

Forum: [Hack Forums](#)

Thread: [A nice algorithmic problem for you to solve](#)

AstroJack - February 24, 2015, 11:57 am

*not really related to Java, but I did the code to solve it with Java, so..

I've Done it optimally with $O(n)$
Will add more if you'd like.

The problem:

Say you have a row of coins (let's say the range is between 10-100,000, and the amount of coins is an even number)

and each coin has a number on it. (Think of the row as a double-ended queue)

Each player, in his turn, takes a coin from one of the ends of the row, and keeps it to himself. The game ends when there's no coins left.

The winner is the person who has the biggest sum of coins' values.

Player number 1 plays first.

Think of an algorithm/Write a code that will give a strategy for player number 1 to ALWAYS make him the winner, or make the game end with a tie.

It's pretty easy, I'm sure you'll figure it out quickly.
GL!

Trisomy 21 - February 24, 2015, 2:51 pm

I don't understand how this is possible if coins have random values, and you didn't specify the possible number values of the coins.

DevinFSP - February 24, 2015, 3:32 pm

If player one is the first person to pick and it's a two-person game, then he will pick the coins 1, 3, 5, 7, 9, 11, etc. From the vague information you gave, just have the odd coins valued at 2 and the even coins valued at 1. That way, player one will always have more points than player two.

Although I'm pretty that's not what you meant, that's what it appears to other people. So either I'm right or you need to clear up your problem/challenge.

D?rkStorm - February 24, 2015, 4:28 pm

You can use a recursive solution with memoization:

```
Code int[][] memo = ...  
int[] values = ...
```

```
int choose(int l, int r) {  
    if(l > r) return 0;  
    if(memo[l][r] != -1) return memo[l][r];  
  
    int takeBothLeft = choose(l + 2, r);  
    int takeLeftRight = choose(l + 1, r - 1);  
    int takeBothRight = choose(l, r - 2);  
    int startVal = values[l] + Math.min(takeBothLeft, takeLeftRight);
```

```

int endVal = values[r] + Math.min(takeLeftRight, takeBothRight);
int best = Math.max(startVal, endVal);

return memo[l][r] = best;
}

```

This assumes both take optimally. For an odd number of moves a win/tie is not guaranteed.

I like the cases:

Code 1 1 5 1 and

Code 1 5 1 1

Leostraza - February 24, 2015, 5:15 pm

I think I got it..

```

Code int scoreP1, scoreP2, numCoins;
for (int i = 0; i < numCoins; i++) {
    if (i % 2 == 0) {
        scoreP1 += i;
    } else {
        scoreP2 += i;
    }
}

```

As you can see, P1 will always have the higher score.

100 + 98 + 96...

P2: 99 + 97 + 95...

AstroJack - February 24, 2015, 9:18 pm

(Feb 24, 2015 03:51 PM)Trisomy 21 Wrote: [\[CITE\]](#) I don't understand how this is possible if coins have random values, and you didn't specify the possible number values of the coins.

Let's say positive integer between 1-100, although it doesn't really matter.

The point is to think about efficiency and do it as fast as possible, even for 100,000 coins.

(Feb 24, 2015 04:32 PM)DevinFSP Wrote: [\[CITE\]](#) If player one is the first person to pick and it's a two-person game, then he will pick the coins 1, 3, 5, 7, 9, 11, etc. From the vague information you gave, just have the odd coins valued at 2 and the even coins valued at 1. That way, player one will always have more points than player two.

Although I'm pretty that's not what you meant, that's what it appears to other people. So either I'm right or you need to clear up your problem/challenge.

The values of the coins are random.

(Feb 24, 2015 05:28 PM)D?rkStorm Wrote: [\[CITE\]](#) You can use a recursive solution with memoization:

Code int[][] memo = ...

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return memo[l][r] = best;
}

```

This assumes both take optimally. For an odd number of moves a win/tie is not guaranteed.

I like the cases:
Code 1 1 5 1 and
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You COULD use recursion, although this will be so slow for numbers above N coins, so it's not optimal, and definitely not O(n), like I did.

(Feb 24, 2015 06:15 PM)Leostraza Wrote: [\[CITE\]](#) I think I got it..

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}

```

As you can see, P1 will always have the higher score.
100 + 98 + 96...

P2: 99 + 97 + 95...

I'm not sure what you did there.. but the coins don't have a value by their position, their values are random.

*If the problem isn't too well-written I'm sorry, I'll re-write it soon.

caudex - February 25, 2015, 3:40 am

Still cant get the point. You say there is a row of coins with random to-the-players-unknown values. If so, how can there be a strategy to win?

