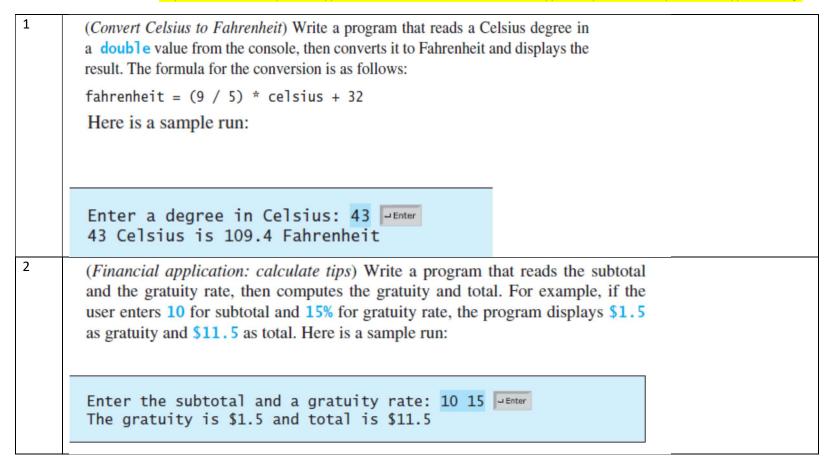
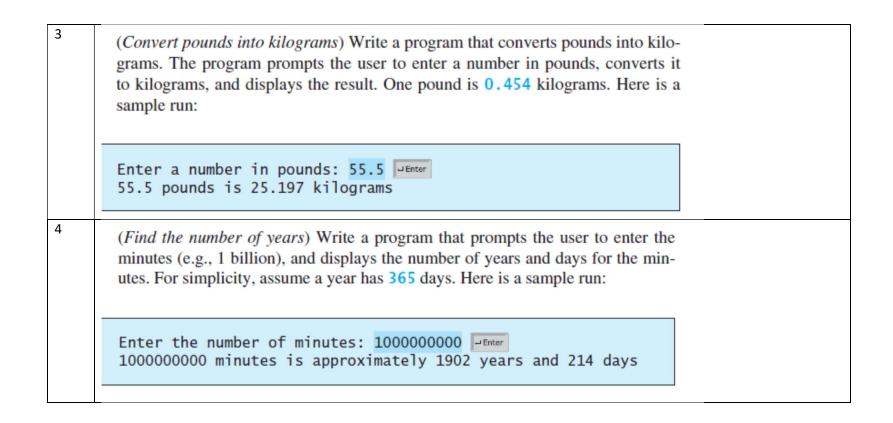
Practice Problems Set – 1

Topics Covered: Sequence type of Statement's (Variables, Data Types, Expressions, Operators, Type Casting)





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(*Physics: finding runway length*) Given an airplane's acceleration a and take-off speed v, you can compute the minimum runway length needed for an airplane to take off using the following formula:

length =
$$\frac{v^2}{2a}$$

Write a program that prompts the user to enter v in meters/second (m/s) and the acceleration a in meters/second squared (m/s²), and displays the minimum runway length. Here is a sample run:

Enter speed and acceleration: 60 3.5

The minimum runway length for this airplane is 514.286

6

(Financial application: compound value) Suppose you save \$100 each month into a savings account with the annual interest rate 5%. Thus, the monthly interest rate is 0.05/12 = 0.00417. After the first month, the value in the account becomes

$$100 * (1 + 0.00417) = 100.417$$

After the second month, the value in the account becomes

$$(100 + 100.417) * (1 + 0.00417) = 201.252$$

After the third month, the value in the account becomes

$$(100 + 201.252) * (1 + 0.00417) = 302.507$$

and so on.

Write a program that prompts the user to enter a monthly saving amount and displays the account value after the sixth month. (In Exercise 5.30, you will use a loop to simplify the code and display the account value for any month.)

Enter the monthly saving amount: 100 Penter
After the sixth month, the account value is \$608.81

(Science: wind-chill temperature) How cold is it outside? The temperature alone is not enough to provide the answer. Other factors including wind speed, relative humidity, and sunshine play important roles in determining coldness outside. In 2001, the National Weather Service (NWS) implemented the new wind-chill temperature to measure the coldness using temperature and wind speed. The formula is

$$t_{wc} = 35.74 + 0.6215t_a - 35.75v^{0.16} + 0.4275t_av^{0.16}$$

where t_a is the outside temperature measured in degrees Fahrenheit and v is the speed measured in miles per hour. t_{wc} is the wind-chill temperature. The formula cannot be used for wind speeds below 2 mph or temperatures below $-58\,^{\circ}\text{F}$ or above 41°F.

Write a program that prompts the user to enter a temperature between -58 °F and 41°F and a wind speed greater than or equal to 2 and displays the wind-chill temperature. Use Math.pow(a, b) to compute $v^{0.16}$. Here is a sample run:

Enter the temperature in Fahrenheit between -58°F and 41°F:
5.3 Jenter
Enter the wind speed (>=2) in miles per hour: 6 Jenter
The wind chill index is -5.56707

8

(Geometry: area of a triangle) Write a program that prompts the user to enter three points (x1, y1), (x2, y2), (x3, y3) of a triangle and displays its area. The formula for computing the area of a triangle is

$$s = (\text{side1} + \text{side2} + \text{side3})/2;$$

$$\text{area} = \sqrt{s(s - \text{side1})(s - \text{side2})(s - \text{side3})}$$

Here is a sample run:

Enter three points for a triangle: 1.5 -3.4 4.6 5 9.5 -3.4 The area of the triangle is 33.6

C

(Financial application: calculate future investment value) Write a program that reads in investment amount, annual interest rate, and number of years, and displays the future investment value using the following formula:

futureInvestmentValue =

 $investmentAmount \times (1 + monthlyInterestRate)^{numberOfYears*12}$

For example, if you enter amount 1000, annual interest rate 3.25%, and number of years 1, the future investment value is 1032.98.

Here is a sample run:

Enter investment amount: 1000.56 Finter

Enter annual interest rate in percentage: 4.25 Finter

Enter number of years: 1 Finter

Accumulated value is \$1043.92

10

(Financial application: calculate interest) If you know the balance and the annual percentage interest rate, you can compute the interest on the next monthly payment using the following formula:

 $interest = balance \times (annualInterestRate/1200)$

Write a program that reads the balance and the annual percentage interest rate and displays the interest for the next month. Here is a sample run:

Enter balance and interest rate (e.g., 3 for 3%): 1000 3.5 The interest is 2.91667