# 3.6 Detecting ranges with if-else statements

Programmers commonly use the sequential nature of the multi-branch if-else arrangement to detect ranges of numbers. In the following example, the second branch expression is only reached if the first expression is false. So the second branch is taken if userAge < 16 is false (so 16 or greater) AND userAge is < 25, meaning userAge is between 16 - 24 (inclusive).

Figure 3.6.1: Using sequential nature of multi-branch if-else for ranges: Insurance prices.

```
#include <iostream>
using namespace std;
int main() {
   int userAge;
   int insurancePrice;
   cout << "Enter your age: ";</pre>
   cin >> userAge;
                                         // Age 15 and under
   if (userAge < 16) {
      cout << "Too young." << endl;</pre>
      insurancePrice = 0;
   else if (userAge < 25) {</pre>
                                         // Age 16 - 24
      insurancePrice = 4800;
   else if (userAge < 40) {</pre>
                                         // Age 25 - 39
      insurancePrice = 2350;
   else {
                                           // Age 40 and up
      insurancePrice = 2100;
   cout << "Annual price: $" << insurancePrice << endl;</pre>
   return 0;
```

Enter your age: 19
Annual price: \$4800
...
Enter your age: 27
Annual price: \$2350
...
Enter your age: 15
Too young.
Annual price: \$0
...
Enter your age: 129
Annual price: \$2100

Source: carsdirect.com, 2017

Feedback?

PARTICIPATION ACTIVITY

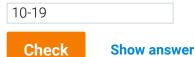
3.6.1: Ranges and multi-branch if-else.



Type the range for each branch. Type ranges as: 25 - 29, or type 30+ for all numbers 30 and larger.

```
if (numSales < 10) {
    ...
}
else if (numSales < 20) { // 2nd branch range: _____
}
else if (numSales < 30) { // 3rd branch range: ____
}
else {    // 4th branch range: ____
}</pre>
```

1) 2nd branch range:



2) 3rd branch range:

20-29

Check Show answer

3) 4th branch range:



4) What is the range for the last branch below?

```
if (numItems < 0) {
    ...
}
else if (numItems > 100) {
    ...
}
else { // Range: _____
}
```

Check Show answer

#### **Correct**

10 - 19

If execution reaches here, the previous expression of numSales < 10 must have been false, meaning numSales is 10 or greater, which coupled with numSales < 20 specifies range 10 - 19.

#### **Correct**

20 - 29

If execution reaches here, the previous expression of numSales < 20 must have been false, meaning numSales is 20 or greater, which coupled with numSales < 30 specifies range 20 - 29.

#### **Correct**

30+

If execution reaches here, the previous expression of numSales < 30 must have been false, meaning numSales is 30 or greater. No upper limit is specified.

#### Correct

0 - 100

The first expression of numItems < 0 must have been false, meaning numItems is 0 or greater. The second expression of numItems > 100 must have been false, meaning numItems is 100 or less. To reach the last else branch, numItems must be 0 - 100.



Feedback?

3.6.2: Complete the multi-branch if-else.	
1) Second branch: userNum is less than 200	
if (userNum < 100 ) {	
•••	
}	
else if ( ) {	
•••	
}	
else { // userNum >= 200	
•••	
}	
Check Show answer	
Second branch: userNum is positive     (non-zero)	

```
if (userNum < 0 ) {</pre>
   }
   }
   else { // userNum is 0
     Check
                 Show answer
3) Second branch: userNum is greater
   than 105
   if (userNum < 100 ) {
   }
   }
   else { // userNum is between
         // 100 and 105
   }
     Check
                 Show answer
4) If the final else branch executes,
```

what must userNum have been?

Type "unknown" if appropriate.

```
if (userNum <= 9) {
    ...
}
else if (userNum >= 11) {
    ...
}
else {
    ... // userNum if this executes?
}
```

### Check

#### **Show answer**

5) Which branch will execute? Valid answers: 1, 2, 3, or none.

```
userNum = 555;
if (userNum < 0) {
    ... // Branch 1
}
else if (userNum == 0) {
    ... // Branch 2
}
else if (userNum < 100) {
    ... // Branch 3
}</pre>
```

Check

**Show answer** 

Feedback?

## CHALLENGE ACTIVITY

3.6.1: Multi-branch if-else statement: Print century.



Write an if-else statement with multiple branches. If givenYear is 2101 or greater, print "Distant future" (without quotes). Else, if givenYear is 2001 or greater (2001-2100), print "21st century". Else, if givenYear is 1901 or greater (1901-2000), print "20th century". Else (1900 or earlier), print "Long ago". Do NOT end with newline.

```
#include <iostream>
using namespace std;

int main() {
   int givenYear;

cin >> givenYear;

/* Your solution goes here */
if(givenYear >= 2101){
```

```
11
           cout << "Distant future";</pre>
  12
        } else if (givenYear >= 2001){
  13
           cout << "21st century";
  14
        } else if (givenYear >= 1901){
  15
           cout << "20th century";</pre>
  16
        } else{
  17
           cout << "Long ago";</pre>
  18
  19
        return 0;
  20
          All tests passed
  Run

✓ Testing with givenYear = 1776

           Your output
                           Long ago

✓ Testing with givenYear = 1901

           Your output
                           20th century

✓ Testing with givenYear = 1948

           Your output
                           20th century
✓ Testing with givenYear = 2000
           Your output
                           20th century

✓ Testing with givenYear = 2001

           Your output
                           21st century

✓ Testing with givenYear = 2101

           Your output
                           Distant future
✓ Testing with givenYear = 2167
           Your output
                           Distant future
                                                                               Feedback?
```