Discussion Assignment Unit 1

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Discussion Assignment Unit 1

by Bhaskar Palit (Instructor) - Friday, 1 September 2023, 9:53 AM

In this unit, you have learned about the fundamental concepts of set theory, operations, and mathematical notations. Before you start with the discussion assignment, you need to know the importance of set theory in the real world to help you build upon this knowledge. Here is an example that will help you understand its importance:

Consider a grocery store where customers can purchase items from a wide range of categories like fruits, vegetables, dairy, bakery, etc. The store wants to analyze the purchasing behavior of its customers and determine the most popular items in each category. They can use set theory to create sets of customers who purchase items from each category and then find the intersection of these sets to determine which customers purchase items from multiple categories.

Now, engage in a discussion with your peers by completing the following task and posting it in the discussion forum:

Create three sets A, B having 4 elements in each, and U, a Universal set of any possible number of elements of your interest. (For example, you can consider the sets $A = \{a, b, c, d\}$, $B = \{1, 2, 3, 4\}$ and $U = \{a, b, c, d, 1, 2, 3, 4, \text{apples}, \text{mangoes}, \text{avocados}\}$.

Note: Do not use the same examples. Create your own sets by changing the numbers and letters.)

Then explain the answers to the following questions to your peers:

i. $A \cup B$

ii. $A \cap B$

iii. $(A \cap B) \cup U$

iv. The Power set of A.

v. A'

vi. $\emptyset \cap B$

vii. $A \times B$

viii. $A - B$

ix. $(A - B) \cup (B - A)$

x. Prove any one De Morgan identity for A and B.

Your Discussion should be a minimum of 200 words in length.

Use APA citations and references for the textbook and any other sources used; refer to the UoPeople APA Tutorials in the LRC for help with APA.

320 words

Permalink

Re: Discussion Assignment Unit 1

by Conrad Bara-Mason - Thursday, 7 September 2023, 9:14 PM

i. A ∪ B (Union of A and B): The union of two sets, A and B, includes all unique elements from both sets. In other words, it combines the elements of A and B without duplicates.

For example, if A = {red, green, blue, yellow} and B = {blue, orange, pink, yellow}, then A ∪ B = {red, green, blue, yellow, orange, pink}.

ii. A ∩ B (Intersection of A and B): The intersection of two sets, A and B, contains only the elements that are common to both sets.

Using the same sets as in the previous example, A ∩ B = {blue, yellow}.

iii. (A ∩ B) ∪ U (Union of the Intersection of A and B with U): First, find the intersection of A and B (common elements), and then combine it with the elements from the universal set U.

Let's assume U = {red, green, blue, yellow, orange, pink, purple}. If A = {red, green, blue, yellow} and B = {blue, orange, pink, yellow}, then (A ∩ B) ∪ U = {blue, yellow, red, green, orange, pink, purple}.

iv. Power set of A: The power set of a set A includes all possible subsets of A, including the empty set and A itself.

If A = {apple, banana, cherry, date}, the power set of A contains 2^4 = 16 subsets, including {}, {apple}, {banana}, {cherry}, {date}, {apple, banana}, {apple, cherry}, {apple, date}, {banana, cherry}, {banana, date}, {cherry, date}, {apple, banana, cherry}, {apple, banana, date}, {apple, cherry, date}, {banana, cherry, date}, {apple, banana, cherry, date}.

v. A' (Complement of A): A' consists of all elements in the universal set U that are not in A.

If U = {apple, banana, cherry, date, 1, 2, 3, 4, grapes, kiwi, orange} and A = {apple, banana, cherry, date}, then A' = {1, 2, 3, 4, grapes, kiwi, orange}.

vi. ∅∩B (Intersection of the Empty Set with B): The intersection with an empty set always results in an empty set.

∅∩B = {}

vii. A × B (Cartesian Product of A and B): The Cartesian product of two sets, A and B, results in pairs of elements, one from A and one from B.

If A = {1, 2, 3, 4} and B = {apple, banana, cherry, date}, then A × B = {(1, apple), (1, banana), (1, cherry), (1, date), (2, apple), (2, banana), (2, cherry), (2, date), (3, apple), (3, banana), (3, cherry), (3, date), (4, apple), (4, banana), (4, cherry), (4, date)}.

viii. A - B (Set Difference of A and B): This operation returns elements that are in A but not in B.

If A = {apple, banana, cherry, date} and B = {cherry, date, kiwi, orange}, then A - B = {apple, banana}.

ix. (A - B) ∪ (B - A) (Symmetric Difference of A and B): This operation returns elements that are in either A or B but not in both.

Using the same sets as in the previous example, (A - B) ∪ (B - A) = {apple, banana, kiwi, orange}.

x. De Morgan's Law (Complement of the Union): De Morgan's Law states that the complement of the union of two sets is equal to the intersection of their complements.

Mathematically, (A ∪ B)' = A' ∩ B'.

In words, the complement of the union of sets A and B is the same as the intersection of the complements of A and B. This law is helpful for simplifying expressions involving sets.

580 words

Rate: Rate...

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Re: Discussion Assignment Unit 1

by Bhaskar Palit (Instructor) - Friday, 8 September 2023, 10:17 AM

Hi Conard,

First of all great work on this assignment. You did every problem correctly. The examples and logical explanations for each situation are to the point and correct. However, in Q X I will suggest you give a proper mathematical proof. For example, here you want to prove that $(A \cup B)' = A' \cap B'$

To prove it you must show the following mathematical steps. Your logical answer is correct but when it comes to proving something you have to be rigorous.

Here $(A \cup B)' = U \setminus (A \cup B) = (U \setminus A) \cap (U \setminus B) = A' \cap B'$

Best,
Bhaskar
96 words

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Re: Discussion Assignment Unit 1

by Conrad Bara-Mason - Friday, 8 September 2023, 8:52 PM

Thank you Professor for your feedback!
6 words

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Re: Discussion Assignment Unit 1

by Benard Wesonga Wasike - Sunday, 10 September 2023, 10:43 AM

Hi Conrad Bara-Mason,
Very wonderful work you have tried to express in this discussion forum, I like the way you have expressed your points on the topic 1 sets. No mistakes were found in the explanation. keep it!
38 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Tendo Gloria Namugga - Monday, 11 September 2023, 10:19 PM

Hello Conrad,
Well done. You gave clear and precise explanations for the questions and included examples as well. My only comment is that for question 10, you should have included either venn diagrams or definitions to further explain your proof. I also think you should include references for your work sources. Thank you.
53 words

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Re: Discussion Assignment Unit 1

by Ammar Khafagy - Monday, 11 September 2023, 10:21 PM

Hello Conard
This is a great post, you have explained each of the required questions correctly to my knowledge, your explanation are simple and very clear, great work, keep it up

31 words

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Re: Discussion Assignment Unit 1

by Cesar De Macedo - Monday, 11 September 2023, 11:30 PM

Hello Conrad,

Your post about set theory is very detailed and easy to understand. I liked how you gave real-life examples for each process. It helped me understand these complicated ideas. Your sets of models made the ideas feel natural and easy to understand.

I also liked that you went one step further and explained De Morgan's Law, which can be hard to understand. It's great that you translated it mathematically and audibly so that anyone can understand it, even if they need to learn much about math.

Overall, your clear explanations and examples make complicated set theory ideas easy to understand. I'm looking forward to hearing more from you on this topic.

113 words

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Re: Discussion Assignment Unit 1

by Faied Jamil - Tuesday, 12 September 2023, 7:17 PM

I find it interesting that the elements of the sets could change as I read them along. From different colours to different fruits. I think you could have explained how the proof is derived instead of just stating it. Still, i do get what you are trying to express here.

Thank you for your post and good luck with our studies.
FJ

62 words

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Re: Discussion Assignment Unit 1

by Ssenyange Joshua - Wednesday, 13 September 2023, 9:48 AM

Conrad, your explanations of set theory operations are clear and comprehensive. The examples you provided make it easy to grasp the concepts. Additionally, you've covered De Morgan's Law, which is crucial in understanding set operations. Overall, your response greatly contributes to our discussion and understanding of set theory. Well done!

50 words

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Re: Discussion Assignment Unit 1

by Immanuel Dhliso - Wednesday, 13 September 2023, 9:55 PM

Great work on your assignment

5 words

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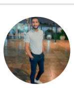

Re: Discussion Assignment Unit 1

by Muhammed Alaa - Thursday, 14 September 2023, 12:18 AM

Dear Conard,

Thank you for providing a comprehensive explanation of various set operations. Your descriptions are clear and concise, making it easy for readers to understand these fundamental concepts in set theory. The examples you've included further enhance the clarity of each operation.

One suggestion would be to consider adding a brief summary or conclusion at the end of your explanation to recap the key takeaways or highlight any important insights. This can help reinforce the main points for readers who may be new to set theory.

Overall, your explanation is well-structured and informative. Keep up the good work!

99 words

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Re: Discussion Assignment Unit 1

by David Kamya - Thursday, 14 September 2023, 3:32 AM

Hi Conard
Your submission shows deep understanding of the required concepts.
The examples are well explained with correct set notations.

20 words

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Re: Discussion Assignment Unit 1

by Sandhya Shah - Thursday, 14 September 2023, 4:49 AM

Hi conard, great explanation, keep up with good work.

9 words

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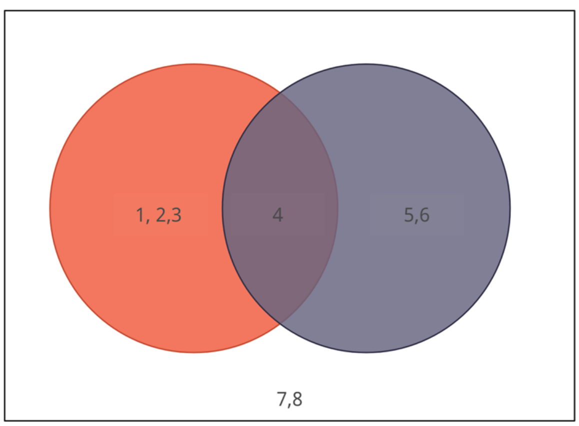
Re: Discussion Assignment Unit 1

by Ammar Khafagy - Thursday, 7 September 2023, 10:32 PM



The sets are

A = {1, 2, 3, 4}

B = {4, 5, 6}

U = {7, 8}

1. $A \cup B = \{1, 2, 3, 4, 5, 6\}$
Because the expression ∪ creates a set that includes *all* elements in both sets

2. $A \cap B = \{4\}$
Because this expression ∩ creates a set with *only* the common elements between both sets

3. $(A \cap B) \cup U = \{4, 7, 8\}$
Because this expression creates a set of only common elements between A and B, as well as all elements in the U set

4. The Power set of $A = \{ \emptyset, \{1\}, \{2\}, \{3\}, \{4\}, \{1,2\}, \{1,3\}, \{1,4\}, \{2,3\}, \{2,4\}, \{3, 4\}, \{1,2,3,4\}\}$
Because the power set is an expression that creates a set containing *all* the sets that can be found inside of set A

5. $A' = \{5, 6, 7, 8\}$
Because this expression creates a set of all elements that are not in the set A. Those are the elements in B and U

6. $\emptyset \cap B = \emptyset$
Because ∅ is the only element that exists in both the B set and the ∅ set

7. $A \times B = \{(1,4), (1,5), (1,6), (2,4), (2,5), (2,6), (3,4), (3,5), (3,6), (4,4), (4,5), (4,6)\}$
Because this expression creates a set containing values arranged in (a, b) sequence, where a is each A element and b is each B elements

8. $A-B = \{1, 2, 3\}$
Because this expression creates a set of elements in A except the elements that appear in B, which is 4

9. $(A - B) \cup (B - A) = (\{1, 2, 3\} \cup (\{5,6\}) = \{1, 2, 3, 5, 6\}$
Because this expression first removes all the common elements between A and B, and then combines all the left elements, creating a set of all A and B elements that are not common, that is leaving the 4 out

10. Prove any one De Morgan identity for A and B:
Let's prove the identity

$(A \cup B)' = A' \cap B'$

$\Rightarrow \{7, 8\} = \{5, 6, 7, 8\} \cap \{1, 2, 3, 7, 8\}$

$\Rightarrow \{7, 8\} = \{7, 8\}$

362 words

Rate: Rate...

