 \% 2 * 3$$

$$\begin{array}{r} 6.5 \\ \hline 13.0 \\ -12 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 3 \\ \hline 39 \\ -30 \\ \hline 9 \\ -9 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 39 \\ \hline 39 \% 10 \\ 9 / 2 = 4 \\ \hline \end{array} \quad \begin{array}{r} 10 \\ \hline 392 \\ -30 \\ \hline 92 \\ -90 \\ \hline 2 \checkmark \end{array} \quad \begin{array}{r} 10 \\ \hline 39 \\ -30 \\ \hline 9 \rightarrow \text{remainder} \\ \hline \end{array}$$

" ( ) > \* % / > + - "

$$j. \text{ int } x = 392 / 10 \% 10 / 2$$

→ left to right

$$\begin{array}{r} 39 \% 10 \\ 9 / 2 \rightarrow 4 \end{array}$$

$$i. \text{ double } x = 8.0 / 5 + 13.0 / 2$$

$$\begin{array}{r} 1.6 \\ 5 \sqrt{8.0} \\ -5 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 6.5 \\ \hline 13.0 \\ -12 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

$$k. \text{ int } x = 39 \% 2 * 3$$

left to right

$$\begin{array}{r} 19 \\ 2 \sqrt{39} \\ -2 \\ \hline 19 \end{array}$$

$$(1) * 3 \rightarrow 3$$

$$2 \sqrt{39}$$

$$\begin{array}{r} 2 \\ \hline 19 \\ -18 \\ \hline 1 \end{array}$$

remainder

a.  $\text{Int } x = 7+3+4 = 14$

b.  $\text{Int } x = 12 + 5 + 8 = 25$

c. ~~Int~~  $x = 13/5 + 18/8 = 4$

d. double  $x = 12 + 5.0 + 2.76 = 19.76$

e. double  $x = 12/3 + 13/2 = 10.0$

f. double  $x = 12/3 + 13.0/2 = 10.5$

g. double  $x = 14/2 + 15.0/4 = 10.75$

h. double  $x = 13/2 \% 5/3 = 0.0$

i. double  $x = 17.0/2 \% 16.0/4$

$8.5 \% 16.0$

$$8.5 / 4 = 2.125$$

$$6.0 \% 5 \Rightarrow 1.0 / 3 = 0.0$$

h. double  $x = 13/2 \% 5/3$

i. double  $x = 17.0/2 \% 16.0/4$

$$2 \sqrt{17.0}$$

$$\begin{array}{r} 8.5 \\ 16.0 \\ \hline 10 \\ 10 \\ \hline 0 \end{array}$$

$8.5 \% 16$        $8.5 / 4$        $5 \sqrt{6.0}$

$$3 \sqrt{1.0}$$

$$16 \sqrt{8.5}$$

$$\begin{array}{r} 0 \\ 8.5 \\ \hline 8.5 \\ 8.5 \\ \hline 0 \end{array}$$

$$4 \sqrt{2.125}$$

$$\begin{array}{r} 2.125 \\ 8.5 \\ 8.0 \\ \hline 0.5 \\ 4 \\ \hline 10 \\ 8 \\ \hline 20 \end{array}$$

8 ÷ 2

$$\begin{array}{r} \overline{1} \\ \overline{10} \\ -\overline{8} \\ \overline{20} \\ -\overline{20} \\ \overline{0} \end{array}$$

## # Logical Operator ' && '

And Operator  
cond1 cond2 Result

| cond1 | cond2 | Result |
|-------|-------|--------|
| T     | T     | T      |
| T     | F     | F      |
| F     | T     | F      |
| F     | F     | F      |

short switching ✓

→ if both condition is true  
your result will be true

— [if any of the condition is  
false your result will be false]

condition1 && condition2

```
a = 10, b = 20, c = 20
10 < 20
condition1: a < b → true
condition2: b == c → true

if(condition1 && condition2) → true
d = a+b+c
10 + 20 + 20

// Since both the conditions are true
d = 50.
```

```
public static void main(String[] args) {
    int age = 24;
    int salary = 950;

    boolean result; // declaration
    result = (age >= 18 && salary > 600);
    System.out.println(result); → true

    result = (age >= 18 && salary > 1000);
    System.out.println(result); → false
```

24 ≥ 18 → true & 950 > 600 → true  
true

24 ≥ 18 & 950 > 1000  
true & false  
false

# # OR Operator "||"

Cond1 Cond2 Result

| Cond1 | Cond2 | Result |
|-------|-------|--------|
| T     | T     | T      |
| T     | F     | T      |
| F     | T     | T      |
| F     | F     | F      |

Short circuiting

- If you get either one of the condition is true, your output will be true
- If both the cond false result  $\rightarrow$  false.

```
condition1 || condition2
a = 10, b = 20, c = 20
condition1: a < b → 10 < 20 → true ✓
condition2: b > c → 20 > 20 → false
if(condition1 || condition2)
    d = a+b+c
// Since one of the condition is true
d = 50.
```

and  
 if both cond true  
 result true  
 otherwise false

or

if both cond false  
 result false  
 otherwise true

```
public static void main(String[] args) {
    int age = 24; ✓
    int salary = 950; ✓

    boolean result; // declaration
    result = (age >= 18 || salary > 1000); 24 >= 18 → true
    System.out.println(result); → true

    result = (age >= 30 || salary > 1000); → 24 >= 30 || 950 > 1000
    System.out.println(result);
}
```

||  
 false      false

false

# Not logic — negation ?

# Not logic — negation }  
 negate } opposite

| Cond | Result |
|------|--------|
| T    | F      |
| F    | T      |

Syntax

$!(\underline{\text{condition}})$

true → false

false — true

```
a = 10, b = 20
!(a < b) // returns false
!(a > b) // returns true
```

