Chapter 1: Review of Java Fundamentals

Multiple Choice Questions:

1) Which of the following is an example of a wrapper class?
   a) `Double`
   b) `int`
   c) `String`
   d) `System`

Answer: a.

2) In order to declare a named constant, the declaration must use which Java keyword?
   a) `final`
   b) `int`
   c) `static`
   d) `void`

Answer: a.

3) If x is a variable of type `int`, what is the largest possible value of the expression (x % 5) ?
   a) 1
   b) 4
   c) 5
   d) $2^{31} - 1$

Answer: b.

4) What is the meaning of the declaration: `String [][] a = new String [60][80];` ?
   a) Create an array of 60 strings, each of size 80 characters.
   b) Create an array of 80 strings, each of size 60 characters.
   c) Create a two-dimensional array of strings with 60 columns and 80 rows.
   d) Create a two-dimensional array of strings with 60 rows and 80 columns.

Answer: d.

5) Which of the following loop headers will arrange for the loop body to execute exactly 10 times?
   a) for (int i = 1; i < 10; ++i)
   b) for (int i = 0; i <= 10; ++i)
   c) for (int i = –5; i < 5; ++i)
   d) for (int i = 2; i < 20; ++i)

Answer: c.

6) What type of Java statement allows you to use classes contained in other packages?
   a) an `access` statement
   b) a `class` statement
   c) an `import` statement
   d) a `package` statement

Answer: c.

7) Which access modifier, used when defining a method, indicates that only one such method is available for all instances of the class?
   a) `final`
   b) `private`
   c) `protected`
   d) `static`

Answer: d.

8) Suppose c1 and c2 are objects of the class Circle. A Circle has a single data member, its radius. The Circle class has a default constructor (implemented correctly), but no other methods have been defined in the implementation of the Circle class. What will happen when we try to execute this code?

```
Circle c1 = new Circle(12.0);
Circle c2 = new Circle(12.0);
boolean same = (c1.equals(c2));
```

a) The code will not compile because `equals( )` has not been implemented in Circle.
b) The value of `same` will be true.
c) The value of `same` will be false.

Answer: c.

9) Suppose a String variable s is initialized to the value "`inheritance`". What value is returned by the call `s.substring(2, 5)` ?

a) nher
b) nheri
c) her
d) heri

Answer: c.

10) Which type of loop is guaranteed to execute its body at least once?

a) do-while
b) for
c) switch
d) while

Answer: a.

11) Which of these expressions is illegal in Java?

a) `x++ 5`
b) `x =+ 5`
c) `x += 5`
d) `x == 5`

Answer: a.

12) Suppose s is of type `String`. What would it mean if s.lastIndexOf(s.charAt(0)) returns the value 1?

a) The first character appears once in the string.
b) The first two characters in the string are identical.
c) The length of the string is 2.
d) The second character of the string is '0'.

Answer: b.

13) If `s1` is of type `String`, what does `s1.compareTo(s1)` return?

a) zero
b) true
c) false
d) Cannot be determined without knowing the value of s1.

Answer: a.

14) How many constructors can a class have?

a) Exactly one
b) At least one but no more than three
c) Exactly the same as the number of data members
d) There is no restriction on the number of constructors

Answer: d.

15) Suppose a `try` block needs to be followed by two catch blocks, each catching a different exception. Which exception should be caught first?
    a) The exception that is more likely to occur
    b) The exception that is more general
    c) The exception that is more specific
    d) It does not matter in what order exceptions are caught

Answer: c.

16) A comment in Java that begins with /** and ends with */ is what kind of comment?
    a) block comment
    b) javadoc comment
    c) line comment
    d) nested comment

Answer: b.

17) In Java, how do we tell the compiler that the body of a loop consists of several statements, rather than one?
    a) We enter all the statements on the same line
    b) We indent all the statements at the same level of indentation
    c) We enclose the statements in curly braces
    d) We insert a break statement at the end of the loop

Answer: c.

18) What feature of Java transforms class objects into a sequence of bytes that may be used by another program?
    a) compilation
    b) inheritance
    c) serialization
    d) tokenization

Answer: c.

19) When using the method `System.out.printf( )`, what is the purpose of the `%d` format code?
    a) For printing a `double`
    b) For printing a `float`
    c) For printing a `String`
    d) For printing an `int`

Answer: d.

20) What does it mean for the return type of a method to be `void`?
    a) The method will never return a value.
    b) The method will return the value zero.
    c) The method does not take parameters.
    d) The method does not have a body.

