**Chapter 1: Introduction**

**Multiple Choice Questions**:

1) \_\_\_\_\_\_\_\_\_\_\_\_\_ consists of specific words and symbols to express a problem solution.

a) A programming language

b) Software

c) Hardware

d) A computer

e) An application

Answer: a

Explanation: A programming language consists of words and symbols to express a problem solution. Software consists of programs and the data these programs use. Hardware is the tangible parts of a computer, such as keyboards and hard disks. A computer is made up of hardware and software, and an application is a program that runs on a computer.

2) Java is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

a) a procedural language

b) a functional language

c) an object-oriented language

d) a fourth-generation language

e) a spoken-language

Answer: c

Explanation: Java is best described as an object-oriented language. Procedural languages, functional languages and fourth-generation languages are different types of languages that don't necessarily include object-oriented features. A spoken language is a language such as English or Spanish, and is too ambiguous for a computer to use.

3) *Problem domain* describes

a) the set of problems that are encountered when testing a program

b) the alternate ways to design the solution

c) the challenges in implementing the solution

d) the real-world issues that are key to a solution

e) all of the above

Answer: d

Explanation: The problem domain is the set of real-world issues that are key to a solution.

4) In order for a program to run on a computer, it must be expressed in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

a) an assembly language

b) a machine language

c) a high-level language

d) an object-oriented language

e) a fourth generation language

Answer: b

Explanation: A computer can only understand its machine language. Assembly languages, high-level languages, object-oriented languages and fourth generation languages are are languages that are easy for humans to understand, but they must first be translated into a machine language before they are run on a computer.

5) A syntax error is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

a) a logical error

b) a compile-time error

c) a run-time error

d) a bug

e) an exception

Answer: b

Explanation: A program that contains a syntax error is invalid, and therefore cannot be compiled. It is a compile-time error because it is caught by the compiler. A logical error is an error that causes a running program to behave in an unexpected manner during run-time. A bug is an example of a logical error. A run-time error is an error that happens while the program is running. In Java, run-time errors are called exceptions.

6) Which of the following is *not* one of the four basic software development activities?

a) establishing the requirements

b) creating a design

c) preliminary practice coding

d) testing

e) implementing the design

Answer: c

Explanation: Preliminary practice coding is not one of the four basic software development activities. Establishing the requirements for a program, creating a design for a program, implementing the design and testing the program all occur during software development.

7) *Software requirements* specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

a) what a program should accomplish

b) which programming language the developer should use

c) how objects should be encapsulated

d) how a solution should be implemented

e) a programming schedule

Answer: a

Explanation: Software requirements specify what a program should accomplish. They do not specify *how* a program or a programmer should get a program to work as it is supposed to, and therefore none of the other choices are correct.

8) The \_\_\_\_\_\_\_\_\_\_\_\_\_ of an object define it define its potential behaviors.

a) attributes

b) white spaces

c) variables

d) methods

e) name

Answer: d

Explanation: The methods of an object represent the objects potential behaviors. The attributes are the values that the object stores internally, and include the objects instance variables. The name of an object has nothing to do with its behaviors. White space is related to the program code and has nothing to do with objects.

9) Which of the following will is considered a logical error?

a) forgetting a semicolon at the end of a programming statement

b) typing a curly bracket when you should have typed a parenthesis

c) multiplying two numbers when you meant to add them

d) dividing by zero

e) misspelling an identifier

Answer: c

Explanation: Multiplying two numbers when you mean to add them is an example of a logical error, because the program will still compile and run, but the output will be incorrect. Forgetting a semicolon, using a bracket instead of a parenthesis and misspelling an identifier will all lead to the program failing to compile, and are therefore compile-time errors. Dividing by zero is an example of a run-time error since it will cause the program to crash at run-time.

10) Which of the following lines is a properly formatted comment?

a) // This is a comment

b) /\* This is a comment \*/

c) /\*

this is a comment

\*/

d) both a and b

e) a, b and c

Answer: e

Explanation: All three are examples of valid comments in Java. The first is an in-line comment, and the second two are examples of multi-line comments, although the second is only on one line.

