

High Adventure Travel Agency

The High Adventure Travel Agency offers four vacation packages for thrill-seeking customers. The rates and options vary for each package. Basic equipment is included in the base charge. You've been asked to write a program to calculate and itemize the charges for each package.

Devil's Courthouse Adventure Weekend:

An action-packed three-day weekend spent camping, rock climbing, and rapelling at Devil's Courthouse, North Carolina. This getaway is for novices and experts alike. Optional climbing instruction is available to beginners at a low price. Tent rental is also available.

Rates:

Base Charge:	\$350 per person
Climbing Instruction:	\$100 per person
Tent Rental:	\$40/night per tent (sleeps 4)

Scuba Bahama

A week-long cruise to the Bahamas with three days of scuba diving. Those with prior experience may dive right in, while beginners should choose to take optional, but very affordable lessons.

Rates:

Base Charge:	\$1,000 per person
Scuba Instruction:	\$100 per person

Sky-Dive Colorado

Four thrilling days with expert sky-diving instructors in Colorado Springs, Colorado. Instruction is included for all members of the party. For lodging, you may choose either the Wilderness Lodge or the Luxury Inn.

Rates:

Base Charge:	\$400 per person
Lodging at Wilderness Lodge:	\$65/night per person
Lodging at Luxury Inn:	\$120/night per person

Barron Cliff Spelunk

Eight days spent hiking and exploring caves in the Barron Cliff Wilderness Area, Tennessee. Camping equipment rental is available.

Rates:

Base Charge:	\$700 per person
Tent Rental:	\$40/night per tent (sleeps 4)



NOTE: A 10 percent discount on the base charges of any package is given for a party of five or more. A 50 percent down payment is required to book any package.

Variables

Table 6A lists constant variables that will be defined globally. All these variables will be defined near the top of the program to make modifications easier (in the event the rates change).

Table 6A Constant Variables Used in the High Adventure Travel Agency Program

Variable	Description
CLIMB_RATE = 350.0	A double. Holds Base rate of Devil’s Courthouse Package.
SCUBA_RATE = 1000.0	A double. Holds Base rate of Bahamas Scuba Package.
SKY_DIVE_RATE = 400.0	A double. Holds Base rate of Sky Dive Colorado Package.
CAVE_RATE = 700.0	A double. Holds Base rate of Barron Cliff Spelunk Package.
CLIMB_INSTRUCT = 100.0	A double. Holds climbing instruction charge.
SCUBA_INSTRUCT = 100.0	A double. Holds scuba instruction charge.
TENT_RATE = 40.0	A double. Holds nightly tent rental charge.
LODGE1_RATE = 65.0	A double. Holds nightly per person Wilderness Lodge charge.
LODGE2_RATE = 120.0	A double. Holds nightly per person Luxury Inn charge.
GROUP_DISCOUNT_RATE = 0.10	A double. Holds discount rate for groups of 5 or more.
DEPOSIT_RATE = 0.50	A double. Holds what part of total cost is required as a deposit.

Modules

Table 6B lists the functions used in the program.

Table 6B Functions Used in the High Adventure Travel Agency Program

Function name	Description
main	Calls the menu function and dispatches program control to the appropriate module, based on the user's choice of packages.
menu	Displays a menu listing the vacation packages. Allows the user to enter a selection, which is validated and then returned to the main function.
climbing	Asks the user for needed data and then calculates charges for the Devil's Courthouse Adventure Weekend package.
scuba	Asks the user for needed data and then calculates charges for the Scuba Bahamas package.
skyDive	Asks the user for needed data and then calculates charges for the Sky-Dive Colorado package.
spelunk	Asks the user for needed data and then calculates charges for the Barron Cliff Spelunk package.

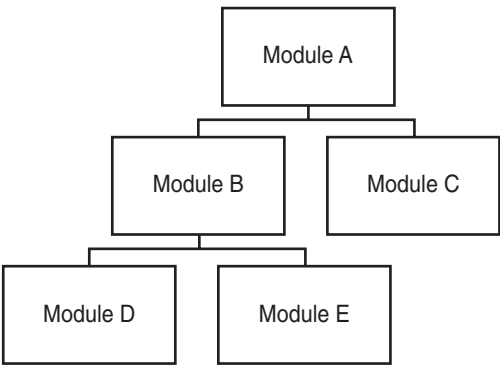
Program Design

In modular programs, hierarchy charts are used to show the relationship between modules. For example, assume an application has five modules: Module A, Module B, Module C, Module D, and Module E, with the following relationship between the modules

- Module A calls Module B and Module C.
- Module B calls Module D and Module E.

