Московский авиационный институт (национальный исследовательский университет)

Институт информационных технологий и прикладной математики

Кафедра вычислительной математики и программирования

Журнал по исследовательской практике (индивидуальный план)

Студенты	Группа
Кузьмичев Александр Николаевич	М8О-406Б-18
Орозбакиев Эмиль Данияр ович	М8О-406Б-18
Синявский Андрей Владимирович	М8О-408Б-18
Команда:	MAI #20: Kuzmichev, Orozbakiev, Sinyavsky

Москва, 2022

Сводная таблица за осень 2021

Дата	Название	Время	Место проведения	Решенные задачи
12.09.2021	Grand Prix of Dolgoprudny	11:00	Дистанционно	L, O
19.09.2021	Grand Prix of IMO	11:00	Дистанционно	N, P
26.09.2021	Grand Prix of XiAn	11:00	Дистанционно	L, N
10.10.2021	XXII Открытая Всесибирская олимпиада	12:00	Дистанционно	N, O, L
24.10.2021	Grand Prix of Korea	11:00	Дистанционно	A, K
07.11.2021	Grand Prix of Siberia	11:00	Дистанционно	3, 14
14.11.2021	Grand Prix of EDG	11.00	Дистанционно	A, I, M, N
21.11.2021	RuCode 4.0	11:00	Дистанционно	A, C, L
28.11.2021	Stage 7-B: Grand Prix of Southeastern Europe, Div 2	11:00	Дистанционно	O, P
05.12.2021	Stage 8-B: Grand Prix of Poland, Div 2	11:00	Дистанционно	H, N, R
12.12.2021	Stage 9-B: Grand Prix of Nanjing, Div 2	11:00	Дистанционно	A, N, O, P, Q
19.12.2021	Moscow Regional Contest 2021	11:00	Дистанционно	A, F, N

Явка на контесты

Дата	Название	Присутствующие
12.09.2021	Grand Prix of Dolgoprudny	Кузьмичев, Орозбакиев, Синявский
19.09.2021	Grand Prix of IMO	Кузьмичев, Орозбакиев, Синявский
26.09.2021	Grand Prix of XiAn	Кузьмичев, Орозбакиев, Синявский
10.10.2021	XXII Открытая Всесибирская олимпиада	Кузьмичев, Орозбакиев, Синявский
24.10.2021	Grand Prix of Korea	Кузьмичев, Орозбакиев, Синявский
07.11.2021	Grand Prix of Siberia	Кузьмичев, Орозбакиев, Синявский
14.11.2021	Grand Prix of EDG	Кузьмичев, Орозбакиев, Синявский
21.11.2021	RuCode 4.0	Кузьмичев, Орозбакиев, Синявский
28.11.2021	Stage 7-B: Grand Prix of Southeastern Europe, Div 2	Кузьмичев, Орозбакиев, Синявский
05.12.2021	Stage 8-B: Grand Prix of Poland, Div 2	Кузьмичев, Орозбакиев, Синявский
12.12.2021	Stage 9-B: Grand Prix of Nanjing, Div 2	Кузьмичев, Орозбакиев, Синявский
19.12.2021	Moscow Regional Contest 2021	Кузьмичев, Орозбакиев, Синявский

Решения задач

Grand Prix of Dolgoprudny 12.09.2021

17.	MAI #9 Efimov, Kholodyakov, Sakharin :	-	-4 4:57	-	-	-	-	-
18.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	-	-	-	-	-	-	-
19.	MAI #44 Artamonov, Polyakov, Sinitsyn :	-	-	-	-	-	-	-

Решение 1

```
N, M = (int(i) for i in input().split())
if M >= N:
  print(0)
else:
  print(N - M)
```

Решение 2

```
m, i = (int(i) for i in input().split())
p, t = (int(i) for i in input().split())
w = int(input())

path_len = abs(m-p) + abs(i-t)

if path_len > w or (path_len%2 != w%2):
  print('N')
else:
  print('Y')
```

Grand Prix of IMO 19.09.2021

38.	lith49	-	-1 2:57	-	-	-	-	-	-	-18 4:59	-7 4:58	+ 3:48	+3 2:15	-	2	424	60%	27.02	0.47
39.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	-	-	-	-	-	-	-	-	-4 1:17	+1 3:14	-	+ 3:44	-	2	439	33%	26.78	0.47

