Starting Out With C++: Early Objects, Eighth Edition
Solutions to End-of-Chapter Review Questions

Chapter 1

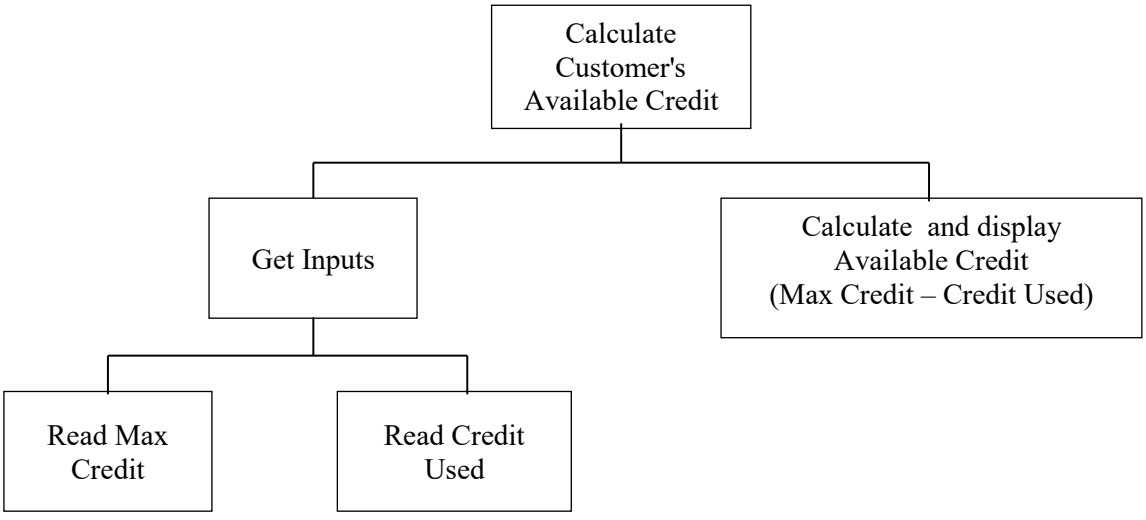
1. programmed
2. CPU
3. arithmetic and logic unit (ALU) and control unit
4. disk drive
5. system software and application software
6. instructions
7. programming language
8. Machine language
9. High-level
10. Low-level
11. portability
12. key
13. programmer-defined symbols
14. Operators
15. Punctuation
16. syntax
17. variable
18. defined (or declared)
19. input, processing, output
20. Input
21. Output
22. hierarchy chart

23. Main memory, or RAM, is volatile, which means its contents are erased when power is removed from the computer. Secondary memory, such as a disk or CD, does not lose its contents when power is removed from the computer.

24. System software consists of programs that manage the computer's hardware devices and control their processes. These include operating system programs, utility programs, and software development tools. Application software consists of programs created for users to solve specific problems or perform general operations.

25. A syntax error is the misuse of a key word, operator, punctuation, or other part of the programming language. A logical error is a mistake that tells the computer to carry out a task incorrectly or to carry out tasks in the wrong order. It causes the program to produce the wrong results.

26. Hierarchy Charts can differ in how far they break down the steps the computer must carry out. Here is one possible chart for this problem.



27. ***Account Balance High Level Pseudocode***

```
Have user input starting balance
Have user input total deposits
Have user input total withdrawals
Calculate current balance
Display current balance
```

Account Balance Detailed Pseudocode

```
Input startBalance           // with prompt
Input totalDeposits          // with prompt
Input totalWithdrawals       // with prompt
currentBalance = startBalance + totalDeposits - totalWithdrawals
Display currentBalance
```

28. ***Sales Tax High Level Pseudocode***

```
Have user input retail price
Have user input sales tax rate
Calculate tax amount
Calculate sales total
Display tax amount and sales total
```

Sales Tax Detailed Pseudocode

```
Input retailPrice             // with prompt
Input salesTaxRate            // with prompt
taxAmount = retailPrice * salesTaxRate
salesTotal = retailPrice + taxAmount
Display taxAmount, salesTotal
```

29. 45
30. 7
31. 28
32. 365
33. The error is that the program performs its math operation before the user has entered values for the variables `width` and `length`.
34. Some of the questions that should be asked are:

    What standard ceiling height should be used, or is this figure to be input?

