Chapter 1

1. a. true; b. false; c. false; d. true; e. false; f. true; g. true; h. true; i. false; j. false; k. true; l. true; m. true; n. true; o. true; p. false; q. true; r. true; s. true

2. CPU.

3. Base 2 or binary.

4. The equivalent machine language program of a high-level language program.

5. In linking, an object program is combined with other programs in the library, used in the program, to create the executable code.

6. Loader

7. #

8. Preprocessor

9. Programming is a process of problem solving.

10. A step-by-step problem-solving process in which a solution is arrived at in a finite amount of time.

11. (1) Analyze and outline the problem and its solution requirements, and design an algorithm to solve the problem. (2) Implement the algorithm in a programming language, such as C++, and verify that the algorithm works. (3) Maintain the program by using and modifying it if the problem domain changes.

12. (1) Thoroughly understand the problem. (2) Understand the problem requirements. (3) If the problem is complex, divide the problem into subproblems and repeat Steps 1 and 2.

13. To find the weighted average of the four test scores, first you need to know each test score and its weight. Next, you multiply each test score with its weight, and then add these numbers to get the average. Therefore,

1. Get testScore1, weightTestScore1
2. Get testScore2, weightTestScore2
3. Get testScore3, weightTestScore3
4. Get testScore4, weightTestScore4
5. weightedAverage = testScore1 \* weightTestScore1 +

testScore2 \* weightTestScore2 +

testScore3 \* weightTestScore3 +

testScore4 \* weightTestScore4;

14. a. Get quarters

b. Get dimes

c. Get nickels

d. Get pennies

e. changeInPennies = quarters \* 25 + dimes \* 10 + nickels \* 5

+ pennies

15. To find the price per square inch, first we need to find the area of the pizza. Then we divide the price of the pizza by the area of the pizza. Let radius denote the radius and area denote the area of the circle, and price denote the price of pizza. Also, let pricePerSquareInch denote the price per square inch.

a. Get radius

b. area = π \* radius \* radius

c. Get price

d. pricePerSquareInch = price / area

16. To determine the least selling price of a car, we need to know the listing price of the car. The algorithm is as follows:

1. Get listingPrice
2. Calculate the least selling price leastSellingPrice using the formula:

leastSellingPrice = listingPrice × 0.85) + 500

17. Suppose that radius denotes radius of the sphere, volume denotes volume of the sphere, and surfaceArea denotes the surface area of the sphere. The following algorithm computes the volume and surface area of the sphere.

|  |  |
| --- | --- |
| **Algorithm** | **C++ Instruction (Code)** |
| 1 1. Get the radius. | cin >> radius; |
| 2 2. Calculate the volume. | volume = (4.0 / 3.0) \* 3.1416 \* radius \* radius \* radius; |
| 3 3. Calculate the surface area. | surfaceArea = 4.0 \* 3.1416 \* radius \* radius; |

18. Suppose that billingAmount denotes the total billing amount, movingCost denotes moving cost, area denotes the area of the yard that needs to be moved, numOfAppl denotes the number of fertilizing applications, and numOfTrees denotes the number of trees to be planted. The following algorithm computes and outputs the billing amount.

1. Enter the area of the yard.
2. Get area
3. Enter the number of fertilizing applications.
4. Get numOfAppl
5. Enter the number of trees to be planted.
6. Get numOfTrees
7. Calculate the billingAmount using the formula:

billingAmount = (area / 5000) \* 35.00 + numOfAppl \* 30.00

+ numOfTrees \* 50.00

19. Suppose that billingAmount denotes the total billing amount, numOfItemsOrdered denotes the number of items ordered, shippingAndHandlingFee denotes the shipping and handling fee, and price denotes the price of an item. The following algorithm computes and outputs the billing amount.

a. Enter the number of items bought.

b. Get numOfItemsOrdered

c. billingAmount = 0.0;

d. shippingAndHandlingFee = 0.0;

e. Repeat the following for each item bought.

i. Enter the price of the item

ii. Get price

iii. billingAmount = billingAmount + price;

f. if billingAmount < 200

shippingAndHandlingFee = 10 \* numOfItemsOrdered;

g. billingAmount = billingAmount + shippingAndHandlingFee

i. Print billingAmount

20. Suppose amountWithdrawn denotes the amount to be withdrawn, serviceCharge denotes the service charges, if any, and accountBalance denotes the total money in the account.

