**Question 1 3 points**

How many numbers from the range <4563-89450> satisfies such algorithm:   
For a given number replace this number by the sum of the squares of its digits. Repeat this operation until the number equals 1 or results start to repeat. If algorithm ends with 1, it is the desired number.  
  
Example for number 11: Example for number 23:   
12+12=2 22+32=13  
22=**4** 12+32=10  
42=16 12+02=**1**12+62=37  
32+72=58  
52+82=89  
82+92=145  
12+42+52=42  
42+22=20  
22+02=**4**

And the answer is:

1. 15369
2. 12352
3. 16987
4. 16325

**Question 2 1 point**

Assuming little-endian byte order. For a bit representation of the double precision (IEEE 754) floating point number, count how many times two consecutive bits differ.

e.g. for some number, binary representation is

0100000000101110100110011001100110011001100110011001100110011010,

and for it the answer is 32, because

0|1|00000000|1|0|111|0|1|00|11|00|11|00|11|00|11|00|11|00|11|00|11|00|11|00|11|00|11|00|11|0|1|0.

Please run the algorithm on number: **3,14159265.**

And the answer is:

1. 27
2. 29
3. 31
4. 33

**Question 3 1 point**

How many numbers between <1000,1000000> are dividable without remainder by all primary numbers between <5, 13>?

And the answer is:

1. 213
2. 199
3. 176
4. 90

**Question 4 3 points**

There are 5 clouds flying on 360x360 matrix. Each cloud has size of 1x1. If at least two clouds meet on the same spot they will create storm. How many storms will occur in 10000 cycles.

|  |  |  |
| --- | --- | --- |
| Cloud | position | move |
| 1 | (0,1) | (1,-1) |
| 2 | (0,0) | (1,1) |
| 3 | (358,0) | (3,1) |
| 4 | (1,1) | (0,-1) |
| 5 | (2,2) | (-1,-2) |

In each lifecycle clouds move as in example:   
x cycle: position x = 359 , y = 3, move x = 2, y = -3   
x+1 cycle: position x = 1 , y = 0   
x+2 cycle: position x = 3 , y = 357

And the answer is:

1. 56
2. 112
3. 84
4. 512
5. 1
6. 0

**Question 5 1 point**

Given two strings:

A =

"

*QnVpbGRpbmcgbGVhZGVycyBvZiB0aGUgZGlnaXRhbCB3b3JsZA0KV2l0aCBhYm91dCAxOCAwMDAg*

*ZXhwZXJ0cywgVGlldG8gaXMgdGhlIGxlYWRpbmcgSVQgc2VydmljZQ0KY29tcGFueSBpbiBOb3J0*

*aGVybiBFdXJvcGUgcHJvdmlkaW5nIElUIGFuZCBwcm9kdWN0DQplbmdpbmVlcmluZyBzZXJ2aWNl*

*cy4NCk91ciBzcGVjaWFsaXplZCBJVCBzb2x1dGlvbnMgYW5kIHNlcnZpY2VzIGNvbXBsZW1lbnRl*

*ZCBieQ0KYSBzdHJvbmcgdGVjaG5vbG9neSBwbGF0Zm9ybSBjcmVhdGUgdGFuZ2libGUgYnVzaW5l*

*c3MgYmVuZWZpdHMuDQpBcyBhIHRydXN0ZWQgdHJhbnNmb3JtYXRpb24gcGFydG5lciwgd2UgYXJl*

*IGNsb3NlIHRvIG91cg0KY3VzdG9tZXJzIGFuZCB1bmRlcnN0YW5kIHRoZWlyIHVuaXF1ZSBuZWVk*

*cy4NCk91ciBidXNpbmVzcyBsaW5lcyBhcmUgdGhlIGZvbGxvd2luZzoNCmwgSW5kdXN0cnkgc29s*

*dXRpb25zIHN1cHBvcnQgY3VzdG9tZXJzIGJ1c2luZXNzDQpwcm9jZXNzZXMgYXMgd2VsbCBhcyBo*

*ZWxwIHRoZW0gbWFuYWdlIGVuZC1jdXN0b21lcg0KaW50ZXJmYWNlIGFuZCBjcmVhdGUgZ3JlYXQg*

*c2VydmljZSBleHBlcmllbmNlcy4gSW4gdGhpcw0KY2F0ZWdvcnksIHdlIHByb3ZpZGUgc29sdXRp*

*b25zIHRvIGluZHVzdHJ5LXNwZWNpZmljIG5lZWRzLg0KVGhlc2Ugc29sdXRpb25zIGFyZSBvZnRl*

*biBiYXNlZCBvbiBwcm9kdWN0cyBkZXZlbG9wZWQNCmJ5IFRpZXRvLiBPbiB0b3Agb2YgdGhlc2Us*

*IHdlIG9mZmVyIGluZHVzdHJ5IGNvbnN1bHRpbmcgYW5kDQpjdXN0b21lci1zcGVjaWZpYyBpbnRl*

*Z3JhdGlvbiB3b3JrLg0KbCBFbnRlcnByaXNlIHNvbHV0aW9ucyBhcmUgdXNlZCBpbiBwcm9jZXNz*

*ZXMgYW5kDQpidXNpbmVzcyBzaXR1YXRpb25zIGNvbW1vbiBmb3IgYWxsIGluZHVzdHJpZXMuIFRo*

*ZXNlDQpzb2x1dGlvbnMgaW5jbHVkZSBwcm9kdWN0cyB0aGF0IGFyZSBkZXZlbG9wZWQgYnkgVGll*

*dG8NCm9yIGEgdGhpcmQgcGFydHkgYXMgd2VsbCBhcyBzZXJ2aWNlcyByYW5naW5nIGZyb20gSVQN*

*CmNvbnN1bHRpbmcgdG8gcmVsYXRlZCBpbnRlZ3JhdGlvbiwgYXBwbGljYXRpb24NCmRldmVsb3Bt*

*ZW50IGFuZCBtYWludGVuYW5jZSB3b3JrLg0KbCBNYW5hZ2VkIHNlcnZpY2VzIGNvbXByaXNlcyBh*

*cHBsaWNhdGlvbiBtYW5hZ2VtZW50DQppLmUuIG1haW50YWluaW5nLCBkZXZlbG9waW5nIGFuZCBl*

*bmhhbmNpbmcgZXhpc3RpbmcgYXBwbGljYXRpb25zDQp1bmRlciBhIGxvbmctdGVybSBjb250cmFj*

*dCwgYW5kIElDVCBpbmZyYXN0cnVjdHVyZQ0Kc2VydmljZXMgdGhhdCBlbnN1cmUgMjQvNyBvcGVy*

*YXRpb25zIGZvciBjdXN0b21lcnMuDQpsIFByb2R1Y3QgZW5naW5lZXJpbmcgc29sdXRpb25zIGNv*

*bXByaXNlIGRlc2lnbiwNCmRldmVsb3BtZW50IGFuZCBtYWludGVuYW5jZSBvZiBzb2Z0d2FyZSBm*

*b3Igb3VyDQpjdXN0b21lcnMgcHJvZHVjdHMuIE91ciBzdHJvbmcgUiZEIG9mZmVyaW5nIGNvdmVy*

*cw0KdGVsZWNvbSBuZXR3b3JrcywgbW9iaWxlIGRldmljZXMgYXMgd2VsbCBhcyBhdXRvbW90aXZl*

*DQphbmQgaW5kdXN0cmlhbCBSJkQgYXJlYXMu*

*"*

B =

"