These relationships are shown in the hierarchy chart in Figure 6A.

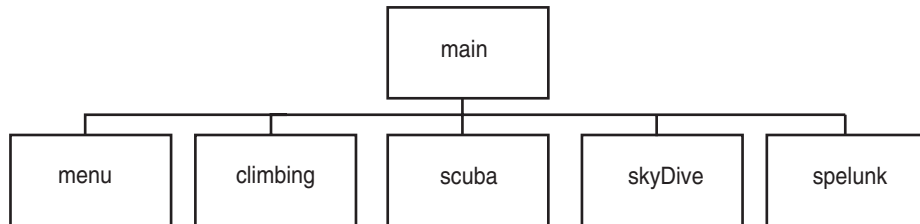
Figure 6A



Notice that the hierarchy chart does not reveal details about the algorithm or specify when the modules are to be called. Instead, it reveals the relationship between the modules.

Figure 6B shows a module hierarchy chart for the High Adventure Travel Agency program.

Figure 6B



The menu that is displayed should list the four vacation packages, plus a fifth option that exits the program. When the user chooses one of the vacation packages, a function is called that asks questions, such as how many people will be going on the trip, and calculates the charges for that particular package. This process repeats until the user chooses to exit the program.

General Pseudocode for Each Program Module

```

Main Module
  Call Menu Module
  Do-While user does not enter 5
    Switch (based on user input)
      Case 1: Call Climbing Module
      Case 2: Call Scuba Module
      Case 3: Call SkyDive Module
      Case 4: Call Spelunk Module
    End Switch
  End Do-While
End of Main Module
  
```

```

Climbing Module:
  Input number in party needing instruction
  Input number of advanced climbers in party
  Input number in party renting equipment
  Calculate base charges
  Calculate discount
  Calculate cost of instruction
  Calculate cost of tent rental
  Calculate total charges
  Calculate minimum required deposit
  Display results
End of Climbing Module
  
```

Scuba Module:

Input number in party needing instruction
Input number of advanced scuba divers in party
Calculate base charges
Calculate discount
Calculate cost of instruction
Calculate total charges
Calculate minimum required deposit
Display results

End of Scuba Module

SkyDive Module:

Input number in party
Calculate base charges
Calculate discount
Input number in party staying at Wilderness Lodge
Input number in party staying at Luxury Inn
Calculate lodging charges
Calculate total charges
Calculate minimum required deposit
Display results

End of SkyDive Module

Spelunk Module:

Input number in party
Input number in party renting equipment
Calculate base charges
Calculate discount
Calculate cost of tent rental
Calculate total charges
Calculate minimum required deposit
Display results

End of Spelunk Module

The Program

The next step would normally be to expand the general pseudocode into detailed pseudocode that includes all the program logic and calculations needed to compute the components of an invoice. We have omitted this step from the case study. The final step is to translate the pseudocode into program source code so the program can be run and tested. The source code listing for the High Adventure Travel Agency program follows.

HighAdventure1.cpp

```

1 // This program will assist the High Adventure Travel Agency
2 // in calculating the costs of their four major vacation packages.
3
4 #include <iostream>
5 #include <iomanip>
6 using namespace std;
7
8 // Constants for the charges                Per person
9 const double CLIMB_RATE = 350.0;           // Base rate - Devil's Courthouse
10 const double SCUBA_RATE = 1000.0;          // Base rate - Bahamas Scuba
11 const double SKY_DIVE_RATE = 400.0;        // Base rate - Sky diving
12 const double CAVE_RATE = 700.0;           // Base rate - Spelunking
13 const double CLIMB_INSTRUCT = 100.0;       // Climbing instruction
14 const double SCUBA_INSTRUCT = 100.0;       // Scuba instruction
15 const double LODGE1_RATE = 65.0;          // Lodging option 1 (sky diving)
16 const double LODGE2_RATE = 120.0;         // Lodging option 2 (sky diving)
17 const double TENT_RATE = 40.0;            // Tent rental per tent
18 const double DEPOSIT_RATE = 0.50;
19 const double GROUP_DISCOUNT_RATE = 0.10;
20
21 // Function prototypes
22 void climbing();
23 void scuba();
24 void skyDive();
25 void spelunk();
26 int menu();
27 void holdScreen();
28
29 int main()
30 {
31     int selection;
32
33     cout << fixed << showpoint << setprecision(2);
34     do
35     {
36         selection = menu();
37         switch(selection)
38         {
39             case 1 : climbing();
40                     break;
41             case 2 : scuba();
42                     break;
43             case 3 : skyDive();
44                     break;
45             case 4 : spelunk();
46                     break;
47             case 5 : cout << "Exiting program.\n\n";
48                     }
49         } while (selection != 5);
50     return 0;
51 }
52

