1. Write a program that asks the user to enter a length in centimeters. If the user enters a negative

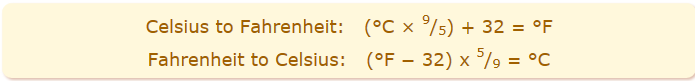
length, the program should tell the user that the entry is invalid. Otherwise, the program

should convert the length to inches and print out the result. There are 2.54 centimeters in an

inch.

2. Ask the user for a temperature. Then ask them what units, Celsius or Fahrenheit, the temperature

is in. Your program should convert the temperature to the other unit. The conversions



3. Ask the user to enter a temperature in Celsius. The program should print a message based

on the temperature:

• If the temperature is less than -273.15, print that the temperature is invalid because it is

below absolute zero.

• If it is exactly -273.15, print that the temperature is absolute 0.

• If the temperature is between -273.15 and 0, print that the temperature is below freezing.

• If it is 0, print that the temperature is at the freezing point.

• If it is between 0 and 100, print that the temperature is in the normal range.

• If it is 100, print that the temperature is at the boiling point.

• If it is above 100, print that the temperature is above the boiling point.

4. Write a program that asks the user how many credits they have taken. If they have taken 23

or less, print that the student is a freshman. If they have taken between 24 and 53, print that

they are a sophomore. The range for juniors is 54 to 83, and for seniors it is 84 and over.

5. Generate a random number between 1 and 10. Ask the user to guess the number and print a

message based on whether they get it right or not.

6. A store charges $12 per item if you buy less than 10 items. If you buy between 10 and 99

items, the cost is $10 per item. If you buy 100 or more items, the cost is $7 per item. Write a

program that asks the user how many items they are buying and prints the total cost.

7. Write a program that asks the user for two numbers and prints Close if the numbers are

within .001 of each other and Not close otherwise.

8. A year is a leap year if it is divisible by 4, except that years divisible by 100 are not leap years

unless they are also divisible by 400. Write a program that asks the user for a year and prints

out whether it is a leap year or not.

9. Write a program that asks the user to enter a number and prints out all the divisors of that

number. [Hint: the % operator is used to tell if a number is divisible by something.

10)Write a multiplication game program for kids. The program should give the player ten randomly

generated multiplication questions to do. After each, the program should tell them

whether they got it right or wrong and what the correct answer is.

11)Write a program that asks the user for an hour between 1 and 12, asks them to enter am or pm,

and asks them how many hours into the future they want to go. Print out what the hour will

be that many hours into the future, printing am or pm as appropriate. An example is shown

below.

**Algorithm Workbench**

1. Write an if statement that checks if the variable a is equal to 1. If it is equal to 1,

print a message saying ‘a equals 1’, else print ‘a is not equal to 1’.

2. Write an if statement that checks if the value a lies in the range of 10 to 30 and

assigns the value of the variable a to 20.

3. Write an if-else statement that assigns 0 to the variable b if the variable a is less

than 10. Otherwise, it should assign 99 to the variable b.

The following code contains several nested if-else statements. Unfortunately, it

was written without proper alignment and indentation. Rewrite the code and use the

proper conventions of alignment and indentation.

if score >= A\_score:

print('Your grade is A.')

else:

if score >= B\_score:

print('Your grade is B.')

else:

if score >= C\_score:

print('Your grade is C.')

else:

if score >= D\_score:

print('Your grade is D.')

else:

print('Your grade is F.')

5. Write an if-else statement that asks the user to enter the speed at which he is driving.

If the speed is more than 50 print ‘Speed in limit’, else print ‘Speed should be

checked’.

6. Write an if-else statement that displays 'Speed is normal' if the speed variable

is within the range of 24 to 56. If the speed variable’s value is outside this range,

display 'Speed is abnormal'.

7. Write an if-else statement that determines whether the points variable is outside

the range of 9 to 51. If the variable’s value is outside this range it should display

“Invalid points.” Otherwise, it should display “Valid points.”

**Programming Exercises**

**1. Day of the Week**

Write a program that asks the user for a number in the range of 1 through 7. The program

should display the corresponding day of the week, where 1 = Monday, 2 = Tuesday,

3 = Wednesday, 4 = Thursday, 5 = Friday, 6 = Saturday, and 7 = Sunday. The program should

display an error message if the user enters a number that is outside the range of 1 through 7.

**2. Areas of Rectangles**

The area of a rectangle is the rectangle’s length times its width. Write a program that asks

for the length and width of two rectangles. The program should tell the user which rectangle

has the greater area, or if the areas are the same.

**3. Age Classifier**

Write a program that asks the user to enter a person’s age. The program should display

a message indicating whether the person is an infant, a child, a teenager, or an adult.

Following are the guidelines:

• If the person is 1 year old or less, he or she is an infant.

• If the person is older than 1 year, but younger than 13 years, he or she is a child.

• If the person is at least 13 years old, but less than 20 years old, he or she is a teenager.

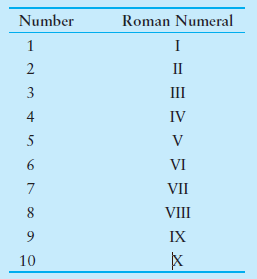
• If the person is at least 20 years old, he or she is an adult.

**4. Roman Numerals**

Write a program that prompts the user to enter a number within the range of 1 through 10.