Answer: a.

21) A built-in class that helps to split strings into pieces, such as words of a sentence, is:
    a) Console
    b) Scanner
    c) StringBuffer
    d) StringTokenizer

Answer: d.

22) How is the `finally` keyword used in Java?
   a) To indicate that a method should terminate and pass a value to the calling environment.
   b) To indicate the last statement that will execute in a program.
   c) To indicate an action that should take place whether an exception occurred or not.
   d) To indicate a termination condition for a loop.

Answer: c.

23) The Java expression `9 / 5 + 9 % 5` equals _____.
   a) 0
   b) 1
   c) 3
   d) 5
   e) 6

Answer: d.

24) If we wanted to write an if-statement that executes whenever the real number x is between 10.0 and 20.0, how should the test condition be written?
```
a) 10.0 < x || x > 20.0
b) 10.0 < x && x > 20.0
c) 10.0 < x && x < 20.0
d) 10.0 < x || x < 20.0
```

Answer: c.

25) Consider the following code that appears in a test class.
```
A a = new A();
int c = a.b;
```
In order for this code to work, which statement must be true?
   a) a must be declared public inside class A
   b) b must be declared public inside class A
   c) c must be declared public inside class A
   d) Method b( ) must return int

Answer: b.

26) All classes extend which built-in class?
```
a) Main
b) Object
c) Simple
d) Super
```

Answer: b.

27) Which of these is <u>not</u> a legal Java identifier?
```
a) 2be
b) to_be
c) TOBE
d) tobE
```

Answer: a.

28) Which is not a primitive type in Java?
```
a) String
b) float
c) double
d) long
```

Answer: a.

29) Short-circuit evaluation refers to:
   a) Jumping from the `try` block to the `catch` block when an exception is thrown.
   b) Avoiding the testing of a boolean condition that is unnecessary.
   c) Truncating the integer result of a division operation.
   d) Avoiding the execution of the `else` clause of an if-statement.

Answer: b.

30) A statement invoking a constructor should also use the Java keyword _____.
```
a) class
b) return
c) public
d) new
```
Answer: d.

True/False Questions:

1) If an `int` is added to a `float`, the result will be an `int`.

Answer: False.

2) If `s1` = "dog" and `s2` = "cat", then `s1.compareTo(s2)` returns a positive integer value.

Answer: True.

3) A default constructor requires at least one parameter in order to compile correctly.

Answer: False.

4) All Java programs must define at least one class.

Answer: True.

5) In Java, when we write an if-statement of the form `if(condition)`, the condition must evaluate to a boolean value.

Answer: True.

6) If `d` is a `double` and `i` is an `int`, then the assignment statement `d = i;` is legal in Java.

Answer: True.

7) All Java classes must contain a method called `main`.

Answer: False.

8) Integer literals beginning with the digit 0 are interpreted to be in decimal notation.

Answer: False.

9) Comments beginning with the characters `//` can extend for multiple lines until the compiler encounters `\\`.

Answer: False.

10) The Java expression (75 – 63) * 10 / 6 – 1 evaluates to 19.

Answer: True.

Short Answer Questions:

1) What is the value of `sum` after the following code executes?

```
int sum = 0;
int count = 0;
while (count < 4)
{
  sum += count / 2;
  count += 1;
}
```

Answer: 2

2) What will happen when you try to run a program that has a syntax error?

Answer: The compiler will not be able to compile your program, because it does not understand your code. Thus, no class file (byte code) will be created to run on the Java virtual machine.

3) Suppose s1 is a String variable. We want to check to see if the first and last characters of s1 are the same. Complete the following if-statement to accomplish the task.

```
boolean same;
if (_____________________________________________________)
  same = true;
else
  same = false;
```

Answer: s1.charAt(0) == s1.charAt(s1.length() – 1)

4) Write a for-loop that will print all the positive integers from 100 down to 1, inclusive, one number per line.

Answer:
```
for (int i = 100; i >= 1; i--)
      System.out.println(i);
```

5) Complete the following code so that it sets found to true if the array `a` consisting of integers contains the value zero.

```
int index = 0;
boolean found = false;
```

Answer:
```
for (index = 0; index < a.length; index++)
  if (a[index] == 0)
    found = true;
```

6) How many times are the indicated statements (#1) and #2) each executed?

```
for (int i = 1; i <= 10; ++i)
   for (int j = 1; j <= 10; ++j)
      for (int k = 1; k <= 5; ++k)
         ++count;                          // statement #1
      System.out.printf("%d\n", count); // statement #2
```

Answer: Statement #1 executes 500 times, and statement #2 executes 1 time.