    How many square feet should be subtracted out for windows and doors, or do you also want this information input since it could vary by room?

    Are the ceilings also to be painted, or just the walls?

    How many square feet will 1 gallon of paint cover?

    How many coats of paint will you use, or should this information be input?

Chapter 2

1. semicolon
2. `iostream`
3. `main`
4. `#`
5. braces `{}`
6.
7. 9.7865E14
8. 1, 2
9. B
10. A, C
11. B (C is valid, but prints the contents of variable `Hello`, rather than the string `Hello"`.)
12. B
13. A) 11 B) 14 C) 3 (An integer divide takes place.)
14. A) 9 B) 14 C) 2

15.
```
double temp,
       weight,
       height;
```

16.
```
int months = 2,
      days,
      years = 3;
```

17.
```
A) d2 = d1 + 2;
B) d1 = d2 * 4;
C) c = 'K';
D) i = 'K';
E) i = i - 1;
```

18.
```
A) d1 = d2 - 8.5;
B) d2 = d1 / 3.14;
C) c = 'F';
D) i = i + 1;
E) d2 = d2 + d1;
```

19.
```
cout << "Two mandolins like creatures in the\n\n\n";
cout << "dark\n\n\n";
cout << "Creating the agony of ecstasy.\n\n\n";
cout << "                    - George Barker\n\n\n";
```

20.
```
cout << "L\n"
     << "E\n"
     << "A\n"
     << "F\n";
```
This can also be written as a single string literal: `cout << "L\nE\nA\nF\n";`

21.
```
Input weeks             // with prompt
days = weeks * 7
Display days
```

22.
```
Input eggs              // with prompt
cartons = eggs / 12     // perform integer divide
Display cartons
```

23.
```
Input speed             // with prompt
Input time              // with prompt
distance = speed * time
Display distance
```

24.
```
Input miles             // with prompt
Input gallons           // with prompt
milesPerGallon = miles / gallons
Display milesPerGallon
```

25. A)
```
0
100
```

B)
```
8
2
```

C)
```
I am the incrediblecomputing
machine
and I will
amaze
you.
```

26. A)
```
Be careful!
This might/n be a trick question.
```

B)
```
23
1
```

27. The C-style comments symbols are backwards.
`iostream` should be enclosed in angle brackets.
There shouldn't be a semicolon after `int main()`.
The opening and closing braces of function `main` are reversed.
There should be a semicolon after `int a, b, c`.
The comment `\\ Three integers` should read `// Three integers`.
There should be a semicolon at the end of each of each of the following lines:
```
a = 3
b = 4
c = a + b
```
`cout` begins with a capital letter.
The stream insertion operator (that appears twice in the `cout` statement)
should read << instead of <.
The `cout` statement uses the variable `C` instead of `c`.

28. Whatever problem a pair of students decides to work with they must determine such things as which values will be input vs. which will be set internally in the program, how much precision is required on calculations, what output will be produced by the program, and how it should be displayed. Students must also determine how to handle situations that are not clear cut. In the paint problem many of these considerations are listed in the teacher answer key (Chapter 1, Question 34). In the recipe program students must determine such things as how to handle quantities, like one egg, that cannot be halved. In the driving program, knowing distance and speed are not enough. Agreement should be reached on how to handle delays due to traffic lights and traffic congestion. Should this be an input value, computed as a percent of overall driving time, or handled some other way?