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Re: Discussion Assignment Unit 1

by Bhaskar Palit (Instructor) - Friday, 8 September 2023, 10:40 AM

Hi Ammar,

I see a very good attempt at this assignment work. You did decent work but I will suggest you invest more time in the lesson first. From your work, I can guess that you understood some of the concepts that are related to Set Theory but there is a major error in your understanding when it comes to Universal set. Put an emphasis on the word Universal. This means it contains everything i.e. a Universal set is a set that is a mother of all sets or contains very other sets. So naturally in your example, the set U shouldn't be just $\{7, 8\}$ but it will be $\{1, 2, 3, 4, 5, 6, 7, 8\}$.

For the above the work that is related to the universal set is incorrect. Another important note is, that in Q X you had to prove one of De Morgan's identities. Which one should do abstractly instead of using the example! Please see my comment on Conard's Post to understand the way of proving something Abstractly.

Best,
Bhaskar

172 words

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Re: Discussion Assignment Unit 1

by Ammar Khafagy - Monday, 11 September 2023, 10:16 PM

Hello Sir
Thank you for the great assessment, I struggled to understand what the Universal set means, so I understand now that my answers are not going to be correct, I'll make sure to give a better post next week
40 words

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Re: Discussion Assignment Unit 1

by Conrad Bara-Mason - Friday, 8 September 2023, 8:54 PM

Hey Ammar,

You are correct in several statements:

1. The union of sets A and B (A ∪ B) contains all elements from both sets, so {1, 2, 3, 4, 5, 6} is correct.

2. The intersection of sets A and B (A ∩ B) only contains elements that are common to both sets, so {4} is correct.

3. The union of the intersection of A and B with set U ((A ∩ B) ∪ U) includes common elements from A and B and all elements from U, so {4, 7, 8} is correct.

However, you have a few errors:

1. A' (complement of A) should contain elements not in A but in the universal set U. So, A' = {5, 6, 7, 8} is not accurate. It should be A' = {5, 6}.

2. Your Cartesian product (A × B) is correct, but it's important to note that it pairs each element of A with each element of B.

3. Your De Morgan identity proof is incorrect. The correct proof would be:

(A ∪ B)' = A' ∩ B'
({1, 2, 3, 4, 5, 6})' = {5, 6, 7, 8}
{7, 8} = {5, 6, 7, 8} ∩ {5, 6, 7, 8}

203 words

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Re: Discussion Assignment Unit 1

by Ammar Khafagy - Monday, 11 September 2023, 10:18 PM

Hello Conrad
Thank you for your effort of going through my post and correcting my answers, I really appreciate it, I struggled what the universal set meant, which is why my answers were incorrect, thank you for your time
39 words

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Re: Discussion Assignment Unit 1

by Jacques Joseph Panikkassary - Tuesday, 12 September 2023, 3:05 AM

Congratulations on your well-structured essay on set theory! It's clear that you've put effort into explaining various set operations using specific examples, and you've done an excellent job of breaking down the concepts for your readers.

Your essay is informative and concise, making it easy to understand the different operations such as union, intersection, complement, Cartesian product, and De Morgan's Law. Additionally, you've used a practical example involving types of cars and a universal set, which makes the concepts more relatable and accessible to your audience.

I appreciate that you've included a reference list to give credit to the sources you consulted, which adds credibility to your essay.

Overall, your essay effectively communicates the fundamentals of set theory and its applications. It provides a clear and structured explanation of the topic, making it a valuable resource for anyone looking to understand this mathematical concept better. Great job!
147 words

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Re: Discussion Assignment Unit 1

by Faied Jamil - Tuesday, 12 September 2023, 7:23 PM

Hi Ammar,

You totally answered the question in your own way. I appreciate the Venn diagram since anything visual is helpful for me. The answer to Q10 is spot on. I enjoyed reading your post.

Thank you and good luck with our studies.
FJ
44 words

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Re: Discussion Assignment Unit 1

by Immanuel Dhliso - Wednesday, 13 September 2023, 9:56 PM

Brilliant venn diagram execution
4 words

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Re: Discussion Assignment Unit 1

by David Kamya - Thursday, 14 September 2023, 3:34 AM

Hello Ammar
This is a very beautifully laid piece of work. I tried drawing these ven-diagrams with GITmint but failed.
May be you can demostrate how you drew such beautiful self explanatory diagrams.
33 words

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Re: Discussion Assignment Unit 1
by Cesar De Macedo - Friday, 8 September 2023, 11:52 PM

Hello everyone,

Welcome to week 1, Here is my essay for the discussion forum.

First, consider the Universal set {**C**} the types of cars you might find on the road, and let **A** and **B** be subsets of **U**.

A = {"Sedan," "SUV," "Convertible", "Truck"}

B = {"Electric", "Hybrid", "Diesel", "Truck"}

U = {"Sedan", "SUV", "Convertible", "Truck", "Electric", "Hybrid", "Diesel", "Coupe", "Van"}

Given the sets above A and B, we can find the following interactions:

Union

A U B: The union of A and B would be all the elements in either **A** or **B**.

In this case, we have:

A U B = {"Sedan", "SUV", "Convertible", **"Truck",** "Electric", "Hybrid", "Diesel"}

Intersection

A n B: I gave a little spoiler above; the intersection of **A** and **B** would be all the elements common to both **A** and **B**.

A n B = {"Truck"}

Intersection with Universe U

(A n **B)** U **C**: This will be the union of the intersection of **A** and **B** with the universal set **C**.

(A n **B)** U **C** = **C**

The power set of A

The Power set of **A** would include all subsets of **A**, including the empty set and **A** itself.

Power set of **A** = {{ }, {"Sedan"}, {"SUV"}, {"Convertible"}, {"Truck"}, {"Sedan", "SUV"}, ...}

Complement of A

A: The complement of **A'** includes all elements in **C** that are not in **A**.

A' = {"Electric," "Hybrid," "Diesel," "Coupe," "Van"}

Intersection B

{} n B: The intersection of an empty set and **B** is the empty set.

{} n B = {}.

Cartesian product

A x **B**: The Cartesian product includes all possible ordered pairs **(a, b)** where a is from **A** and **b** is from **B**.

An x B = {("Sedan", "Electric"), ("Sedan", "Hybrid"), ...}

A difference B

A - B: This is **A** minus the elements also found in **B**.

A - B = {"Sedan", "SUV", "Convertible"}

Combine

(A - B) U (B - A): This will combine elements unique to each set.

(A - B) U (B - A) = {"Sedan", "SUV", "Convertible", "Electric", "Hybrid", "Diesel"}

De Morgan's Law

(A U B)' = A' n B'

Let’s prove the morgan’s identity:

Let x be an element in **(A U B)'** => x not in **A** and x not in **B** => x in **A'** and x in **B'** => x in **A'** n **B'**

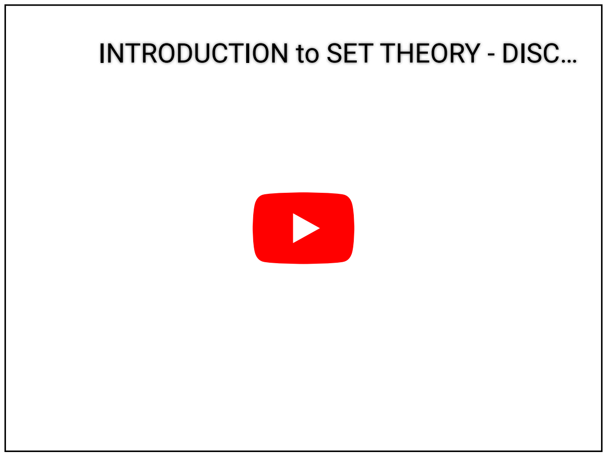
(A U B)' = A' n B'

I hope this helps you understand set theory's significance and operations better! Please have a look at my reference list for more information.

Reference:

Doerr, A., & Levasseur, K. (2022). Applied Discrete Structures. University of Massachusetts Lowell.

TrevTutor. (2023). Discrete Math 1 (Video playlist). YouTube.



447 words

Rate: Rate...

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Re: Discussion Assignment Unit 1
by Benard Wesonga Wasike - Sunday, 10 September 2023, 10:40 AM

Hi Cesar De Macedo,
This is an amazing post that you have shown to us on this topic called sets. I completely agree with you the way you have expressed your points in the assignment. I like the way you have applied your APA citations in the text. in general, I can say good work

55 words

Permalink Show parent

Re: Discussion Assignment Unit 1
by Jacques Joseph Panikkassary - Tuesday, 12 September 2023, 3:02 AM

Congratulations on your well-structured essay on set theory! It's clear that you've put effort into explaining various set operations using specific examples, and you've done an excellent job of breaking down the concepts for your readers.

Your essay is informative and concise, making it easy to understand the different operations such as union, intersection, complement, Cartesian product, and De Morgan's Law. Additionally, you've used a practical example involving types of cars and a universal set, which makes the concepts more relatable and accessible to your audience.

I appreciate that you've included a reference list to give credit to the sources you consulted, which adds credibility to your essay.

Overall, your essay effectively communicates the fundamentals of set theory and its applications. It provides a clear and structured explanation of the topic, making it a valuable resource for anyone looking to understand this mathematical concept better. Great job!

147 words

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Re: Discussion Assignment Unit 1
by Bhaskar Palit (Instructor) - Tuesday, 12 September 2023, 6:02 PM

Hi Cesar,
I have nothing to comment on as you have solved all of the asked questions perfectly with perfect logical explanation. Well done.

