

Programming Techniques – Part 1

Tutorial 1

Operators and expression

- 1) What is an expression? What are its components?
- 2) What is an operator? Describe several different types of operators that are included in Java.
- 3) What is an operand? What is the relationship between operators and operands?
- 4) Describe the five arithmetic operators in Java. Summarise the rules associated with their use.
- 5) Summarise the rules that apply to expressions whose operands are of different types.
- 6) How can the value of an expression be converted to a different data type? What is it called?
- 7) What is meant by operator precedence? What are the relative precedences of the arithmetic operators?
- 8) In what order are the operations carried out within an expression that contains nested parenthesis?
- 9) What are unary operators? How many operands are associated with a unary operator?
- 10) Describe the six unary operators? What is the purpose of each?
- 11) Describe two different ways to utilise the increment and decrement operators. How to the two methods differ?
- 12) How can the number of bytes allocated to each data type be determined for a particular java compiler?
- 13) Describe the four relational operators included in Java. With what type of operands can they be used? What type of expression is obtained?
- 14) Describe the two equality operators. How do they differ from relational operators?
- 15) Describe the two logical operators included in Java. What is the purpose of each? With what type of operands can they be used? What type of expression is obtained?
- 16) Describe the logical not operator? What is its purpose? How many operands does it require?
- 17) Describe the six assignment operators. What is the purpose of each?
- 18) How can multiple assignments be written in Java?
- 19) Suppose a, b and c are integer variables that have been assigned the values a = 8, b = 3 and c = -5. Determine the value of each of the following arithmetic expressions.
 - a) $a + b + c$
 - b) $2 * b + 3 * (a - c)$
 - c) a / b
 - d) $a \% b$
 - e) a / c
 - f) $a \% c$
 - g) $a * b / c$
 - h) $a * (b / c)$
 - i) $(a \% c) \% b$
 - j) $a * (c \% b)$
- 20) Suppose x, y and z are floating-point variables that have been assigned the values x = 8.8, y = 3.5 and z = -5.2. Determine the value of each on the following arithmetic expressions.
 - a) $x + y + z$
 - b) $2 * y + 3 * (x - z)$
 - c) x / y
 - d) $x \% y$
 - e) $x / (y + z)$
 - f) $(x / y) + z$
 - g) $2 * x / 3 * y$
 - h) $2 * x / (3 * y)$
- 21) Suppose c1, c2 and c3 are character-type variables that have been assigned the characters E, 5 and ?, respectively. Determine the numerical value of the following expressions. 'E' = 69, '5' = 53 and '?' = 63
 - a) c1
 - b) $c1 - c2 + c3$
 - c) $c2 - 2$
 - d) $c2 - '2'$
 - e) $c3 + 'F'$
 - f) $c1 \% c3$
 - g) $'2' + '2'$
 - h) $(c1 / c2) * c3$
 - i) $3 * c2$
 - j) $'3' * c2$
- 22) A Java program contains the following declarations:

```
int i,j;
long ix;
short s;
float x;
double dx;
char c;
```

Determine the data type of each of the following expressions.
 - a) $i + c$
 - b) $x + c$
 - c) $dx + x$
 - d) $((int\ dx)) + ix$
 - e) $i + x$
 - f) $s + j$
 - g) $ix + j$
 - h) $s + c$
 - i) $ix + c$
- 23) A Java program contains the following declarations and initial assignments:

```
int i = 8, j = 5;
float x = 0.005, y = -0.01;
char c = 'c', d = 'd';
```

Determine the value of each of the following expressions. Use the values initially assigned to the variables for each expression.
 - a) $(3 * i - 2 * j) \% (2 * d - c)$

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- b) $2 * ((i / 5) + (4 * (j - 3)) \% (i + j - 2))$
 - c) $(i - 3 * j) \% (c + 2 * d) / (x - y)$
 - d) $-(i + j)$
 - e) $++i$
 - f) $i++$
 - g) $-j$
 - h) $++x$
 - i) $y--$
 - j) $i \leq j$
 - k) $c > d$
 - l) $x \geq 0$
 - m) $x < y$
 - n) $j != 6$
 - o) $c == 99$
 - p) $5 + (i + j) > 'c'$
 - q) $(2 * x + y) == 0$
 - r) $2 * x + (y == 0)$
 - s) $2 * x + y == 0$
 - t) $!(i \leq j)$
 - u) $!(c == 99)$
 - v) $!(x > 0)$
 - w) $(i > 0) \&\& (j < 5)$
 - x) $(i > 0) \parallel (j < 5)$
 - y) $(x > y) \&\& (i > 0) \parallel (j < 5)$
 - z) $(x > y) \&\& (i > 0) \&\& (j < 5)$
- 24) A Java program contains the following declarations and initial assignments:
- ```
int i = 8, j = 5, k;
float x = 0.005, y = -0.01, z;
char a, b, c = 'c', d = 'd'
```
- Determine the value of each of the following assignment expressions.
- a)  $k = (i + j)$
  - b)  $z = (x + y)$
  - c)  $i = j$
  - d)  $k = (x + y)$
  - e)  $k = c$
  - f)  $z = i / j$
  - g)  $a = b = d$
  - h)  $i = j = 1.1$
  - i)  $z = k = x$
  - j)  $k = z = x$
  - k)  $i += 2$
  - l)  $y -= x$
  - m)  $x *= 2$
  - n)  $i /= j$
  - o)  $i \% = j$
  - p)  $i += (j - 2)$
  - q)  $k = (j == 5) ? i : j$
  - r)  $k = (j > 5) ? i : j$
  - s)  $z = (x >= 0) ? x : 0$
  - t)  $z = (y >= 0) ? y : 0$
  - u)  $a = (c < d) ? c : d$
  - v)  $i -= (j > 0) ? j : 0$