Chapter 3

1. A) `cin >> description;`
   B) `getline(cin, description);`
2. `char name[35];`
3. A) `cin >> setw(25) >> name;`
   B) `cin.getline(name, 25);`
4. `cin >> age >> pay >> section;`
5. `iostream` and `iomanip`
6. `char city[31];`
7. A) `price = 12 * unitCost;`
   B) `cout << setw(12) << 98.7;`
   C) `cout << 12;`
8. 5, 22, 20, 6, 46, 30, 0, 3, 16
9. A) `a = 12 * x;`
   B) `z = 5 * x + 14 * y + 6 * k;`
   C) `y = pow(x, 4);`
   D) `g = (h + 12) / (4 * k);`
   E) `c = pow(a, 3) / (pow(b, 2) * pow(k, 4));`
10. Two implicit data type conversions occur. First, because `mass` is a `float`, a copy of the `int` value stored in `units` is promoted to a `float` before the multiplication operation is done. The result of `mass * units` will be a `float`. The second data type conversion occurs when the `float` result is promoted to a `double` in order to be stored in `double` variable `weight`.
11. 8
12. Either of these will work:
```
unitsEach = static_cast<double>(qty) / salesReps;
unitsEach = qty / static_cast<double>(salesReps);
```
13. `const int RATE = 12;`
14.
```
x += 5;
total += subtotal;
dist /= rep;
ppl *= period;
inv -= shrinkage;
num %= 2;
```
15. `east = west = north = south = 1;`
16. `int sum = 0;`
17. No, a named constant must be initialized at the time it is defined. It cannot be assigned a value at a later time.

18.
```
cout << fixed << showpoint << setprecision(2);
cout << setw(8) << divSales;
```

19.
```
cout << fixed << showpoint << setprecision(4);
cout << setw(12) << profit;
```

20. A) `cmath` B) `iostream` C) `iomanip`

Note: Once students understand that inputs from the keyboard should *always* be preceded by prompts, the `// with prompt` comment can be omitted from the pseudocode. Therefore, beginning with Chapter 3, we no longer include it.

21.
```
Input score1
Input score2
Input score3
average = (score1 + score2 + score3) / 3.0
Display average
```

22.
```
discountPct = .15
Input salesAmt
amtSaved = salesAmt * discountPct
amtDue = salesAmt – amtSaved
Display amtSaved, amtDue
```

23.
```
Input maxCredit
Input creditUsed
availableCredit = maxCredit – creditUsed
Display availableCredit
```

24.
```
PI = 3.14
PRICE_PIZZA12 = 12.00
PRICE_PIZZA14 = 14.00
areaPizza12 = PI * (12 / 2)²
areaPizza14 = PI * (14 / 2)²
pricePerSqIn12 = PRICE_PIZZA12 / areaPizza12
pricePerSqIn14 = PRICE_PIZZA14 / areaPizza14
Display  pricePerSqIn12, pricePerSqIn14
```

25. A)
```
Your monthly wages are 3225  // Some compilers display 3225.0000
```
B)
```
6 3 12
```
C)
```
In 1492 Columbus sailed the ocean blue.
```

26. A)
```
Hello George
```
B)
```
Hello George Washington
```
C)
```
Minutes: 612002.0000
Hours: 10200.0332
Days: 425.0014
Months: 13.9726
Years: 1.1644
```

27. A) `#include <iostream>` is missing.
Each `cin` and `cout` statement starts with capital C.
The << operator is mistakenly used with `cin`.
The assignment statement should read:

```
sum = number1 + number2;
```

The last `cout` statement should have << after `cout`.
The last `cout` statement is missing a semi-colon.
The body of the main function should be indented within the braces.

B) The `cin` statement should read:

```
cin >> number1 >> number2;
```

The assignment statement should read:

```
quotient = static_cast<double>(number1) / number2;
```

The last `cout` statement is missing a semicolon.
There is no `return 0;`

28. A) The variables should not be declared const.
The last `cout` statement is missing a semicolon.

B) There shouldn't be a semicolon after the #include directive.
The function header for `main` should read:

```
int main()
```

The combined assignment operators are improperly used. They should read as follows:

```
number1 *= 50;
number2 *= 50;
```

There is no `return 0;`

29. A) There shouldn't be a semicolon after the `#include` directive.
The function header for `main` should read:

```
int main()
```

The variable `number` is defined, but it is called `number1` in the `cin` statement.
The combined assignment operator is improperly used. The statement should read:

```
half /= 2;
```

There is a logical error. The value divided by 2 should be `number`, not `half`.
The results are never output.
There is no `return 0;`

B) There shouldn't be a semicolon after the `#include` directive.
`name` should be declared as a `string` or a `char` array. If declared as `string`, a

```
#include <string>
```

directive is needed.

