

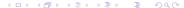
Assignment Project Exam Help Algorithms COMP3121/9101 https://powcoder.com

Aleks Ignjatović, ignjat@cse.unsw.edu.au

Cound thin Wheeler and the policy Code Ku

School of Computer Science and Engineering University of New South Wales Sydney

1. INTRODUCTION



What is this course about?

It is about designing algorithms for solving practical problems.

Assignment Project Exam Help

https://powcoder.com

What is this course about?

It is about **designing algorithms** for solving practical problems.

Ssignment Project Exam Help What is an algorithm?

An algorithm is a collection of precisely defined steps that are executable using certain/specified mechanical methods. $\frac{\text{NUDS.}}{\text{NUDS.}} / \frac{\text{DOWCOGET.COm}}{\text{DOWCOGET.COm}}$

What is this course about?

It is about **designing algorithms** for solving practical problems.

Assignment Project Exam He What is an algorithm?

An algorithm is a collection of precisely defined steps that are executable using certain/specified mechanical methods. $\frac{\text{NUDS:}}{\text{NUDS:}} / \frac{\text{DOWCOGET.COm}}{\text{DOWCOGET.COm}}$

By "mechanical" we mean the methods that do not involve any creativity, intuition or even intelligence. Thus, algorithms are specified by detailed asin related "repart powcoder

What is this course about?

It is about **designing algorithms** for solving practical problems.

Assignment Project Exam Help

An algorithm is a collection of precisely defined steps that are executable using certain/specified mechanical methods. $\frac{\text{NUDS:}}{\text{NUDS:}} / \frac{\text{DOWCOGEI.COm}}{\text{DOWCOGEI.COm}}$

By "mechanical" we mean the methods that do not involve any creativity, intuition or even intelligence. Thus, algorithms are specified by detailed asin related "repart powcoder

The word "algorithm" comes by corruption of the name of Muhammad ibn Musa al-Khwarizmi, a Persian scientist 780-850, who wrote an important book on algebra, "Al-kitab al-mukhtasar fi hisab al-qabr wal-muqabala". You are encouraged to read about him in Wikipedia.

Assignment Project Exam Help

In this course we will deal only with sequential deterministic algorithms which means that:

- they are the assumpthat only one step can be executed at a time;
- the action of each step gives the same result whenever this step is executed for the same input powcoder

Can you find every algorithm you might need using Google?

Assignment Project Exam Help

https://powcoder.com

Can you find every algorithm you might need using Google?

Assignment Project Exam Help

To learn techniques which can be used to solve new, unfamiliar problems that arise in a rapidly changing field.

**The company of the company

ntips://poweoder.com

Can you find every algorithm you might need using Google?

Assignment Project Exam Help

To learn techniques which can be used to solve new, unfamiliar problems that arise in a rapidly changing field.

https://powcoder.com

Course content:

Can you find every algorithm you might need using Google?

Assignment Project Exam Helr

To learn techniques which can be used to solve new, unfamiliar problems that arise in a rapidly changing field.

**The control of the control of

Course content:

- a survey of algorithm design techniques
- partial a for the party powing common partial and the party powing common party party powing common party party powing common party party powing common party part techniques

Can you find every algorithm you might need using Google?

Assignment Project Exam Hel

To learn techniques which can be used to solve new, unfamiliar problems that arise in a rapidly changing field.

**The control of the control of

Course content:

- a survey of algorithm design techniques
- partial a cori wise to party powing the gen techniques
- emphasis on development of your algorithm design skills

Textbook:

Algingical fracents of Project Exam Help paper back edition available at the UNSW book store

https://powcoder.com

Textbook:

Alguer and finden to Project Exam Help paperback edition available at the UNSW book store

excellent: very readable textbook (and very pleasant to read!);

https://powcoder.com

Textbook:

Kleiner and finder 1490 Physicant Exam Help paperback edition available at the UNSW book store

- excellent: very readable textbook (and very pleasant to read!);
- not https://powcoder.com

Textbook:

Alginground Findes n44go Physican Exam Help paper back edition available at the UNSW book store

- excellent: very readable textbook (and very pleasant to read!);
- not he good: as a /t-fference manual fell later use om

An alternative textbook:

Cormen, Leiserson, Rivest and Stein: Introduction to Algorithms preferable the third environ the fillal of which the bookstore

Textbook:

Alginground Findes n44go Physican Exam Help paper back edition available at the UNSW book store

- excellent: very readable textbook (and very pleasant to read!);
- not h took as a federence manual follater use om

An alternative textbook:

Cormen, Leiserson, Rivest and Stein: Introduction to Algorithms preferable holding the holding the light of the bookstore

• excellent: to be used later as a reference manual;

Textbook:

Alginground Findes n44go Physican Exam Help paper back edition available at the UNSW book store

- excellent: very readable textbook (and very pleasant to read!);
- not https://powcoder.com

An alternative textbook:

Cormen, Leiserson, Rivest and Stein: Introduction to Algorithms preferably the third entropy that the light entropy is the first state.

