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1  /*
2  PROGRAM: TimeFun
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4  DATE: 2013-11-18
5  DEV ENV: MS Visual Studio 2013
6  DESCRIPTION: This program will...
7      - Get the time in the 24hr format
8      - Convert that time to 12hr format
9      - Print the time in both the 24 and 12hr format
10 */
11
12 #include <iostream>
13 #include <iomanip>
14
15 void GetTime24(int& hour, int& minute);
16 char ConvertTime24to12(int InHour, int& OutHour);
17 void PrintTime24(int hour, int minute);
18 void PrintTime12(int hour, int minute, char suffix);
19 bool AskRepeat();
20
21
22 using namespace std;
23
24 int main()
25 {
26     int hour24;
27     int hour12;
28     int minute;
29     char suffix;
30     bool loop = true;
31     do
32     {
33         GetTime24(hour24, minute); //get 24h time
34         suffix = ConvertTime24to12(hour24, hour12); //convert to 12h time
35         //print 12h time
36         cout << "That time in the 12hr format is: ";
37         PrintTime12(hour12, minute, suffix);
38         //print 24h time
39         cout << "That time in the 24hr format is: ";
40         PrintTime24(hour24, minute);
41         loop = AskRepeat(); //see if user wants to loop
42         cout << endl;
43     } while (loop == true);
44 }
45
46 /*=====
47 FUNCTION: GetTime24
48 DESCRIPTION: Prompts the user for a time in the 24hr format
49 PARAMETERS:
50     - (0) hour - the hours that the user entered
51     - (0) minute - the minutes that the user entered
52 RETURN VALUES: none
53 */
54 void GetTime24(int& hour, int& minute)
55 {
```

```

56     bool loop = true;
57     do
58     {
59         char delim;//used as the delimiter for the hours and minutes
60         cout << "Enter a time using the 24 hour format: ";
61         cin >> hour >> delim >> minute;
62         //check validity of input
63         if (!cin)//check cin for fail state
64         {
65             cin.clear();
66             cin.ignore(INT_MAX, '\n');//ignore until end of steam (line ending in this  ➤
67             case)
68             cout << "Only integers, please." << endl;
69         }
70         else if (delim != ':')//check delimiter
71             cout << "Please separate the hours and minutes with a ':'" << endl;
72         else if (hour < 0 || hour > 23)//check hours
73             cout << "Please enter an hour between 0 and 23" << endl;
74         else if (minute < 0 || minute > 59)//check minutes
75             cout << "Please enter the minute between 0 and 59." << endl;
76         else
77             loop = false;
78     } while (loop == true);
79 }
80 /*=====
81 FUNCTION: ConvertTime24to12
82 DESCRIPTION: converts the 24 hour time given to 12 hour time
83 PARAMETERS:
84     - (I/O) hour
85         in as an int between 0 and 23
86         out converted to int between 0 and 12 with a suffix of A or P
87 RETURN VALUES: the A (for AM) or P (for PM) suffix
88 */
89 char ConvertTime24to12(int InHour, int& OutHour)
90 {
91     if (InHour > 12)
92     {
93         OutHour = InHour - 12;
94         return 'P';
95     }
96     else if (InHour == 12)
97     {
98         OutHour = InHour;
99         return 'P';
100     }
101     else if (InHour == 0)
102     {
103         OutHour = 12;
104         return 'A';
105     }
106     else
107     {
108         OutHour = InHour;
109         return 'A';

```

```
110     }
111 }
112
113 /*=====
114 FUNCTION: PrintTime24
115 DESCRIPTION: prints the time in the 24 hour format
116 PARAMETERS:
117     - (I) hour - the hours field
118     - (I) minute - the minutes field
119 RETURN VALUES: none, prints a value
120 */
121 void PrintTime24(int hour, int minute)
122 {
123     cout << setw(2) << setfill('0') << hour
124     << ':'
125     << setw(2) << setfill('0') << minute << endl;
126 }
127
128 /*=====
129 FUNCTION: PrintTime12
130 DESCRIPTION: prints time in 12 hour format
131 PARAMETERS:
132     - (I) hour - the hours field
133     - (I) minute - the minutes field
134 RETURN VALUES: none, output printed
135 */
136 void PrintTime12(int hour, int minute, char suffix)
137 {
138     cout << setw(2) << setfill('0') << hour
139     << ':'
140     << setw(2) << setfill('0') << minute
141     << suffix << 'M' << endl;
142 }
143
144 /*=====
145 FUNCTION: AskRepeat
146 DESCRIPTION: asks the user if they want to repeat the program
147 PARAMETERS: none, gets user input directly
148 RETURN VALUES:
149     - true if input is 'y' or 'Y'
150     - false if input is anything else
151 */
152 bool AskRepeat()
153 {
154     char input;
155     cout << "Do you want to run this program again? [Y/N] ";
156     cin >> input;
157     if (input == 'y' || input == 'Y')
158         return true;
159     else
160         return false;
161 }
162
163 /*
164 TEST DATA:
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```
165 "ab:cd" - puts stream in fail state (invalid type), reprompt
166 "12 32" - puts stream in fail state (tries to write a 3 to char), reprompt
167 "12-32" - reprompt
168 "0:-12" - reprompt
169 "0:81" - reprompt
170 "-4:83" - reprompt
171 "24:00" - commonly used but improper, reprompt
172 "0:00" - output should be 12:00AM and 00:00
173 "8:23" - output should be 8:23AM and 8:23
174 "23:9" or "23:09" - output should be 11:09PM and 23:09
175 "12:00" - output should be 12:00PM and 12:00
176 */
```