Решение N

```
S = input()
T = input()
length = len(S)

success = False
flags = [1, 0]
for st_flag in flags:
  flag = st_flag
```

```
  i = 0
  j = 0
  match_it = 0
  while i <= length-1 and j <= length-1:
    if flag:
      if S[i] == S[match_it]:
        match_it += 1
        flag = 0
      i += 1
    else:
      if T[j] == S[match_it]:
        match_it += 1
        flag = 1
      j += 1
    if match_it == length:
      success = True
      break
  if success == True:
    break
print("Yes" if success else "No")
```

Решение P

```
N = int(input())
s = input()
res = 0
for i in range(N):
  print(i)
  s_cpy = list(s)
  count = 0
  memory = ''
  j = i
  while True:
    if (j == 0 or j == N-1) and s_cpy[j] == '_':
      res = max(res, count)
      break
    if (j == 0 and s_cpy == '<') or (j == N-1 and s_cpy == '>'):
      count += 1
      res = max(res, count)
      break
    if s_cpy[j] == '>':
      s_cpy[j] = '_'
      count += 1
      j += 1
      memory = '>'
    elif s_cpy[j] == '<':
      s_cpy[j] = '_'
      count += 1
      j -= 1
      memory = '<'
```

```
    elif s_cpy[j] == '_':
      j = j+1 if memory == '>' else j-1
print(res)
```

Grand Prix of XiAn 26.09.2021

47.	MAI #33 Amursky, Lyugge, Chesnov :	-	-	-	-	-	-	+ 0:40	-	+ 3:11	-8 2:55	-2 1:27	2	231	0%	26.82	0.16
48.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	-	-	-	-	-	-	+1 1:22	-	+1 2:07	-1 4:55	-	2	250	50%	26.59	0.16
49.	MAI #25 Vasiliev, Ilyin, Marochkin	-	-	-	-	-	-	+ 1:29	-	+ 2:41	-	-	2	250	0%	26.37	0.16

Grand Prix of Korea 24.10.2021

36.	MAI #19 Marinin, Sin, Sharudin	0:38	-	-	-	-	-	-	-	-	-	1:59	2	177	33%	31.58	0.12
37.	MAI #23 Kudinov, Leychenko, Markov :	+ 0:15	-	-	-	-	-	-	-7 4:32	-	+ 2:42	2	178	0%	31.25	0.12
38.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	+ 0:38	-	-	-	-3 4:59	-	-	-7 2:34	-	+ 3:13	2	232	0%	30.93	0.12

Решение A

```
m = int(input())
a = [int(i) for i in input().split()]
i = 0
while i <= m-1:
  print(a[i], end='')
  i += a[i]
  if i <= m-1:
    print(' ', end='')
```

Grand Prix of Siberia 07.11.2021

42.	MAI #29 Leukhin, Sikorsky, Yadrov :	-	-	+ 0:44	-	-	-	-	-	-	-2 1:01	+ 0:18	2	63	0%	39.06	0.06
43.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	-	-	+ 1:09	-	-	-	-	-	-	-5 4:57	+ 1:00	2	129	0%	38.67	0.06
44.	MAI #19 Marinin, Sin, Sharudin	-	-	+ 0:34	-	-	-	-	-	-	-2 2:25	+2 1:09	2	143	50%	38.28	0.06

Решение 3

```
B = int(input())
for i in range(B):
  S,n,f,m = (int(i) for i in input().split())
  if (S >= n + m) and (S <= n*f + m):
    print('YES')
  else:
    print('NO')
```

Решение 14

```
N, S = (int(i) for i in input().split())
pairs = []
used = set()
max_a = 0
for i in range(N):
  a, b = (int(i) for i in input().split())
  pairs.append((a, b))

pairs.sort(key=lambda x: x[1])
for pair in pairs:
  if pair[1] > S:
    break
  elif pair[0] in used:
    continue
  else:
    S -= pair[1]
    used.add(pair[0])
print(len(used))
```

Grand Prix of EDG 14.11.2021

27.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	+ 0:17	-	-	-	-	-	+ 2:05	-	-	+2 1:41	+1 0:57	-6 4:56	4	362	42%	59.26	0.10
28.	MAI #36 Kireev, Nedosekov, Sharakovsky	+1 1:00	-8 2:54	-	-	-	-	+1 1:52	-	-	+1 0:28	+1 1:21	-8 3:07	4	363	50%	58.51	0.10
		+						+			+1	+1						

