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

Chapter 1

1. programmed
2. CPU
3. arithmetic logic unit (ALU) and control unit
4. disk drive
5. operating systems 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. An operating system is a set of programs that manages the computer's hardware devices and controls their processes. Application software are programs that users use 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 Chart:
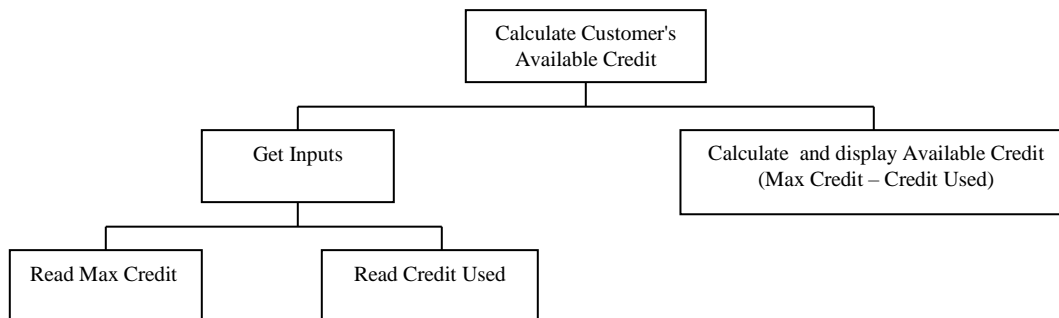
27. ***Account Balance High Level Pseudocode***
    Have user input starting balance
    Have user input total deposits
    Have user input total withdrawals
    Calculate current balance
    Display current balance

  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. constants, or literals
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 the three assignment statements.

`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) `fstream`   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.`