Best,
Bhaskar
26 words

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Re: Discussion Assignment Unit 1
by Faied Jamil - Tuesday, 12 September 2023, 7:29 PM

Hi Cesar,

Great work in employing various types of vehicles in your post. The distinct colors really help too !!! However, I was hoping you could have provided the elements examples as your proved the DM Law. But still good work and I understand your post well. Maybe our post for next unit we can opt for different car brand names eh :)

p/s Your intersection symbol is the letter 'n' instead of '∩'.

Thank you for your post and good luck with our studies.
FJ
86 words

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Re: Discussion Assignment Unit 1
by Ssenyange Joshua - Wednesday, 13 September 2023, 9:48 AM

Cesar, your detailed exploration of set theory operations is impressive and demonstrates a strong grasp of the subject. The inclusion of a proof for De Morgan's Law adds depth to your explanation. Your references show a commitment to solid sources. Great contribution to our discussion!
45 words

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Re: Discussion Assignment Unit 1
by Fatima Qudimat - Wednesday, 13 September 2023, 4:05 PM

Dear Cesar,

Thank you for your contribution to this week's discussion, You've done a great job proving one direction of De Morgan's law for sets. you've successfully proved both directions of De Morgan's law for sets, which is an important result in set theory. Let x be an element in (A U B)' => x not in A and x not in B => x in A' and x in B' => x in A' n B'
(A U B)' = A' n B'

Well done!

Thanks / Fatima
89 words

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Re: Discussion Assignment Unit 1
by Immanuel Dhliso - Wednesday, 13 September 2023, 9:56 PM

You cited your work brilliantly
5 words

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Re: Discussion Assignment Unit 1

by Muhammed Alaa - Thursday, 14 September 2023, 12:19 AM

Dear Cesar,

Thank you for sharing your essay on set theory operations. Your explanations and examples are clear and well-organized, making it easy for readers to follow along and understand the concepts. It's evident that you have a solid grasp of the topic.

One suggestion would be to include a brief conclusion at the end to summarize the key takeaways or emphasize the importance of set theory in various applications. This can provide a sense of closure to your essay.

Overall, your essay is informative and well-structured. Keep up the excellent work!

92 words

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Re: Discussion Assignment Unit 1

by Jeremiah Bankole - Thursday, 14 September 2023, 3:08 AM

Hello Cesar,

Such an elaborate and well detailed post. It was easy to follow through. Would have loved you to complete the power set though. This was good overall. Keep it up.

Jeremiah.

33 words

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Re: Discussion Assignment Unit 1

by David Kamya - Thursday, 14 September 2023, 3:36 AM

HI ceasar
Great work mate. Well organized and precise to the point.
The use of colors to capture details is also brilliant. The explanations are straight to the point.
see you in the next one.

35 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Sandhya Shah - Thursday, 14 September 2023, 4:58 AM

Hi Cesar, After reviewing your work, I have identified an error in my own. learned from you. thank you for today's discussion assignment. excellent work

25 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Tendo Gloria Namugga - Saturday, 9 September 2023, 12:38 AM

Create three sets A, B having 4 elements in each, and U, a Universal set of any possible number of elements of your interest.

Sets A = {2, 4, 6, 8}, B = {2, 3, 5, 7}, U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

i). A ∪ B
A ∪ B = A or B or (A ∪ B)
= list of elements in A or B or both
= {2, 3, 4, 5, 6, 7, 8}

ii). A ∩ B
A ∩ B = list of elements in A and B
= {2}

iii). (A ∩ B) ∪ U
(A ∩ B) ∪ U = (A ∩ B) or U or ((A ∩ B) ∩ U)
= List of elements in (A and B) or U or in both (A and B) and U
(A ∩ B) = {2}, U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, ((A ∩ B) ∩ U) = {2}
(A ∩ B) ∪ U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

iv). The Power set of A.
Power of set A, P(A) = the set of all subsets of A (Doerr et al, 2022)
A = {2, 4, 6, 8}
P(A) = {∅, {2}, {4}, {5}, {6}, {2, 4}, {2, 6}, {2, 8}, {4, 6}, {4, 8}, {6, 8}, {2, 4, 6}, {2, 4, 8}, {2, 6, 8}, {4, 6, 8}, {2, 4, 6, 8}}

v). A’
A’ = Set of elements that are not in A (Levin, 2021), so we list all the elements in B or in U that are not in A.
= {1, 3, 5, 7, 9, 10}

vi). ∅∩B
∅∩B = Intersection of an empty set and set B; we know that an empty set is a subset for any set. Therefore:
∅∩B = {∅}

vii). A × B
A × B = Set of all possible ordered pairs whose first component comes from A and whose second component comes from B (Doerr et al, 2022)
A = {2, 4, 6, 8}, B = {2, 3, 5, 7}
A × B = {(2, 2), (2, 3), (2, 5), (2, 7), (4, 2), (4, 3), (2, 5), (4, 7),(6, 2), (6, 3), (6, 5), (6, 7),(8, 2), (8, 3), (8, 5), (8, 7)}

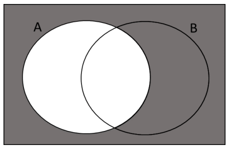
viii). A-B
A - B = set of elements that are in A and not in B
= {4, 6, 8}

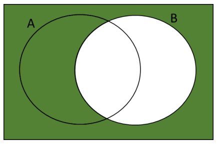
ix). (A − B) ∪ (B − A)
(A − B) = elements in A but not in B = {4, 6, 8}
(B − A) = elements in B but not in A = {3, 5, 7}
(A − B) ∪ (B − A) = {3, 4, 5, 6, 7}

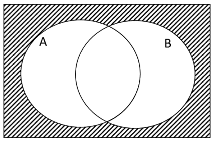
x). Prove any one De Morgan identity for A and B.
De Morgan’s First Law states that the complement of the union of A and B is the same as A complement intersect B complement.
(A∪B)' = A' ∩ B'
(A∪B)' = list of elements that are not in A or B or both A and B
= A' ∩ B'

Using Venn Diagrams

A' B' A' ∩ B'







References
Doerr, A., & Levasseur, K. (2022). Applied discrete structures (3rd ed.). licensed under CC BY-NC-SA

Levin, O. (2021). Discrete mathematics: An open introduction (3rd ed.). licensed under CC 4.0
Mathispower4u. (2022b, June 14).

[Video]. YouTube.

569 words

Rate: Rate...

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Re: Discussion Assignment Unit 1

by Cesar De Macedo - Saturday, 9 September 2023, 5:38 PM

Hello Tendo,

You did a great job covering a lot of ground on sets. However, I have one point to mention:
For the empty set intersecting with B, $\emptyset \cap B$ should equal $\emptyset$, not $\{\emptyset\}$. The empty set is a subset of every set, but the intersection of an empty set with any set is the empty set itself.

Again, great job, and keep it up!
67 words

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Re: Discussion Assignment Unit 1

by Tendo Gloria Namugga - Saturday, 9 September 2023, 6:21 PM

Hello Cesar,
Thank you for your feedback. I understand your argument but, if I may ask, is there a difference between $\emptyset$ and $\{\emptyset\}$? I think they both mean the same thing, an empty set for the first one and a set containing an empty set for the second one. Please let me know your thoughts.
56 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Bhaskar Palit (Instructor) - Tuesday, 12 September 2023, 6:02 PM

Hi Tendo,
I have nothing to comment on as you have solved all of the asked questions perfectly with perfect logical explanation. Well done.

Best,
Bhaskar
26 words

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Re: Discussion Assignment Unit 1
by Yoonsuk Chang - Tuesday, 12 September 2023, 8:37 PM

Hi Tendo Gloria Namugga,

You have correctly identified the properties of these operations and have provided clear examples to illustrate their application. I believe that the discussion provides a clear and accurate explanation of the fundamental concepts in set theory. Thank you for the diagrams and YouTube link information.

49 words

Permalink Show parent

Re: Discussion Assignment Unit 1
by Fatima Qudimat - Wednesday, 13 September 2023, 4:11 PM

Dear Tendo,
Thank you for your contribution to this week's discussion, You did well with your nominated three sets. You have answered all the aspects required with the correct answers, I liked using the Venn Diagram to show the results for better illustration and your APA reference is in all order.
Keep up the good work.
Regards / Fatima

59 words

Permalink Show parent

Re: Discussion Assignment Unit 1
by Martha Chukwudike - Wednesday, 13 September 2023, 5:59 PM

You've done an impressive job of the assignment. keep it up.

11 words

Permalink Show parent

Re: Discussion Assignment Unit 1
by Muhammed Alaa - Thursday, 14 September 2023, 12:20 AM

Dear Tendo,

I appreciate your detailed and well-structured exploration of set operations using sets A, B, and U. Your explanations are clear, and you've effectively demonstrated each operation with examples. Additionally, you provided citations for your definitions, which is a good practice for academic work.

Here are a few suggestions:

When listing elements, consider using braces {} to clearly indicate sets. For example, in section viii), you could write "A - B = {4, 6, 8}" to make it more visually apparent.

In section iv) about the power set of A, you mentioned a reference (Doerr et al., 2022), but it would be helpful to include a full reference list at the end of your work for clarity and to give proper credit.

In section x) where you mention proving a De Morgan's identity, you've stated the law correctly, but you could add a step-by-step proof to demonstrate how it works in practice. This would enhance the completeness of your explanation.

161 words

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Re: Discussion Assignment Unit 1

by Martha Chukwudike - Saturday, 9 September 2023, 2:32 PM

Using *A= {g, w, x, y}   B= {2, 4, 6, 8}   U= {g,w,x,y,2,4,6,8,orange, kiwi, plum}*

i. A ∪ B

Ans:
{g, w, x, y, 2, 4, 6, 8}

ii. A ∩ B

Ans:
{Ø}

iii. (A ∩ B) ∪ U

Ans:
Whenever an empty set is multiplied by a set containing elements, the result is an Empty set
Therefore (A ∩ B) ∪ U = Ø

iv. The Power set of A.

Ans:
P(A) = {(g), (w), (x), (y), (g, w), (g, x), (g, y), (w, x), (w, y), (x, y), (g, w, x, y)}

v. A’

Ans:
{2, 4, 6, 8, orange, kiwi, plum}

vi. ∅∩B

Ans:
{Ø} ∩ B{2, 4, 6, 8} = Ø.

vii. A × B

Ans:
{(g,2), (g,4), (g,6), (g,8), (w,2), (w,4), (w,6), (w,8), (x,2), (x,4), (x,6), (x,8), (y,2), (y,4), (y,6), (y,8)}

viii. A-B

Ans:
{Ø} Empty set

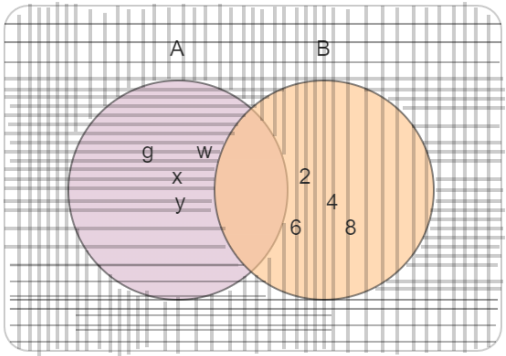
ix. (A − B) ∪ (B − A)

Ans:
{Ø} U {Ø} = Ø.

x. Prove any one De Morgan identity for A and B

Ans:
De Morgan's first law states that the complement of the union of A and B is equal to A-complement intersect B-complement.

