

## Problem Statement

B1: average speed

A woman runs on tracks of different lengths each day. She always times the last lap. Use the time for the last lap (in seconds) and the length of the track (in miles) to calculate her speed in miles per hour. Include at least decimal place if answer is not integer.

Example 1

She runs a half mile track and her last lap took 180 sec. So, the length is 0.5 miles and time is

180 sec (3 minutes). So her speed is 10 miles per hour.

Example 2

Length = 1 mile

Time = 270 sec

Answer: speed is 13.33 miles per hour

## Problem Statement

### 2 Beginning — Probability

Below are the probabilities for desired outcomes for each six different football games:

Game number 0 1 2 3 4 5

Probability 0.5 0.4 0.6 0.75 0.3 0.83

Some combination of these outcomes must occur in order for a certain team to make the playoffs. Write a program that takes as input a nonnegative integer  $n$  giving the number of relevant games, then  $n$  different game numbers. It then outputs the probability that all  $n$  of these games have the desired outcome, assuming the above probabilities and that the games are independent. In order to compute this probability, you will need to multiply together all of the probabilities for the selected games (if no games are selected, the probability is 1). You may assume that  $0 \leq n \leq 6$  and that the  $n$  game numbers are all valid and distinct.

Example 1:

Enter number of games: 0

Probability: 1

Example 2:

Enter number of games: 2

Enter game number: 4

Enter game number: 1

Probability: 0.12

Example 3:

Enter number of games: 6

Enter game number: 0

Enter game number: 2

Enter game number: 4

Enter game number: 5

Enter game number: 3

Enter game number: 1

Probability: 0.02241

## Problem Statement

B3: Money conversion including fees

You are going to travel to France. You will need to convert dollars to euros (the currency of the European Union). The display at the currency exchange booth shows CR: the conversion rate as euros per dollar and the fee as a percentage. The fee is taken before your money is converted. How many euros will the exchange give you for  $N$  dollars?

Example 1

The CR: Conversion Rate is 0.784 euros per dollar. The F: Fee is 1.0%. You have \$100. The exchange takes 1 dollar as their fee. The \$99 dollars are convert to 77.616 euros.

Example 2

Dollars: \$200

CR: 0.5

Fee: 0

**Answer:** 100

## Problem Statement

### 4 Beginning — Character Matching

Write a program that inputs two strings having the same length and reports the number of character positions in which the strings contain the same character. For example, if the given strings are “purple” and “people” there are four positions that match: the first position and each of the last three. You may assume that the strings are no longer than 20 characters.

Example 1:

Enter string a: purple

Enter string b: people

4 matches.

Example 2:

Enter string a: onetwothree

Enter string b: fourfivesix

0 matches.

Example 3:

Enter string a: bananas

Enter string b: cabanas

5 matches.

## Problem Statement

### B5: Average MPG

Whenever the woman gets gas for her car, she fills the tank until the pump stops. She then records the current odometer reading and the amount of gas, e.g. 21007.9 miles and 14.5 gal. Write a program that when given this data (that is, a list of odometer readings and gals of gas) will calculate the average miles per gal for the total set of data. You may prompt for additional records. Include at least one decimal place if not an integer answer.

Example 1:

Odometer:	100.6	Gas:	30.4
Odometer:	250.4	Gas:	30

**Answer:** 4.993 mpg

Example 2:

Odometer:	1004.5	Gas:	30
Odometer:	1340.5	Gas:	12.3
Odometer:	1702.4	Gas:	13.2

**Answer:** 27.7468 mpg

## Problem Statement

### 6 Beginning — Spiral

Consider a spiral path formed by walking through the Cartesian plane as follows:

- Begin at (0, 0) facing toward (1, 0).
- Repeat forever:
  - Take a step forward to the next grid point.
  - If the grid point to the right is not already in the path, turn right.

