EGR 125 Name: \_David Vermaak\_

Introduction to Engineering Methods (C++)

File: N125-Ch3LB

**Chapter 3 Homework – Selection Structures**

**Related Textbook Material**: Chapter 3 in Introduction to Programming with C++, 3rd Edition, by Liang

**Assignment:** Work all problems by hand unless specifically instructed otherwise.

1. (24 pts) Work the following exercises in the textbook. Work each problem by hand (not using the compiler). Be sure to ***write out the instructions for each problem and include the given information***.

**Checkpoint Exercises:**

* 3.16: What is the output of the following code if number is 14, 15, and 30?

|  |  |
| --- | --- |
| if (number % 2 == 0)  cout << number << " is even";  if (number % 5 == 0)  cout << number << " is multiple of 5"; | if (number % 2 == 0)  cout << number << " is even";  else if (number % 5 == 0)  cout << number << " is multiple of 5"; |
| 14 *is even* | 14 *is even* |
| 15 *is multiple of 5* | 15 *is multiple of 5* |
| 30 *is even is multiple of 5* | 30 *is even* |

* 3.21: Assuming that x is 1, show the result of the following Boolean expressions:

(true) && (3 > 4) ***| 0***

!(x > 0) && (x > 0) ***| 0***

(x > 0) || (x < 0) ***| 1***

(x != 0) || (x == 0) ***| 1***

(x >= 0) || (x < 0) ***| 1***

(x != 1) == !(x == 1) ***| 1***

* 3.24: To test whether x is between 10 and 100, which of the following expressions are correct?

*a. 100 > x > 10*

*b. (100 > x) && (x > 10)*

~~c. (100 > x) || (x > 10)~~

*d. (100 > x) and (x > 10)*

~~e. (100 > x) or (x > 10)~~

* 3.26: What is the value of the expression x >= 50 && x <= 100 if x is:

1. 45 **| *0***
2. 67 **| *1***
3. 101 **| *0***

* 3.36: Rewrite the following if statements using the conditional operator:

|  |  |
| --- | --- |
| if (ages >= 16)  ticketPrice = 20;  else  ticketPrice = 10; | if (count % 10 == 0)  cout << count << endl;  else  cout << count << " "; |
| ticketPrice = (ages >= 16) ? 20 : 10 | String1 = (count % 10 == 0) ? (cout << count << endl;) : (cout << count << " ";) |

* 3.40: Evaluate the following expressions:

2 \* 2 - 3 > 2 && 4 – 2 > 5 ***| 0***

2 \* 2 - 3 > 2 || 4 – 2 > 5 ***| 0***

(2-4) (32 points) Complete problems 2-4 on the attached worksheet.

2. (12 pts) Determine whether each expression below is true, false, or invalid assuming that:

**int A = 5, B = 6, C = 4;**

|  |  |  |
| --- | --- | --- |
| Problem | Expression | True, false, or invalid? |
| 1 | if (A = 5) | ***T*** |
| 2 | if (A == 6) | ***F*** |
| 3 | if (A) | ***I*** |
| 4 | if (1 < B < 3) | ***F*** |
| 5 | if (1 < B && B < 3) | ***F*** |
| 6 | if(A < C) | ***F*** |
| 7 | if(‘A’ < ‘C’) | ***T*** |
| 8 | if(‘A’ > 60) | ***T*** |
| 9 | if(B % 3 == 0) | ***T*** |
| 10 | if(C%3 == 0) | ***F*** |
| 11 | if(B%3) | ***F*** |
| 12 | if(!(C%3)) | ***F*** |

3. (5 pts) Determine the value of Result assuming that:

**int A = 5, B = 6, C = 4;**

|  |  |  |
| --- | --- | --- |
| Problem | Expression | Value of Result |
| 1 | Result = (A - 5)? 2 : 3 | 3 |
| 2 | Result = (B < C)? 2 : 3 | 3 |
| 3 | Result = (B)? 2 : 3 | 2 |
| 4 | Result = (A/C + C/B)? 2 : 3 | 2 |
| 5 | Result = (C-B)? 2 : 3 | 2 |

4. (15 pts) Determine the logical result for each Boolean expression below assuming that:

**int m = 6, n = -4;**

**double x = -5.25, y = 0.0, z = 1.25E1;**

**bool a = false, b = true, c = true;**

|  |  |  |
| --- | --- | --- |
| Problem | Problem | **True / False** |
| 1 | **m <= -n** | F |
| 2 | **x < -sqrt(z)** | T |
| 3 | **2 \* abs(n) <= m + 2** | T |
| 4 | **int(z) == 6\*(n + m)** | T |
| 5 | **( x <= y ) && (y >= z)** | F |
| 6 | **!(x > z)** | T |
| 7 | **(( m >= -n) && ( x + z > y))** | T |
| 8 | **!( -m <= n ) || !( x + z > y )** | F |
| 9 | **(( m <= n ) || ( y - x > z ))** | F |
| 10 | **!(( m > n ) && !(x >= z ))** | F |
| 11 | **!a || ! b** | T |
| 12 | **!( a && b )** | T |
| 13 | **a || ! b** | F |
| 14 | **( a && b ) || c** | T |
| 15 | **!a && (b || !c)** | T |

5. (11 pts) Cost of shipping: Write, compile, and test a C++ program that uses an **if-else structure** for problem 3.11

* Use the format specified earlier (initial block of comments with TCC logo, name, description, etc.)
* Display clear instructions so that the user understands the purpose of the program and what to enter.
* When the shipping cost is displayed, include the symbol ($).
* Run the program for the following 6 cases:
  + 1 weight in each of the valid ranges (4 cases)
  + 1 negative weight (display an appropriate message)
  + 1 weight over 20 lb (not 50 as the text states) with the message indicated in the text
* Turn in a printout of the program and printouts of the 3 test cases.

**PROGRAM #5:** **Cost of Shipping**

// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: 9/14/2021

// Name: David Vermaak

// Project: Cost of Shipping

// Inputs: weight

// Outputs: cost

// Program Description: this program calculates the cost of shipping a package of certain

// weight with price per pound varying by weight ranges.

//

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <iostream> //header containing cout and cin

using namespace std; //introduces namespace std needed to use cout and cin

int main ()

{

int a = 1;

float weight, cost;

do // sets up the while loop

{

a = a + 1; // this is a counter for the loop it iterates every time it loops

// prompts the user for input

cout << "Please Weigh your package to continue:\n\n";

cout << "Enter the weight in pounds (lb):";

cin >> weight;

cout << "\n";

if (weight > 0 && weight <= 1)

{

cost = 3.5 \* weight;

cout << "The cost to ship your package is $" << cost << endl;

}

else if (weight > 1 && weight <= 3)

{

cost = 5.5 \* weight;

cout << "The cost to ship your package is $" << cost << endl;

}

else if (weight > 3 && weight <= 10)

{

cost = 8.5 \* weight;

cout << "The cost to ship your package is $" << cost << endl;

}

else if (weight > 10 && weight <= 20)

{

cost = 10.5 \* weight;

cout << "The cost to ship your package is $" << cost << endl;

}

else if (weight > 20 )

{

cout << "The package cannot be shipped" << endl;

}

else

{

cout << "What are you shipping, helium balloons? \n Weight must be a positive value" << endl;

}

}

while(a < 7); // the while loop keeps running until the counter a = 7

return 0;

}

**OUTPUT FOR PROGRAM #5:**

*Please Weigh your package to continue:*

*Enter the weight in pounds (lb):0.5*

*The cost to ship your package is $1.75*

*Please Weigh your package to continue:*

*Enter the weight in pounds (lb):2*

*The cost to ship your package is $11*

*Please Weigh your package to continue:*

*Enter the weight in pounds (lb):5*

*The cost to ship your package is $42.5*

*Please Weigh your package to continue:*

*Enter the weight in pounds (lb):16*

*The cost to ship your package is $168*

*Please Weigh your package to continue:*

*Enter the weight in pounds (lb):25*

*The package cannot be shipped*

*Please Weigh your package to continue:*

*Enter the weight in pounds (lb):-2*

*What are you shipping, helium balloons?*

*Weight must be a positive value*

*--------------------------------*

*Process exited after 92.37 seconds with return value 0*

*Press any key to continue . . .*

6. (11 pts) Find future dates: Write, compile, and test a C++ program that uses an **if-else structure** for problem 3.5 on page 107.