Using a Venn Diagram:



$$\overline{A \cup B} = \overline{A} \cap \overline{B}$$

Not (A or B) = Not A and Not B.

Reference

Doerr, A., & Levasseur, K. (2022). *Applied discrete structures* (3rd ed.). licensed under CC BY-NC-SA

220 words

Rate: Rate...

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Re: Discussion Assignment Unit 1

by Michelle Gonzaley - Sunday, 10 September 2023, 5:52 PM

Hello Martha,

I commend your generally correct and well-structured set theory discussion post. You responded to each question as directed and cited a source in APA format. I appreciate how you added the Venn diagram, which helps to illustrate set operations principles.

Your answers are mainly accurate, but there is a minor error in question viii about the subtraction of sets A and B. The solution should be set A minus the components from set B. In this situation, A and B have no members in common, hence A - B should be equal to A, not an empty set.

Your explanation for question iii (A ∩ B) ∪ U, is not totally correct. When an empty set intersects with any other set, the outcome should be an empty set, not necessarily when multiplied. The proper explanation is that the intersection of A and B is an empty set, and when you union an empty set with any set U the outcome is still the same set U. As a result, (A ∩ B) ∪ U = U.

Well done and keep up the good work.

Regards
Michelle
188 words

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Re: Discussion Assignment Unit 1
by Tendo Gloria Namugga - Monday, 11 September 2023, 10:42 PM

Hello Martha Chukwudike,
Thank you for sharing your work. I have a few points to note with some of your answers. For question iii), the answer should be all the elements in U that are also in (A ∩ B) because it is the union of the sets, so the answer should be all the elements in U instead of an empty set. For question viii), the answer should be the elements in A that are not in B and since the two sets do not have any common members, the answer would be all the elements of set A. Lastly for question ix), the answer should include all the elements in A and all the elements in B since both sets have no intersection.
125 words

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Re: Discussion Assignment Unit 1
by Cesar De Macedo - Tuesday, 12 September 2023, 12:00 AM

Hello Martha,

Great job on your detailed exploration of set theory! Your work is easy to follow, well-organized, and accurately tackles complex concepts. I particularly enjoyed your use of a Venn Diagram for demonstrating De Morgan's law, and I am looking forward to learning more from your future posts!
49 words

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Re: Discussion Assignment Unit 1
by Yoonsuk Chang - Tuesday, 12 September 2023, 8:42 PM

Hi Martha Chukwudike,

The discussion information you have provided for the set operations looks great. The explanations are also clear and concise. The Venn diagram proof is helpful in visualizing the relationship between the sets involved.
36 words

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Re: Discussion Assignment Unit 1
by Ssenyange Joshua - Wednesday, 13 September 2023, 9:50 AM

Martha, your explanations and calculations regarding set operations are concise and accurate. Your use of symbols like Ø and the inclusion of a De Morgan's Law illustration through a Venn diagram make your response clear and visually helpful. The reference adds credibility to your work. Well done!
47 words

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Re: Discussion Assignment Unit 1
by Bhaskar Palit (Instructor) - Wednesday, 13 September 2023, 10:54 AM

Hi Martha,

I have nothing to comment on as you have solved all of the asked questions perfectly with perfect logical explanations except Q(iii), as if you take a union of any set with the universal set you will only get the universal one. Another advice I will give you is to solve De Morgan's law by using logic or the Venn Diagram instead of using your example.

Best,
Bhaskar
70 words

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Re: Discussion Assignment Unit 1
by Muhammed Alaa - Saturday, 9 September 2023, 4:15 PM

Creating sets A, B, and U as instructed:

A = {q, a, s, w}
B = {0, 9, 8, 7}
C = {q, a, s, w, 0, 9, 8, 7, blue, red, green}

i. A ∪ B (Union of A and B):
A ∪ B = {q, a, s, w} ∪ {0, 9, 8, 7} = {q, a, s, w, 0, 9, 8, 7}

ii. A ∩ B (Intersection of A and B):
A ∩ B = {q, a, s, w} ∩ {0, 9, 8, 7} = {} (empty set, as there are no common elements)

iii. (A ∩ B) ∪ C (Union of the intersection of A and B with C):
(A ∩ B) ∪ C = ({} ∪ C) = C = {q, a, s, w, 0, 9, 8, 7, blue, red, green}

iv. Power set of A (P(A)):
P(A) is the set of all subsets of A. A has 4 elements, so P(A) will have 2^4 = 16 subsets. Listing them all would be extensive, but here's an example of a few: {}, {q}, {a}, {s}, {w}, {q, a}, {q, s}, {q, w}, {a, s}, {a, w}, {s, w}, {q, a, s}, {q, a, w}, {q, s, w}, {a, s, w}, {q, a, s, w}

v. A' (Complement of A):
A' = U - A = {0, 9, 8, 7, blue, red, green}

vi. ∅ ∩ B (Intersection of the empty set with B):
∅ ∩ B = {} (empty set, as there are no elements in the intersection)

vii. A × B (Cartesian Product of A and B):
A × B is the set of all possible ordered pairs (a, b) where a is from A and b is from B. In this case, it would be a set of 16 ordered pairs.

viii. A - B (Set difference of A and B):
A - B = {q, a, s, w} - {0, 9, 8, 7} = {q, a, s, w}

ix. (A - B) ∪ (B - A) (Symmetric Difference of A and B):
(A - B) ∪ (B - A) = ({q, a, s, w} - {0, 9, 8, 7}) ∪ ({0, 9, 8, 7} - {q, a, s, w}) = {q, a, s, w} ∪ {0, 9, 8, 7} = {q, a, s, w, 0, 9, 8, 7}

x. De Morgan's Identity (A ∪ B)' = A' ∩ B':
De Morgan's law states that the complement of the union of two sets is equal to the intersection of their complements. In this case, (A ∪ B)' = A' ∩ B'.
427 words

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Re: Discussion Assignment Unit 1

by Michelle Gonzaley - Sunday, 10 September 2023, 3:21 AM

Hello Muhammed,

I commend your clear and understandable discussion post. You have created sets A, B, and U as instructed and correctly performed the set operations. Your description of the sets and operations appears excellent, showcasing you have a solid grasp of set theory concepts!

Continue to do excellent work.

Regards
Michelle

52 words

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Re: Discussion Assignment Unit 1

by Bhaskar Palit (Instructor) - Wednesday, 13 September 2023, 10:59 AM

Hi Alaa,
I have nothing to comment on as you have solved all of the asked questions perfectly with perfect logical explanation. Well done.

Best,
Bhaskar

26 words

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Re: Discussion Assignment Unit 1

by Fatima Qudimat - Wednesday, 13 September 2023, 4:14 PM

Dear Muhammed,
Thank you for your contribution to this week's discussion, You did well with your nominated three sets. You have answered all the aspects required with the correct answers, I liked your illustration of each part of this assignment you did an excellent job this week. Keep up the good work.
Regards / Fatima

55 words

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Re: Discussion Assignment Unit 1

by Conrad Bara-Mason - Wednesday, 13 September 2023, 6:47 PM

Hey Muhammed!
Your explanations and calculations for set operations and De Morgan's law are accurate and clear. Nice work!

19 words

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Re: Discussion Assignment Unit 1

by Sandhya Shah - Thursday, 14 September 2023, 5:36 AM

Hello Mohammad, I like how well-organized and thorough your discussion post is. It answers all of the questions about sets A, B, and the universal set U. Your explanations are clear and simple. Good job

35 words

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Re: Discussion Assignment Unit 1

by Azzam Abo Dakka - Sunday, 10 September 2023, 12:21 AM

Hello, my friends:
let's consider the following sets:

- Set A = {apple, banana, cherry, date}
- Set B = {1, 2, 3, 4}
- Universal Set U = {apple, banana, cherry, date, 1, 2, 3, 4, mango, orange, papaya}

Now let's answer the questions:

i. A ∪ B: This is the union of sets A and B. It includes all elements that are in A or in B or in both. So A ∪ B = {apple, banana, cherry, date, 1, 2, 3, 4}

ii. A ∩ B: This is the intersection of sets A and B. It includes all elements that are common to both A and B. Since there are no common elements in A and B, A ∩ B = ∅

iii. (A ∩ B) ∪ U: This is the union of the intersection of sets A and B with the universal set U. Since A ∩ B = ∅, (A ∩ B) ∪ U = U

iv. The Power set of A: The power set of a set is the set of all possible subsets of the set. The power set of A would be {∅, {apple},{banana},{cherry},{date},{apple,banana},{apple,cherry},{apple,date},...,{apple,banana,cherry,date}}

v. A': This is the complement of set A with respect to the universal set U. It includes all elements that are in U but not in A. So A' = {1, 2, 3, 4, mango, orange, papaya}

vi. ∅∩B: This is the intersection of an empty set with set B. Since an empty set has no elements to intersect with B, ∅∩B = ∅

vii. A × B: This is the Cartesian product of sets A and B. It includes all ordered pairs where the first element is from A and the second element is from B.

viii. A-B: This is the difference of sets A and B. It includes all elements that are in A but not in B. Since there are no common elements in A and B to subtract from A, A-B = A

ix. (A − B) ∪ (B − A): This is the symmetric difference of sets A and B. It includes all elements that are in either of the sets but not in their intersection.

x. De Morgan's Law states that for any two sets A and B: (A ∪ B)' = A' ∩ B' and (A ∩ B)' = A' ∪ B'. Let's prove the first identity:

(A ∪ B)' means we take the complement of the union of sets A and B with respect to U.
A' ∩ B' means we take the intersection of the complements of sets A and B with respect to U.
Since both expressions result in a set that includes all elements that are in U but not in either A or B or both (i.e., neither in their union), we can say that (A ∪ B)' = A' ∩ B'. Hence proved.
References:
1- Doerr, A., & Levasseur, K. (2022). Applied discrete structures (3rd ed.). licensed under CC BY-NC-SA

2- Levin, O. (2021). Discrete mathematics: An open introduction (3rd ed.). licensed under CC 4.0

3- Mathispower4u. (2022b, June 14). De Morgan's laws with Venn diagrams [Video]. YouTube.
Here you will learn the De Morgan's laws for union and intersection.
535 words

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Re: Discussion Assignment Unit 1

by Michelle Gonzaley - Sunday, 10 September 2023, 2:28 AM

Hello Azzam,

I applaud your well-structured discussion post which provides a comprehensive and accurate answer to the questions about sets A, B, and the universal set U. Your answers are correct, and the explanations are clear and easy to understand.