QSBsZWFkaW5nIHNlcnZpY2UgaW50ZWdyYXRvciBjcmVhdGluZyB0aGUgYmVzdA0Kc2VydmljZSBl

eHBlcmllbmNlIGluIElUDQpEZW1hbmQgZm9yIHNlcnZpY2VzIHRoYXQgYXJlIGF2YWlsYWJsZSBv

biBhIGNvbnRpbnVvdXMgYmFzaXMNCmFuZCBhcmUgZWFzeSB0byB1c2Ugd2l0aG91dCB0aW1lIG9y

IHBsYWNlIHJlc3RyaWN0aW9ucw0KY29udGludWVzIHRvIHJpc2UuIEhvd2V2ZXIsIHRoZSByZWFs

IHN1Y2Nlc3MgY29tZXMgZnJvbQ0KdXNhYmlsaXR5LCBleGNpdGVtZW50IGFuZCBhIGdyZWF0IHNl

cnZpY2UgZXhwZXJpZW5jZS4gTmV3DQpzZXJ2aWNlcywgZS5nLiBtb2JpbGUgZW50ZXJwcmlzZSBz

b2x1dGlvbnMsIGFyZSBrZXkgc291cmNlcyBmb3Igb3VyDQpmdXR1cmUgZ3Jvd3RoLiBFdmVyeXRo

aW5nIGdvZXMgbW9iaWxlIQ0KSVQgaXMgaW5jcmVhc2luZ2x5IHBhY2thZ2VkIGFuZCBjb25zdW1l

ZCBhcyBhIHNlcnZpY2UuIE91cg0Kc3RyYXRlZ3kgZHJpdmVzIGZvciBoaWdoZXIgZGlmZmVyZW50

aWF0aW9uIGFuZCBzcGVjaWFsaXphdGlvbiBhbmQNCmdvaW5nIGZvcndhcmQsIG1vcmUgZm9jdXMg

aXMgcGxhY2VkIG9uIHByb2R1Y3RpemluZyBvdXIgaGlnaA0KdmFsdWUgYWRkaW5nIHNlcnZpY2Vz

IGFuZCBvZmZlcmluZ3MuDQpUaWV0b3MgdW5pcXVlIHZhbHVlIHByb3Bvc2l0aW9uIGRyaXZlcyBn

cm93dGggYW5kDQpwcm9maXRhYmlsaXR5DQpJbiB0b2RheXMgY29tcGV0aXRpdmUgbGFuZHNjYXBl

LCBpdCBpcyBkaWZmaWN1bHQgdG8gYmVhdCB0aGUNCmNvbXBldGl0aW9uIG9uIHByaWNlIG9yIHB1

cmUgcGVyZm9ybWFuY2UuIFdlIGhhdmUgY2hvc2VuIHRvDQpkaWZmZXJlbnRpYXRlIG91cnNlbHZl

cyBmcm9tIHRoZSBjb21wZXRpdG9ycyB0aHJvdWdoIHN1cGVyaW9yDQpjdXN0b21lciBjZW50cmlj

aXR5LiBXZSBzZWVrIHRvIG1lZXQgb3VyIGN1c3RvbWVycyBidXNpbmVzcw0KY2hhbGxlbmdlcyB3

aXRoIG91ciBzcGVjaWFsaXplZCBzZXJ2aWNlcy4NCldpdGggb3VyIHVuaXF1ZSB2YWx1ZSBwcm9w

b3NpdGlvbiwgd2UgaGVscCBvdXIgY3VzdG9tZXJzDQp0byBncm93IGFuZCBpbXByb3ZlIHByb2R1

Y3Rpdml0eS4gU3VwcG9ydGluZyBjdXN0b21lcnMgd2l0aA0KdGhlIHJlbGF0ZWQgYnVzaW5lc3Mg

dHJhbnNmb3JtYXRpb24gaXMgb25lIG9mIG91ciBjb3JlDQpjb21wZXRlbmNlcy4NClRoZSBzZWN0

b3JzIHdlIGNvdmVyDQpUZWxlY29tIGFuZCBNZWRpYQ0KRmluYW5jZSBhbmQNCkluZHVzdHJ5IHNl

Y3RvcnMuDQpJbmR1c3RyeSBzZWN0b3JzIGluY2x1ZGUNCi0gQXV0b21vdGl2ZQ0KLSBFbmVyZ3kg

KEVuZXJneSB1dGlsaXRpZXMgJiBPaWwgYW5kIGdhcykNCi0gSGVhbHRoY2FyZSBhbmQgd2VsZmFy

ZQ0KLSBNYW51ZmFjdHVyaW5nDQotIExvZ2lzdGljcw0KLSBQdWJsaWMNCi0gUmV0YWlsLg0KVGll

dG8gYWltcyB0byBiZSBhIG1hcmtldCBsZWFkZXIgaW4gSVQgc2VydmljZXMgaW4NCk5vcnRoLUVh

c3QgRXVyb3BlLCBhbmQgZXhwYW5kIG9wZXJhdGlvbnMgaW4gbmV3IG1hcmtldHMNCnN1Y2ggYXMg

UnVzc2lhIGFuZCBQb2xhbmQuDQpPcGVyYXRpbmcgY291bnRyaWVzOiBBdXN0cmlhLCBHZXJtYW55

LCBQb2xhbmQsIEJlbGFydXMsIEluZGlhLCBSdXNzaWEsDQpCZWxnaXVtLCBJbmRvbmVzaWEsIFNp

bmdhcG9yZSwgQ2FuYWRhLCBJdGFseSwgU3BhaW4sIENoaW5hLCBMYXR2aWEsIFN3ZWRlbiwgQ3pl

Y2ggUmVwdWJsaWMsIExpdGh1YW5pYSwgVWtyYWluZSwgRGVubWFyaywgTWFsYXlzaWEsIFVuaXRl

ZCBLaW5nZG9tLCBFc3RvbmlhLCBOZXRoZXJsYW5kcywgVVNBLCBGaW5sYW5kLCBOb3J3YXksIEZy

YW5jZS4=

"

determine the number of the unique common subsequences in them. Omit line breaks during processing.