As I understood this:

- A random row starting anywhere and ending anywhere
- The row got an even coin-count (lets say 4 to make it easy understanding MY problem with this)
- Each player picks a coin from one of the ends

From that point lets take two examples:

- 1| 4 - 6 - 5 - 3 (a range from 3-6)
- 2| 12 - 11 - 10 - 13 (10-13)

As the players dont know the values, instead of this only the range, they cant choose effectivly where to pick the next coin. So for the first game it would look like X - X - X - X to the players. How should they get any difference into that to build up a strategy?

AstroJack - February 25, 2015, 7:03 am

(Feb 25, 2015 04:40 AM)caudex Wrote: [\[CITE\]](#) Still cant get the point. You say there is a row of coins with random to-the-players-unknown values. If so, how can there be a strategy to win?

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The players DO know the values, that's the whole point.

I don't think I mentioned they don't know the values.

??????M1kep?????? - February 25, 2015, 10:46 am

(Feb 25, 2015 08:03 AM)AstroJack Wrote: [\[CITE\]](#) The players DO know the values, that's the whole point.

I don't think I mentioned they don't know the values.

Please rewrite the first post, makes no sense to anybody

Doug Dimmadome - February 25, 2015, 12:04 pm

(Feb 25, 2015 08:03 AM)AstroJack Wrote: [\[CITE\]](#) The players DO know the values, that's the whole point.

I don't think I mentioned they don't know the values.

You really need to specify that the players can see the values after they are randomized. I nor my team understood this post.

Kind Regards,
Massive

AstroJack - February 25, 2015, 12:04 pm

(Feb 25, 2015 11:46 AM)??????M1kep?????? Wrote: [\[CITE\]](#) Please rewrite the first post, makes no sense to anybody

Can't edit the post, 1440 mins has passed.

But I don't really understand what isn't clear.

I think the rules&who wins are said just fine, and I 'added' that players know each value of each coin.. That's about it.

??????M1kep?????? - February 25, 2015, 1:12 pm

(Feb 25, 2015 01:04 PM)AstroJack Wrote: [\[CITE\]](#) Can't edit the post, 1440 mins has passed.

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Ok.... Then wouldn't the best approach be to pick from the end the had the higher value?

SunnyAkuma - February 25, 2015, 1:17 pm

We can just take an array with size even, Sort it in ascending order , then Player1 start picking coins from the End and Player2 starts picking from the beginning one by one.

IF that's what you meant by "Each player, in his turn, takes a coin from one of the ends of the row". well here , Player 1 will win even if player2 decides to pick coins from the end.

Since player1 starts first , and picks the last coin which is the largest cause we sorted the array,
Then Player2 decides from whichever end he wants to pick up the coin,

Basically , player1 will always pick from the end , and even if player 2 does the same , Player1 will still win cause he started first and the largest number came to his pocket.

If all numbers are same in the array , then it'll always be a draw because the length of the array is even. Both players will end up with exactly same number of coins with same value.

AstroJack - February 25, 2015, 1:19 pm

(Feb 25, 2015 01:04 PM)Massive Wrote: [\[CITE\]](#) You really need to specify that the players can see the values after they are randomized. I nor my team understood this post.

Kind Regards,
Massive

I kinda thought it was obvious, because obviously you can't think of a strategy without knowing the next possible moves.

Anyways, the 2 players can see the whole row of the coins, and their attached values. Hope this clears it up.

(Feb 25, 2015 02:12 PM)??????M1kep?????? Wrote: [\[CITE\]](#) Ok.... Then wouldn't the best approach be to pick from the end the had the higher value?

No, because what if the next coin after the one you took has a value which's 1000 times bigger than what you've picked? Probably gonna lose!

(Feb 25, 2015 02:17 PM)SunnyAkuma Wrote: [\[CITE\]](#) We can just take an array with size even, Sort it in ascending order , then Player1 start picking coins from the End and Player2 starts picking from the beginning one by one.

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If all numbers are same in the array , then it'll always be a draw because the length of the array is even. Both players will end up with exactly same number of coins with same value.

You can't rearrange the coins. You can only pick one from each side every turn, and you cannot change the deck. That's the whole point.

And even if it was allowed - ordering the deck in an ascending/descending order is a minimum time complexity of $O(n \log n)$, while the optimal solution has a complexity of $O(n)$, so it's still not qualified as an optimal solution.

Edit :

A picture to emphasize what the players see, and visual aspects might help you find the solution. I know it helped me :

Still no solution for this problem. :)

D?rkStorm - February 25, 2015, 1:23 pm

The problem asks: given an array of coins that are not sorted and have some random value that is potentially not unique and two players who take turns choosing from either end of the array (and thus removing the coin they choose) what strategy ensures that player 1 always either ties or wins. It's really a fairly simple question.