$!(10 < 20) \rightarrow \text{false}$

$!(10 > 20) \rightarrow \text{true}$

```
public static void main(String[] args) {
    int age = 24;
```

// → single line comment

/\* \*/ — multi line comment

```
boolean result; // declaration
result = !(age >= 24); ! (true)
System.out.println(result); // false
result = !(age == 25); false ! (false) → true
System.out.println(result); // true
```

}

True & true  
**1. boolean ans = 3 > 2 && 14 > 3;** → true

2. Boolean ans =  
 $40 > 3 \text{ && } 40 > 50$

false

3.

**Boolean ans =**

$$40 \geq 40 \quad || \quad 50 \geq 2 * 25 \rightarrow \text{true}$$

true

4

**Boolean ans =**

$$(2 \times 3 == 4 \quad \&\& \quad 6 \times 4 == 9) \quad || \quad (4 > 2)$$

6 == 4      24 == 9  
false      false

} true || → friends  
false & → friends  
short switch

$$(\text{false}) \quad || \quad (\text{true}) \rightarrow \text{true}$$

5

**Boolean ans =**

$$(4 > 5) \quad \&\& \quad (3 > 5 \quad \&\& \quad 80 == 2 \times 40)$$

false

→ false

6

**Boolean ans =**

$$(20 \overset{\text{true}}{\times} 5 == 100 \quad || \quad 10 == 10) \quad \&\& \quad (30 \times 2 == 60 \quad || \quad 40 > 30)$$

60 == 60

int age = 24;  
= → assigning  
== → comparison

7

$$\text{Boolean ans} = !(\overset{\text{! (true)}}{30 > 20}) \rightarrow \text{false}$$

8.

$$\text{Boolean ans} = !(\overset{\text{true}}{30 == 30}) \rightarrow \text{false}$$

9.

**Boolean ans =**

$$!(30 \geq 20 \quad || \quad 40 \geq 10)$$

true

! (true)

→ false ✓

10.

**Boolean ans =**

$$!(\overset{\text{!}}{20 \times 4 + 40 \geq 100} \quad || \quad 20 \overset{\text{!}}{== 10}) \quad \&\&$$

**Boolean ans =**

$$!(20 \times 4 + 40 >= 100) \quad || \quad 20 == 10) \quad \&\& \\ (3 \times 2 <= 60 \quad || \quad 4 >= 30)$$

$6 \leq 6$  true

$![(20 >= 100) \quad \text{true} \quad \&\& \quad (\text{true})]$

$!(\text{true}) \rightarrow \text{false}$

11.

**Boolean ans =**

$$!(20 \% 3 == 2)$$

$!(2 == 2) \rightarrow \text{false}$

$$3 \sqrt[6]{20}$$

$$\begin{array}{r} 6 \\ \overline{)20} \\ -18 \\ \hline 2 \end{array}$$

12.

**Boolean ans =**

$$(!(\underline{40 == 40}) \quad \&\& \quad 80 > 36)$$

true    false  $\&$  true  $\rightarrow$  false

13.

**Boolean ans =**

$$(!(\underline{50 > 20} \quad || \quad 90 > 2 \times 45) \quad \&\& \quad (30 != 2 \times 15))$$

!(true)  $\&$  (false)  
false  $\&$  false  $\rightarrow$  false

### Homework Questions:

Store the result of the following expressions in "ans" variable of type boolean and print the final result.

1. boolean ans =  $40 >= 2 * 45 \quad || \quad 30 >= 2 * 10$
2. boolean ans =  $40 > 3 \quad \&\& \quad 20 > 3$
3. boolean ans =  $50 > 7 \quad \&\& \quad 30 >= 40$
4. boolean ans =  $50 < 25 \quad || \quad 30 > 2$
5. boolean ans =  $70 <= 75 \quad || \quad 40 <= 2$
6. boolean ans =  $!(45 == 35)$
7. boolean ans =  $(20 < 32 \quad \&\& \quad 2 != 30) \quad \&\& \quad (35 >= 20 \quad || \quad 35 != 25)$
8. boolean ans =  $!(20 > 30)$
9. boolean ans =  $!(30 > 40)$
10. boolean ans =  $!(40 == 2 * 20) \quad \&\& \quad 75 == 15 * 5$
11. boolean ans =  $!(40 >= 40) \quad || \quad (50 >= 2 * 25)$
12. boolean ans =  $!(10 * 5 == 50) \quad || \quad (2 * 3 == 7 \quad || \quad 9 == 28 / 3)$
13. boolean ans =  $(20 * 5 == 100 \quad || \quad 10 != 10) \quad \&\& \quad (30 * 2 == 60 \quad || \quad 50 < 40)$

```
11.boolean ans = !(40>=40) || (30>=2 & 25)
12.boolean ans = !(10*5==50) || (2*3==7 || 9==28/3)
13.boolean ans = (20*5==100 || 10!=10) && (30*2==60 || 50<40)
14.boolean ans = ( !(90>=40) && !(80>36) )
15.boolean ans = ( (50>=20) || 90>2*45) && ( 30!=2*15)
```