And the answer is:

1. 1335
2. 2853
3. 3027
4. 4003
5. 6262
6. 8401

**Question 6 3 points**

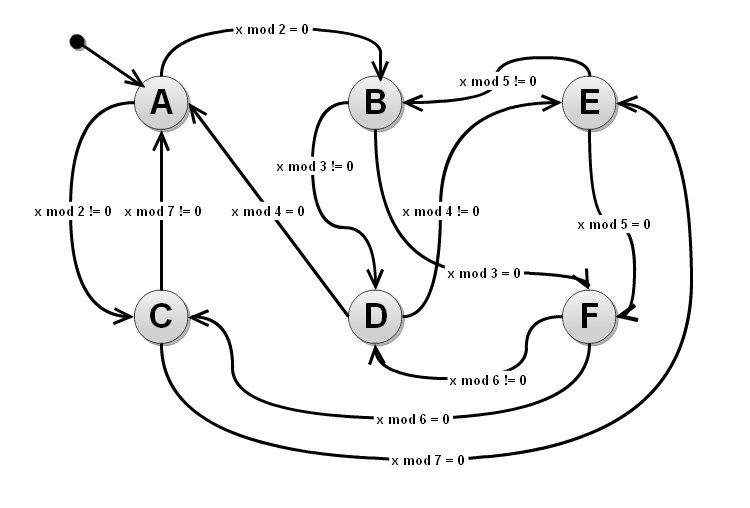
Football coach wants to compose set of 3 best defenders from 12 players that are available at the moment. Each player has his skills rated. Each player also affects other players rating. How many combinations of 3 players, which have maximum possible value, can be made by coach.

|  |  |  |  |
| --- | --- | --- | --- |
| Player number | Player rating | Effect one | Effect two |
| 0 | 2 | player 2 rating -1 | player 5 rating -3 |
| 1 | 6 | player 3 rating +1 | player 9 rating -1 |
| 2 | 4 | player 8 rating +2 | player 6 rating -2 |
| 3 | 3 | player 5 rating +1 | player 3 rating +4 |
| 4 | 8 | player 1 rating +2 | player 2 rating -4 |
| 5 | 7 | player 7 rating -2 | player 3 rating -1 |
| 6 | 5 | player 9 rating +2 | player 8 rating -1 |
| 7 | 9 | player 6 rating -3 | player 5 rating -4 |
| 8 | 6 | player 9 rating -1 | player 4 rating +3 |
| 9 | 5 | player 3 rating +3 | player 10 rating -1 |
| 10 | 9 | player 7 rating -2 | player 2 rating +3 |
| 11 | 6 | player 1 rating +2 | player 7 rating +1 |

And the answer is:

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6

**Question 7 1 point**

Input for the state machine is set of natural numbers <1;9999>. After each transition state machine takes another argument and does next transition according to its value. Arguments are taken in sequence starting from {1} and ending with {9999}. In which state will the state machine end after all transitions will be done.

And the answer is:

1. A
2. B
3. C
4. D
5. E
6. F

**Question 8 3 points**

100 windmills are composed into 10x10 matrix. If value of windmill is 1 then its wings rotate clockwise, if it's 0 they rotate counterclockwise. In each cycle all windmills can change direction in which they rotate. Windmill changes its direction if in previous cycle more than half of its neighbours were rotating in opposite direction to it. After how many cycles all windmills will be rotating in the same direction?

{1, 1, 1, 1, 1, 1, 0, 0, 1, 0},  
{1, 0, 0, 0, 1, 0, 1, 1, 1, 1},  
{0, 0, 0, 1, 0, 0, 0, 0, 0, 0},  
{0, 1, 1, 0, 1, 1, 0, 1, 0, 1},  
{1, 0, 0, 1, 1, 1, 0, 1, 0, 1},  
{0, 1, 0, 0, 0, 1, 0, 0, 1, 0},  
{0, 1, 0, 1, 1, 1, 0, 0, 1, 0},  
{0, 0, 0, 1, 1, 1, 0, 1, 0, 0},  
{0, 1, 0, 1, 1, 1, 0, 1, 1, 1},  
{0, 0, 1, 0, 0, 0, 0, 0, 0, 1}

And the answer is:

1. 10
2. 12
3. 16
4. 20
5. 22
6. It's not possible that they will all rotate in the same direction.

**Question 9 3 points**

The Unruly Winnie, in his virtual world, has been carrying a container containing 1-bytes letters. Unfortunately he stumbled over exception and content of container scattered.

Letters started to join together, creating 4 bytes ints.

For a given int array:  
int input[] = {1364476232, 1129601601, 1128613712, 1447510359, 1179861337, 1178686549, 1096439881, 1380341577, 1229078855, 1397113431};  
check how many letters inside are in a range from "I" to "U" (including "I" and "U") .

And the answer is:

1. 14
2. 10
3. 15
4. 12

**Question 10 1 point**

In the sentence “TO JEST PRZYKLADOWE KONKURSOWE ZDANIE DO SPRAWDZENIA DLA KAZDEGO UCZESTNIKA KONKURSU” calculate an average value of the ASCII codes values of every character including spaces. Do NOT include NULL terminating char into average value. Average should be rounded down to assure that value will fit to ASCII code.  
How many characters whose ASCII value is equal to the calculated average are in this sentence?

And the answer is:

1. 0
2. 1
3. 2
4. 3

**Question 11 3 points**

Caesar cipher which operates only on non-accented capital Latin letters has been modified in a way that it alternately adds and subtracts key from letter.  
To make decoding more difficult, the key which at the beginning is equal to 1 will be increased by 1 for every next character. Encountering an illegal character like ' ' or '+' also increments key.  
Every character that doesn't belong to the above set should be passed to output.

What's the result of the encryption of the sentence:  
char input[] = "PRZYKLADOWE ZDANIE TESTOWE";

And the answer is:

1. QPCUPFHVYMP MPPXZM ZZWQRVE
2. QPCUPFIVXMP MPPXYM ZZWQQVE
3. QPCUPFIVXMP NPPXZM ZZWRQWE
4. QPCURFHVVMP MPPWZM ZZWQQVE
5. QPCURFIVVMP NPRWZM ZZWQRVE
6. QPCUPFHVXMP MPPXZM ZZWQQVE

**Question 12 1 point**

The goal is to find specified element in given matrix which has dimensions X and Y. First element has value "START" and next elements are created with step "STEP".

Example: X=4, Y=3, START=3, STEP is in range <0;4> and it changes cyclically.  
3 3 4 6

9 13 13 14  
16 19 23 23  
element x=2 y=3 => 19

Question: What's the value of element x=423, y=146 for rectangle X=450, Y=250, START=11, STEP <0;6>?

And the answer is:

1. 316943
2. 229863
3. 197022
4. 164187
5. 198377

|  |  |  |
| --- | --- | --- |
|  | |  | | --- | | **Question 13 1 point**  There is a given rectangle with side length of x. Basing on that rectangular there is created a new one, so that the vertices of the new rectangle are in the middle of the sides of the old rectangle. This operation is repeated n times.  How big is the area of the nth rectangle, if x = 100 and n = 13.  And the answer is:   1. It is impossible to calculate 2. 0.610352 3. 1.2207 4. 4.88281 | |

**Question 14 3 points**

A is the sum of all prime numbers from the range <0-10000>, B is the sum of all numbers divisible by 243 from the same range.