```

```

53 /*****
54 *                               menu                               *
55 * Displays the main menu and gets the user's choice. *
56 * Returns a valid integer in the range 1 - 5. *
57 *****/
58 int menu()
59 {
60     int choice;
61
62     cout << "High Adventure Travel Agency\n";
63     cout << "-----\n";
64     cout << "1) Devil's Courthouse Adventure Weekend\n";
65     cout << "2) Scuba Bahama\n";
66     cout << "3) Sky-Dive Colorado\n";
67     cout << "4) Barron Cliff Spelunk\n";
68     cout << "5) Exit Program\n\n";
69
70     cin >> choice;
71     while (choice < 1 || choice > 5) // Validate input
72     {
73         cout << "Invalid Selection. Enter 1, 2, 3, 4, or 5: ";
74         cin >> choice;
75     }
76     return choice;
77 }
78
79 /*****
80 *                               climbing                           *
81 * This function calculates the charges for the *
82 * Devil's Courthouse Adventure Weekend package. *
83 *****/
84 void climbing()
85 {
86     const int NUM_DAYS = 3; // Length of this trip
87     int     beginners,      // Clients needing instruction
88           advanced,         // Clients not needing instruction
89           tentsNeeded;      // Number of tents being rented
90     double baseCharges,    // Base charge for the entire group
91           instructionChgs, // Total instruction cost
92           tentChgs,        // Total tent rental cost
93           totalChgs,       // Total charges
94           discount = 0.0,   // Discount amount
95           deposit;         // Required deposit
96

```

```

97  cout << "\nDevil's Courthouse Adventure Weekend\n";
98  cout << "-----\n";
99  cout << "How many will be going who need an instructor? ";
100 cin >> beginners;
101 cout << "How many advanced climbers will be going? ";
102 cin >> advanced;
103 cout << "How many tents (sleep 4) do you want to rent? ";
104 cin >> tentsNeeded;
105
106 // Calculate base charges
107 baseCharges = (beginners + advanced) * CLIMB_RATE;
108 totalChgs = baseCharges;
109
110 // Calculate discount for 5 or more
111 if ((beginners + advanced) > 4)
112 {
113     discount = (totalChgs * GROUP_DISCOUNT_RATE);
114     totalChgs -= discount;
115 }
116 // Add cost of instruction
117 instructionChgs = beginners * CLIMB_INSTRUCT;
118 totalChgs += instructionChgs;
119
120 // Add cost of tent rental
121 tentChgs = tentsNeeded * TENT_RATE * (NUM_DAYS - 1);
122 totalChgs += tentChgs;
123
124 // Calculate required deposit
125 deposit = totalChgs * DEPOSIT_RATE;
126
127 // Display Charges
128 cout << "\nNumber in party: " << (beginners + advanced);
129 cout << endl;
130 cout << "Base charges:      $" << setw(8) << baseCharges << endl;
131 cout << "Instruction cost: $" << setw(8) << instructionChgs << endl;
132 cout << "Tent Rental:      $" << setw(8) << tentChgs << endl;
133 cout << "Discount:         $" << setw(8) << discount << endl;
134 cout << "Total Charges:    $" << setw(8) << totalChgs << endl;
135 cout << "Required Deposit: $" << setw(8) << deposit << endl << endl;
136 holdScreen();
137 }
138