A portion of this spiral is shown in the following figure:

```
4
0
1
2
3
4
-1
-2
-3
-4
-4 -3 -2 -1 0 1 2 3
```

Write a program that takes an x-coordinate as input and reports how many steps are needed to reach the point (x, 0). You may assume the input value is a nonnegative integer no greater than 1000.

Example 1:

Enter x coordinate: 0

0 steps to (0, 0)

Example 2:

Enter x coordinate: 2

10 steps to (2, 0)

Example 3:

Enter x coordinate: 1000

3997000 steps to (1000, 0)

Solution  
B1: Speed on the Track

```
int T;  
float L;  
float S;  
  
cout << "\nenter Time: ";  
cin >> T;  
cout << "\nenter Length of track in miles ";  
cin >> L;  
  
S = 60*60*L/T;  
cout << "\nSpeed is " << S;  
  
return 0;
```

```
/* 2 Beginning - Probability */
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace Ksu.Contest2014.SubsetProbability
{
    class Program
    {
        static void Main(string[] args)
        {
            double[] probs = { 0.5, 0.4, 0.6, 0.75, 0.3, 0.83 };
            Console.Write("Enter number of games: ");
            int n = Convert.ToInt32(Console.ReadLine());
            double p = 1;
            for (int i = 0; i < n; i++)
            {
                Console.Write("Enter game number: ");
                p *= probs[Convert.ToInt32(Console.ReadLine())];
            }
            Console.WriteLine();
            Console.WriteLine("Probability: " + p);
            Console.ReadLine();
        }
    }
}
```



Solution  
B3: Changing Money

```
float D;  
float E;  
float CR;  
float F;  
  
cout << "\nenter Dollars: ";  
cin >> D;  
cout << "\nenter CR: conversion rate: ";  
cin >> CR;  
cout << "\nenter F: fee percentage: ";  
cin >> F;  
E = (D - D*0.01*F)*CR ;  
cout << "\nNumber of Euro is " << E;  
  
return 0;
```

```
/* 4 Beginning - Character Matching */
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace Ksu.Contest2014.CountMatches
{
    class Program
    {
        static void Main(string[] args)
        {
            Console.Write("Enter string a: ");
            string a = Console.ReadLine();
            Console.Write("Enter string b: ");
            string b = Console.ReadLine();
            int count = 0;
            for (int i = 0; i < a.Length; i++)
            {
                if (a[i] == b[i])
                {
                    count++;
                }
            }
            Console.WriteLine(count + " matches.");
            Console.ReadLine();
        }
    }
}
```

Solution  
B5: Average Mileage

```
float initmileage, nextmileage;
float totalgas, nextgas;

char R = 'Y';
cout << "\nEnter first odometer reading: ";
cin >> initmileage;
cout << "\nEnter first gas amount: ";
cin >> totalgas;
totalgas = 0;
cout << "\nAre there more receipts? Y or N:";
cin >> R;
while (R != 'N'){
    cout << "\nEnter next odometer reading: ";
    cin >> nextmileage;
    cout << "\nEnter next gas amount: ";
    cin >> nextgas;
    totalgas = totalgas + nextgas;
    cout << "\nAre there more receipts? Y or N:";
    cin >> R;
}

if (totalgas == 0) { cout << "\nNot enough data - at least two
    valid records needed."; }
else
{ cout << "\nAve milage is " << (nextmileage -
    initmileage)/totalgas;
}

return 0;
```

```
/* 6 Beginning - Spiral */
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace Ksu.Contest2014.SpiralBeginning
{
    class Program
    {
        static void Main(string[] args)
        {
            Console.Write("Enter x coordinate: ");
            int x = Convert.ToInt32(Console.ReadLine());
            int steps = 0;
            for (int i = 0; i < x; i++)
            {
                steps += 8 * i + 1;
            }
            Console.WriteLine(steps + " steps to (" + x + ", 0)");
            Console.ReadLine();
        }
    }
}
```