- excellent: to be used later as a reference manual;
- not so good: somewhat formalistic and written in a rather dry style.

Problem:

Two thieves have robbed a warehouse and have to split a pile of items vising personal property of the property

https://powcoder.com

Problem:

Two thieves have robbed a warehouse and have to split a pile of items vision pite tag entite. Person person that way that ensures that each thief believes that he has got at least one half of the loot.

The solution: DS://DOWCOGER.COM

One of the two thieves splits the pile in two parts, so that he believes that both parts are of equal value. The other thief then chooses the part that he believes is to ever that the believes the part that the believes

Problem:

Two thieves have robbed a warehouse and have to split a pile of items vision pite tag entin. Design perigrit in xiling this lie way that chaures that each thief believes that he has got at least one half of the loot.

The solutible DS://powcoder.com

One of the two thieves splits the pile in two parts, so that he believes that both parts are of equal value. The other thief then chooses the part that he believes that the there were than the other week.

The hard part: how can a thief split the pile into two equal parts? Remarkably, this turns out that, most likely, there is no more efficient algorithm than the brute force: we consider all partitions of the pile and see if there is one which results in two equal parts.

Problem:

Three thieves have robbed a warehouse and have to split a pile of items vithout price tags on them. Dow do they do this in a way that easily that each thief believes that he has not at least one third of the loot?

• Remarkably, the problem with 3 thieves is much harder than the problem with 3 thieves is much harder than the

Problem:

Three thieves have robbed a warehouse and have to split a pile of items vithout price tags on them. Dow do they do this in a way that easily that each older believes that he has got at least one third of the loot?

- Remarkably, the problem with 3 thieves is much harder than the problem with 3 thieves is much harder than the
- Let us try do the same trick as in the case of two tieves. Say the first thief splits the loot into three piles which he thinks are of equal called her the charling two thickes chose which pile they want to take.

Problem:

Three thieves have robbed a warehouse and have to split a pile of items vithout price taxs on them. Dow do they to this in a way that easily that each thief believes that he has you at least one third of the loot?

- Remarkably, the problem with 3 thieves is much harder than the problem with 3 thieves is much harder than the
- Let us try do the same trick as in the case of two tieves. Say the first thief splits the loot into three piles which he thinks are of equal value the want to take.
- If they choose different piles, they can each take the piles they have chosen and the first thief gets the remaining pile; in this case clearly each thief thinks that he got at least one third of the loot.

Problem:

Three thieves have robbed a warehouse and have to split a pile of items vithout price tass on them. Dow do they do this in a way that easiline that each thief believes that he has got at least one third of the loot?

- Remarkably, the problem with 3 thieves is much harder than the problem thick thick the problem with 3 thieves is much harder than the
- Let us try do the same trick as in the case of two tieves. Say the first thief splits the loot into three piles which he thinks are of equal calce the where maning two thieves choose vilic pile they want to take.
- If they choose different piles, they can each take the piles they have chosen and the first thief gets the remaining pile; in this case clearly each thief thinks that he got at least one third of the loot.
- But what if the remaining two thieves choose the same pile?

• One might think that in this case the first thief can pick any of the two piles that the second and the third thief did not choose; the remaining two piles are put together and the two remaining thieves split them as in Problem 1 with only two thieves.

Assignment Project Exam Help

https://powcoder.com

• One might think that in this case the first thief can pick any of the two piles that the second and the third thief did not choose; the remaining two piles are put together and the two remaining thieves split them as in Problem 1 with only two thieves.