```



```

139 /*****
140  *           scuba function           *
141  * This function calculates the charges for the *
142  * Scuba Bahama package.                *
143  *****/
144 void scuba()
145 {
146     int    beginners,           // Clients needing instruction
147           advanced;           // Clients not needing instruction
148     double baseCharges,         // Base charge for the entire group
149           instructionChgs,      // Total instruction cost
150           totalChgs,           // Total charges
151           discount = 0.0,       // Discount amount
152           deposit;             // Required deposit
153
154     cout << "\nScuba Bahama\n";
155     cout << "-----\n";
156     cout << "How many will be going who need an instructor? ";
157     cin  >> beginners;
158     cout << "How many advanced scuba divers will be going? ";
159     cin  >> advanced;
160
161     // Calculate base charges
162     baseCharges = (beginners + advanced) * SCUBA_RATE;
163     totalChgs = baseCharges;
164
165     // Calculate discount for 5 or more
166     if ((beginners + advanced) > 4)
167     {
168         discount = (totalChgs * GROUP_DISCOUNT_RATE);
169         totalChgs -= discount;
170     }
171     // Add cost of instruction
172     instructionChgs = beginners * SCUBA_INSTRUCT;
173     totalChgs += instructionChgs;
174
175     // Calculate required deposit
176     deposit = totalChgs * DEPOSIT_RATE;
177
178     // Display Charges
179     cout << "\nNumber in party: " << (beginners + advanced);
180     cout << endl;
181     cout << "Base charges:      $" << setw(8) << baseCharges << endl;
182     cout << "Instruction cost: $" << setw(8) << instructionChgs << endl;
183     cout << "Discount:          $" << setw(8) << discount << endl;
184     cout << "Total Charges:     $" << setw(8) << totalChgs << endl;
185     cout << "Required Deposit: $" << setw(8) << deposit << endl << endl;
186     holdScreen();
187 }
188

```

```

189 /*****
190 *          skyDive          *
191 * This function calculates the charges for the *
192 * Sky-Dive Colorado package.                *
193 *****/
194 void skyDive()
195 {
196     const int NUM_DAYS = 4;    // Length of this trip
197     int      party,           // Number in party
198           lodge1,             // Number at 1st lodging choice
199           lodge2;             // Number at 2nd lodging choice
200     double baseCharges,       // Base charge for the entire group
201           lodgingChgs,        // Total lodging cost
202           totalChgs,          // Total charges
203           discount = 0.0,     // Discount amount
204           deposit;           // Required deposit
205
206     cout << "\nSky-Dive Colorado\n";
207     cout << "-----\n";
208     cout << "How many will be going? ";
209     cin  >> party;
210
211     // Calculate base charges
212     baseCharges = party * SKY_DIVE_RATE;
213     totalChgs = baseCharges;
214
215     // Calculate discount for 5 or more
216     if (party > 4)
217     {
218         discount = (totalChgs * GROUP_DISCOUNT_RATE);
219         totalChgs -= discount;
220     }
221     // Calculate lodging costs
222     cout << "How many will stay at Wilderness Lodge? ";
223     cin  >> lodge1;
224     cout << "How many will stay at Luxury Inn? ";
225     cin  >> lodge2;
226     lodgingChgs = lodge1 * LODGE1_RATE * (NUM_DAYS - 1) +
227                 lodge2 * LODGE2_RATE * (NUM_DAYS - 1);
228     totalChgs += lodgingChgs;
229
230     // Calculate required deposit
231     deposit = totalChgs * DEPOSIT_RATE;
232
233     // Display Charges
234     cout << "\nNumber in party: " << party;
235     cout << endl;
236     cout << "Base charges:      $" << setw(8) << baseCharges << endl;
237     cout << "Lodging:              $" << setw(8) << lodgingChgs << endl;
238     cout << "Discount:             $" << setw(8) << discount << endl;
239     cout << "Total Charges:       $" << setw(8) << totalChgs << endl;
240     cout << "Required Deposit:    $" << setw(8) << deposit << endl << endl;
241     holdScreen();
242 }