Well done and keep up the good work!

Regards
Michelle

50 words

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Re: Discussion Assignment Unit 1

by Uzoma Nguzo - Tuesday, 12 September 2023, 11:04 PM

Hello Azzam, Nice presentation. Set theory is a foundational branch of mathematics that deals with collections of objects, which are called "sets." It provides a formal framework for describing and manipulating these collections.

33 words

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1302-01- Discrete Mathematics Discussion Assignment Unit 1

by Michelle Gonzaley - Sunday, 10 September 2023, 1:50 AM

1302-01 Discrete Mathematics

Discussion Assignment Unit 1

I. **A** ∪ **B** - **Union of Sets A and B** - If set A = {x, y, z, w} and set B = {1, 2, 3, 4}, then the union of A and B (A ∪ B) would be {x, y, z, w, 1, 2, 3, 4}. This represents all unique elements in both sets A and B.

II. **A ∩ B** - **Intersection of Sets A and B** - Using the same sets A and B, the intersection of A and B (A ∩ B) would be an empty set {}, as there are no common elements between these two sets.

III. **(A ∩ B)** ∪ **U** - **Union of Intersection of A and B with U** - The intersection of A and B is an empty set, so (A ∩ B) is {}. When you take the union of this empty set with the universal set U, it remains {}. This means there are no additional elements added to the empty set.

IV. **The Power Set of A** - **The power set of A, denoted as P(A),** is the set of all possible subsets of A, including the empty set and A itself. If A = {x, y, z, w}, the power set of A would be {{}, {x}, {y}, {z}, {w}, {x, y}, {x, z}, {x, w}, {y, z}, {y, w}, {z, w}, {x, y, z}, {x, y, w}, {x, z, w}, {y, z, w}, {x, y, z, w}}.

V. **A'** - **Complement of Set A** - A' represents the complement of set A, which contains all elements not in A but in the universal set U. If U = {x, y, z, w, 1, 2, 3, 4, apples, mangoes, avocados}, then A' = {1, 2, 3, 4, apples, mangoes, avocados}.

VI. ∅ **∩ B** - **Intersection of Empty Set with Set B** - The intersection of an empty set with any other set is always an empty set, so ∅ ∩ B = {}.

VII. **A × B** - **Cartesian Product of Sets A and B** - The Cartesian product of sets A and B is the set of all possible ordered pairs where the first element is from A and the second element is from B. If A = {x, y, z, w} and B = {1, 2, 3, 4}, then A × B = {(x, 1), (x, 2), (x, 3), (x, 4), (y, 1), (y, 2), (y, 3), (y, 4), (z, 1), (z, 2), (z, 3), (z, 4), (w, 1), (w, 2), (w, 3), (w, 4)}.

VIII. **A - B** -**Set Difference of A and B** - A-B is the set of elements that are in A but not in B. If A = {x, y, z, w} and B = {1, 2, 3, 4}, then A - B = {x, y, z, w}.

IX. **(A - B) ∪ (B - A)** -**Union of Set Differences** (A - B) is {x, y, z, w}, and (B - A) is {1, 2, 3, 4}. The union of these sets is {x, y, z, w, 1, 2, 3, 4}, which includes all elements that are either in A but not in B or in B but not in A.

X. **De Morgan's Identity for A and B** - De Morgan's laws describe the complement of a union and the complement of an intersection. One of these laws is: A' ∪ B' = (A ∩ B)'

Using the previously defined sets, I have A' = {1, 2, 3, 4, apples, mangoes, avocados}, B' = {x, y, z, w}, and (A ∩ B)' = {x, y, z, w}. Therefore, A' ∪ B' = {1, 2, 3, 4, apples, mangoes, avocados} ∪ {x, y, z, w} = {1, 2, 3, 4, apples, mangoes, avocados, x, y, z, w}, which is the complement of (A ∩ B).

Word Count: 638

References:

Al Doerr., & Levasseur, K. (2022). "Applied Discrete Structures," 3rd edition. Licensed under CC BY-NC-SA. Retrieved from: https://discretemath.org/ads/colophon-1.html

Jamaloodeen, M., Pinzon, K., Pragel, D., Roberts, J., & Siva, S. (2021). "Discrete Math," 3rd edition. Licensed under CC BY-NC. Retrieved from: https://ggc-discrete-math.github.io/index.html#_about_this_text

Levin, O. (2021). "Discrete Mathematics: An Open Introduction," 3rd edition. Licensed under CC 4.0. Retrieved From: https://discrete.openmathbooks.org/dmoi3/frontmatter.html

707 words

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Re: 1302-01- Discrete Mathematics Discussion Assignment Unit 1
by Benard Wesonga Wasike - Sunday, 10 September 2023, 10:46 AM

Hi Michelle Gonzaley,
Thank you for your contribution to this week's Discussion forum. Your work is easy to understand, neatly organized, and very informative. I was able to grasp a better image of the Set as applied in really life scenarios that were explained in this week's assignment upon going through your post. Great use of reference as well.
59 words

Permalink Show parent

Re: 1302-01- Discrete Mathematics Discussion Assignment Unit 1
by Azzam Abo Dakka - Monday, 11 September 2023, 12:43 AM

Hello Michelle,
You did a great job and a wonderful explanation of the concepts, and it was great to follow through. Thank you for your efforts in this discussion and I wish you success.
34 words

Permalink Show parent

Re: 1302-01- Discrete Mathematics Discussion Assignment Unit 1
by Uzoma Nguzo - Tuesday, 12 September 2023, 11:01 PM

Hi Michelle, Good work. Thanks for your explanation. Understanding sets, their operations, and the symbols used are crucial for building a solid foundation in mathematics and various other fields reliant on set theory.
33 words

Permalink Show parent

Re: 1302-01- Discrete Mathematics Discussion Assignment Unit 1
by Bhaskar Palit (Instructor) - Wednesday, 13 September 2023, 11:00 AM

Hi Michelle,

I have nothing to comment on as you have solved all of the asked questions perfectly with perfect logical explanations except Q(iii), as if you take a union of any set with the universal set you will only get the universal one. Another piece of advice I will give you is to solve De Morgan's law by using logic or the Venn Diagram instead of using your example.

Best,
Bhaskar
72 words

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Re: Discussion Assignment Unit 1
by Benard Wesonga Wasike - Sunday, 10 September 2023, 9:14 AM

According to Levin, O. (2021). A set theory from my own understanding I can say that this is a branch of mathematics that mostly deals with the properties of well-defined. In order to explain this we will apply the example given by the Grocery store that needs to be analyzed the behavior of their customers. We find that in order to solve this concept, we need to apply the concept of sets in order to identify the customers who buy items from different categories. From there is when we will be able to come up with customers who bought a lot items from different categories and the most popular items from different categories. Once this has been established, is when we can come up with the conclusion from the observation collected.

So creating the three sets A, B, and U. We consider A={5,6,7,8}, B = { v, w, x, y} and U= { 5,6,7,8, v,w,x,y b,c,d }. Levin, O. (2021).

i. A ∪ B -this show union, it implies that all elements that are in A and also in B. so for this answer it will be A ∪ B = {5, 6, 7, 8, v, w, x, y}. Levin, O. (2021).

ii. A ∩ B -this shows the intersection, this shows all elements that are in both A and B, so in this example we find nothing. Now the answer will be A ∩ B = ∅ this show an empty set where there is no element that exist between A and B. Levin, O. (2021).

iii. (A ∩ B) ∪ **U.** This it exist the intersection, and remember that in example ii, we find that (A ∩ B) it was an empty set which had a symbol ∅. So to find the union of the set (A ∩ B) ∪ U = (5, 6, 7, 8, v, w,x,y). Mathispower4u. (2022g, June 23).

iv. The Power set of A. these indicates all subsets of A. including the empty sets and itself. So in this case the power set of A is {{}, {5}, {6}, {7}, {8}, {5, 6}, {5, 7}, {5, 8}, {6, 7}, {6, 8}, {7, 8}, {5, 6, 7}, {5, 6, 8}, {5, 7, 8}, {6, 7, 8}, {5, 6, 7, 8}}. Levin, O. (2021).

v. A’ -This is the complement of a set A is the set of all elements that are not found in A. Therefore, A’ = {v, w, x, y}. Levin, O. (2021).

vi. ∅∩B –in this case we can say that the intersection of any set with the empty set is always the empty set. Therefore, ∅∩B = ∅. Levin, O. (2021).

vii. A × B – These indicates that Cartesian product of two sets A and B is the set of all ordered pairs (v, w) where v is in A and w is in B. Therefore, A × B = {(1, v), (1, w), (1, x), (1, y), (2, v), (2, w), (2, x), (2, w), (3, v), (7, w), (7, x), (7, y), (8, v), (8, w), (8, x), (8, w)}. Mathispower4u. (2022d, June 14).

viii. A-B – These indicates the set difference of two sets A and B is the set of all elements that are in A but not in B. Therefore, A-B = {5, 6, 7, 8}. Doerr, A., & Levasseur, K. (2022).

ix. (A − B) ∪ **(B − A)** - This is the symmetric difference of A and B, which is the set of all elements that are in A or in B, but not in both. Therefore, (A − B) ∪ (B − A) = {5, 6, 7, 8, v, w, x, y}. Doerr, A., & Levasseur, K. (2022).

x. Prove any one De Morgan identity for A and B. – According to Mathispower4u. (2022b, June 14). The law states that the complement of the union of two sets is equal to the intersection of their complements, and the complement of the intersection of two sets is equal to the union of their complements.

That is, (A ∪ B)’ = A’ ∩ B’ and (A ∩ B)’ = A’ ∪ B’.

I can prove it by saying

(A ∪ B)’ = {x | x ∉ (A ∪ B)} = {x | x ∉ A and x ∉ B} = {x | x ∈ A’ and x ∈ B’} = A’ ∩ B’

In summary I can say that based on the observation that I have met is that set theory is the most important and more powerful tool that has numerous areas where it can be used in the real world cases. Through the use of sets I can say that creating sets and performing operations on them, it helps us to gain insights into difficult systems and come up with better decision from the assumption made. Doerr, A., & Levasseur, K. (2022).

References

Doerr, A., & Levasseur, K. (2022). Applied discrete structures (3rd ed.). licensed under CC BY-NC-SA.

Levin, O. (2021). Discrete mathematics: An open introduction (3rd ed.). licensed under CC 4.0.

Mathispower4u. (2022b, June 14). De Morgan’s laws with venn diagrams [Video]. YouTube.

Mathispower4u. (2022d, June 14). The cartesian product of two sets [Video]. YouTube.

Mathispower4u. (2022f, June 23). Determine the greatest and least values of the cardinality of an intersection and union [Video]. YouTube.

Mathispower4u. (2022g, June 23). The cardinality of the union of three sets application: TV shows [Video]. YouTube.

898 words

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Re: Discussion Assignment Unit 1

by Azzam Abo Dakka - Monday, 11 September 2023, 12:41 AM

Hello Benard,
Excellent work. Thank you for your efforts in this discussion. I wish you success.