Assignment Project Exam Help

https://powcoder.com

- One might think that in this case the first thief can pick any of the two piles that the second and the third thief did not choose; the remaining two piles are put together and the two remaining thieves split them as in Problem 1 with only two thieves.
- Unfortunately this does not work:

 Stlegie first to fishlit the Diffic three Means. Height happen, for example, that the second thief thinks that

of the ttps://wpow.codeth.com
$$A = 50\%, B = 40\%, C = 10\%$$

$$A = 50\%, B = 10\%, C = 40\%.$$

- One might think that in this case the first thief can pick any of the two piles that the second and the third thief did not choose; the remaining two piles are put together and the two remaining thieves split them as in Problem 1 with only two thieves.
- Unfortunately this does not work:

 Saturable first works blits the of the present. He wight happen, for example, that the second thief thinks that

of the ttps://wpow.God eth.Com
$$A = 50\%, B = 40\%, C = 10\%$$

$$A = 50\%, B = 10\%, C = 40\%.$$

• Thus Aif the first thief picks pile B, then the second thief will object that the first thief is getting 40.0 WMe Could bely get only 60%/2 = 30%.

- One might think that in this case the first thief can pick any of the two piles that the second and the third thief did not choose; the remaining two piles are put together and the two remaining thieves split them as in Problem 1 with only two thieves.
- Unfortunately this does not work:

 Sthe Helffel for fishits the Detroit three pleasant. Height happen, for example, that the second thief thinks that

of that tapsue, where
$$A = 50\%$$
, $B = 40\%$, $C = 10\%$
of that tapsue, where $A = 50\%$, $B = 10\%$, $C = 40\%$.

- Thus if the first thief picks pile B, then the second thief will object that the first thick is getting 40% of the will be get only 60%/2 = 30%.
- If the first thief picks pile C then the third thief will object for the same reason.

- One might think that in this case the first thief can pick any of the two piles that the second and the third thief did not choose; the remaining two piles are put together and the two remaining thieves split them as in Problem 1 with only two thieves.
- Unfortunately this does not work:

 Street Pleffet with the Difference of the pleffet three pleasant. Height happen, for example, that the second thief thinks that

of that tapsue, where
$$A = 50\%$$
, $B = 40\%$, $C = 10\%$
of $A = 50\%$, $B = 10\%$, $C = 40\%$.

- Thus if the first thief picks pile B, then the second thief will object that the first thick is getting 40% of the will be get only 60%/2 = 30%.
- If the first thief picks pile C then the third thief will object for the same reason.
- What would be a correct algorithm?



- One might think that in this case the first thief can pick any of the two piles that the second and the third thief did not choose; the remaining two piles are put together and the two remaining thieves split them as in Problem 1 with only two thieves.
- Unfortunately this does not work:

 Street Pleffet with the Difference of the pleffet three pleasant. Height happen, for example, that the second thief thinks that

of that tapsue, where
$$A = 50\%$$
, $B = 40\%$, $C = 10\%$
of that tapsue, where $A = 50\%$, $B = 10\%$, $C = 40\%$.

- Thus if the first thief picks pile B, then the second thief will object that the first thick is getting 40% of the will be get only 60%/2 = 30%.
- If the first thief picks pile C then the third thief will object for the same reason.
- What would be a correct algorithm?
- Let the thieves be T_1, T_2, T_3 ;

Assignment Project Exam Help

https://powcoder.com

Algorithm:

 T_1 makes a pile P_1 which he believes is 1/3 of the whole loot;

 T_1 proceeds to ask T_2 if T_2 agrees that $P_1 \leq 1/3$;

If T_2 says YES, then T_1 asks T_3 if T_3 agrees that $P_1 \leq 1/3$;

If T_3 says YES, then T_1 takes P_1 ;

Assignmentherest pecter Exam Help Else of T₃ says NO, then T₃ takes P₁;

 T_1 and T_2 split the rest as in Problem 1.

Else if T_1 says NO, then T_2 reduces the size of P_1 to $P_2 < P_1$ such that T_2 thirt $P_3 > 1/3$; $P_4 > 1/3$; $P_5 > 1/3$; $P_5 > 1/3$;

 T_2 then proceeds to ask T_3 if he agrees that $P_2 \leq 1/3$;

If T_3 says YES then T_2 takes P_2 ;

A and 3 styling cest as in Problem 4 Coder

 T_1 and T_2 split the rest as in Problem 1.

Algorithm:

 T_1 makes a pile P_1 which he believes is 1/3 of the whole loot;

 T_1 proceeds to ask T_2 if T_2 agrees that $P_1 < 1/3$;

If T_2 says YES, then T_1 asks T_3 if T_3 agrees that $P_1 \leq 1/3$;

If T_3 says YES, then T_1 takes P_1 ;

ASSISTATION TO THE RESEARCH TO SELECTION TO

 T_1 and T_2 split the rest as in Problem 1.