11) The Java compiler translates Java source code into \_\_\_\_\_\_\_\_\_\_\_\_\_ .

a) Java bytecode

b) C++

c) assembly code

d) machine code

e) an object-oriented language

Answer: a

Explanation: The Java compiler translates source into Java bytecode, which is an architecture-neutral language. The bytecode can then be run on a Java virtual machine. It does not translate Java into C++, assembly code, or machine code. Java is already an object-oriented language, so there is no need to translate it into one.

12) Classes can be created from other classes by using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

a) encapsulation

b) polymorphism

c) inheritance

d) attributes

e) machine code

Answer: c

Explanation: Inheritance allows a programmer to create new classes from existing classes. Polymorphism is related to dynamic method binding in the inheritance hierarchy. Encapsulation is the conceptual idea that states that an object should be self-governing. Attributes are the values that are stored within an object. Machine code is a language that a computer can understand directly without translation.

13) Which of the following is not a valid Java identifier?

a) answer\_7

b) highest$

c) anExtremelyLongIdentifierIfYouAskMe

d) 2ndlevel

e) thirdNumber

Answer: d

Explanation: An identifier in Java can consist of any number of letters, numbers, the dollar sign character or underscores. It cannot, however, start with a digit. Therefore, 2ndlevel is not a valid identifier.

14) Which task(s) is/are done in the implementation activity in the software development process?

a) specify what the program must accomplish

b) determine how a program will accomplish its requirements

c) write the source code that will solve the problem

d) ensure that the program solves the targeted problem

e) all of the above

Answer: c

Explanation: Implementation is the process of writing the source code that will solve a problem. Answer a) refers to the software requirements. Answer b) refers to the software design. Answer d) refers to testing activities.

15) Which of the following describes the act of ensuring that a program solves the intended problem in all cases?

a) establishing the requirements

b) testing

c) preliminary practice coding

d) implementing the design

e) creating a design

Answer: b

Explanation: Testing a program is the act of ensuring that a program solves the intended problem in all cases. Establishing the requirements is done at the beginning of the software life cycle, and refers to specifying what a program should accomplish. Creating the design refers to designing the software and implementing the design refers to the actual coding portion of software development.**True/False Questions**:

1) An editor is typically included as part of an IDE.

Answer: True

Explanation: An IDE is an *integrated development environment.* It typically includes all of the tools needed to write programs in a particular language. This includes a compiler, an editor, and a debugger among other things.

2) Comments affect the run-time execution of a program.

Answer: False

Explanation: Comments are useful for people who are reading the code and do not affect the run-time execution of a program.

3) A reserved word can be used to name a method.

Answer: False

Explanation: A reserved word cannot be used as an identifier in Java.

4) "Purchase a computer" is one of the problem-solving steps.

Answer: False

Explanation: The problem-solving steps include understanding the problem, designing a solution, considering alternate solutions and refining the solution, implementing the solution, and testing.

5) In Java, total, ToTal and TOTAL are all different identifiers.

Answer: True

Explanation: Java is case-sensitive, so these three identifiers are distinct and different.

6) Testing is the act of ensuring that a program will solve the targeted problem.

Answer: True

Explanation: Testing is the act of ensuring that a program will solve the targeted problem, given all of the constraints under which it must perform.

7) The attribute of an object defines its potential behaviors

Answer: False

Explanation: The attributes of an object are values that are stored internally in the object. The methods of an object define its potential behaviors.

8) An interpreter is a program that translates code that is written in one language into equivalent code in another language.

Answer: False

Explanation: A compiler is a program that translates code that is written in one language into equivalent code in another language. An interpreter is a program that interprets code in another language line-by-line.

9) Syntax rules dictate the form of a program. Semantics dictate the meaning of the program statements.

Answer: True

Explanation: These are correct definitions for *syntax* and *semantics* in the context of a programming language.

10) An object should never be encapsulated.

Answer: False

Explanation: In the object-oriented programming paradigm, it is important that an object be encapsulated, meaning that it manages all of its own information. **Short Answer Questions**:

1) Explain why "Understand the problem" is the first activity in problem solving.

