SC3231: Algorithm Design

Section: 541

Present

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This report is a part of SC3231 subject

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TIMUS JUDGE ONLINE 1052. RABBIT HUNT

TIME LIMIT: 1.0 SECOND
MEMORY LIMIT: 64 MB

DIFFICULTY: 223

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1052. RABBIT HUNT

- Time Limit: 2.0 second
- Memory Limit: 16 MB
- A good hunter kills two rabbits with one shot. Of course, it can be easily done since for any two points we can always draw a line containing the both. But killing three or more rabbits in one shot is much more difficult task. To be the best hunter in the world one should be able to kill the maximal possible number of rabbits.
- Assume that rabbit is a point on the plane with integer x and y coordinates. Having a set of rabbits you are to find the largest number of rabbits that can be killed with single shot, i.e. maximum number of points lying exactly on the same line. No two rabbits sit at one point.
- http://acm.timus.ru/problem.aspx?space=1&num=1052

1052. RABBIT HUNT

- Input
- An input contains an integer N ($2 \le N \le 200$) specifying the number of rabbits. Each of the next Nlines in the input contains the x coordinate and the y coordinate (in this order) separated by a space ($-1000 \le x, y \le 1000$).
- Output
- The output contains the maximal number of rabbits situated in one line.

input	output
6 7 122 8 139 9 156 10 173 11 190 -100 1	5

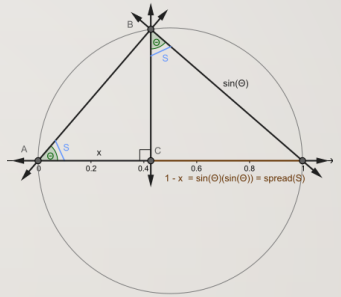
1052. RABBIT HUNT

The point is that how we can know 3 and more points in one line?

There are so many ways:

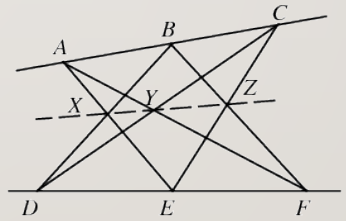
1. Rational trigonometry

$$\sin\angle BAD/AC + \sin\angle CAD/AB = \sin\angle BAC/AD$$



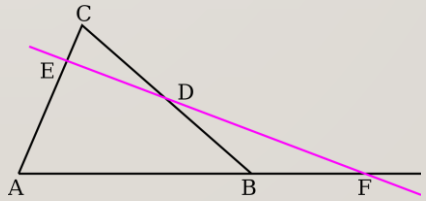
2. Pappus's Hexagon Theorem

http://mathworld.wolfram.com/PappussHexagonTheorem.html



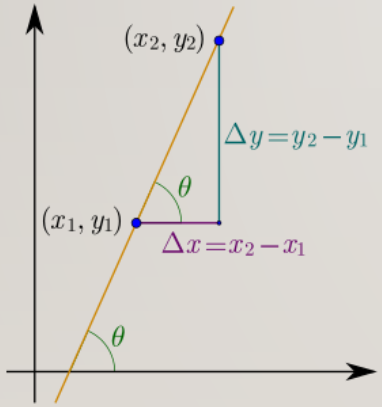
3. Menelaus' theorem

$$\frac{AF}{FB} \times \frac{BD}{DC} \times \frac{CE}{EA} = 1$$

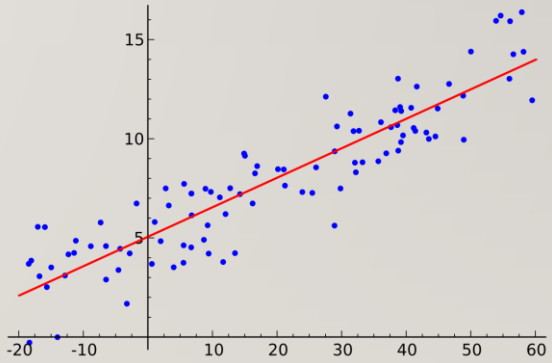


1052. RABBIT HUNT

- However, all of above methods are too complexed
- We just use the most naïve and brute force – calculate slopes (O(n^3)).
- An input contains an integer N (3 ≤ N ≤ 200) specifying the number of rabbits.