* Use the format specified earlier (initial block of comments with TCC logo, name, description, etc.)
* Use the input & output format shown in the text examples.
* Display an error message if the day entered is not in the range 0-6
* Display an error message if the number of days elapsed is not positive
* Run the program for the following 6 test cases:
  + The two sample cases shown in the text
  + Two more valid test cases (using days not already tested)
  + An invalid day
  + An invalid number of days elapsed
* Turn in a printout of the program and printouts of the 6 test cases.

**PROGRAM #6: Finding Future Dates** //if only programming could help me

//find dates :(

// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: 9/14/2021

// Name: David Vermaak

// Project: Finding Future Dates

// Inputs: day and days

// Outputs: days of the week that each numeric input corresponds to

// Program Description: This program takes numeric inputs and calculates the

// corresponding day of the week

//

//

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <iostream> //header containing cout and cin

using namespace std; //introduces namespace std needed to use cout and cin

int main ()

{

int day, days;

string dayoftheweek, dayoftheweekb; //initializes the strings used to store days

// prompts the user for input

cout << "This Program outputs days of the week depending on what number you input\n\n";

cout << "Please enter a number (0-6)\n";

//get user input

cin >> day;

cout << "\n";

cout << "Please enter the number of days elapsed since today \n";

cin >> days;

days = day + days % 7; // calculation to find days elapsed within (1-7) range

{

if (day == 0)

{ dayoftheweek = "Today is Sunday :)";

}

else if (day == 1)

{ dayoftheweek = "Today is Monday :( ";

}

else if (day == 2)

{ dayoftheweek = "Today is Tuesday :/ ";

}

else if (day == 3)

{ dayoftheweek = "Today is Wednesday :/ ";

}

else if (day == 4)

{ dayoftheweek = "Today is Thursday :/ ";

}

else if (day == 5)

{ dayoftheweek = "Today is Friday :) ";

}

else if (day == 6)

{ dayoftheweek = "Today is Saturday :) ";

}

else if (day < 0 || day > 6) //sets up error condition

{

cout << "Invalid First Selection. Try Again\n";

cout << "The options only include (0-6)\n";

return 0;

}

}

if (days <= -1) //sets up error condition

{

cout << "Invalid Second Selection. Try Again\n";

return 0;

}

else

{

if (days == 0 || days == 7) // catch all condition

{ dayoftheweek = "Today is Sunday :)";

}

else if (days == 1)

{ dayoftheweekb = "Monday ";

}

else if (days == 2)

{ dayoftheweekb = "Tuesday ";

}

else if (days == 3)

{ dayoftheweekb = "Wednesday ";

}

else if (days == 4)

{ dayoftheweekb = "Thursday ";

}

else if (days == 5)

{ dayoftheweekb = "Friday ";

}

else if (days == 6)

{ dayoftheweekb = "Saturday ";

}

}

cout << dayoftheweek <<"and the future day is " << dayoftheweekb; // strings out

return 0;

}

**OUTPUT FOR PROGRAM #6:**

**6.1:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*1*

*Please enter the number of days elapsed since today*

*3*

*Today is Monday :( and the future day is Thursday :( is a sad face for Monday*

**6.2:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*0*

*Please enter the number of days elapsed since today*

*31*

*Today is Sunday :)and the future day is Wednesday*

**6.3:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*2*

*Please enter the number of days elapsed since today*

*4*

*Today is Tuesday :/ and the future day is Saturday*

**6.4:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*4*

*Please enter the number of days elapsed since today*

*50*

*Today is Thursday :/ and the future day is Friday*

**6.5:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*9*

*Please enter the number of days elapsed since today*

*12*

*Invalid First Selection. Try Again*

*The options only include (0-6)*

**6.6:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*1*

*Please enter the number of days elapsed since today*

*-10*

*Invalid Second Selection. Try Again*

7. (11 pts) Day of the week: Write, compile, and test a C++ program that uses a **switch structure** where the user is prompted to enter a number (0 - 6) corresponding to the days of the week (0 = Sunday, 1 = Monday, etc.) and the program should display the name of the day. For example, if the user enters 2, the program should output Tuesday.