Answer: Understanding the problem is critical to designing the solution. Without a good understanding of the problem, you may design a solution to the wrong problem.

2) Write a short Java program that outputs the following:

\*

\*

\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\* Time flies like an arrow

\*

\*

\*

Answer:

public class Arrow {

public static void main(String [] args) {

System.out.println(" \*");

System.out.println(" \*");

System.out.println(" \*");

System.out.println(" \*\*\*\*\*\*\*\*\*\*\*\*\*\* Time flies like an arrow");

System.out.println(" \*");

System.out.println(" \*");

System.out.println(" \*");

}

}

3) Why is testing part of the problem-solving process?

Answer: Testing allows us to find errors in our solution. The errors may be in the design, in the refinement of the design, or in the implementation. Testing helps to ensure that a solution is viable.

4) Identify the syntax errors in the following snippet of code:

public clas Hello {

public static void main(String [] args) {

Sytem.out.println("Hello Wrld!")

}

}

Answer: There are three syntax errors in this snippet of code: "class" is spelled incorrectly; "System" is spelled incorrectly; there is no semicolon after the print statement. Although "world" is spelled incorrectly, it is not a syntax error since it is part of a string literal.

5) Explain the difference between the *syntax* of a program and the *semantics* of a program.

Answer: Syntax rules dictate the form of a program. Semantics dictate the meaning of the program statements. In other words, syntax specifies the actual code of the program, while semantics refers to the meaning that is attached to the code.

6) Why is ambiguity a problem for programming languages?

Answer: Ambiguity is a problem for programming languages because it is extraordinarily difficult for a computer to tell what is meant by a phrase or a sentence from its context. Therefore translating an ambiguous language into machine code is very difficult.

7) Why is it important to consider alternate solutions to a problem?

Answer: The initial design of a solution may not be the best way to solve a problem. By considering alternate solutions, the design can be improved if necessary.

8) Why is inheritance a form of software reuse?

Answer: Inheritance supports creating classes based on the definition of an existing class. The new class re-uses the existing class’s attributes and methods.

9) Determine a good identifier for each of the following entities in a program that calculates the final grade:

a) A grade on the first test of the semester

b) The total number of tests

c) The total number of homework assignments

d) The relative weight of the tests

Answer:

a) firstTest

b) totalNumTests

c) totalNumAssn

d) testWeight

Note that there are other descriptive identifiers that can be used for each of these.

10) Explain the difference between a *compile-time error* and a *run-time error*. Give an example of each.

Answer: A *compile-time error* will cause the compiler to exit with an error, and therefore the program will not be properly translated. A program with a *run-time error* will compile and be translated, but will crash or throw an exception while it is running. An example of a *compile-time* error is forgetting a semicolon. An example of a *run-time error* is dividing by zero.

11) What are the primary concepts that support object-oriented programming?

Answer: The primary concepts that support object-oriented programming are *objects, attributes, methods, classes, encapsulation, inheritance and polymorphism.*

12) What are some advantages to writing programs in a high-level language instead of machine code?

Answer: Programs written in a high-level language are more easily readable by humans and, therefore, they can be debugged and maintained easier than programs written in machine code. In addition, high-level languages support more natural problem-solving approaches such as object-oriented programming, whereas machine languages typically do not.

13) Name the four basic activities that are involved in a software development process.

Answer: The four basic activities that are involved in a software development process are *establishing the requirements, creating the design, implementing the design* and *testing.*

14) Write a program that outputs Four Score and Seven Years Ago on six lines, with the words centered relative to each other.

Answer:

public class Lincoln {

public static void main(String [] args) {

System.out.println(" Four ");

System.out.println("Score");

System.out.println(" and ");

System.out.println("Seven");

System.out.println("Years");

System.out.println(" Ago ");

}

}

15) Give three examples of Java reserved words.

Answer: Three commonly used reserved words in Java are public, static, and void. See figure 1.1 in your textbook for a list of all reserved words in Java.