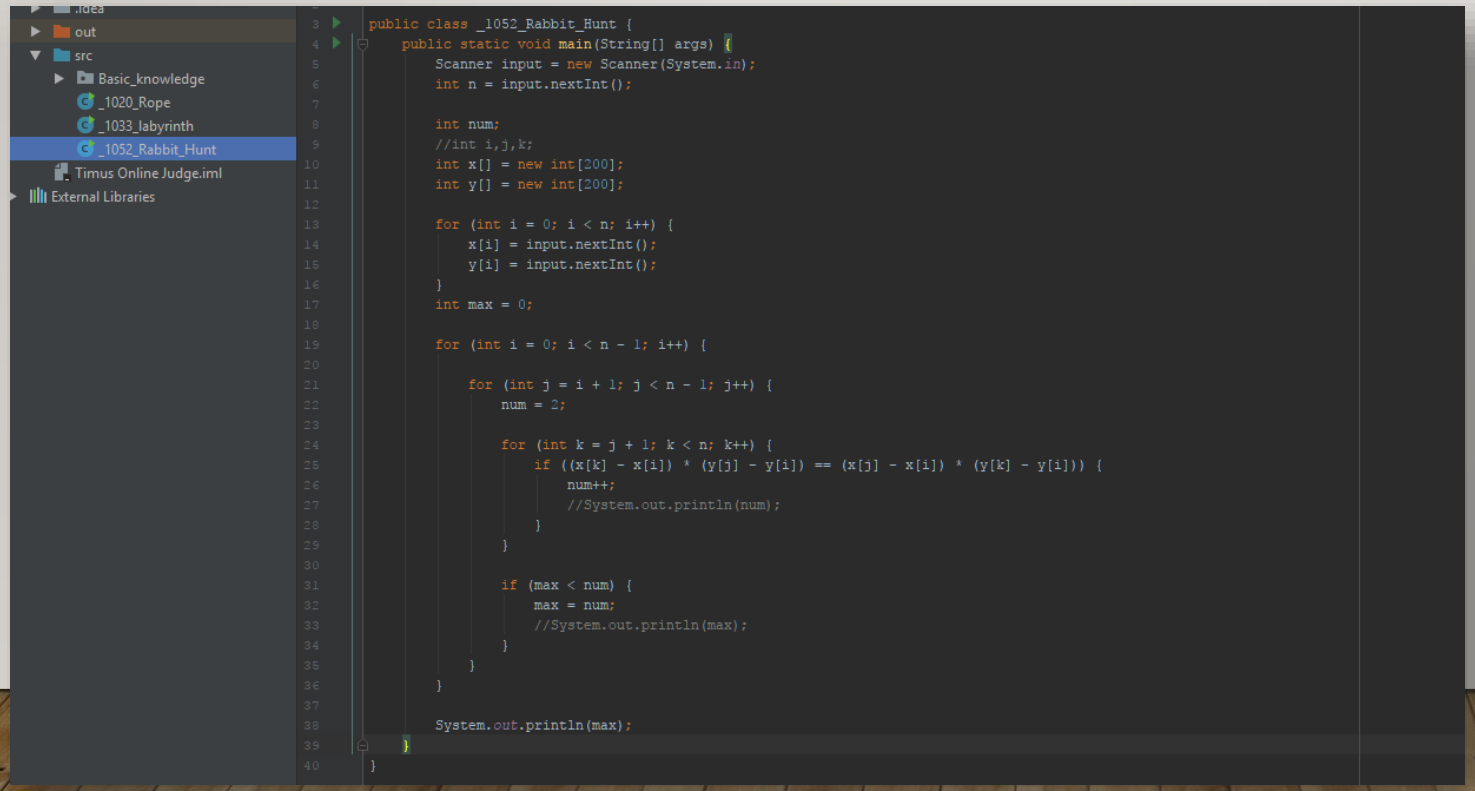


(x3 - x1) (y2 - y1) = (y3 - y1) (x2 - x1)



1052. RABBIT HUNT

- https://github.com/jeromepan/Timus-Online-Judge-Solution/blob/master/_1052_Rabbit_Hunt.java



Result

```
<terminated> RabbitHunt [Java Application] C:\Program Files\Java\jre1.8.0_144\bin\javaw.exe
6
7 122
8 139
9 156
10 173
11 190
-100 1
5
```

1052. RABBIT HUNT

7629229	22:44:15 18 Nov 2017	jerrypan	1052. Rabbit Hunt	Java 1.8	Accepted		0.14	2 584 KB
7629227	22:43:45 18 Nov 2017	jerrypan	1052. Rabbit Hunt	Java 1.8	Wrong answer	1	0.078	2 076 KB
7629215	22:29:06 18 Nov 2017	jerrypan	1052. Rabbit Hunt	Java 1.8	Wrong answer	2	0.109	2 020 KB
7629214	22:28:22 18 Nov 2017	jerrypan	1052. Rabbit Hunt	Java 1.8	Wrong answer	1	0.062	2 136 KB
7629200	22:15:41 18 Nov 2017	jerrypan	1052. Rabbit Hunt	Java 1.8	Wrong answer	2	0.062	2 040 KB
7629185	22:00:36 18 Nov 2017	jerrypan	1052. Rabbit Hunt	Java 1.8	Runtime error	1	0.078	2 184 KB