```

```

243
244 /*****
245  *           spelunk           *
246  * This function calculates the charges for the *
247  * Barron Cliff Spelunk package.           *
248  *****/
249 void spelunk()
250 {
251     const int NUM_DAYS = 8;    // Length of this trip
252     int party,                // Number in party
253         tentsNeeded;          // Number of tents being rented
254     double baseCharges,        // Base charge for the entire group
255         tentChgs,             // Total tent rental cost
256         totalChgs,            // Total charges
257         discount = 0.0,        // Discount amount
258         deposit;              // Required deposit
259
260     cout << "\nBarron Cliff Spelunk Weekend\n";
261     cout << "-----\n";
262     cout << "How many will be going? ";
263     cin >> party;
264     cout << "How many tents (sleep 4) do you want to rent? ";
265     cin >> tentsNeeded;
266
267     // Calculate base charges
268     baseCharges = party * CAVE_RATE;
269     totalChgs = baseCharges;
270
271     // Calculate discount for 5 or more
272     if (party > 4)
273     {
274         discount = (totalChgs * GROUP_DISCOUNT_RATE);
275         totalChgs -= discount;
276     }
277     // Add cost of tent rental
278     tentChgs = tentsNeeded * TENT_RATE * (NUM_DAYS - 1);
279     totalChgs += tentChgs;
280
281     // Calculate required deposit
282     deposit = totalChgs * DEPOSIT_RATE;
283
284     // Display Charges
285     cout << "\nNumber in party: " << party;
286     cout << endl;
287     cout << "Base charges:      $" << setw(8) << baseCharges << endl;
288     cout << "Tent Rental:      $" << setw(8) << tentChgs << endl;
289     cout << "Discount:         $" << setw(8) << discount << endl;
290     cout << "Total Charges:    $" << setw(8) << totalChgs << endl;
291     cout << "Required Deposit: $" << setw(8) << deposit << endl << endl;
292     holdScreen();
293 }
294

```

```
295 /*****
296  *           holdScreen           *
297  * This function holds the screen display until *
298  * the user is ready to return to the main menu. *
299  *****/
300 void holdScreen()
301 {
302     cout << "Press Enter to return to the main menu. ";
303     cin.ignore();
304     cin.get();
305     cout << "\n\n";
306 }
```

Program Output with Example Input Shown in Bold

```
High Adventure Travel Agency
-----
1) Devil's Courthouse Adventure Weekend
2) Scuba Bahama
3) Sky-Dive Colorado
4) Barron Cliff Spelunk
5) Exit Program

1

Devil's Courthouse Adventure Weekend
-----
How many will be going who need an instructor? 3
How many advanced climbers will be going? 2
How many tents (sleep 4) do you want to rent? 1

Number in party: 5
Base charges:    $ 1750.00
Instruction cost: $ 300.00
Tent Rental:    $ 80.00
Discount:       $ 175.00
Total Charges:  $ 1955.00
Required Deposit: $ 977.50

Press Enter to return to the main menu.
```

High Adventure Travel Agency

-
- 1) Devil's Courthouse Adventure Weekend
 - 2) Scuba Bahama
 - 3) Sky-Dive Colorado
 - 4) Barron Cliff Spelunk
 - 5) Exit Program

2

Scuba Bahama

How many will be going who need an instructor? 4
How many advanced scuba divers will be going? 0

Number in party: 4
Base charges: \$ 4000.00
Instruction cost: \$ 400.00
Discount: \$ 0.00
Total Charges: \$ 4400.00
Required Deposit: \$ 2200.00

Press Enter to return to the main menu.

High Adventure Travel Agency

-
- 1) Devil's Courthouse Adventure Weekend
 - 2) Scuba Bahama
 - 3) Sky-Dive Colorado
 - 4) Barron Cliff Spelunk
 - 5) Exit Program

3

Sky-Dive Colorado

How many will be going? 8
How many will stay at Wilderness Lodge? 4
How many will stay at Luxury Inn? 4

Number in party: 8
Base charges: \$ 3200.00
Lodging: \$ 2220.00
Discount: \$ 320.00
Total Charges: \$ 5100.00
Required Deposit: \$ 2550.00

Press Enter to return to the main menu.

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High Adventure Travel Agency

-
- 1) Devil's Courthouse Adventure Weekend
 - 2) Scuba Bahama
 - 3) Sky-Dive Colorado
 - 4) Barron Cliff Spelunk
 - 5) Exit Program

4

Barron Cliff Spelunk Weekend

How many will be going? 6
How many tents (sleep 4) do you want to rent? 2

Number in party: 6
Base charges: \$ 4200.00
Tent Rental: \$ 560.00
Discount: \$ 420.00
Total Charges: \$ 4340.00
Required Deposit: \$ 2170.00

Press Enter to return to the main menu.

High Adventure Travel Agency

-
- 1) Devil's Courthouse Adventure Weekend
 - 2) Scuba Bahama
 - 3) Sky-Dive Colorado
 - 4) Barron Cliff Spelunk
 - 5) Exit Program

5

Exiting program.