Else if T_1 says NO, then T_2 reduces the size of P_1 to $P_2 < P_1$ such that T₂ that psi/3; powcoder.com

 T_2 then proceeds to ask T_3 if he agrees that $P_2 \leq 1/3$;

If T_3 says YES then T_2 takes P_2 ;

Tank 43 syllthe cest as in Problem Wcoder

 T_1 and T_2 split the rest as in Problem 1.

Homework: Try generalising this to n thieves! (a bit harder than with three thieves!)

Algorithm:

 T_1 makes a pile P_1 which he believes is 1/3 of the whole loot;

 T_1 proceeds to ask T_2 if T_2 agrees that $P_1 < 1/3$;

If T_2 says YES, then T_1 asks T_3 if T_3 agrees that $P_1 \leq 1/3$;

If T_3 says YES, then T_1 takes P_1 ;

Assignmenthe Respective Exam Help Else if T₃ says NO, then T₃ takes P₁;

 T_1 and T_2 split the rest as in Problem 1.

Else if T_1 says NO, then T_2 reduces the size of P_1 to $P_2 < P_1$ such that T2 thrklps j/3; powcoder.com

 T_2 then proceeds to ask T_3 if he agrees that $P_2 \leq 1/3$;

If T_3 says YES then T_2 takes P_2 ;

A and A3 sylvithe cestlas int Problem wooder

 T_1 and T_2 split the rest as in Problem 1.

Homework: Try generalising this to n thieves! (a bit harder than with three thieves!)

Hint: there is a nested recursion happening even with 3 thieves!

Assignment Project Exam Help

https://powcoder.com

Assignmenta Paroject pExtam akolicap we have just designed terminates and returns a solution to the problem

at hand?

https://powcoder.com

Assignmenta Paroject pExtam algorithm we have just designed terminates and returns a solution to the problem

we have just designed terminates and returns a solution to the problem at hand?

when this is not obvious by inspecting the algorithm using common sense!

at hand?

Assignmenta Project Exam algorithm we have just designed terminates and returns a solution to the problem

https://powcoder.com
When this is not obvious by inspecting the algorithm using common sense!

Mathematical definition of the state of the

```
Example: MERGESORT

Merge-Sort(A,p,r) *sorting A[p..r]*

• if p < r

• then q \leftarrow \lfloor \frac{p+r}{2} \rfloor

• MERGE-SORT(A, q + 1, r)

• MERGE(A, p, q, r)

https://powcoder.com
```

```
Example: MERGESORT

Merge-Sort(A,p,r) *sorting A[p..r]*

• if p < r

• then q \leftarrow \lfloor \frac{p+r}{2} \rfloor

• MERGE-SORT(A, q + 1, r)

• MERGE(A, p, q, r)

• The depth of recursion in MERGE-SORT is \log_2 n.
```

Merge-Sort(A,p,r)

sorting A[p..r]

- \bullet if p < r

$\mathbf{\overset{t_{\mathbf{hen}}}{Assignment}}_{\mathbf{R},\mathbf{roject}}\mathbf{Exam}\;\mathbf{Help}$ MERGE-SORT(A, q + 1, r)

- MERGE(A, p, q, r)
- ttps://powcoder.com
- On each level of recursion merging intermediate arrays takes O(n)**Add WeChat powcoder

Merge-Sort(A,p,r)

sorting A[p..r]

- \bullet if p < r

\mathbf{S} then $q \leftarrow \lfloor \frac{p+r}{2} \rfloor$ Resignments Respect Exam Help MERGE-SORT(A, q + 1, r)

- MERGE(A, p, q, r)

- On each level of recursion merging intermediate arrays takes O(n)
- Thu, Acidson across that and with and the content of the content o in $O(n \log_2 n)$ many steps.

Merge-Sort(A,p,r)

sorting A[p..r]

- \bullet if p < r

\mathbf{S} then $q \leftarrow \lfloor \frac{p+r}{2} \rfloor$ Resignments Respect Exam Help MERGE-SORT(A, q + 1, r)

- MERGE(A, p, q, r)
- https://powcoder.com
- On each level of recursion merging intermediate arrays takes O(n)
- Thu, Acids We Chartapad, W. Coderinates in $O(n \log_2 n)$ many steps.
- Merging two sorted arrays always produces a sorted array, thus, the output of Mergesort will be a sorted array.

