exgcd

人员

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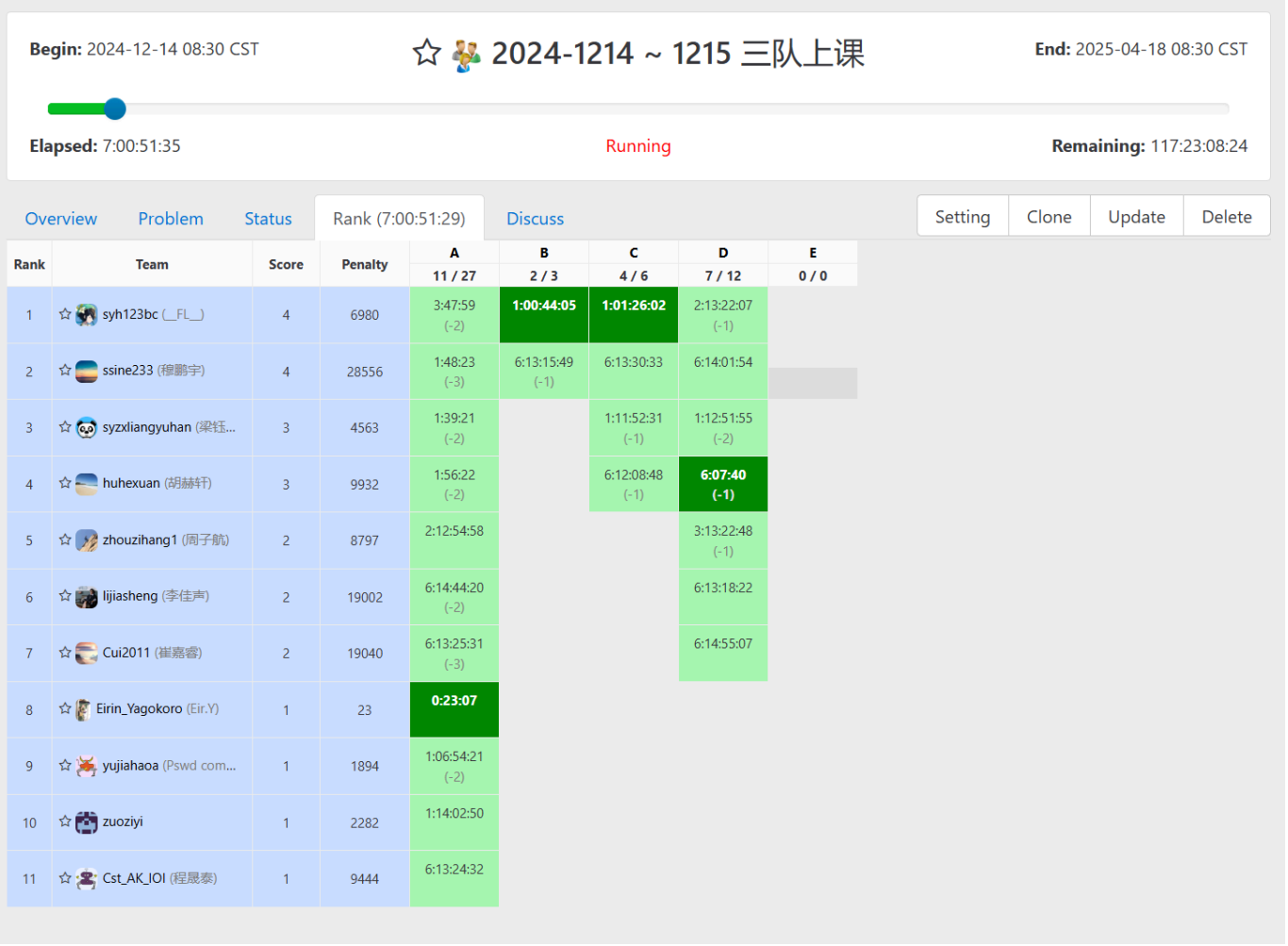
上周作业检查