16 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Tendo Gloria Namugga - Monday, 11 September 2023, 11:06 PM

Hello Benard,
Well done on your assignment, you answered all the questions and included references for your citations. I have a few things to point out, for question iii), I agree with the explanation but you did not include all the elements of set U, so the answer should have been {5, 6, 7, 8, v, w, x, y, b, c, d}. Question v) should have included the elements in U that are not in A as well so, {v, w, x, y, b, c, d}. Thank you.

88 words

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Re: Discussion Assignment Unit 1

by Uzoma Nguzo - Sunday, 10 September 2023, 10:52 PM

I will establish three sets, A, B, and U, and then use these sets to explain the answers to the presented questions. Set theory is a fundamental mathematical topic with practical applications, such as evaluating customer purchase behavior in a supermarket.

Making the Sets:

Let us first define three sets:

• Set A: A = {x, y, z, w}

• Set B: B = {1, 2, 3, 4}

• Universal Set U: U= (x, y, z, w, 1, 2, 3, 4, apples, oranges, bananas)

Let us now address the following questions:

i. A ∪ B (Union of Sets A and B): A ∪ B represents the union of sets A and B, which includes all unique elements from both sets. In this case, A ∪ B = {x, y, z, w, 1, 2, 3, 4}.

ii. A ∩ B (Intersection of Sets A and B): A ∩ B represents the intersection of sets A and B, which includes elements that are common to both sets. In this case, A ∩ B = ∅ (empty set) since there are no common elements between A and B.

iii. (A ∩ B) ∪ U (Union of the Intersection of A and B with U): First, we calculate the intersection of A and B, which is ∅. Then, we take the union of ∅ with U, resulting in U itself. Therefore, (A ∩ B) ∪ U = U.

iv. The Power set of A: The power set of a set A, denoted as P(A), includes all possible subsets of A, including the empty set and the set itself. For set A = {x, y, z, w}, the power set P(A) = {∅, {x}, {y}, {z}, {w}, {x, y}, {x, z}, {x, w}, {y, z}, {y, w}, {z, w}, {x, y, z}, {x, y, w}, {x, z, w}, {y, z, w}, {x, y, z, w}}.

v. A' (Complement of Set A): The complement of set A, denoted as A', includes all elements that are in the universal set U but not in A. In this case, A' = {1, 2, 3, 4, apples, oranges, bananas}.

vi. ∅∩B (Intersection of the Empty Set and B): The intersection of the empty set ∅ with any set results in the empty set itself. Therefore, ∅∩B = ∅.

vii. A × B (Cartesian Product of Sets A and B): The Cartesian product of sets A and B consists of all possible ordered pairs, where the first element is from A, and the second element is from B. In this case, A × B = {(x, 1), (x, 2), (x, 3), (x, 4), (y, 1), (y, 2), (y, 3), (y, 4), (z, 1), (z, 2), (z, 3), (z, 4), (w, 1), (w, 2), (w, 3), (w, 4)}.

viii. A-B (Set Difference between A and B): The set difference A - B includes all elements that are in A but not in B. In this case, A - B = {x, y, z, w} since all elements of A are not in B.

ix. (A − B) ∪ (B − A) (Union of Set Differences): This operation includes elements that are in either A but not in B or in B but not in A. In this case, (A − B) ∪ (B − A) = {x, y, z, w} ∪ {1, 2, 3, 4} = {x, y, z, w, 1, 2, 3, 4}.

x. De Morgan Identity for A and B (One of the De Morgan Laws): The De Morgan Laws state that the complement of the union of two sets is equal to the intersection of their complements, and the complement of the intersection of two sets is equal to the union of their complements. Mathematically, it can be represented as:

• Complement of (A ∪ B) = A' ∩ B'

• Complement of (A ∩ B) = A' ∪ B'

These laws are useful in set operations, logic, and computer science.

In conclusion, set theory is essential to mathematics and has practical applications in domains such as data analysis, logic, and computer technology. Understanding set operations and mathematical notations is critical for tackling real-world problems such as analyzing client purchase behavior in a supermarket.

696 words

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Re: Discussion Assignment Unit 1

by Azzam Abo Dakka - Monday, 11 September 2023, 12:39 AM

Hello Uzoma,
Thank you for this wonderful discussion and well-done work. It was easy to understand the explanation provided. I wish you success.

23 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Martha Chukwudike - Wednesday, 13 September 2023, 6:03 PM

An effective demonstration of the discussion assignment, thanks for sharing.

10 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Muhammad Fawad Alam - Thursday, 14 September 2023, 2:04 AM

Uzoma,
A very well written explanation to the answers. You have showed that you understand Set Theory and Notation. Well done!

21 words

Permalink Show parent

Re: Discussion Assignment Unit 1

by Faied Jamil - Monday, 11 September 2023, 8:48 PM

For my post, I define the sets A and B as follow:
A = {white, rye, sourdough, multigrain}
B = {yogurt, milk, cheese, butter}

Thus, in line with the forum question:
U = {white, rye, sourdough, multigrain, yogurt, milk, cheese, butter, apples, mangoes, avocados}

My explanation in line with the elements of sets A, B and U as stated above are as follow:

i. A ∪ B = {white, rye, sourdough, multigrain, yogurt, milk, cheese, butter}
Literally means the union of A and B and this will be a **full combination of every element** in both A and B.

ii. A ∩ B = ∅
Literally means the intersection of A and B and this should consist of elements which are common to both A and B. Since both A and B have no common elements, the answer is an **empty set**.

iii. (A ∩ B) ∪ U = {white, rye, sourdough, multigrain, yogurt, milk, cheese, butter, apples, mangoes, avocados}
The answer is the set U itself since the union of an empty set with any set, in this case set U, is **the set itself**.

iv. The Power set of A = P(A) = { {}, {white}, {rye}, {sourdough}, {multigrain}, {white, rye}, {white, sourdough}, {white, multigrain}, {rye, sourdough}, {rye, multigrain}, {sourdough, multigrain}, {white, rye, sourdough}, {white, rye, multigrain}, {white, sourdough, multigrain}, {rye, sourdough, multigrain}, {white, rye, sourdough, multigrain} }
It is defined as the set of **all possible subsets** of A and there are **16** elements in it since the number of elements in a power set is equal to 2^n, where n is the number of elements in the original set.

v. A' = U - A = {yogurt, milk, cheese, butter, apples, mangoes, avocados}
Literally means the complement of A or those **elements not within A** which naturally consist of all elements of B as well.

vi. ∅ ∩ **B =** ∅
The result is an **empty set** since the empty set on the left has **nothing in common** with B.

vii. A × B = {(white, yogurt), (white, milk), (white, cheese), (white, butter), (rye, yogurt), (rye, milk), (rye, cheese), (rye, butter), (sourdough, yogurt), (sourdough, milk), (sourdough, cheese), (sourdough, butter), (multigrain, yogurt), (multigrain, milk), (multigrain, cheese), (multigrain, butter)}
This means the set of all possible **ordered pairs** where the first element is from A and the second element is from B.

viii. A - B = {white, rye, sourdough, multigrain}
This results in all elements of A that are **in A but not in B**. In this case, it is all elements of A since A and B have no common elements.

ix. (A − B) ∪ **(B − A) = {white, rye, sourdough, multigrain, yogurt, milk, cheese, butter}**
This results in full **union of the difference elements** in both A and B. For this case, it is a simple union of A and B.

x. Prove any one De Morgan identity for A and B.
Let us consider the law **(A ∪ B)' = A' ∩ B'** and use our examples above to work out the proving.
Based on our defined elements of sets A, B and U:
Step 1 => **(A ∪ B)' = {apples, mangoes, avocados}**
Step 2 => A’ = U - A = {yogurt, milk, cheese, butter, apples, mangoes, avocados}
Step 3 => B’ = U - B = {white, rye, sourdough, multigrain, apples, mangoes, avocados}
Step 4 => **A' ∩ B' = {apples, mangoes, avocados}**
Thus, from steps 1 and 4, we deduce that **(A ∪ B)' = A' ∩ B'** (proven).

~579 words

References

Kirk, D. (2023, April 17). *Contemporary Mathematics*. OpenStax. Retrieved September 7, 2023, from https://openstax.org/details/books/contemporary-mathematics

610 words

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Re: Discussion Assignment Unit 1

by Jacques Joseph Panikkassary - Tuesday, 12 September 2023, 3:05 AM

Congratulations on your well-structured essay on set theory! It's clear that you've put effort into explaining various set operations using specific examples, and you've done an excellent job of breaking down the concepts for your readers.

Your essay is informative and concise, making it easy to understand the different operations such as union, intersection, complement, Cartesian product, and De Morgan's Law. Additionally, you've used a practical example involving types of cars and a universal set, which makes the concepts more relatable and accessible to your audience.

I appreciate that you've included a reference list to give credit to the sources you consulted, which adds credibility to your essay.

Overall, your essay effectively communicates the fundamentals of set theory and its applications. It provides a clear and structured explanation of the topic, making it a valuable resource for anyone looking to understand this mathematical concept better. Great job!

147 words

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Re: Discussion Assignment Unit 1
by Muhammad Fawad Alam - Thursday, 14 September 2023, 1:58 AM

Faied,
A very well written response to answer the questions and show your understanding on Set Theory and Notation. I also enjoyed how you formatted it as it made it easy to read. Well done!
35 words

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Re: Discussion Assignment Unit 1
by Jeremiah Bankole - Thursday, 14 September 2023, 3:20 AM

Hello Faied,

You have given a very elaborate response. You covered all required questions and gave the right answers backed up by accurate assessment. Well done. Keep it up. Good job with the reference provided. Thanks for your contribution.

