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# Kapitulli 3

# Introduction to Programming

Prof:Muzafer Shala

Ass:Laberion Zebica Student:Elion Krasniqi

Kampusi:FERIZAJ

1.Write an expression that checks whether an integer is **odd or even**.

using System;

namespace ConsoleApp9

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

int number = 23;

bool even = number % 2 == 0 ? true : false;

Console.WriteLine("{0} is even? {1}", number, even);

}

}

}

}

2.    Write a Boolean expression that checks whether a given integer is **divisible by both 5 and 7**, without a remainder.

using System;

namespace ConsoleApp9

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

static void Main(string[] args)

{

int number = 36;

bool divisible = number % 35 == 0 ? true : false;

Console.WriteLine("{0} is divisible by both 5 and 7? {1}", number, even);

}

}

}

}

}

3.    Write an expression that checks for a given integer if its **third digit** (right to left) is 7.

using System;

namespace ConsoleApp10

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

int number = 45764;

bool isSeven = (number / 100) % 10 == 7 ? true : false;

Console.WriteLine("Third digit of {0} is 7", number, even);

}

}

}

}

4.    Write an expression that checks whether the **third bit** in a given integer is 1 or 0.

using System;

namespace ConsoleApp12

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

int number = 452;

Console.WriteLine("The third bit of {0} is 1? {1}", number, ((number >> 3) & 1) == 1);

}

}

}

}

5.    Write an expression that calculates the **area of a trapezoid** by given sides **a**, **b** and height **h**.

using System;

namespace ConsoleApp13

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

float a = 2;

float b = 3;

float h = 1;

Console.WriteLine("S={0}", (a + b) / (2 \* h));

}

}

}

}

6.    Write a program that prints on the console the **perimeter and the area of a rectangle**by given side and height entered by the user.

using System;

namespace ConsoleApp13

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

static void Main(string[] args)

{

Console.Write("Enter a: ");

int a = Convert.ToInt32(Console.ReadLine());

Console.Write("Enter b: ");

int b = Convert.ToInt32(Console.ReadLine());

Console.WriteLine("S={0}, P={1}", a \* b, (a + b) \* 2);

}

}

}

}

}

7.    The gravitational field of the Moon is approximately 17% of that on the Earth. Write a program that calculates the **weight of a man on the moon** by a given weight on the Earth.

using System;

namespace ConsoleApp13

{

class Program

{

static void Main(string[] args)

{

Console.WriteLine("Enter weight of a man: ");

int weight = Convert.ToInt32(Console.ReadLine());

Console.WriteLine("This person will weight {0}kg on the Moon.", weight \* 0.17);

}

}

}

8.    Write an expression that checks for a given point {x, y} if it is **within the circle**K[{0, 0}, R=5]. Explanation: the point {0, 0} is the center of the circle and 5 is the radius.

using System;

namespace ConsoleApp14

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

Console.Write("Enter x: ");

int x = Convert.ToInt32(Console.ReadLine());

Console.Write("Enter y: ");

int y = Convert.ToInt32(Console.ReadLine());

bool isInside = (x \* +y \* y <= 5) ? true : false;

Console.WriteLine("The point O({0},{1}) is inside K((0,0),5)?: {2}", x, y, isInside);

}

}

}

}

9.    Write an expression that checks for given point {x, y} if it is **within the circle** K[{0, 0}, R=5] and **out of the rectangle** [{-1, 1}, {5, 5}]. Clarification: for the rectangle the lower left and the upper right corners are given.

namespace Chapter\_3\_Solution\_9

{

class Program

{

static void Main(string[] args)

{

Console.Write("Enter x: ");

int x = Convert.ToInt32(Console.ReadKey());

Console.Write("Enter y: ");

int y = Convert.ToInt32(Console.ReadKey());

bool isInsideCircle = (x \* x + y \* y <= 5) ? true : false;

bool isOutsideRectangle = (x < -1 && x > 5 && y < 1 && y > 5) ? true : false;

Console.WriteLine("The point O({0},{1}) is inside K((0,0),5)?: {2}", x, y, isInsideCircle);

Console.WriteLine("The point O({0},{1}) is outside rectangle ((-1, 1), (5, 5)?: {2}", x, y, isOutsideRectangle);

}

}

}

10.   Write a program that takes as input a **four-digit number** in format **abcd** (e.g. 2011) and performs the following actions:

-     Calculates the sum of the digits (in our example 2+0+1+1 = 4).

-     Prints on the console the number in reversed order: **dcba** (in our example 1102).

-     Puts the last digit in the first position: **dabc** (in our example 1201).

-     Exchanges the second and the third digits: **acbd** (in our example 2101).

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

namespace Chapter\_3\_Solution\_9

{

class Program

{

static void Main(string[] args)

{

Console.Write("Enter x: ");

int x = Convert.ToInt32(Console.ReadKey());

Console.Write("Enter y: ");

int y = Convert.ToInt32(Console.ReadKey());

bool isInsideCircle = (x \* x + y \* y <= 5) ? true : false;

bool isOutsideRectangle = (x < -1 && x > 5 && y < 1 && y > 5) ? true : false;

Console.WriteLine("The point O({0},{1}) is inside K((0,0),5)?: {2}", x, y, isInsideCircle);

Console.WriteLine("The point O({0},{1}) is outside rectangle ((-1, 1), (5, 5)?: {2}", x, y, isOutsideRectangle);

}

}

}

11.   We are given number **n** and position **p**. Write a sequence of operations that prints the value of **the bit on the position** **p** in the number (0 or 1). Example: **n**=35, **p**=5 -> 1. Another example: n=35, **p**=6 -> 0.