Is A divisible by B and are they relatively prime (co-prime) (0 and 1 aren't prime numbers)?

And the answer is:

1. divisible, co-prime
2. divisible, not co-prime
3. not divisible, co-prime
4. not divisible, not co-prime

|  |  |  |
| --- | --- | --- |
|  | |  | | --- | | **Question 15 3 points**  The grasshopper is jumping through the straight path, starting from the beginning of it. The path is 50 centimeters long. Grasshopper can make different length jumps. Each jump can be from 2 centimeters to 10 centimeters long. Length of each jump is a natural number. Each next grasshopper’s jump is at least as long as its earlier jump.  How many different combinations of jumps can the grasshopper make to stop his journey exactly at the end of the path?  And the answer is:   1. 15436 2. 9732 3. 7246 4. 5738 | |

**Question 16 1 point**

Count how many numbers are in range <1000; 100000> that have exactly three ‘1’ digits in its hexadecimal representation.

For example in range <1; 1000> there is only one such number: 273 (0x111).

And the answer is:

1. 943
2. 1085
3. 1202
4. 1134

|  |  |  |
| --- | --- | --- |
|  | |  | | --- | | **Question 17 5 points**  There are 100 packages waiting in a shipping company. Each package has a unique number from range <1; 100> (package number is a natural number). Each package has its weight and a charge, which shipping company will take from a package sender only if the package will be delivered. So it happens that each package weight in kilograms equals package number modulo 11 plus 1 and charge in Euros equals package number modulo 13 plus 1. Company has only one lorry which can take only 250 kilograms of packages.  weight(n) = (n mod 11) + 1 charge(n) = (n mod 13) + 1  What is a maximum amount of Euros which the company can earn in one lorry delivery?  And the answer is:   1. 487 2. 488 3. 489 4. 490 | |

**Question 18 5 points**

There is a board with 40x15 fields. Each field has a number on it (look at the table below). You have one pawn, which is standing on A1 field. The pawn can move horizontally, vertically or diagonally but only to the next field (so if the pawn is not standing on the edge of a board, it can move to 8 different fields). The goal is to move the pawn to O40 field. The pawn's path is a collection of all fields, on which the pawn was standing during the journey from A1 field to O40 including them.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| A | 2 | 4 | 4 | 6 | 9 | 3 | 1 | 1 | 5 | 1 | 2 | 5 | 5 | 8 | 5 | 8 | 1 | 8 | 6 | 1 | 1 | 9 | 4 | 8 | 4 | 6 | 1 | 8 | 7 | 4 | 3 | 7 | 1 | 7 | 6 | 5 | 7 | 8 | 4 | 2 |
| B | 5 | 6 | 3 | 3 | 6 | 9 | 4 | 1 | 9 | 5 | 4 | 9 | 8 | 3 | 5 | 3 | 1 | 6 | 1 | 1 | 6 | 5 | 3 | 1 | 1 | 6 | 7 | 9 | 1 | 7 | 5 | 4 | 7 | 1 | 4 | 6 | 5 | 9 | 4 | 8 |
| C | 3 | 9 | 6 | 2 | 1 | 3 | 6 | 1 | 7 | 4 | 8 | 5 | 1 | 9 | 9 | 1 | 6 | 3 | 7 | 1 | 3 | 1 | 7 | 7 | 3 | 6 | 3 | 8 | 2 | 2 | 6 | 3 | 2 | 6 | 1 | 8 | 6 | 5 | 5 | 7 |
| D | 4 | 7 | 6 | 3 | 1 | 6 | 3 | 8 | 9 | 2 | 2 | 3 | 8 | 6 | 1 | 8 | 1 | 9 | 4 | 8 | 7 | 4 | 3 | 3 | 2 | 1 | 4 | 4 | 5 | 1 | 2 | 3 | 5 | 9 | 3 | 7 | 6 | 3 | 9 | 1 |
| E | 1 | 2 | 5 | 9 | 4 | 9 | 7 | 5 | 4 | 3 | 2 | 5 | 6 | 1 | 2 | 5 | 4 | 9 | 2 | 4 | 9 | 5 | 8 | 9 | 5 | 4 | 8 | 5 | 3 | 8 | 7 | 5 | 3 | 7 | 4 | 9 | 6 | 7 | 3 | 2 |
| F | 4 | 4 | 8 | 1 | 2 | 1 | 1 | 4 | 7 | 7 | 7 | 8 | 5 | 9 | 6 | 3 | 3 | 7 | 8 | 3 | 5 | 2 | 9 | 4 | 2 | 4 | 2 | 3 | 7 | 5 | 6 | 8 | 8 | 2 | 7 | 2 | 1 | 5 | 9 | 2 |
| G | 8 | 2 | 3 | 9 | 4 | 2 | 5 | 9 | 3 | 4 | 3 | 5 | 3 | 3 | 3 | 8 | 3 | 8 | 9 | 5 | 5 | 2 | 4 | 5 | 1 | 8 | 9 | 7 | 1 | 8 | 2 | 9 | 8 | 7 | 4 | 3 | 7 | 3 | 2 | 2 |
| H | 8 | 9 | 5 | 6 | 9 | 8 | 8 | 7 | 3 | 8 | 2 | 2 | 4 | 1 | 3 | 9 | 3 | 5 | 5 | 5 | 1 | 2 | 5 | 4 | 5 | 4 | 9 | 6 | 8 | 1 | 8 | 3 | 7 | 8 | 2 | 2 | 8 | 4 | 1 | 8 |
| I | 3 | 1 | 8 | 2 | 8 | 5 | 7 | 6 | 3 | 2 | 5 | 1 | 1 | 6 | 5 | 2 | 5 | 7 | 2 | 2 | 1 | 8 | 7 | 1 | 6 | 8 | 6 | 5 | 2 | 5 | 2 | 6 | 1 | 2 | 1 | 8 | 3 | 7 | 2 | 8 |
| J | 9 | 9 | 6 | 3 | 5 | 8 | 5 | 5 | 8 | 5 | 9 | 1 | 4 | 3 | 9 | 2 | 7 | 6 | 1 | 6 | 9 | 4 | 2 | 2 | 4 | 9 | 5 | 7 | 5 | 9 | 7 | 6 | 8 | 1 | 7 | 8 | 6 | 7 | 5 | 9 |
| K | 5 | 6 | 1 | 2 | 2 | 7 | 5 | 2 | 9 | 9 | 8 | 3 | 9 | 9 | 1 | 8 | 1 | 5 | 3 | 5 | 4 | 6 | 9 | 8 | 4 | 7 | 5 | 1 | 1 | 9 | 1 | 9 | 6 | 7 | 5 | 4 | 1 | 2 | 2 | 2 |
| L | 7 | 2 | 1 | 5 | 6 | 8 | 8 | 2 | 1 | 3 | 8 | 3 | 2 | 1 | 6 | 3 | 8 | 1 | 4 | 5 | 4 | 6 | 1 | 4 | 7 | 7 | 7 | 7 | 3 | 8 | 2 | 3 | 1 | 3 | 7 | 2 | 8 | 5 | 1 | 8 |
| M | 9 | 3 | 1 | 5 | 7 | 7 | 1 | 3 | 5 | 5 | 9 | 8 | 6 | 4 | 6 | 8 | 5 | 7 | 4 | 9 | 9 | 8 | 7 | 3 | 9 | 1 | 9 | 8 | 5 | 6 | 5 | 3 | 6 | 5 | 3 | 5 | 6 | 9 | 8 | 9 |
| N | 8 | 1 | 7 | 4 | 6 | 6 | 5 | 4 | 3 | 5 | 9 | 6 | 8 | 5 | 8 | 7 | 9 | 4 | 3 | 1 | 7 | 3 | 9 | 6 | 9 | 8 | 1 | 5 | 3 | 4 | 3 | 4 | 3 | 2 | 8 | 3 | 8 | 7 | 8 | 4 |
| O | 2 | 8 | 1 | 9 | 2 | 7 | 8 | 2 | 2 | 7 | 5 | 2 | 7 | 6 | 9 | 7 | 4 | 2 | 8 | 6 | 4 | 3 | 7 | 2 | 5 | 4 | 5 | 3 | 3 | 4 | 8 | 4 | 2 | 9 | 6 | 2 | 9 | 3 | 4 | 6 |