You can now write the algorithm as follows:

a. Get amountWithdrawn.

b. if amountWithdrawn > 500

Print "The maximum amount that can be drawn is $500"

otherwise (if accountBalance <= 0)

Print "Account balance is <= 0. You cannot withdraw any money."

otherwise

{

if (amountWithdrawn > accountBalance)

{

Print "Insufficient balance. If you withdraw, services charges

will be $25.00. Select Yes/No."

if (Yes)

{

if (amountWithdrawn > 300)

serviceCharge = (amountWithdrawn – 300) \* 0.04;

otherwise

serviceCharge = 0;

accountBalance = accountBalance – amountWithdrawn

- serviceCharge – 25;

Print "Collect your money. "

}

}

}

otherwise

{

if (amountWithdrawn > 300)

serviceCharge = (amountWithdrawn – 300) \* 0.04;

otherwise

serviceCharge = 0;

accountBalance = accountBalance – amountWithdrawn

- serviceCharge;

Print "Collect your money."

}

21. Suppose x1 and x2 are the real roots of the quadratic equation.

a. Get a

b. Get b

c. Get c

d. if (b \* b – 4 \* a \* c < 0)

Print "The equation has no real roots."

Otherwise

{

temp = b \* b – 4 \* a \* c;

x1 = (-b + temp) / (2 \* a);

x2 = (-b - temp) / (2 \* a);

}

22. Suppose that tuition denotes the tuition per semester, semesterUnits denotes the average semester units, courseUnits denotes the number of course units, semesterWeeks denotes the number of weeks in a semester, classDaysPerWeek denotes the number of days a class meets in a week, classDaysPerSemester denotes the total number of days a class meets in a semester, costPerUnit denotes the cost of one unit of a course, and costPerClass denotes the cost of one class.

a. Get tuition

b. Get semesterUnits

c. Get semesterWeeks

d. Get courseUnits

e. Get classDaysPerWeek

f. Compute costPerUnit using the following formula.

costPerUnit = tuition / semesterUnits;

g. Compute classDaysPerSemester using the following formula.

classDaysPerSemester = classDaysPerWeek \* semesterWeeks;

h. Compute costPerClass using the following formula.

costPerClass = (costPerUnit \* courseUnits) / classDaysPerSemester;

23. Suppose averageTestScore denotes the average test score, highestScore denotes the highest test score, testScore denotes a test score, sum denotes the sum of all the test scores, count denotes the number of students in class, and studentName denotes the name of a student.

a. First you design an algorithm to find the average test score. To find the average test score, first you need to count the number of students in the class and add the test score of each student. You then divide the sum by count to find the average test score. The algorithm to find the average test score is as follows:

i. Set sum and count to 0.

ii. Repeat the following for each student in class.

1. Get testScore

2. Increment count and update the value of sum by adding the current test score to sum.

iii. Use the following formula to find the average test score.

if (count is 0)

averageTestScore = 0;

otherwise

averageTestScore = sum / count;

b. The following algorithm determines and prints the names of all the students whose test score is below the average test score.

Repeat the following for each student in class:

i. Get studentName and testScore

ii.

if (testScore is less than averageTestScore)

print studentName

c. The following algorithm determines the highest test score

i. Get first student’s test score and call it highestTestScore.

ii. Repeat the following for each of the remaining students in the class

1. Get testScore

2. if (testScore is greater than highestTestScore)

highestTestScore = testScore;

d. To print the names of all the students whose test score is the same as the highest test score, compare the test score of each student with the highest test score and if they are equal print the name. The following algorithm accomplishes this.

Repeat the following for each student in the class:

i. Get studentName and testScore

ii. if (testScore is equal to highestTestScore)

print studentName

You can use the solutions of the subproblems obtained in parts a to d to design the main algorithm as follows:

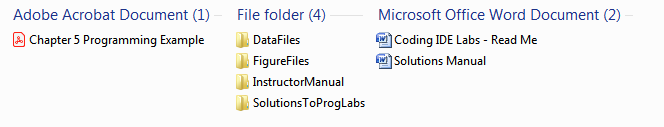
1. Use the algorithm in part a to find the average test score.

2. Use the algorithm in part b to print the names of all the students whose score is below the average test score.

3. Use the algorithm in part c to find the highest test score.

4. Use the algorithm in part d to print the names of all the students whose test score is the same as the highest test score

**Solution Manual Files:**

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