Merge-Sort(A,p,r)

sorting A[p..r]

- \bigcirc if p < r

Assignment Project Exam Help MERGE-SORT(A, q + 1, r)

- MERGE(A, p, q, r)
- The depth of recursion in Merge-Sort is log₂ n.
- On each level of recursion merging intermediate arrays takes O(n)
- Thu, Add Sow e Chatapad, W Coderinates in $O(n \log_2 n)$ many steps.
- Merging two sorted arrays always produces a sorted array, thus, the output of Mergesort will be a sorted array.
- The above is essentially a proof by induction, but we will never bother formalising proofs of (essentially) obvious facts.

• However, sometimes it is **NOT** clear from a description of an algorithm that such an algorithm will not enter an infinite loop

Assignment Project Exam Help

https://powcoder.com

• However, sometimes it is **NOT** clear from a description of an algorithm that such an algorithm will not enter an infinite loop

Assignment Project Exam Help exponentially many steps (in the size of the input), which is usually almost as bad as never terminating.

https://powcoder.com

- However, sometimes it is **NOT** clear from a description of an algorithm that such an algorithm will not enter an infinite loop
- A sand fail to terminate Project Exam Help sometimes it is NOT crear that an algorithm will not run in exponentially many steps (in the size of the input), which is usually almost as bad as never terminating.
 - Sometimes is Not power of the Connection why such an algorithm, after it terminates, produces a desired solution.

- However, sometimes it is **NOT** clear from a description of an algorithm that such an algorithm will not enter an infinite loop
- sand fail to terminate Project Exam Help sometimes it is Nor clear that an algorithm will not rum in exponentially many steps (in the size of the input), which is usually almost as bad as never terminating.
- Sometimes is the polyton of the Configuration of the solution of the configuration of the c
- Proofs are needed for such circumstances; in a lot of cases they are the Aldway that the theorem the circumstances in a lot of cases they are

- However, sometimes it is **NOT** clear from a description of an algorithm that such an algorithm will not enter an infinite loop
- sand fail to terminate Project Exam Help someones it is Nor clear that an algorithm will not run in exponentially many steps (in the size of the input), which is usually almost as bad as never terminating.
- Sometimes Some
- Proofs are needed for such circumstances; in a lot of cases they are the cally way that the theoretical the color of the
- For that reason we will **NEVER** prove the obvious (the CLRS textbook sometimes does just that, by sometimes formulating and proving trivial little lemmas, being too pedantic!). We will prove only what is genuinely nontrivial.

- However, sometimes it is **NOT** clear from a description of an algorithm that such an algorithm will not enter an infinite loop
- sand fail to terminate Project Exam Help someones it is NOT crear that an algorithm will not run in exponentially many steps (in the size of the input), which is usually almost as bad as never terminating.
- Sometimes Symposite Office Office Configuration why such an algorithm, after it terminates, produces a desired solution.
- Proofs are needed for such circumstances; in a lot of cases they are the plant that the discrimination of the plant that the discrimination of the plant that the plant the plant that the plant the plant that the plant the
- For that reason we will **NEVER** prove the obvious (the CLRS textbook sometimes does just that, by sometimes formulating and proving trivial little lemmas, being too pedantic!). We will prove only what is genuinely nontrivial.
- However, <u>BE VERY CAREFUL</u> what you call trivial!!

The Stable Matching Problem

Assignment Project Exam Help

https://powcoder.com

The Stable Matching Problem

Assignment Projects Exame Help

https://powcoder.com

The Stable Matching Problem

Assignment Projects Exame Help

- They all attend a dinner party; after the party:
 - hvery man gives/you a list with his darking of all women present,
 - every woman gives you a list with her ranking of all men present;

The Stable Matching Problem

Assignment Projects Exame Help

- They all attend a dinner party; after the party:
 - Lycry man gives you a list with his chaking of all women present,
 - every woman gives you a list with her ranking of all men present;

The Stable Matching Problem

Assignment Projects Exame Help

- They all attend a dinner party; after the party:
 - layer man gives you a list with his darking of all women present, POWCOGET. COIN
 - every woman gives you a list with her ranking of all men present;
- Design an algorithm which produces a *stable matching*, which is: a set of pairs part of pairs pai

The Stable Matching Problem

Assignment Projects Exame Help

- They all attend a dinner party; after the party:
 - hyper man gives you a list with his tanking of all women present, powerful to the property of the property o
 - every woman gives you a list with her ranking of all men present;
- Design an algorithm which produces a *stable matching*, which is: a set of pars h (θ , v) of parameters and h (θ) of that the following situation never happens:

for two pairs p = (m, w) and p' = (m', w'):

- man m prefers woman w' to woman w, and
- woman w' prefers man m to man m'.