What is the minimum sum of field numbers of the pawn's path?

And the answer is:

1. 106
2. 108
3. 100
4. 102

**Question 19 3 points**

How many pairs of numbers less than 1000000 satisfy the following requirements:

* both numbers are dividable by 4
* sum of positive integer divisors of first number other than the number itself is equal to second number and vice versa (sum of divisors of second number is equal to first number)

And the answer is:

1. 17
2. 9
3. 34
4. 28

**Question 20 3 points**

A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself.  
A palindromic number is a 'symmetrical' number like 12321 that remains the same when its digits are reversed.   
How many palindromic primes are in (0,100000)? What is the value of 64th palindromic prime?

Answers:

And the answer is:

1. 123, 36263
2. 113, 36563
3. 117, 37573
4. 122, 35353

**Question 21 1 point**

Among Fibonacci numbers there are such ones that are dividable by prime numbers. Out of first 1000 Fibonacci numbers, how many can be divided by prime numbers ranging from <1,10>?

And the answer is:

1. 1
2. 9
3. 8
4. 5

**Question 22 1 point**

How many integer numbers, smaller than 1000000, satisfy all of the following requirements:

* when divided by 3 gives a remainder of 1,
* when divided by 4 gives a remainder of 2,
* when divided by 5 gives a remainder of 3,
* when divided by 6 gives a remainder of 4,
* when divided by 7 gives a remainder of 5,
* when divided by 8 gives a remainder of 6,
* when divided by 9 gives a remainder of 7
* and contains at least one digit '7'

And the answer is:

1. 7
2. 438
3. 203
4. 92

**Question 23 3 points**

The last two digits of the sum of all the primes below 0.25E02 is **00**:

2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23 = 1**00**

Find the last two digits of the sum of all the primes below 1.0E07.

And the answer is:

1. 00
2. 01
3. 56
4. 57

**Question 24 1 point**

How many numbers fulfilling the following criteria are maximum six digits long?

Criteria:

- the number is at least two digits long

- example number (197) is calculated as follows: 1+9+7=17, 9+7+17=33, 7+17+33=57, 17+33+57=107, 33+57+107=197

And the answer is:

1. 24
2. 34
3. 36
4. 40

**Question 25 1 point**

How many numbers from the range <1-1000000> have exactly three '5' digits and how many of them have four or six 'ones' in binary representation?

And the answer is:

1. 14580, 560
2. 14560, 559
3. 14580, 559
4. 14600, 563

**Question 26 3 points**

There is a big cube having length of a side = 205891132094649 units. The cube is divided into 27 identical cubes. Next, cubes located in the middle of each side of the big cube are removed. The cube located in the center of the big cube is also removed. In the next iteration, the operation is repeated for all the cubes that were not removed. What is the volume of empty space after 30 iterations ?

And the answer is:

1. 8726889826263712425891397479476727340041449
2. 4003424884507469232388931607395307982184249
3. 235633541501888235499067731945871638181119123
4. 3490755930505484970356558991790690936016579600

**Question 27 1 point**

How many Fridays the thirteenth will be there until the year 2365 (including 2012)?

And the answer is:

1. 610
2. 532
3. 657
4. 599

**Question 28 1 point**

Adjacent bit count of a number consisting of bits X1, X2, X3, …, Xn can be calculated as X1\*X2 + X2 \*X3 + X3 \* X4 + … + Xn – 1 \* Xn.

What is the average adjacent bit count of integers in range <1, 100000> and how many of them have adjacent bit count equal to 4?

And the answer is:

1. 3.32, 17149
2. 3.32, 18245
3. 3.66, 17149
4. 3.66, 18245

**Question 29 1 point**

Let’s call a number curious when the sum of the factorials of its digits is equal to the number.   
For instance 145 is curious, because 1! + 4! + 5! = 145.

Please note that numbers 1 and 2 are not curious as they consist of only one digit so they are not **sum** of factorials. What’s the sum of squares of all curious numbers in range <1, 100 000 000>?

And the answer is:

1. 1 456 389 120
2. 1 647 163 250
3. 1 937 231 020
4. 1 923 562 210

**Question 30 1 point**

In the text below there are 4 pairs of words which are different but after adding ASCII decimal values of their letters have the same sum. What are these sums?

*Computer programming is the iterative process of writing or editing source code. Editing source code involves testing, analyzing, and refining, and sometimes coordinating with other programmers on a jointly developed program.*

*A person who practices this skill is referred to as a computer programmer, software developer or coder. The sometimes lengthy process of computer programming is usually referred to as software development.*

*The term software engineering is becoming popular as the process is seen as an engineering discipline.*

Source: [en.wikipedia.org](http://en.wikipedia.org/wiki/Computer_program)

**Hint: don't analyze full stops and commas.**

And the answer is:

1. 345, 678, 756, 789
2. 411, 534, 899, 1003
3. 365, 476, 667, 967
4. 440, 847, 973, 1187

**Question 31 1 point**

How many numbers in this range <-300, 50200> are both divisible by the sum of its even and odd digits?