The program should display the Roman numeral version of that number. If the number is

outside the range of 1 through 10, the program should display an error



**5. Mass and Weight**

Scientists measure an object’s mass in kilograms and its weight in newtons. If you know

the amount of mass of an object in kilograms, you can calculate its weight in newtons with

the following formula:

*weight* 5 *mass* 3 9.8

Write a program that asks the user to enter an object’s mass, and then calculates its weight.

If the object weighs more than 500 newtons, display a message indicating that it is too

heavy. If the object weighs less than 100 newtons, display a message indicating that it is

too light.

**6. Magic Dates**

The date June 10, 1960, is special because when it is written in the following format, the

month times the day equals the year:

6/10/60

Design a program that asks the user to enter a month (in numeric form), a day, and a twodigit

year. The program should then determine whether the month times the day equals the

year. If so, it should display a message saying the date is magic. Otherwise, it should display

a message saying the date is not magic.

**7. Color Mixer**

The colors red, blue, and yellow are known as the primary colors because they cannot

be made by mixing other colors. When you mix two primary colors, you get a secondary

color, as shown here:

When you mix red and blue, you get purple.

When you mix red and yellow, you get orange.

When you mix blue and yellow, you get green.

**134** Chapter 3 Decision Structures and Boolean Logic

Design a program that prompts the user to enter the names of two primary colors to mix. If

the user enters anything other than “red,” “blue,” or “yellow,” the program should display

an error message. Otherwise, the program should display the name of the secondary color

that results.

**8. Hot Dog Cookout Calculator**

Assume that hot dogs come in packages of 10, and hot dog buns come in packages of 8.

Write a program that calculates the number of packages of hot dogs and the number of

packages of hot dog buns needed for a cookout, with the minimum amount of leftovers.

The program should ask the user for the number of people attending the cookout and the

number of hot dogs each person will be given. The program should display the following

details:

• The minimum number of packages of hot dogs required

• The minimum number of packages of hot dog buns required

• The number of hot dogs that will be left over

• The number of hot dog buns that will be left over

**9. Roulette Wheel Colors**

On a roulette wheel, the pockets are numbered from 0 to 36. The colors of the pockets are

as follows:

• Pocket 0 is green.

• For pockets 1 through 10, the odd-numbered pockets are red and the even-numbered

pockets are black.

• For pockets 11 through 18, the odd-numbered pockets are black and the even-numbered

pockets are red.

• For pockets 19 through 28, the odd-numbered pockets are red and the even-numbered

pockets are black.

• For pockets 29 through 36, the odd-numbered pockets are black and the even-numbered

pockets are red.

Write a program that asks the user to enter a pocket number and displays whether the

pocket is green, red, or black. The program should display an error message if the user

enters a number that is outside the range of 0 through 36.

**10. Money Counting Game**

Create a change-counting game that gets the user to enter the number of coins required

to make exactly one dollar. The program should prompt the user to enter the number of

pennies, nickels, dimes, and quarters. If the total value of the coins entered is equal to one

dollar, the program should congratulate the user for winning the game. Otherwise, the

program should display a message indicating whether the amount entered was more than

or less than one dollar.

**11. Book Club Points**

Serendipity Booksellers has a book club that awards points to its customers based on the

number of books purchased each month. The points are awarded as follows:

• If a customer purchases 0 books, he or she earns 0 points.

• If a customer purchases 2 books, he or she earns 5 points.

• If a customer purchases 4 books, he or she earns 15 points.

• If a customer purchases 6 books, he or she earns 30 points.

• If a customer purchases 8 or more books, he or she earns 60 points.

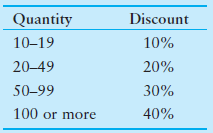
Write a program that asks the user to enter the number of books that he or she has purchased

this month and displays the number of points awarded.

**12. Software Sales**

A software company sells a package that retails for $99. Quantity discounts are given

according to the following table:



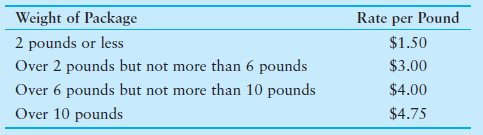
Write a program that asks the user to enter the number of packages purchased. The program

should then display the amount of the discount (if any) and the total amount of the

purchase after the discount.

**13. Shipping Charges**

The Fast Freight Shipping Company charges the following rates:



Write a program that asks the user to enter the weight of a package and then displays the

shipping charges.

**14. Body Mass Index**

Write a program that calculates and displays a person’s body mass index (BMI). The BMI

is often used to determine whether a person is overweight or underweight for his or her

height. A person’s BMI is calculated with the following formula:



where *weight* is measured in pounds and *height* is measured in inches. The program

should ask the user to enter his or her weight and height and then display the user’s BMI.

The program should also display a message indicating whether the person has optimal

weight, is underweight, or is overweight. A person’s weight is considered to be optimal

if his or her BMI is between 18.5 and 25. If the BMI is less than 18.5, the person is considered

to be underweight. If the BMI value is greater than 25, the person is considered

to be overweight.

**15. Time Calculator**

Write a program that asks the user to enter a number of seconds and works as follows:

• There are 60 seconds in a minute. If the number of seconds entered by the user is greater

than or equal to 60, the program should display the number of minutes in that many

seconds.

• There are 3,600 seconds in an hour. If the number of seconds entered by the user is

greater than or equal to 3,600, the program should display the number of hours in that

many seconds.

• There are 86,400 seconds in a day. If the number of seconds entered by the user is

greater than or equal to 86,400, the program should display the number of days in that

many seconds.