Решение B

```
T = int(input())
for i in range(T):
  x = int(input())
  print(2*x-1)
```

Решение D

```
T = int(input())

for case in range(T):
  n = int(input())
  soldiers = input()
  count = 0
  sum = 0
  for i in range(n-1, -1, -1):
    if soldiers[i] == '0':
      count += 1
    else:
      if count > 0:
        sum += i+1
        count -= 1
      else:
        count += 1
  print(sum)
```

Решение F

```
N = int(input())
D = [int(i) for i in input().split()]
D.sort(reverse=True)
#print(D)
if N == 1:
  print(1)
else:
  res = 1
  tmp = 1
  for i in range(1,N):
    if D[i-1] == D[i]:
      tmp += 1
    else:
      res = max(res, tmp)
      tmp = 1
  print(res)
```

Решение L

```
def gcd (a, b):
  if (b==0):
    return a
  else:
    return gcd(b, a%b)

n = int(input())
nums = []
b = []
for i in range(n):
  a, b_ = (int(i) for i in input().split())
  nums.append(a)
  b.append(b_)

gcd_nums = nums[0]
if n > 0:
  for i in range(1, n):
    gcd_nums = gcd(gcd_nums, nums[i])

gcd_b = b[0]
if n > 0:
  for i in range(1, n):
    gcd_b = gcd(gcd_b, b[i])

prod = 1
for num in nums:
  prod = prod * num

print(int(prod / gcd_nums), gcd_b)
```

RuCode 4.0 21.11.2021

Решение A

```
a = int(input())
b = int(input())
c = int(input())
print(a + b + c)
```

Решение C

```
n = int(input())
k = int(input())
donuts = [False for i in range(n)]
count = 0
for i in range(k):
  dnt = int(input()) - 1
  if not donuts[dnt]:
    count += 1
    donuts[dnt] = True
print(count)
print(count + (n-k))
```

Решение L

```
import sys

x = 0
y = ''
seen_edge = False
revealed_figure = ''
count = 0
moved_left = False
moved_down = False

while True:
  if count == 8:
    x += 1
    break
  info = input()
  if info == 'black' or info == 'white' or info == 'pawn':
    x += 1
    count += 1
    moved_down = False
    print("? D")
    sys.stdout.flush()
  else:
    if revealed_figure == info and moved_down:
      break
    elif revealed_figure == '':
      revealed_figure = info
```

```
      count += 1
      x += 1
      print("? L")
      sys.stdout.flush()
      moved_left = True
    elif moved_left:
      moved_left = False
      if info == revealed_figure:
        y = 'a'
      elif revealed_figure == 'king':
        y = 'd'
      elif revealed_figure == 'queen':
        y = 'e'
      elif info == 'rook':
        y = 'b'
      elif info == 'knight':
        y = 'h' if revealed_figure == 'rook' else 'c'
      elif info == 'bishop':
        y = 'g'
      elif info == 'queen':
        y = 'f'
      revealed_figure = info
      count += 1
      print("? D")
      sys.stdout.flush()
      moved_down = True
print(f'! {y}{x-1}')
```

Stage 7-B: Grand Prix of Southeastern Europe 28.11.2021

25.	MAI #14 Mazin, Mikhailova, Naumov :	-	-	-	-	-3 4:38	-	-	-	-	-	-	-	+2 2:14	+ 0:45	2	220	50%	55.06	0.11
26.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	-	-	-	-	-	-	-	-	-	-	-	-	+ 1:15	+ 2:28	2	223	0%	54.36	0.11
27.	MAI #32 Pishhik, Uvarov, Kharkov	-3 4:39	-	-	-	-3 3:33	-	-	-	-	-	-	-	+ 0:41	+2 2:32	2	233	50%	53.67	0.11

Решение O

```
n = int(input())
s = input()
t = input()

res = 0
count = 1
for i in range(n):
  if s[i] == t[i]:
   count += 1
  else:
    if s[i] < t[i]:
      res += count * (n-i)
```

```
    count = 1
print(res)
```

Решение P

```
N = int(input())
a = [int(i) for i in input().split()]
b = [int(i) for i in input().split()]
res = 0
for i in range(N-1, -1, -1):
  if b[i+1] > a[i+1]:
    tmp = (b[i+1] - a[i+1] + 1) // 2
    b[i] += tmp
    res += tmp
if b[0] > a[0]:
  print(-1)
else:
  print(res)
```