* Use the format specified earlier (initial block of comments with TCC logo, name, description, etc.)
* Give clear instructions so that the user knows what to enter.
* Display an error message if the day entered is not in the range 0-6
* Run the program for the following 5 test cases:
  + Valid cases for 3 different days of the week
  + A negative input
  + An input >= 7
* Turn in a printout of the program and printouts of the 5 test cases.

**PROGRAM #7: Day of the Week**

// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: 9/14/2021

// Name: David Vermaak

// Project: Day of the week

// Inputs: number (0-6)

// Outputs: day of the week

// Program Description: this program displays the day of the week that corresponds to the

// numeric input.

//

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <iostream> //header containing cout and cin

using namespace std; //introduces namespace std needed to use cout and cin

int main ()

{

int choice;

// display menu

cout << "This Program outputs days of the week depending on what number you input\n\n";

cout << "Please enter a number (0-6)\n";

//get user input

cin >> choice;

cout << "\n";

switch(choice)

{

case 0:

cout << "Today is Sunday :) \n";

break;

case 1:

cout << "Today is Monday :( \n";

break;

case 2:

cout << "Today is Tuesday :/ \n";

break;

case 3:

cout << "Today is Wednesday :/ \n";

break;

case 4:

cout << "Today is Thursday :/ \n";

break;

case 5:

cout << "Today is Friday :) \n";

break;

case 6:

cout << "Today is Saturday :) \n";

break;

return 0;

default:

cout << "Invalid Selection. Try Again\n";

cout << "The options only include (0-6)\n";

cout << "What are you, French?\n";

cout << " https://en.wikipedia.org/wiki/French\_Republican\_calendar ";

}

return 0;

}

**OUTPUT FOR PROGRAM #7:**

**7.1:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*0*

*Today is Sunday :)*

**7.2:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*1*

*Today is Monday :(*

**7.3:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*2*

*Today is Tuesday :/*

**7.4:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*-1*

*Invalid Selection. Try Again*

*The options only include (0-6)*

**7.5:**

*This Program outputs days of the week depending on what number you input*

*Please enter a number (0-6)*

*7*

*Invalid Selection. Try Again*

*The options only include (0-6)*

*What are you, French?*

[*https://en.wikipedia.org/wiki/French\_Republican\_calendar*](https://en.wikipedia.org/wiki/French_Republican_calendar)

8. (11 points) Convert temperature: Write, compile, and test a C++ program that uses a **switch structure** where the user is prompted to enter a temperature and a unit (c, C, f, or F). If the temperature is entered in degrees Fahrenheit it should be converted to degrees Celsius. If the temperature is entered in degrees Celsius it should be converted to Fahrenheit. Hint: Read the temperature as a double and the unit as a char.

***Example***: Input: 35.2 c Output: 35.2 degrees C = 95.4 degrees F

* Use the format specified earlier (initial block of comments with TCC logo, name, description, etc.)
* Give clear instructions so that the user knows what to enter.
* The output should display the result in both degrees C and degrees F as real numbers.
* The program should print an error message if an invalid unit is entered.
* Test the program for the 7 inputs shown below.
  + 0 c
  + 100 C
  + 35.2 c
  + 32 f
  + 212 F
  + 95.4 F
  + Any number followed by an invalid letter
* Turn in a printout of the program and printouts of the 7 test cases.

**PROGRAM #8: Convert Temperature**

// \_\_\_\_ \_\_ \_\_

// / / \ / \

// / / /

// / \\_\_\_/ \\_\_\_/

//

// Date: 9/14/2021

// Name: David Vermaak

// Project: Convert Temperature

// Inputs: a number and one character

// Outputs: temperature in F, C, and K

// Program Description: this program converts the temperature from one into the other two

// measurement systems

//

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#include <iostream> //header containing cout and cin

using namespace std; //introduces namespace std needed to use cout and cin

int main ()