And the answer is:

1. 1898
2. 2012
3. 513
4. 809

**Question 32 3 points**

The island was divided into 64 parts (8x8 - island is square). You have to deploy eight lighthouse (which may light horizontally, vertically and diagonally) and set them up, so that each lighthouse is not lighting on other lighthouse. How many ways of deployment exist?

And the answer is:

1. 120
2. 92
3. 56
4. 18

**Question 33 3 points**

We can move from top to bottom of a triangle of values from a value in a row to adjacent values in the row below. For triangle:

24

64 58

13 27 97

One possible path can be

24

64 58

13 27 97

Another one can be

24

64 58

13 27 97

Each path generates a sum of values; let’s call the lowest possible sum *the* *minimum sum* of a triangle. For the triangle above the *minimum sum* equals 101, as 13 + 64 + 24 = 101

24

64 58

13 27 97

There is no other path that generates lower sum.

What is *the minimum sum* of the triangle below?

24

64 58

13 27 97

46 23 73 29

93 86 12 67 91

14 3 16 7 3 24

53 69 14 19 48 59 46

14 79 55 38 69 44 16 19

25 10 58 67 14 32 28 9 7

2 74 65 83 27 16 22 77 59 10

And the answer is:

1. 200
2. 230
3. 260
4. 290

**Question 34 1 point**

Word ***a*** is an *anagram* of word ***b*** if we can rearrange letters in ***a*** to produce ***b*** as a result. We cannot add nor remove any letters. Example: word *oboafr* is an anagram of *foobar*. Given a set of 60 distinct words, count the number of pairs of words that are anagrams.

**Note:** If ***a*** and ***b*** are distinct words, where ***a*** is an anagram of ***b***, and ***b*** is an anagram of ***a***, then *{a,b}* and *{b,a}* are considered as a single pair.

wnwjfznwtdpyjsgnjctuwcnjcmltrr  
abrfxjlrminpgpdqamzlejbqbpwkwu  
iamxtlpgrkepvatjqernodzyfajqqc  
vwrplefmvyjaxgmzffehpkkzlabdfs

lubcmjxhqnyfbggqqyezdrrmepgdxy

tfuhzgwxckkbnfbxqlknkskmykbatp  
cbpoewhgmrrryuqhrwettutvfgmadb  
chvowthqjoclzlntlckwkvebcbiazw  
exuelwjpzunxvkbcrxzhzcphqtjpck  
tsamxawsmbysxurfbgbyjiluzkattv  
aullubmyzsyxcujqrepftsaivrdrhn  
guqfqozvbwpvrbtafpjqjjqdswgbui  
fvriwvnzavfmdvrggsqwhccztkzgcv  
wzfdlrkpkeczwcrwynzqvrjfvdxqsx  
smlwbugaitzkmfrubtayaxyjxtvbss  
jbnzieewdhgxozbujbgxgodtdhabsb  
pdxvekfbfwzdtcgyltibkgwalpcvph  
vnrlguacvfsnlnwfayiqgxvvyggbjs  
cmclznhwslbnmgyjiyifazihkanxbk  
zmxqcugiyedjsdpedxqzxpeqhullsq  
kjlblbrmjpwawzfmrpnixbuagdqpqe  
ilfojkjojqlyovkmimpoeuppgehrzx

cwngyktfmxnkxktfbqazhlkubpkbks  
iyrsjhdcjxdylzdswfmtlqsxkxhuwx  
ayhbmvxpwgrcibonvlqskslaopiorj  
sdcxjzehullxudqpqsmyzqxeqeipgd  
tvujrycdvowqcbetzfmotuindzmhwo  
efmrnqvoyjatpdapictglzqaxeqjrk

vxefloeoeihavcctnhluldhltxwunt  
jrnnhtvflhjxdhqwnanaqolbqzvbcd  
ulenjzngttgnvqpzkzihovnpzasfyf  
bmlvzydmemqpmmqennvaybtrevfqnc  
duqeiottbxebtznflpbbfofkzwrlgi  
oahtvwumpgtmdqhwytrfrbubceergr  
zngnnzvgsiptnyfeuhapzvkzjloftq  
vtzmlvymecvqmmrnqeypmdfbqanbne  
mulhkelxeatgqxfemrntnpaqnyzlet  
hzclbyfzqaxqaovcvjcbgzrhmlpwhy  
dqljywdyjudytsuvogkigkubqsfoku  
xivjfuavhmmagvmqdavmhmzesaopkt  
hnewmdjbhwccsuokvkwyoyalfkbmcv  
cbhjzvrtwzyutwvomotfdqucmedion  
pqgijkxzjuoplofooepmrhjyivklme  
ohawmsjtpxopgjoqfggjgcuisxdqyp  
cdkxkdroldsnsclpgbehkvdkiqqhdf  
fdvsscqnkcfwgjudsvabhwycjvmjns  
ccwlbtchklkvoeotwavzichlwjznbq  
rhdixxyjruocovptmfcmuwkiufwxys  
hzhxzxejuccrekcpxunpztjkqlwbvp  
ybkjwuvspygauntjzcceqbscmiuukl

yzhporvmmuapgknvzcoppriktstmeg  
rlxlptcmfjbdrysrvqnuuzsahyaieu  
pjnctvujccwiqmuseagublzkbkuysy  
wlcsvgjnfvsaynnqgxfagvulrivybg  
pigjctnjmgbfaekswoaeibgdpxapvm  
piifqthtvjynejkeiatczqzfnjcexf  
zsvivrckmkpnygpztremaugmopopht  
pooqftqigxupwjxgcgpdayjgsmhjos  
szgiuwvvjpqpaqdqoqrfjbfgbjwutb  
vxsoabngsrvcioarlhjomiwlbpykqp

And the answer is:

1. 10
2. 19
3. 22
4. 25

**Question 35 3 points**

Given a point in Cartesian coordinate system, consider the below sequence of Euclidean operations (let's call it *a transformation*):

1. Rotate the point counterclockwise by an angle of 90 degrees about the origin of plane
2. Translate the point by fixed vector [3, 2]

What is the resulting point, if we apply the above transformation 1,000,000,000,000,000,007 times with the initial point (4, 2) ?

And the answer is:

1. (50000000000000045, 50000000000000043)
2. (50000000000000044, 50000000000000042)
3. (50000000000000052, 50000000000000050)
4. Other

|  |  |
| --- | --- |
|  |  |

**Question 36 3 points**

Let's change the relations according to which the order of numbers is determined:

5 < 3 < 1 < 7 < 0 < 2 < 9 < 8 < 4 < 6

That is, all the numbers listed in this order go as follows:  
5,3,1,7,0,2,9,8,4,6,55,53,51,57,50,52,59,58,54,56,35,33,31,37,30,32,39,38,34,36,15,...

**Note:** 00 is a valid number, as well as 55 is.

Examples:

51 is less than 50

76 is less than 09

6 is less than 35

5 is less than 01

Given a list of numbers, sort the items according to above relations and determine the **47th** element in the resulting sequence?