AstroJack - February 25, 2015, 1:29 pm

(Feb 25, 2015 02:23 PM)D?rkStorm Wrote: [\[CITE\]](#) The problem asks: given an array of coins that are not sorted and have some random value that is potentially not unique and two players who take turns choosing from either end of the array (and thus removing the coin they choose) what strategy ensures that player 1 always either ties or wins. It's really a fairly simple question.

A double-ended queue is a better name for this data structure, but you got the point. :)

Anyways, it is pretty simple when you understand what player 1 can do that player 2 can't. I guess it's just I didn't explain the problem like I should've, I guess.

Trisomy 21 - February 25, 2015, 2:21 pm

(Feb 25, 2015 02:23 PM)D?rkStorm Wrote: [\[CITE\]](#) The problem asks: given an array of coins that are not sorted and have some random value that is potentially not unique and two players who take turns choosing from either end of the array (and thus removing the coin they choose) what strategy ensures that player 1 always either ties or wins. It's really a fairly simple question.

No it doesn't, it reads: Say you have a row of coins (let's say the range is between 10-100,000, and the amount of coins is an even number)

and each coin has a number on it. (Think of the row as a double-ended queue)

Each player, in his turn, takes a coin from one of the ends of the row, and keeps it to himself. The game ends when there's no coins left.

The winner is the person who has the biggest sum of coins' values.

Im just saying you can't really blame anybody for not interpreting op's nonsense instructions as he intended them to be.

AstroJack - February 25, 2015, 2:51 pm

(Feb 25, 2015 03:21 PM)Trisomy 21 Wrote: [\[CITE\]](#) No it doesn't, it reads: Say you have a row of coins (let's say the range is between 10-100,000, and the amount of coins is an even number)

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Trisomy 21 - February 25, 2015, 3:00 pm

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I'd love to know what to fix. But everyone just seems to rubble babble about it, without telling me what else to do, except for mentioning that they know the coins' values.

Well first your instructions say each coin has a number on it, then later it says you add up all of your coins' values. You expected people to infer that number meant value, but that wasn't the issue it just made your instructions harder to read.

You didn't specify whether or not we knew the coins values, and assuming we do know, you didn't tell us if we know all of the coins values in the row, or just know the two coins on each end of the row.

You didn't specify a range of possible values for the coins. A game where the value of each coin was a random number between 1 and 2 (both inclusive) could have a different strategy than a game where the value was a random number between 1 and 100,000.

It might sound obvious to you because I am explaining it so clearly, but I only fully realized what you left out after another member explained what you were trying to do. We can't know what you didn't tell us.

AstroJack - February 25, 2015, 3:04 pm

(Feb 25, 2015 04:00 PM)Trisomy 21 Wrote: [\[CITE\]](#) Well first your instructions say each coin has a number on it, then later it says you add up all of your coins' values. You expected people to infer that number meant value, but that wasn't the issue it just made your instructions harder to read.

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It might sound obvious to you because I am explaining it so clearly, but I only fully realized what you left out after another member explained what you were trying to do. We can't know what you didn't tell us.

Well, the range really doesn't matter for the solution. Unless it's 1-1 which will obviously be a tie. The reason I didn't include range is because it doesn't really matter.

And yes, I might have forgotten to state some things which are neccessary, but I did state them later on, you can check on the picture I added.

SunnyAkuma - February 25, 2015, 8:38 pm

well ,If a DE Linked list is filled with random values and both players can only pick up coins from the ends(and not from the middle),

The only strategy I can think of is,

Player 1 always compares the values of both ends and picks up the bigger one.

But this is not enough to ensure victory every time or make it a draw , what if the value at both ends are like [7,99,3,6] , Here , player 1 will pick 7 cause it's bigger than 6 , but then the row would look like [99,3,6] and in Player2's turn , of course he'll pick 99.This situation can occur multiple times in a larger row hence making Player2's sum larger.

I can't think of anything else.Are there supposed to be anymore rules ??

6577657534735 - February 25, 2015, 9:16 pm

Wish I didn't google the answer, really ruined it for me.

Spoiler ([Click to View](#)) This can be done in $O(n)$ very easily and you only have to look at one coin once, and you can look at every coin in the beginning to determine your simple strategy ahead of time. Way easier than you'll expect.

??????M1kep?????? - February 25, 2015, 9:23 pm

(Feb 25, 2015 10:16 PM)Abraluna Wrote: ([CITE](#)) Wish I didn't google the answer, really ruined it for me. Hint ([Click to View](#)) This can be done in $O(n)$ very easily and you only have to look at one coin once, and you can look at every coin in the beginning to determine your simple strategy ahead of time. Way easier than you'll expect.