Assignment Project Exam Help

https://powcoder.com

Stable Matching Problem: examples

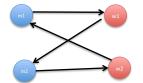
Assignment Project Exam Help

https://powcoder.com

Stable Matching Problem: examples

Case1: Preferences: stable matching not stable Assignment Project Exam Help https://powcoder.com

Add We Case2: powcoder







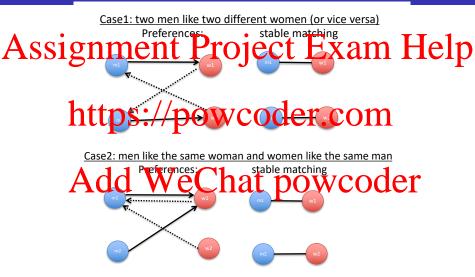


Is there always a stable matching for any preferences of two pairs?

Assignment Project Exam Help

https://powcoder.com

Is there always a stable matching for any preferences of two pairs?



Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Alsymptopherman Party exist Exam Help

https://powcoder.com

Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Alssner Trabecratin Parsie Exam Help

Answer: YES, but this is NOT obvious!

https://powcoder.com

Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Allsverieg nymber principle of Exam Help

Answer: YES, but this is NOT obvious!

Given n het tands worker bowner over the them, i.e., just to form n couple.

Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Allsvaries near the preferences provided by Exam Help

Answer: YES, but this is NOT obvious!

Given n lections g women bow many ways are there to match them, i.e., just to form n couples?

Answer: n!

Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Alssner Therman Project Exam Help

Answer: YES, but this is NOT obvious!

Given n lect tark g women bow many welve are there to match them, i.e., just to form n couples?

Answer: $n! \approx (n/e)^n$ - more than exponentially many in n ($e \approx 2.71$);

Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Allswerieg preparation powers exist Exam Help

Answer: YES, but this is NOT obvious!

Given n lect tark g women bow many welve are there to match them, i.e., just to form n couples?

Answer: $n! \approx (n/e)^n$ - more than exponentially many in n ($e \approx 2.71$);

Can we find deale Wto Gihatsoph Wood of ear?

Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Allsvaries mathematical every exist $\frac{1}{2}$

Answer: YES, but this is NOT obvious!

Given n lectured g women bow many welve are there to match them, i.e., just to form n couples?

Answer: $n! \approx (n/e)^n$ - more than exponentially many in n ($e \approx 2.71$);

Can we far deale Weak in a tsopo woodier?

Answer: YES, using the Gale - Shapley algorithm.

Question: Is it true that for every possible collection of n lists of preferences provided by all men, and n lists of preferences provided by Allswerieg preparation powers exist Exam Help

Answer: YES, but this is NOT obvious!

Given n lect tark g women bow many welve are there to match them, i.e., just to form n couples?

Answer: $n! \approx (n/e)^n$ - more than exponentially many in n ($e \approx 2.71$);

Can we find deale When in a tsop to wond diet?

Answer: YES, using the Gale - Shapley algorithm.

Originally invented to pair newly graduated physicians with US hospitals for residency training.

Assignment Project Exam Help

https://powcoder.com

Produces pairs in stages, with possible revisions;

Assignment Project Exam Help

https://powcoder.com

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called free.

Assignment Project Exam Help

https://powcoder.com

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help

https://powcoder.com

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help

• Start with all men free;

https://powcoder.com

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
 - Start with all men free;

While there exists a free man who has not proposed to all women

https://powcoder.com

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
- Start with all men free;

While there exists a free man who has not proposed to all women pilk such a free man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet;

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Men will be proposing to women. Women will decide if they accept a Start Bill was fare to be a second a second
- Start with all men free;

While there exists a free man who has not proposed to all women pilk such a free/man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet;

If no one has proposed to w yet

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Men will be proposing to women. Women will decide if they accept a self they accept a sel
- Start with all men free:

While there exists a free man who has not proposed to all women pick such a free/man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet; Tf

no one has proposed to w yet

she always accepts and a pair p = (m, w) is formed; Add WeChat powcoder

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
- Start with all men free;

While there exists a free man who has not proposed to all women pick such a free/man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet;

If no one has proposed to w yet she always accepts and a pair p=(m,w) is formed;

ElAddis We Chat powcoder

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
- Start with all men free;

While there exists a free man who has not proposed to all women pick such a free/man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet; If no one has proposed to w yet she always accepts and a pair p=(m,w) is formed;

Elsa che is a vade in a paint of we coder if m is higher on her preference list than m'

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
- Start with all men free;

While there exists a free man who has not proposed to all women pilk such a free man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet;

If no one has proposed to w yet

she always accepts and a pair p = (m, w) is formed;

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
- Start with all men free;

While there exists a free man who has not proposed to all women pilk such a free man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet;

If no one has proposed to w yet

she always accepts and a pair p = (m, w) is formed;

Else the is a very n a paint p which is a paint p which is higher on her preference list than p the pair p' = (m', w) is deleted; p becomes a free man:

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
- Start with all men free;

While there exists a free man who has not proposed to all women pilk such a free man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet;

If no one has proposed to w yet

she always accepts and a pair p = (m, w) is formed;

The is already in a pain p' = p' which is higher on her preference list than p' the pair p' = (m', w) is deleted; p' becomes a free man; a new pair p = (m, w) is formed;

◆ロト ◆御ト ◆恵ト ◆恵ト 恵 めへで

- Produces pairs in stages, with possible revisions;
- A man who has not been paired with a woman will be called *free*.
- Assignment Project Exam Help
 - Start with all men free;

While there exists a free man who has not proposed to all women pilk such a free man m and have him propose to the highest ranking woman w on his list to whom he has not proposed yet;

If no one has proposed to w yet

she always accepts and a pair p = (m, w) is formed;

Elsa the is already in a paint p' which p' is higher on her preference list than m' the pair p' = (m', w) is deleted; m' becomes a free man;

a new pair p = (m, w) is formed;

Else m is lower on her preference list than m'; the proposal is rejected and m remains free.

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop

Assignment Project Exam Help

https://powcoder.com

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

Assignment Project Exam Help

https://powcoder.com

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

Assignment the While loop one man proposes to one we man; Assignment the World Color Lox. am Help

https://powcoder.com

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

A series of the While loop one man proposes to one we man;

• thus, every man can make at most n proposals;

https://powcoder.com

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

A set ganding of the While loop one man proposes to one we man;

• thus, every man can make at most n proposals;

- there are n men, so in total they can make $\leq n^2$ proposals.

https://powcoder.com

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

A set ganding of the While loop one man proposes to one we man;

• thus, every man can make at most n proposals;

- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no clore than n^2 many times.

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

Assignment the While loop one man proposes to one we man;

- thus, every man can make at most n proposals:
- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no flore than n^2 many times.

Claim 2: Algorithm produces a matching, i.e., every man is eventually

paired with a woman (and thus also every woman is paired to a man) $Add \ We Chat \ powcoder$

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

A set gandnesset the while loop one man proposes to one we man;

the work man can make at most a proposely.

- thus, every man can make at most n proposals;
- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no clore than n^2 many times.

Claim 2: Algorithm produces a matching, i.e., every man is eventually paired with a woman (and thus also every woman is paired to a man)

Proof: Add WeChat powcoder

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

In every round of the While loop one man proposes to one we man; SSI Bandin Glast to a world Color on Enx: am Help

- thus, every man can make at most n proposals:
- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no flore than n^2 many times.

Claim 2: Algorithm produces a matching, i.e., every man is eventually paired with a woman (and thus also every woman is paired to a man)

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

In every round of the While loop one man proposes to one we man; SSI Bandin Colos to X: am Help

- thus, every man can make at most n proposals:
- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no flore than n^2 many times.

Claim 2: Algorithm produces a matching, i.e., every man is eventually paired with a woman (and thus also every woman is paired to a man)

- This means that m has already proposed to every woman.

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

In every round of the While loop one man proposes to one we man; SSI Randments to a world Color on X: am Help

- thus, every man can make at most n proposals:
- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no clore than n^2 many times.

Claim 2: Algorithm produces a matching, i.e., every man is eventually paired with a woman (and thus also every woman is paired to a man)

- This means that m has already proposed to every woman.
- Thus, every woman is paired with a man, because a woman is not paired with anyone only if no one has made a proposal to her.