574, 7114, 37, 53216, 9326, 706, 4205, 91124, 65720, 34, 21413, 89, 29, 4080, 01234, 69, 90, 1300, 13, 85, 17723, 1193, 40883, 3177, 75228, 0925, 07545, 3741, 32021, 5509, 28, 63, 49, 2894, 89683, 254, 5923, 673, 7271, 65, 249, 65932, 14123, 3309, 27, 165, 62, 89393, 5231, 47693, 977, 9614, 24557, 6547, 13613, 23, 909, 35353, 29232, 33, 39194, 181, 765, 382, 19, 08, 65, 77778, 44, 999, 0551, 8146, 6479, 95292, 22, 54706, 967, 0082, 484, 44, 83391, 6373, 76, 8689, 6792, 5162, 36, 85, 5485, 676, 016, 33, 03435, 01502, 24, 140, 7428, 93391, 1967, 7134

And the answer is:

1. 5231
2. 5923
3. 7134
4. 7114

**Question 37 1 point**

Sum of some integers and their reverse representation consists only of even digits.

For example 13 is such a number because 13 + 31 = 44; number 20 is also such number as 20 + 2 = 22. Another example: 101 + 101 = 202.

How many such numbers are there in range <1, 1 000 000> and what is the count of unique sums of these numbers and their reverse representations? For instance in a group of numbers 22, 24 and 60 there are two unique sums, because 22 + 22 = 44, 24 + 42 = 66 and 60 + 6 = 66.

And the answer is:

1. 15624, 248
2. 15624, 243
3. 16876, 248
4. 16876, 243

**Question 38 1 point**

Calculate the sum of diagonal (from top left to bottom right) numbers for matrix with 111 rows and 111 columns built as such:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 9 | 10 | 11 | 12 | 13 |
| 8 | 21 | 22 | 23 | 14 |
| 7 | 20 | 25 | 24 | 15 |
| 6 | 19 | 18 | 17 | 16 |
| 5 | 4 | 3 | 2 | 1 |

*Example for 5 columns and 5 rows. Sum of diagonal (from left to right) numbers equal 73.*

Sum of such diagonal is:

And the answer is:

1. 905631
2. 809211
3. 902894
4. 902893

|  |  |  |
| --- | --- | --- |
|  | |  | | --- | |  | |

**Question 39 3 points**

Calculate the sum of diagonal (from left to right) numbers for matrix with 50 rows and 50 columns build in such way:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 18 | 28 | 29 | 39 |
| 40 | 41 | 51 | 61 | 62 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 |
| 79 | 80 | 90 | 100 | 101 | 111 |
| 112 | 113 | 114 | 115 | 116 | 117 |

*Example for 6 rows and 6 columns. Sum of diagonal numbers is 354.*

***Hint:*** *Number of row and column of underline numbers are prime numbers.*

Sum of diagonal numbers for such matrix is:

And the answer is:

1. 120430
2. 120440
3. 120450
4. 120420

**Question 40 1 point**

How many six digits palindrome numbers are there?

And the answer is:

1. 901
2. 902
3. 903
4. 900

**Question 41 1 point**

How many 5-characters long palindromes are in the text below?