The statement `cin.getline >> name;` should read

```
cin >> name;
```

The statement `cin >> go;` should read

```
cin.get(go);
```

30. Before the price per square inch of a pizza can be calculated, we need to know both the number of square inches it contains and its price. The price for each size pizza can be set at the beginning of the program as constants, since they are known. This can also be done with PI, which is needed for the pizza area calculation. We will use 3.14 for PI because that is precise enough for our calculations. The area of each pizza can be calculated with the formula `area = PI * radius`^{2}, where the radius of each pizza is half of its diameter. Now that the price of each pizza and its area are known, the price per square inch for each pizza can be found by dividing the price by the area.

If you are unsure what to divide by what to get the answer, try thinking of a simple example using actual numbers. Suppose a pizza contained only 12 square inches and cost $12.00, then it would cost 12 / 12 or $1.00 per square inch. But if it were twice that big for the same price, it would only cost half as much per square inch. Right? Since 24/12 = $2.00 per square inch, that can't be right. But 12 / 24 = $ .50 per square inch. That is clearly correct. So you can see that we need to divide the price by the square inches to get the correct result.

Chapter 4

1. relational
2. false, true
3. false, true
4. braces
5. true, false
6. `default`
7. false
8. true
9. `!`
10. lower
11. `&&`
12. `||`
13. block (or local)
14. integer
15. `break`
16. 1, 0, 0, 1

17.
```
if (y == 0)
   x = 100;
```

18.
```
if (y == 10)
   x = 0;
else
   x = 1;
```

19.
```
if (score >= 90)
   cout << "Excellent";
else if (score >= 80)
   cout << "Good";
else
   cout << "Try Harder";
```

20.
```
if (minimum)
   hours = 10;
```

21.
```
if(x < y)
   q = a + b;
else
   q = x * 2;
```

22.
```
switch (choice)
{
   case 1:  cout << fixed << showpoint << setprecision(2);
            break;
   case 2:
   case 3:  cout << fixed << showpoint << setprecision(4);
            break;
   case 4:  cout << fixed << showpoint << setprecision(6);
            break;
   default: cout << fixed << showpoint << setprecision(8);
            break;
}
```

23. T, F, T

24. T, F, T

25.
```
if (grade >= 0 && grade <= 100)
   cout << "The number is valid.";
```

26.
```
if (temperature >= -50 && temperature <= 150)
   cout << "The number is valid.";
```

27.
```
if (hours < 0 || hours > 80)
   cout << "The number is not valid.";
```

28. When using string objects, use the following code:

```
if(book1 <= book2)
   cout << book1 << " " << book2 << endl;
else
   cout << book2 << " " << book1 << endl;
```

With using C-strings, you must replace the above `if` statement with:

```
if (strcmp(book1, book2) <= 0)
```

29.
```
if(sales < 10000)
   commission = .10;
else if (sales <= 15000)
   commission = .15;
else
   commission = .20;
```

30. There are several correct ways to write this. Here is one way.

```
if(dept == 5 && price >= 100)
   discount = .20;
else if (price >= 100)  // but dept is not 5
   discount = .15;
else if(dept == 5)      // but price < 100
   discount = .10;
else                    // dept is not 5 and price < 100
   discount = .05;
```

31. It should read

```
if (!(x > 20))
```

32. It should use `&&` instead of `||`.

33. It should use `||` instead of `&&`.

34. The statement will always be true. It `x` equals neither 1 nor 2, it is clearly true. If `x` equals 1 it is true because `x != 2` is true. If `x` equals 2 it is true because `x != 1` is true. The statement should use `&&` instead of `||`.