Can you spoiler the "hint" please? Just feel like it's kind of making it easier

AstroJack - February 25, 2015, 9:24 pm

(Feb 25, 2015 10:16 PM)Abraluna Wrote: ([CITE](#)) Wish I didn't google the answer, really ruined it for me. This can be done in $O(n)$ very easily and you only have to look at one coin once, and you can look at every coin in the beginning to determine your simple strategy ahead of time. Way easier than you'll expect.

Yup! A pretty easy solution.

I'm surprised no one thought of it yet.

SunnyAkuma - the are no specific rules.

??????M1kep?????? - February 25, 2015, 9:35 pm

(Feb 25, 2015 09:38 PM)SunnyAkuma Wrote: ([CITE](#)) well ,If a DE Linked list is filled with random values and both players can only pick up coins from the ends(and not from the middle),

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I can't think of anything else.Are there supposed to be anymore rules ??My thoughts/possible help ([Click to View](#))

I think you have to analyze the value of the second coin in from each row and determine what would give player two the least points.

Ex.

[1,6,58,23,45,12,66,95,21,4,8,5,7,2,65,35,32,45]

The first player should take the right side first because that give him 45 and player two logically would take the 32

Which would leave

[1,6,58,23,45,12,66,95,21,4,8,5,7,2,65,35]

The player one looks at the coins and should choose the left most coin because that'd give player two either 6, or 35 points. But if player two takes the thirty five that means that player one would get the 65.

Leaving the set as:

[6,58,23,45,12,66,95,21,4,8,5,7,2]

I'm not sure what player two's assumed playing style is

AstroJack - February 26, 2015, 5:26 am

(Feb 25, 2015 10:35 PM)??????M1kep?????? Wrote: [\[CITE\]](#) My thoughts/possible help [\(Click to View\)](#)

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Leaving the set as:

[6,58,23,45,12,66,95,21,4,8,5,7,2]

I'm not sure what player two's assumed playing style is

Player 2's playstyle doesn't matter as long as Player 1 does his strategy.

??????M1kep?????? - February 26, 2015, 9:57 pm

Hmmm ldk, I know nothing about algorithms, but I'll give this a try later tonight

AstroJack - February 27, 2015, 4:03 am

(Feb 26, 2015 10:57 PM)??????M1kep?????? Wrote: [\[CITE\]](#) Hmmm ldk, I know nothing about algorithms, but I'll give this a try later tonight

Waiting for it! :)

Will give out a hint if some people want to try it with a lil 'easier' start.

??????M1kep?????? - February 27, 2015, 12:10 pm

(Feb 27, 2015 05:03 AM)AstroJack Wrote: [\[CITE\]](#) Waiting for it! :)

Will give out a hint if some people want to try it with a lil 'easier' start.

Was pretty busy last night, almost home now, have a couple threads I said I'd look at, then I'll start :p

AstroJack - March 4, 2015, 5:10 am

BUMP

Still no answer for this problem.

Will give a strategic hint if necessary!

lockhead - March 4, 2015, 8:13 am

I think I've got it:

Basically all the coins lie on an even or uneven spot (1st = uneven, 2nd = even, 3rd = uneven,...).

Before player one takes a coin he sums up all the coin-values of the even and uneven coins. He

then takes those which have an higher overall value. I hope that is understandable :P

AstroJack - March 5, 2015, 8:04 am

(Mar 4, 2015 09:13 AM)lockhead Wrote: [\[CITE\]](#) I think I've got it:

Basically all the coins lie on an even or uneven spot (1st = uneven, 2nd = even, 3rd = uneven,...). Before player one takes a coin he sums up all the coin-values of the even and uneven coins. He then takes those which have an higher overall value. I hope that is understandable :P
Not only understandable, but also correct! :)

The advantage that player 1 has is that he can choose whether he wants to take the even spotted coins or the uneven spotted coins (by taking the last or the first)

nOrr - March 5, 2015, 11:07 pm

What if both players pick a coin from the spots that contain highest sum, for example both players pick from the even spots?

lockhead - March 6, 2015, 3:50 am

(Mar 6, 2015 12:07 AM)nOrr Wrote: [\[CITE\]](#) What if both players pick a coin from the spots that contain highest sum, for example both players pick from the even spots?

Thats not possible. Imagine it like this: (e = even, u = uneven)

u - e - u - e

Lets assume that the even coins have a higher sum, so P1 takes the uneven coin. It then looks like this:

e - u - e

So P2 can only choose one of the two even coins :P

AstroJack - March 6, 2015, 5:53 am

(Mar 6, 2015 12:07 AM)nOrr Wrote: [\[CITE\]](#) What if both players pick a coin from the spots that contain highest sum, for example both players pick from the even spots?

Look at what lockhead said below you.

It's not possible, since the advantage that the 1st player has is that he can choose whether he wants the coins on the even spots or the uneven spots. Once you figure that out - the solution is simple!