KAXOJWRHGCMNUPONJPDUVTCKJLFZZTZBJCWFRMRKJPLGNAIUMDSXHRWSUOQJIEHKXZDWANYYUSHT

LKLGDIUMEUCUIMQFUGZDJZMYAHDXUPRFBHGIEKLMHDTOTDBSKBTWMEFKPFKYNNMQMBVJVXQTWWJJ

IJFJTJIZBLRMQBAPNAFIDNOLDXNCLSJHLXRFJZDVFEZSQVDDAZDZYSUCAAVUEJFRIHCZGGRONYJT

TUNRAFVOECXFHGPJNQGQTIBZTIJFCUWLWKFLPZOQSLYFOKGQEWGEFJNLLUCYJRPQKUZNKYCJGRVF

FYIASIMWTVJQRDQZKRTHYWZQSTZVRUZKKSWJRKUZTXMPDCNHWDDIVIFQHAFWDREZEXJCIQETKZUW

RZYAMAQJCTUIJFKADHFSVJAVJDKGDOINRNWTJMDQDZDIKUFXELAJOFTYTSIDXGIVFHDBTLGUEQUZ

ESMSECAYBGIJKMKDRMLTDOBWDKYYVHJYIWZFUCUPCAGSNQLFRYGBURUZKVBIJEOJZKUPWBJEMFQB

EORKXXERZVCACIFAVBFTRJIYSSQVCJIDSCIRUOYTZNCUQMOYGJBFHORCCCPOGEWEFZHJKJYTYQTB

TYUMNAKIRZUEYABBPGDJGRWLLYGVIUWHYFFISUNVDGXXJZDYEELPYSZDJZUNHBNMCJVMRRTVPVKE

LRKWQOWTUANONVWXYALFXJJKWKYHKBKZFANTVURLIDLRIDXPKMZRJSXSIWWUHRGOWVUNVRYUKDPI

FMUPMXLACENZBRBJIWCNCCEWIIYMJDYGKVMFJOXEQRYBBDCVEXRNJOAFXSRJQGWVBKEHVMILWYUJ

FPGFEDAAETDJMRPNNETXOHFGQLWRSSNXNMHNDWJCDXIDHHQXJAJUKITOEUVFEZJRXAJNNFFQVPOZ

AAEMRALFSUIHMQNXJJMJMPIVTTTXVCHQTFAOFJSDGMGITAMHXUGKKXKJGSXVEPXTMHJKZMGRXMKP

ITYQILXLAWBCRXHRGGHGXTVYTBIODQRJQDGZONKXRHBNYADHHJKSRDVFSCJSXSULMRTYRQVLDDXA

ZUARDYRBNECGJTKFWCRUOQUEGRAVVIZVJRMXIWZGROYZRJKHYTDSYSIOQMHSPFSSDLOTCKVTAOVK

KHOQGUYTBQANEJRAAADRVBALCDUAHGRNJVJNBLZJURUTGNRPZBBKRFOPMTCATBVHKWHHNXPZROXR

YKWFZCPVFQPGOSXBSIDTPSOWEKPADEMUABPEVJAHLNPOGJESJESYHONHINFLCTPFIVRZSUOWUCCT

BXWFKCIZEVJHYUEXEDUYSDZOIBGWTOHIYSOSELZBWUEKPMWECTZULEYMKAPIHVFBXSXRRYPTKKOI

VRIPHQNQKSCOPCSWVKPXAEQDNVPKBPPLYNXKIBCLVZGVEWVZQTUQYAZOUDDRTFWWVVKPGTEQPKNO

MOLDTZQRJHOMMDGJXNXYBQXEEVPMNDPTPVWZCLRZIEYYVNUTGIEGPGFXPBUQSETVHARUALXEOACW

VJBLDUFYABLXCDGRBIQWAZYIKMPBBQDBZZINKAFJWALFEOCCHSPWVWHWFTPQHOOYCUJGVPLIOPSP

YXKGFVXOMHDGOPVFBQKVSQDXQBMEMQBNPNHZEVTUOJOCDWUJIVHQVSLBABQDEUFXTTVMKGDHMNYQ

SZLPHHZUGRKHRDAABOUYRIZKMSFRWVXBFCHWBGESMOREFXZKFAPPQSLRBFTFHSZGDEDRHVUFEOJG

NMNIAAMWFYWOBFAVZQCTGTXAERJYNNFOSBNKFILSRCRTVYPSAPXQDWDCLZLKIOQYUPQZNQTHAQFY

OURSJAXQELWGIKKZVDJDZDBVHPWWKZHFFQLLJNWLWGFAVCDGBUCGEEHBXJVMMMJOGFQAJTDFWJNO

UJUXTLURFNQTYYCEJNMPXHAIMGKEURNYCFMWEZAINTVRCVLQFBYHNRBPYLZYRCSNFWVONYLXFSGN

TOZPHQHXSORNMZYZIMIHSNKDX

And the answer is:

1. 1
2. 3
3. 7
4. 9

**Question 42 1 point**

What is the sum of ten biggest primes smaller than 2000000?

And the answer is:

1. 17999275
2. 19999128
3. 19999256
4. 21998947

**Question 43 5 points**

Some King has big treasury which is possible to be opened only by a digital key.   
He forgot that key, but he wrote it in an encoded version (one line/long string) in his diary.  
  
1102120211011301110111021101120211041202110113031102110112051304110111021204120113011201110112051705130113011204110211031203110211041201110211021402140211021209110111051103160111011401130111031201110311011203120210511041304140211021102110111031101120112041103110111011302110112011101120312041101110111011101110212031501110212011104110313011301110112   
  
To encode his digital key, the King has invented such a coding algorithm:  
  
1. Split the key into 4-digit numbers   
2. Convert each 4-digit number into binary number

3. Every binary number has to be 14 bits word

4. Combine all 14-bit numbers into one binary sequence (from left to right)   
5. Get first bit from left, from entire sequence of bits and write it to encoded output

6. Check received bit and count number of occurrences of this bit in sequence starting from current position to right sequentially. When you reach different value, stop counting and write the counter to encoded output. Reset the counter

7. Then start from this different bit you reached in the previous step (while counting). Write this bit to encoded output.

And do again what is described in step 6. Do it until you reach end of bit sequence.

Example (encoding of 56783251):   
  
1. 5678 3251   
2. 5678 -> 1011000101110  
3251 -> 110010110011  
3. 5678 -> 01011000101110  
3251 -> 00110010110011  
4. 0101100010111000110010110011   
5. 01110112031101130312021101120212  
  
Help the King and decode the secret key.

And the answer is:

1. 9821480865132823066570938646035505822817253594081784819174532841057019383211455596446229489549303819
2. 9821480865132823066878938846095507822317656595081684811174502841097079365211043796446229489549303819
3. 9821480865132823366470538447095805862317353574081284831374502841527019385261055566446229489549303819
4. 9821480865132823066470938446095505822317253594081284811174502841027019385211055596446229489549303819

**Question 44 3 points**

You have captured a cryptogram and by an accident you have taken possession of a cryptographic key that was used to generate it. You know that the message has been ciphered with XOR as an encrypting function in CBC mode. What value of IV (initialization vector) was used to encrypt the message?

HINT: you need to guess the first original message's byte.

The key: 0xC3

The encrypted message: [91, 241, 87, 224, 76, 175, 47, 131, 50, 129, 45, 156, 62, 137, 35, 143, 34, 218, 57, 187, 19, 165, 70, 206, 98, 211, 120, 212, 100, 194, 111, 140, 59, 145, 55, 212, 37, 203, 62, 209, 50, 161, 76, 192, 45, 206, 79, 227, 88, 187, 75, 176, 95, 188, 57, 179, 93, 174, 93, 170, 93, 175, 76, 199, 65, 206, 94, 212, 89, 209, 91]

And the answer is:

1. 204
2. 223
3. 212
4. 194

**Question 45 3 points**

|  |  |
| --- | --- |
|  |  |

For each number in range of 160 to 5111160 (Sexagesimal numeral system with sixty in its base) count the product of each digit and sum them up.

Example sum for the range from 32(57)60 to 33160

3\*2\*57+3\*2\*58+3\*2\*59+3\*3\*0+3\*3\*1 = 1053

And the answer is:

1. 10797123487767510
2. 52023531435610
3. 94523649534534553410
4. 32456156645410

**Question 46 1 point**

Convert all integers from scope <1234; 5678> to hex numbers (represented as digits and small letters). Sum all digits from created series. Select also letters from the series and convert it to ASCII codes. Sum all received integers.

Sum from digits and from letters (represented as ASCI codes) respectively are:

And the answer is:

1. 39644 and 485728
2. 43236 and 595688
3. 37328 and 612284
4. 35362 and 654828

**Question 47 1 point**

How many Fridays 13th are in leap years in third millennium (according to Gregorian calendar)?

And the answer is:

1. 416
2. 417
3. 423
4. 424

**Question 48 1 point**

From the set of first 36 Fibonacci numbers take only these whose ordinal (position) number is a prime number.  
How many prime numbers there will be in a set of sums of adjacent numbers out of set from first step, if even sums are divided by 2?

And the answer is:

1. 1
2. 3
3. 4
4. 5

**Question 49 3 points**

There are 1 million closed school lockers in a row, labeled 1 through 1,000,000.  
You first go through and flip every locker open.  
Then you go through and flip every other locker (locker 2, 4, 6, etc...). When you're done, all the even-numbered lockers are closed.  
You then go through and flip every third locker (3, 6, 9, etc...). "Flipping" mean you open it if it's closed, and close it if it's open. For example, as you go through this time, you close locker 3 (because it was still open after the previous run through), but you open locker 6, since you had closed it in the previous run through.  
Then you go through and flip every fourth locker (4, 8, 12, etc...), then every fifth locker (5, 10, 15, etc...), then every sixth locker (6, 12, 18, etc...) and so on. At the end, you're going through and flipping every 999,998th locker (which is just locker 999,998), then every 999,999th locker (which is just locker 999,999), and finally, every 1,000,000th locker (which is just locker 1,000,000).

In the end, what is the state of following lockers - 999, 23314, 100200, 678343 and 1000000?

And the answer is:

1. open, closed, open, closed, open
2. open, closed, closed, closed, open
3. closed, closed, closed, closed, open
4. closed, closed, open, closed, closed

**Question 50 1 point**

We have a list of pairs of Fibonacci and Tribonacci numbers. What is the greatest common divisor bigger than 10 of these pairs? Please limit Fibonacci and Tribonacci sequence to 40th element.

And the answer is:

1. 19
2. 37
3. 72
4. 141