Begin: 2024-12-14 08:30 CST

☆ 2024-1214 ~ 1215 三队上课

End: 2025-04-18 08:30 CST

Elapsed: 7:00:51:35 Running Remaining: 117:23:08:24

Overview Problem Status Rank (7:00:51:29) Discuss Setting Clone Update Delete

Rank	Team	Score	Penalty	A 11 / 27	B 2 / 3	C 4 / 6	D 7 / 12	E 0 / 0
1	☆ syh123bc (_FL_)	4	6980	3:47:59 (-2)	**1:00:44:05**	**1:01:26:02**	2:13:22:07 (-1)	
2	☆ ssine233 (穆鹏宇)	4	28556	1:48:23 (-3)	6:13:15:49 (-1)	6:13:30:33	6:14:01:54	
3	☆ syzxliangyuhan (梁钰...	3	4563	1:39:21 (-2)		1:11:52:31 (-1)	1:12:51:55 (-2)	
4	☆ huhexuan (胡赫轩)	3	9932	1:56:22 (-2)		6:12:08:48 (-1)	**6:07:40 (-1)**	
5	☆ zhouzihang1 (周子航)	2	8797	2:12:54:58			3:13:22:48 (-1)	
6	☆ lijiasheng (李佳声)	2	19002	6:14:44:20 (-2)			6:13:18:22	
7	☆ Cui2011 (崔嘉睿)	2	19040	6:13:25:31 (-3)			6:14:55:07	
8	☆ Eirin_Yagokoro (Eir.Y)	1	23	**0:23:07**				
9	☆ yujiahaoa (Pswd com...	1	1894	1:06:54:21 (-2)				
10	☆ zuoziyi	1	2282	1:14:02:50				
11	☆ Cst_AK_IOI (程晟泰)	1	9444	6:13:24:32				

作业

https://vjudge.net/contest/681136

课堂表现

今天的 2 道题目同学们整体掌握的都不是很熟, 尤其是第 2 题, 同学们课下要再好好复习一下, **一定要自己推导一下整个exgcd的过程。**

课堂内容

exgcd

$$ax+by=c$$

$$\uparrow x_0^*=\frac{c}{t},\ y_0^*=\frac{c}{t}$$

$$ax+by=t\ [t=gcd(a,b)]$$

$$bx'+(a\%b)y'=t'\ [t'=gcd(b,a\%b)]$$

$$ax+by=bx'+(a\%b)y'$$

$$\begin{cases} x=? \\ y=? \end{cases}$$

$$ax_0+by_0=1$$

$$a(x_0+1)+b\left(y_0-\frac{a}{b}\right)=1$$

$$a(x_0+k)+b\left(y_0-\frac{k\cdot a}{b}\right)=1$$

$k=b$

$$\begin{cases} x=x_0+kb \\ y=y_0-ka \end{cases}$$

1. $(x_0\%b+b)\%b$

2. $x_0+kb>0$

$$kb>-x_0$$

$$k>\frac{-x_0}{b}$$

$$k\geq\left\lceil\frac{-x_0+1}{b}\right\rceil$$

P1082 [NOIP2012 提高组] 同余方程

```
#include <bits/stdc++.h>

using namespace std;

typedef long long LL;
```

```
void exgcd(int a, int b, LL& x, LL& y) {
  if (!b) { x = 1, y = 0; return; }

  exgcd(b, a%b, x, y);
  LL _x = x, _y = y;
  x = _y, y = _x - (a/b)*_y;
}

LL get_up(LL a, int b) {
  if (a >= 0) return (a+b-1)/b;
  return a/b;
}

int main()
{
  int a, b; cin >> a >> b;
  LL x, y;
  exgcd(a, b, x, y);

  LL k = get_up(-x+1, b);
  cout << x + k*b << endl;
  return 0;
}
```

P5656 【模板】二元一次不定方程 (exgcd)

```
#include <bits/stdc++.h>

using namespace std;

typedef long long LL;

void exgcd(int a, int b, LL& x, LL& y) {
  if (!b) { x = 1, y = 0; return; }

  exgcd(b, a%b, x, y);
  LL _x = x, _y = y;
  x = _y, y = _x - (a/b)*_y;
}

LL get_up(LL a, int b) {
  if (a >= 0) return (a+b-1)/b;
  return a/b;
}

LL get_down(LL a, int b) {
  if (a >= 0) return a/b;
  return (a-b+1)/b;
}

int main()
```

```
{
  int T; cin >> T;
  while (T -- ) {
    int a, b, c; cin >> a >> b >> c;
    int t = __gcd(a, b);
    if (c%t) { cout << -1 << endl; continue; }

    LL x, y; exgcd(a, b, x, y);
    x *= c/t, y *= c/t;

    int q = a/t, p = b/t;
    LL down = get_up(-x+1, p), up = get_down(y-1, q);
    if (down > up) cout << x+down*p << " " << y-up*q << endl;
    else cout << up-down+1 << " " << x+down*p << " " << y-up*q << " " \
              << x+up*p << " " << y-down*q << endl;
  }
  return 0;
}
```