Stage 8-B: Grand Prix of Poland, Div 2 05.12.2021

42.	Moscow IPT AaAaAaAAaAaAAa	-	-	-	-1 0:56	-	-	-	-	-8 1:31	+1 1:14	+5 0:21	-2 1:15	+ 0:04	3	220	66%	35.15	0.22
43.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	-	-	-	+ 0:37	-	-	-	-	+4 1:22	-	-7 2:54	-	+ 0:27	3	228	57%	34.80	0.13
44.	MAI #21 Vakhramyan, Kosogorov, Simonov :	-	-	-	+	-	-	-	-	+3	-	-3	-	+1	3	249	57%	34.46	0.13

Решение H

```
T = int(input())
for i in range(T):
  s = input()
  for c in s:
    print(chr((ord(c)+13-97)%26+97), end='')
  print()
```

Решение N

```
T = int(input())
for case in range(T):
  N = int(input())
  L = 1
  a = 0.3
  while L*(L+1) < 2*N:
    a = (float(N) - L*(L+1)/2)/(L+1)
    if int(a) == a:
      break
    L += 1
  if int(a) != a:
    print('IMPOSSIBLE')
  else:
```

```
    print(f'{N} = {int(a)}', end='')
    for i in range(1, L+1):
      print(f' + {int(a + i)}', end='')
    print()
```

Решение R

```
T = int(input())
for case in range(T):
  full = True
  nums = [0 for i in range(10)]
  s = input()
  for i in range(len(s)):
    nums[int(s[i])] += 1
  for i, num in enumerate(nums):
    if not num:
      print(i, end='')
      full = False
  if full:
    print('full', end='')
  print()
```

Stage 9-B: Grand Prix of Nanjing, Div 2 12.12.2021

		0:42		0:21							0:21	0:51	1:30	2:14					
22.	MAI #20 Kuzmichev, Orozbakiev, Sinyavsky	+ 1:40	-	-	-	-	-	-	-	-	+ 0:28	+ 2:50	+2 3:32	+ 2:30	5	702	28%	86.40	0.17
23.	MAI #48 Vankov, Nurmammedov, Cis :	+2 2:37	-	-	-	-	-	-	-	-	+ 1:34	+2 2:58	+ 2:54	+ 2:41	5	845	44%	85.14	0.17
		+5									+2	+1	+	+1					

Решение A

```
n, a, b = (int(i) for i in input().split())
print("D"*(n-1) if n/2 > b else "U"*(n-1), end='')
```

Решение O

```
N = int(input())

print((N // 26) + (N % 26 > 0) + 1, end = ' ')
print(chr((N-1) % 26 + ord('a')))
```

Решение Q

```
n = int(input())
d = []
for i in range(n):
  d.append(int(input()))

hm = {}
res = 0
s = 0
```

```

for i in range(n):
  s += d[i]
  if d[i] == 0 and res == 0:
    res = 1
  if s == 0:
    res = i + 1
  if s in hm:
    res = max(res, i - hm[s])
  else:
    hm[s] = i
print(res)
```

Moscow Regional Contest 2021 19.12.2021

#	Participant	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Score
		278/352	0/8	11/27	134/681	87/849	239/511	175/322	154/972	12/623	51/109	3/8	37/104	71/345	235/649	2/29	
203	Moscow AI: MAI #20 (Andrey Sinyavsky,Aleksander Kuzmichev,Emil Orozbakiev)	+ 00:14	—	—	—	—	+1 00:30	—	—	—	—	—	—	—	+2 02:16	—	3

Решение F

```
n = int(input())
if n < 4:
  print(-1)
else:
  print(5 + (n-4))
  print("1 2\n1 3\n2 3\n2 4\n3 4")
  if n > 4:
    tmp = 4
    for i in range(n-4):
      print(f'{tmp} {tmp+1}')
      tmp += 1
```

Решение N

```
a = int(input())
b = int(input())
c = int(input())
d = int(input())
e = int(input())
f = int(input())

d = float(d) / c * b
c = b
f = float(f) / e * d
e = d

if f != a or (a + c <= e) or (e + c <= a) or (a + e <= c):
  print(-1)
```

```
15 else:
16   print(1)
```