Jeremiah.
40 words

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Re: Discussion Assignment Unit 1
by Jacques Joseph Panikkassary - Tuesday, 12 September 2023, 2:45 AM

Certainly, let's create new sets A, B, and U with different elements and then address the questions:

1. Sets A, B, and U:
- A = {red, blue, green, yellow}
- B = {circle, square, triangle, hexagon}
- U = {red, blue, green, yellow, circle, square, triangle, hexagon, star, diamond, oval}

Now, let's answer the questions:

i. A ∪ B (Union of A and B):
- A ∪ B = {red, blue, green, yellow, circle, square, triangle, hexagon}
This set contains all unique elements from both A and B.

ii. A ∩ B (Intersection of A and B):
- A ∩ B = ∅
There are no common elements between A and B.

iii. (A ∩ B) ∪ U (Union of the Intersection of A and B with U):
- (A ∩ B) ∪ U = U
Since the intersection of A and B is empty, this union with U will be equal to U itself.

iv. The Power set of A:
- The Power set of A, denoted as P(A), contains all possible subsets of A, including the empty set and A itself. It includes 2^4 = 16 subsets.

v. A' (Complement of A with respect to U):
- A' = {circle, square, triangle, hexagon, star, diamond, oval}
A' contains all elements in U that are not in A.

vi. ∅∩B (Intersection of the empty set with B):
- ∅∩B = ∅
The intersection with an empty set always results in an empty set.

vii. A × B (Cartesian Product of A and B):
- A × B = {(red, circle), (red, square), (red, triangle), (red, hexagon), (blue, circle), (blue, square), (blue, triangle), (blue, hexagon), (green, circle), (green, square), (green, triangle), (green, hexagon), (yellow, circle), (yellow, square), (yellow, triangle), (yellow, hexagon)}

viii. A - B (Set difference of A and B):
- A - B = {red, blue, green, yellow}
This includes all elements in A that are not in B.

ix. (A - B) ∪ (B - A) (Union of Set differences):
- (A - B) ∪ (B - A) = {red, blue, green, yellow} ∪ {circle, square, triangle, hexagon} = {red, blue, green, yellow, circle, square, triangle, hexagon}

x. De Morgan Identity for A and B:
- De Morgan's Law states that (A ∪ B)' = A' ∩ B' and (A ∩ B)' = A' ∪ B'.
Let's prove (A ∪ B)' = A' ∩ B':
(A ∪ B)' = {circle, square, triangle, hexagon, star, diamond, oval}
A' ∩ B' = {circle, square, triangle, hexagon, star, diamond, oval}
Both sides are equal, which confirms De Morgan's Law for this case.

These sets and their operations illustrate the concepts of set theory in a different context.
448 words

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Re: Discussion Assignment Unit 1
by Jacques Joseph Panikkassary - Tuesday, 12 September 2023, 3:03 AM

i forgot to put the references.References:

Al Doerr., & Levasseur, K. (2022). "Applied Discrete Structures," 3rd edition. Licensed under CC BY-NC-SA. Retrieved from: https://discretemath.org/ads/colophon-1.html

Jamaloodeen, M., Pinzon, K., Pragel, D., Roberts, J., & Siva, S. (2021). "Discrete Math," 3rd edition. Licensed under CC BY-NC. Retrieved from: https://ggc-discrete-math.github.io/index.html#_about_this_text

Levin, O. (2021). "Discrete Mathematics: An Open Introduction," 3rd edition. Licensed under CC 4.0. Retrieved From: https://discrete.openmathbooks.org/dmoi3/frontmatter.html
64 words

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Re: Discussion Assignment Unit 1
by Muhammad Fawad Alam - Thursday, 14 September 2023, 1:54 AM

Jacques,
You managed to show that you understand Set Theory and notation. Well done!
14 words

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Re: Discussion Assignment Unit 1
by Ozioma Nwobodo - Tuesday, 12 September 2023, 2:22 PM

In this unit, you have learned about the fundamental concepts of set theory, operations, and mathematical notations. Before you start with the discussion assignment, you need to know the importance of set theory in the real world to help you build upon this knowledge. Here is an example that will help you understand its importance:

Consider a grocery store where customers can purchase items from a wide range of categories like fruits, vegetables, dairy, bakery, etc. The store wants to analyze the purchasing behavior of its customers and determine the most popular items in each category. They can use set theory to create sets of customers who purchase items from each category and then find the intersection of these sets to determine which customers purchase items from multiple categories.

Now, engage in a discussion with your peers by completing the following task and posting it in the discussion forum:

Create three sets A, B having 4 elements in each, and U, a Universal set of any possible number of elements of your interest. (For example, you can consider the sets A = {a, b, c, d}, B = {1, 2, 3, 4} and U = {a, b, c, d, 1, 2, 3, 4, apples, mangoes, avocados}.

Note: Do not use the same examples. Create your own sets by changing the numbers and letters.)

Then explain the answers to the following questions to your peers:

i. A ∪ ***B***

ii. A ∩ ***B***

iii. (A ∩ ***B)*** ∪ ***U***

iv. The Power set of A.

v. A′

vi. ∅∩***B***

vii. A × B

viii. A-B

ix. (A − B) ∪ ***(B − A)***

x. Prove any one De Morgan identity for A and B.

Your Discussion should be a minimum of 200 words in length.

Use APA citations and references for the textbook and any other sources used; refer to the [UoPeople APA Tutorials in the LRC] for help with APA.

ANSWER

Set theory, a foundational concept in mathematics, finds extensive practical use in real-world scenarios. To illustrate, consider a grocery store aiming to analyze customer purchasing behavior. Employing set theory, the store can form sets of customers for each product category, then identify overlaps to pinpoint those who buy from multiple categories. This data aids in determining popular items per category and informs decisions regarding inventory management and marketing strategies (Doerr & Levasseur, 2022).

Now, let's define three sets:

Set A = {city1, city2, city3, city4}, Set B = {warehouseA, warehouseB, warehouseC, warehouseD}, and

Set U = {city1, city2, city3, city4, warehouseA, warehouseB, warehouseC, warehouseD, portX, portY, portZ}.

i. A ∪ B: The union of sets A and B combines all unique elements, representing all possible destinations for deliveries. Therefore,

A ∪ B = {city1, city2, city3, city4, warehouseA, warehouseB, warehouseC, warehouseD}.

ii. A ∩ B: The intersection of sets A and B, in this context, would represent any cities that also have a warehouse. This could be an empty set (∅) if the company's warehouses are located separately from the cities.

iii. (A ∩ B) ∪ U: After finding the intersection of A and B (which might be ∅), the union with U restores all elements in U, representing all possible destinations, including cities, warehouses, and ports.

Therefore,

(A ∩ B) ∪ U = {city1, city2, city3, city4, warehouseA, warehouseB, warehouseC, warehouseD, portX, portY, portZ}.

iv. Power set of A: The power set of A includes all subsets of A, including the set itself and the empty set.

The power set of A would be {{}, {city1}, {city2}, {city3}, {city4}, {city1, city2}, {city1, city3}, {city1, city4}, {city2, city3}, {city2, city4}, {city3, city4}, {city1, city2, city3}, {city1, city2, city4}, {city1, city3, city4}, {city2, city3, city4}, {city1, city2, city3, city4}}.

v. A': The complement of A would include all elements not present in A, which, in this context, could be warehouses and ports (Levin, 2021).

Hence, A' = {warehouseA, warehouseB, warehouseC, warehouseD, portX, portY, portZ}.

vi. ∅∩B: The intersection of an empty set (∅) with any set, such as set B, always results in an empty set (∅).

vii. A × B: The Cartesian product of A and B would represent all possible combinations of cities and warehouses.

For example, {(city1, warehouseA), (city1, warehouseB), ..., (city4, warehouseD)}.

viii. A - B: The set difference of A and B would represent cities that don't have warehouses, which might be the case for certain cities. This would yield a set like {city1, city2, city3, city4}.

ix. (A - B) ∪ (B - A): This is the symmetric difference of A and B, encompassing elements found in either A or B, but not both. In this context, it could represent cities that have warehouses but not ports, and vice versa (Levin, 2021).

x. De Morgan's Law: In this logistics scenario, De Morgan's Law might not have a direct application. However, in a different context, it could be relevant. For instance, if we were considering the complement of the union of two routes, it would be equivalent to the intersection of their complements, representing destinations not covered by either route.

In conclusion, set theory proves invaluable in optimizing logistical operations. Through the strategic arrangement and analysis of sets, companies can make data-driven decisions that enhance efficiency, reduce costs, and ultimately improve customer satisfaction (Doerr & Levasseur, 2022).

Reference:

Doerr, A., & Levasseur, K. (2022). *Applied discrete structures (3rd ed.)*. licensed under CC BY-NC-SA https://my.uopeople.edu/pluginfile.php/1775382/mod_book/chapter/460460/Doerr_Text.pdf

Levin, O. (2021). *Discrete mathematics: An open introduction (3rd ed.)*. licensed under CC 4.0 https://my.uopeople.edu/pluginfile.php/1775382/mod_book/chapter/460460/Levin_Text.pdf

914 words

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Re: Discussion Assignment Unit 1

by Yoonsuk Chang - Tuesday, 12 September 2023, 8:45 PM

Hi Ozioma Nwobodo,

The discussion of the grocery store scenario successfully demonstrates how set theory can be used to analyze customer behavior and improve business strategies. The sets you created for cities, warehouses, and ports also clearly illustrate how these principles can be applied to logistics. Overall, though, your work seems great.

52 words

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Re: Discussion Assignment Unit 1

by Ssenyange Joshua - Tuesday, 12 September 2023, 4:46 PM

Importance of Set Theory in the Real World

Set theory is a fundamental branch of mathematics that has practical applications in various fields, including computer science, statistics, and economics. Understanding set theory is crucial because it provides a framework for organizing and analyzing data. One real-world example where set theory is applicable is in analyzing customer purchasing behavior in a grocery store.

Consider a grocery store that offers a wide range of products across different categories such as fruits, vegetables, dairy, and bakery items. The store wants to understand the purchasing patterns of its customers and identify the most popular items in each category. Set theory can be used to accomplish this task.

To start, we can create sets to represent the customers who purchase items from each category. Let's create three sets: A, B, and U.

Set A represents customers who purchase items from category A.

Set B represents customers who purchase items from category B.

Set U represents the universal set, which includes all possible elements of interest.

For example, we can define sets as follows:

A = {apple, banana, orange, pear}

B = {milk, cheese, yogurt, butter}

U = {apple, banana, orange, pear, milk, cheese, yogurt, butter, bread, eggs, vegetables}

Now, let's explain the answers to the questions posed in the discussion assignment:

i. A ∪ B (Union of A and B): The union of sets A and B represents the customers who purchase items from either category A or category B or both. In this case, the union would be: A ∪ B = {apple, banana, orange, pear, milk, cheese, yogurt, butter}

ii. A ∩ B (Intersection of A and B): The intersection of sets A and B represents the customers who purchase items from both category A and category B. In this case, the intersection would be: A ∩ B = {}

iii. (A ∩ B) ∪ U (Union of the intersection of A and B with U): This operation represents the customers who purchase items from either the intersection of A and B or the universal set U. In this case, the union would be: (A ∩ B) ∪ U = {apple, banana, orange, pear, milk, cheese, yogurt, butter, bread, eggs, vegetables}

iv. Power set of A: The power set of a set A represents all possible subsets of A, including the empty set and the set itself. In this case, the power set of A would be: Power set of A = {{}, {apple}, {banana}, {orange}, {pear}, {apple, banana}, {apple, orange}, {apple, pear}, {banana, orange}, {banana, pear}, {orange, pear}, {apple, banana, orange}, {apple, banana, pear}, {apple, orange, pear}, {banana, orange, pear}, {apple, banana, orange, pear}}

v. A' (Complement of A): The complement of set A represents all the elements that are not in A but are in the universal set U. In this case, the complement of A would be: A' = {milk, cheese, yogurt, butter, bread, eggs, vegetables}

vi. ∅ ∩ B (Intersection of the empty set with B): The intersection of the empty set with any set is always the empty set. In this case, the intersection would be: ∅ ∩ B = {}

vii. A × B (Cartesian Product of A and B): The Cartesian product of sets A and B represents all possible ordered pairs where the first element is from set A and the second element is from set B. In this case, the Cartesian product would be: A × B = {(apple, milk), (apple, cheese), (apple, yogurt), (apple, butter), (banana, milk), (banana, cheese), (banana, yogurt), (banana, butter), (orange, milk), (orange, cheese), (orange, yogurt), (orange, butter), (pear, milk), (pear, cheese), (pear, yogurt), (pear, butter)}

viii. A - B (Set Difference of A and B): The set difference of sets A and B represents the elements that are in A but not in B. In this case, the set difference would be: A - B = {apple, banana, orange, pear}

ix. (A - B) ∪ (B - A) (Union of the set difference of A and B with the set difference of B and A): This operation represents the elements that are in either the set difference of A and B or the set difference of B and A. In this case, the union would be: (A - B) ∪ (B - A) = {apple, banana, orange, pear, milk, cheese, yogurt, butter}

x. Proving a De Morgan Identity for A and B: One of the De Morgan identities states that the complement of the union of two sets is equal to the intersection of their complements. In symbols, it can be written as: (A ∪ B)' = A' ∩ B'

To prove this identity, we can show that the elements in both sets are the same. We can start by considering an arbitrary element x:

If x is in (A ∪ B)', it means that x is not in A ∪ B. This implies that x is not in A and x is not in B. Therefore, x is in A' and x is in B'. Hence, x is in A' ∩ B'.