7) Interpret the overall meaning of this if-statement:

```
if (num % 7 == 0 || num % 11 == 0)
```

Answer: It tests to see if the value of `num` is divisible by either 7 or 11.

8) Suppose a, b and c are the lengths of the 3 sides of a triangle. Write an if-statement that will determine if the triangle is isosceles (at least 2 of the 3 sides are equal). You may assume that a, b and c are of type `int`.

Answer:
```
if (a == b || a == c || b == c)
  System.out.println("isosceles triangle");
```

9) What is wrong with this Java statement? `int num = new int(5);`

Answer: `int` is a primitive type in Java, not a class. We can immediately assign it the value of 5; there is no constructor to call, and no need to dynamically allocate memory.

10) Why does the Java statement `System.out.println("answer = " + 3 + 4);` not print `answer = 7` ?

Answer: Because the + operator is left-to-right associative. We evaluate the first + first, and by doing so we concatenate the integer 3 into the string. Then, we concatenate the 4 into the string.

11) Suppose a class Planet had a method findLife( ) that we call as follows in main( ):
```
int value = p.findLife("goat", true, 0.5);
```
How would the findLife( ) method be declared in Planet.java?

Answer:
```
public int findLife(String s, boolean b, double d)
```

12) Suppose x and y are `int` variables. Write a statement that declares the boolean variable `between`, and sets this variable equal to true if the value of y is between 0 and x, inclusive, and equal to false otherwise. (Assume that you don't know if x is positive or negative.)

Answer:
```
boolean between = (x >= y && y >= 0) || (0 >= y && y >= x);
```

13) Suppose `a` is a one-dimensional array of double. Show how you would find the largest element of `a` using Java code.

Answer:
```
double max = a[0];
for (int i = 1; i < a.length; ++i)
  if (a[i] > max)
    max = a[i];
```

14) The following code attempts to find the sum of the elements in the third column (from the left) of a two dimensional `int` array called `a` that has 10 rows and 20 columns. Correct the errors in the code.
```
int sum = 0;
for (int i = 0; i < 20; i++)
  sum = sum + a[3][i];
```

Answer: The loop should be written this way:
```
for (int i = 0; i < 10; i++)
  sum = sum + a[i][2];
```

15) A leap year occurs when the year number (e.g. 1984) is divisible by 4. But there is a special case for years ending in 00: these must be divisible by 400 to be considered a leap year. Thus, 1900 was not a leap year, but 2000 was. Write an if-statement that determines if the integer variable `year` represents a leap year. (Hint: use the % operator for taking remainders.)

Answer:
```
if (year % 100 == 0 && year % 400 == 0 ||
    year % 100 != 0 && year % 4 == 0)
  System.out.println("It's a leap year.");
```

16) If `s = "hello, world"` (with exactly one space between the comma and 'w'), what does `s.indexOf(",")` return?

Answer: 5

17) What is wrong with this loop? How would you fix it?

```
int num = 1;
while (num <= 10) {
  System.out.println("num = " + num);
}
```

Answer: It is an infinite loop. After the print statement, we need to increment num, as in the statement `num++;` .

18) The following code containing a loop attempts to find how many times the letter 'r' appears in a string. But something is wrong with the loop. How would you fix it?

```
String s = "railroad";
int count = 0;
char letter = s.charAt(index);
for (int index = 0; index < s.length(); ++index)
  if (letter == 'r')
    ++count;
```

Answer:The assignment to `letter` needs to be moved down into the loop right before we check to see if the letter is an r.

19) Suppose c is a variable of type char. We want to know if c is a lowercase vowel letter (a/e/i/o/u). What is wrong with the following comparison?

```
if (c == 'a' || 'e' || 'i' || 'o' || 'u')
```

Answer: We have to repeat the "c ==" each time we want to perform a comparison. A vowel by itself is not a boolean expression.

20) Suppose `temp` is an array of 12 `double` values that holds the average temperatures of the 12 months of the year, January through December, in that order. Use Java to find the average of the temperatures for the 3 summer months, June, July and August only, and set this answer to the variable summerAverage.

Answer: `double summerAverage = (temp[5] + temp[6] + temp[7]) / 3.0;`