{

char choice;

double deg, degf, degc, degk;

do

{

// display menu

cout << "This Program converts temperature into Fahrenheit, Celsius, and Kelvin\n";

cout << "Please choose one of the following options to continue:\n";

cout << "Fahrenheit: (F) \n";

cout << "Celsius: (C) \n";

cout << "Kelvin: (K) \n";

cout << "Quit: (Q)\n\n";

cout << "Enter your choice: ";

//get user input

cin >> choice;

cout << "enter the number of degrees: ";

cin >> deg;

switch(choice)

{

case 'F':

case 'f':

degf = deg;

degc = ((degf - 32)\*5)/9;

degk = degc + 273.15;

cout << degf << " degrees F = " << degc << " degrees C and also = " << degk << " degrees K\n";

break;

case 'C':

case 'c':

degc = deg;

degf = degc\* 9/5 + 32;

degk = degc + 273.15;

cout << degc << " degrees C = " << degf << " degrees F and also = " << degk << " degrees K\n";

break;

case 'K':

case 'k':

degk = deg;

degc = degk - 273.15;

degf = degc\* 9/5 + 32;

cout << degk << " degrees K = " << degc << " degrees C and also = " << degf << " degrees F\n";

break;

case 'Q':

case 'q':

cout << "Program has ended\n";

return 0;

default:

cout << "Invalid Selection. Try Again\n";

cout << "How hard can this be?\n";

}

}

while(choice != 'Q' || choice != 'q' );

return 0;

}

**OUTPUT FOR PROGRAM #8:**

**8.1:**

*This Program converts temperature into Fahrenheit, Celsius, and Kelvin*

*Please choose one of the following options to continue:*

*Fahrenheit: (F)*

*Celsius: (C)*

*Kelvin: (K)*

*Quit: (Q)*

*Enter your choice: C*

*enter the number of degrees:0*

*0 degrees C = 32 degrees F and also = 273.15 degrees K*

**8.2:**

*This Program converts temperature into Fahrenheit, Celsius, and Kelvin*

*Please choose one of the following options to continue:*

*Fahrenheit: (F)*

*Celsius: (C)*

*Kelvin: (K)*

*Quit: (Q)*

*Enter your choice: C*

*enter the number of degrees: 100*

*100 degrees C = 212 degrees F and also = 373.15 degrees K*

**8.3:**

*This Program converts temperature into Fahrenheit, Celsius, and Kelvin*

*Please choose one of the following options to continue:*

*Fahrenheit: (F)*

*Celsius: (C)*

*Kelvin: (K)*

*Quit: (Q)*

*Enter your choice: c*

*enter the number of degrees: 35.2*

*35.2 degrees C = 95.36 degrees F and also = 308.35 degrees K*

**8.4:**

*This Program converts temperature into Fahrenheit, Celsius, and Kelvin*

*Please choose one of the following options to continue:*

*Fahrenheit: (F)*

*Celcius: (C)*

*Kelvin: (K)*

*Quit: (Q)*

*Enter your choice: f*

*enter the number of degrees: 32*

*32 degrees F = 0 degrees C and also = 273.15 degrees K*

**8.5:**

*This Program converts temperature into Fahrenheit, Celsius, and Kelvin*

*Please choose one of the following options to continue:*

*Fahrenheit: (F)*

*Celcius: (C)*

*Kelvin: (K)*

*Quit: (Q)*

*Enter your choice: F*

*enter the number of degrees: 212*

*212 degrees F = 100 degrees C and also = 373.15 degrees K*

**8.6:**

*This Program converts temperature into Fahrenheit, Celsius, and Kelvin*

*Please choose one of the following options to continue:*

*Fahrenheit: (F)*

*Celcius: (C)*

*Kelvin: (K)*

*Quit: (Q)*

*Enter your choice: F*

*enter the number of degrees: 95.4*

*95.4 degrees F = 35.2222 degrees C and also = 308.372 degrees K*

**8.7:**

*This Program converts temperature into Fahrenheit, Celsius, and Kelvin*

*Please choose one of the following options to continue:*

*Fahrenheit: (F)*

*Celcius: (C)*

*Kelvin: (K)*

*Quit: (Q)*

*Enter your choice: y*

*enter the number of degrees: 123*

*Invalid Selection. Try Again*

*How hard can this be?*