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

A selection of the While loop one man proposes to one we man;

- thus, every man can make at most n proposals:
- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no clore than n^2 many times.

Claim 2: Algorithm produces a matching, i.e., every man is eventually paired with a woman (and thus also every woman is paired to a man)

- This means that m has already proposed to every woman.
- Thus, every woman is paired with a man, because a woman is not paired with anyone only if no one has made a proposal to her.
- But this would mean that n women are paired with all of n men so m cannot be free.

Claim 1: Algorithm terminates after $\leq n^2$ rounds of the While loop Proof:

A set gandness to the While loop one man proposes to one we man;

- thus, every man can make at most n proposals:
- there are n men, so in total they can make $\leq n^2$ proposals.

Thus the While loop can be executed no clore than n^2 many times.

Claim 2: Algorithm produces a matching, i.e., every man is eventually paired with a woman (and thus also every woman is paired to a man)

- This means that m has already proposed to every woman.
- Thus, every woman is paired with a man, because a woman is not paired with anyone only if no one has made a proposal to her.
- But this would mean that n women are paired with all of n men so m cannot be free. Contradiction!

Claim 3: The matching produced by the algorithm is stable.

Assignment Project Exam Help

https://powcoder.com

Claim 3: The matching produced by the algorithm is stable. **Proof:**

Assignment Project Exam Help

https://powcoder.com

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

Assignment Project Exam Help

https://powcoder.com

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

As singuished with men of increasing ranks on her list Help

https://powcoder.com

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

Assans him with men of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable;

https://powcoder.com

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

Assans him with the of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that: **Proposition** 1. The proposition of the proposition of

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

Assans him with the of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that: w' prefers m over m'.

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

A Sisangs hand with tren of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that:

**The property of the proper

• Since *m* prefers *w'* over *w*, he must have proposed to *w'* before proposed to *w'* before proposed to *w'* before

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

a woman is paired with men of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that: nttps://pow.coder.com \overline{w}' prefers m over m'.

- Since m prefers w' over w, he must have proposed to w' before propaint w; We Chat powcoder

 • Since he is paired with w, woman w must have either:

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

a woman is paired with men of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that: nups://pow.coder.com w' prefers m over m'.

- Since m prefers w' over w, he must have proposed to w' before propaint w: We Chat powcoder

 • Since he is paired with w, woman w must have either:
- - rejected him because she was already with someone whom she prefers, or

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

a woman is paired with men of increasing ranks on her list telp

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that: nttps://pow.coder.com w' prefers m over m'.

- Since m prefers w' over w, he must have proposed to w' before propaint w; We Chat powcoder

 • Since he is paired with w, woman w must have either:
- - rejected him because she was already with someone whom she prefers, or
 - dropped him later after a proposal from someone whom she prefers;

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

a woman is paired with men of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that: nttps://pow.coder.com w' prefers m over m'.

- Since m prefers w' over w, he must have proposed to w' before propaing to w; We Chat powcoder

 • Since he is paired with w, woman w must have either:
- - rejected him because she was already with someone whom she prefers, or
 - dropped him later after a proposal from someone whom she prefers;
- In both cases she would now be with m' whom she prefers over m.

Claim 3: The matching produced by the algorithm is stable.

Proof: Note that during the *While* loop:

a woman is paired with men of increasing ranks on her list Help

Assume now the opposite, that the matching is not stable; thus, there are two pairs p = (m, w) and p' = (m', w') such that: nttps://pow.coder.com \overline{w}' prefers m over m'.

- Since m prefers w' over w, he must have proposed to w' before propaint w; We Chat powcoder

 • Since he is paired with w, woman w must have either:
- - rejected him because she was already with someone whom she prefers, or
 - dropped him later after a proposal from someone whom she prefers;
- In both cases she would now be with m' whom she prefers over m.
- Contradiction!

A Puzzle!!!

Why puzzles? It is a fun way to practice problem solving!

Assignment will project a pax and nite led p couples were present.

- Not put poked process the wholiquot know each other introduced themselves and shook hands.
- People who knew each other from before did not shake hands.
- Later that evening Tom got bored, so he walked around and asked all other guests (including his wife) how many hands they had shaken that evening, and got 19 different answers.
- How many hands did Mary shake?
- How many hands did Tom shake?



That's All, Folks!!