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

namespace Chapter\_3\_Solution\_11

{

class Program

{

static void Main(string[] args)

{

int n = 35, p = 6, i = 1, mask = i << p;

Console.WriteLine((n & mask) != 0 ? "Third bit is 1" : "Third bit is 0");

}

}

}

12.   Write a Boolean expression that checks if the bit on position **p** in the integer **v** has the value 1. Example v=5, **p**=1 -> **false**.

espace ConsoleApp15

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

int v = 350;

int p = 350;

int mask = 1 << p;

bool isOne = (v & mask) != 0 ? true : false;

Console.WriteLine("The bit at position {0}of number {1} is 1? {2}", p, v, isOne);

}

}

}

}

13.   We are given the number **n**, the value **v** (**v** = 0 or 1) and the position **p**. write a sequence of operations that changes the value of **n**, so the bit on the position **p** has the value of **v**. Example: n=35, p=5, v=0 -> n=3. Another example: n=35, p=2, v=1 -> n=39.

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

int n = 350;

int v = 0;

int p = 3;

n = (v == 0) ? n = n & (~(1 << p)) : n = n | (1 << p);

Console.WriteLine(n);

}

}

}

}

14.   Write a program that checks if a given number **n** (1 <**n** < 100) is a **prime number** (i.e. it is divisible without remainder only to itself and 1).

using System;

namespace ConsoleApp15

{

class Program

{

static void Main(string[] args)

{

static void Main(string[] args)

{

int number = 72;

bool isPrime = true;

if (number > 2)

for (int i = 2; i <= Math.Ceiling(Math.Sqrt(numbber)); ++i)

{

if (number % i == 0) isPrime = false;

}

Console.WriteLine("{0} is prime?: {1}", number, isPrime);

}

}

}

}

15.   \* Write a program that **exchanges the values of the bits** on positions 3, 4 and 5 with bits on positions 24, 25 and 26 of a given 32-bit unsigned integer.

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

namespace Chapter\_3\_Solution\_15

{

class Program

{

static void Main(string[] args)

{

Console.Write("Enter number: ");

int v = Convert.ToInt32(Console.ReadLine());

int mask = 1 << 3;

int bitAt3 = (v & mask) != 0 ? 1 : 0;

mask = 1 << 4;

int bitAt4 = (v & mask) != 0 ? 1 : 0;

mask = 1 << 5;

int bitAt5 = (v & mask) != 0 ? 1 : 0;

mask = 1 << 24;

int bitAt24 = (v & mask) != 0 ? 1 : 0;

mask = 1 << 25;

int bitAt25 = (v & mask) != 0 ? 1 : 0;

mask = 1 << 26;

int bitAt26 = (v & mask) != 0 ? 1 : 0;

v = (bitAt3 == 0) ? v = v & (~(1 << 24)) : v = v | (1 << 24);

v = (bitAt4 == 0) ? v = v & (~(1 << 25)) : v = v | (1 << 25);

v = (bitAt5 == 0) ? v = v & (~(1 << 26)) : v = v | (1 << 26);

v = (bitAt24 == 0) ? v = v & (~(1 << 3)) : v = v | (1 << 3);

v = (bitAt25 == 0) ? v = v & (~(1 << 4)) : v = v | (1 << 4);

v = (bitAt26 == 0) ? v = v & (~(1 << 5)) : v = v | (1 << 5);

Console.WriteLine(v);

}

}

}

16.   \* Write a program that **exchanges bits** {p, p+1, …, p+k-1} with bits {q, q+1, …, q+k-1} of a given 32-bit unsigned integer.

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

namespace Chapter\_3\_Solution\_16

{

class Program

{

private static uint ModifyNumber(uint number, int p, int q, int k)

{

int[] pBits = new int[k];

int[] qBits = new int[k];

for (int position = p, i = 0; i < pBits.Length; position++, i++)

{

pBits[i] = PthBit(number, position);

}

for (int position = q, i = 0; i < qBits.Length; position++, i++)

{

qBits[i] = PthBit(number, position);

}

for (int position = p, i = 0; i < qBits.Length; position++, i++)

{

number = ModifiedNumber(number, position, qBits[i]);

}

for (int position = q, i = 0; i < pBits.Length; position++, i++)

{

number = ModifiedNumber(number, position, pBits[i]);

}

return number;

}

private static int PthBit(uint number, int position)

{

uint pthBit = (number >> position) & 1;

return (int)pthBit;

}

private static uint ModifiedNumber(uint number, int position, int bitValue)

{

uint actualP = (uint)bitValue << position;

number = number & (~((uint)1 << position));

uint result = number | actualP;

return result;

}

static void Main(string[] args)

{

Console.Write("Enter number: ");

uint number = uint.Parse(Console.ReadLine());

Console.Write("Enter p: ");

int p = int.Parse(Console.ReadLine());

Console.Write("Enter q: ");

int q = int.Parse(Console.ReadLine());

Console.Write("Enter k: ");

int k = int.Parse(Console.ReadLine());

if (p > q)

{

int oldValue = p;

p = q;

q = oldValue;

}

if (p + k >= q)

{

k += p - q - 1;

q += p + k + 1;

}

number = ModifyNumber(number, p, q, k);

Console.WriteLine(number);

}

}

}