If x is in A' ∩ B', it means that x is in A' and x is in B'. This implies that x is not in A and x is not in B. Therefore, x is not in A ∪ B. Hence, x is in (A ∪ B)'.

Since we have shown that every element in (A ∪ B)' is in A' ∩ B' and vice versa, we can conclude that (A ∪ B)' = A' ∩ B'.

In conclusion, set theory provides a powerful framework for organizing and analyzing data in various real-world scenarios. By creating sets and performing operations such as union, intersection, complement, and set difference, we can gain insights into relationships and patterns within the data.

964 words

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Re: Discussion Assignment Unit 1

by Uzoma Nguzo - Tuesday, 12 September 2023, 11:07 PM

Hi Seenyange, Good job. Your presentation is self-explanatory. Thanks

9 words

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Re: Discussion Assignment Unit 1

by Martha Chukwudike - Wednesday, 13 September 2023, 6:04 PM

You've done great work on this assignment. You solved every problem correctly.

12 words

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Re: Discussion Assignment Unit 1

by Yoonsuk Chang - Tuesday, 12 September 2023, 6:44 PM

I believe that the store is interested in analyzing the purchasing behavior of its customers and determining the most popular items in each category. Therefore, we can use set theory to create sets of customers who purchase items from each category and then find intersections of these sets to determine which customers purchase items from multiple categories.

For this set theory, we can create three unique sets as shown below.

A = {milk, cheese, butter}

B = {apple pie, bread, muffin}

U = {milk, cheese, butter, apple pie, bread, muffin, oranges, bananas}.

i. A ∪ B represents all elements that are either dairy products or bakery items or both. For instance, {milk, cheese, butter, apple pie, bread, muffin}.

ii. A ∩ B would be empty in this case as there are no common elements between dairy products and bakery items. For instance, {} empty set.

iii. (A ∩ B) ∪ U would simply be equal to U because A and B have no intersection; hence we just end up with our universal set. For instance, {milk, cheese, butter, apple pie, bread, muffin, oranges, bananas}.

iv. The Power Set of A includes every possible combination of different numbers of dairy products that a customer could buy. For instance, {{}, {milk}, {cheese}, {butter},{milk, cheese}, {milk, butter}, {cheese, butter}, {milk, cheese, butter}}

v. The complement of a set A is the set of all elements that are not in A For instance, {apple pie , bread, muffin}.

vi. An empty set (∅) intersected with any set will yield an empty set – For instance, {} (∅).

vii. The Cartesian product (A × B) includes ordered pairs from Sets 'A' & 'B', representing combinations of one dairy product and one bakery item that a customer might buy together. Therefore,, {(milk, apple pie), (milk, bread), (milk, muffin), (cheese, apple pie), (cheese, bread), (cheese, muffin), (butter, apple pie), (butter, bread), (butter, muffin)}.

viii. The difference (A-B) contains only those elements present in Set 'A' but not in Set 'B'. In our example this would still be all elements in A since none are present in B. For instance, {milk, cheese, butter}.

ix. (A − B) ∪ (B − A), also known as the symmetric difference of A and B which are in A or in B, but not in both. For instance, {milk, cheese, butter, apple pie, bread, muffin)

x. For De Morgan's Law, the complement of the union of A and B is: (A ∪ B)' = {oranges, bananas} and the intersection of the complements of A and B is : A' ∩ B' = {oranges, bananas} so, (A ∪ B)' = to A' ∩ B', proving De Morgan's first law for our set A' ∩ B'.

In conclusion, by understanding these concepts, we can better analyze the shopping behavior of customers in our hypothetical grocery store by identifying overlapping shopping patterns across different categories, which is critical information for inventory management and marketing strategies.

Word count: 488

Reference

Doerr, A., & Levasseur, K. (2022). *Applied discrete structures* (3rd ed.). licensed under CC BY-NC-SA

Levin, O. (2021). *Discrete mathematics: An open introduction* (3rd ed.). licensed under CC 4.0

522 words

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Re: Discussion Assignment Unit 1
by Fatima Qudimat - Wednesday, 13 September 2023, 3:46 PM

MATH 1302–01 – AY2024 – T1

Discussion Forum Unit 1

My three sets A, B and U will be as per the following:

Set A = {pear, apple, banana, orange}

Set B = {carrot, broccoli, lettuce, tomato}

Universal Set U = {apple, banana, orange, pear, carrot, broccoli, lettuce, tomato, milk, bread, eggs}

i. A ∪ B (Union of A and B):

The union of sets A and B, denoted as A ∪ B, is the set that contains all the elements that are in either A or B or both. In this case, **A ∪ B = {apple, banana, orange, pear, carrot, broccoli, lettuce, tomato}.**

ii. A ∩ B (Intersection of A and B):

The intersection of sets A and B, denoted as A ∩ B, is the set that contains all the elements that are common to both A and B. (Levin, 2021)

Since there are no common elements between A and B in this example, A ∩ B would be an empty set (∅).

iii. (A ∩ B) ∪ U (Union of the intersection of A and B with U):

First, we find the intersection of A and B, which is ∅. Then, taking the union of ∅ with U will simply be the set U itself.

Therefore, (A ∩ B) ∪ U equals U, which is {apple, banana, orange, pear, carrot, broccoli, lettuce, tomato, milk, bread, eggs}.

iv. The Power set of A:

The power set of a set A, denoted as P(A), is the set that contains all possible subsets of A, including the empty set and A itself.

In this case, the power set of A would be {{}, {apple}, {banana}, {orange}, {pear}, {apple, banana}, {apple, orange},

{apple, pear}, {banana, orange}, {banana, pear}, {orange, pear}, {apple, banana, orange}, {apple, banana, pear}, {apple, orange, pear}, {banana, orange, pear}, {apple, banana, orange, pear}}.

v. A' (Complement of A):

The complement of a set A, denoted as A', is the set that contains all the elements that are not in A but are in the universal set U. **In this case, A' would be {carrot, broccoli, lettuce, tomato, milk, bread, eggs}.**

vi. ∅ ∩ B (Intersection of the empty set with B):

The intersection of the empty set (∅) with any set B will always result in an empty set (∅). **Therefore, ∅ ∩ B = { }.**

vii. A × B (Cartesian Product of A and B):

The Cartesian product of sets A and B, denoted as A × B, is the set of all possible ordered pairs where the first element comes from A and the second element comes from B. **In this case, A × B would be {(apple, carrot), (apple, broccoli), (apple, lettuce), (apple, tomato), (banana, carrot), (banana, broccoli), (banana, lettuce), (banana, tomato), (orange, carrot), (orange, broccoli), (orange, lettuce), (orange, tomato), (pear, carrot), (pear, broccoli), (pear, lettuce), (pear, tomato)}.**

viii. A - B (Set Difference of A and B):

The set difference of sets A and B, denoted as A - B, is the set that contains all the elements that are in A but not in B. **In this case, A - B would be {apple, banana, orange, pear} since all the elements of A are not present in B.**

ix. (A − B) ∪ (B − A) (Union of the set difference of A and B with the set difference of B and A):

First, A − B would be {apple, banana, orange, pear}, and B − A would be {carrot, broccoli, lettuce, tomato}. **The union of these sets gives us {apple, banana, orange, pear, carrot, broccoli, lettuce, tomato}.**

x. Proof of De Morgan's Law for Sets:

One of De Morgan's Laws for sets states that the complement of the union of two sets is equal to the intersection of their complements. In other words, (A ∪ B)' = A' ∩ B'. (Levin, 2021)

Step 1: Find the complement of sets A and B.

A' (complement of A) = U - A = {carrot, broccoli, lettuce, tomato, milk, bread, eggs}

B' (complement of B) = U - B = {apple, banana, orange, pear, milk, bread, eggs}

Step 2: Find the union of the complements of A and B.

(A' ∪ B') = {carrot, broccoli, lettuce, tomato, milk, bread, eggs} ∪ {apple, banana, orange, pear, milk, bread, eggs}

Step 3: Find the complement of the union of A and B.

(A ∪ B)' = U - (A ∪ B)

Step 4: Calculate the union of sets A and B.

A ∪ B = {apple, banana, orange, pear} ∪ {carrot, broccoli, lettuce, tomato} = {apple, banana, orange, pear, carrot, broccoli, lettuce, tomato}

Step 5: Calculate the complement of the union.

(A ∪ B)' = U - (A ∪ B) = {apple, banana, orange, pear, carrot, broccoli, lettuce, tomato, milk, bread, eggs} - {apple, banana, orange, pear, carrot, broccoli, lettuce, tomato} = {milk, bread, eggs}

Step 6: Compare the results we have:

(A' ∪ B') = {carrot, broccoli, lettuce, tomato, milk, bread, eggs} ∪ {apple, banana, orange, pear, milk, bread, eggs} = {carrot, broccoli, lettuce, tomato, apple, banana, orange, pear, milk, bread, eggs}

(A ∪ B)' = {milk, bread, eggs}

As we can see, the results of both calculations are identical (A' ∪ B') = (A ∪ B)'

This proves De Morgan's Law for Sets (A ∪ B)' = A' ∩ B'

Reference

Levin, O. (2021). *Discrete mathematics: An open introduction* (3rd ed.). licensed under CC 4.0

890 words

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Re: Discussion Assignment Unit 1

by Amina Bozgert - Thursday, 14 September 2023, 6:50 AM

Hi Fatima,
Nice job, your assignment is well done and has all requirements. Keep it up.
16 words

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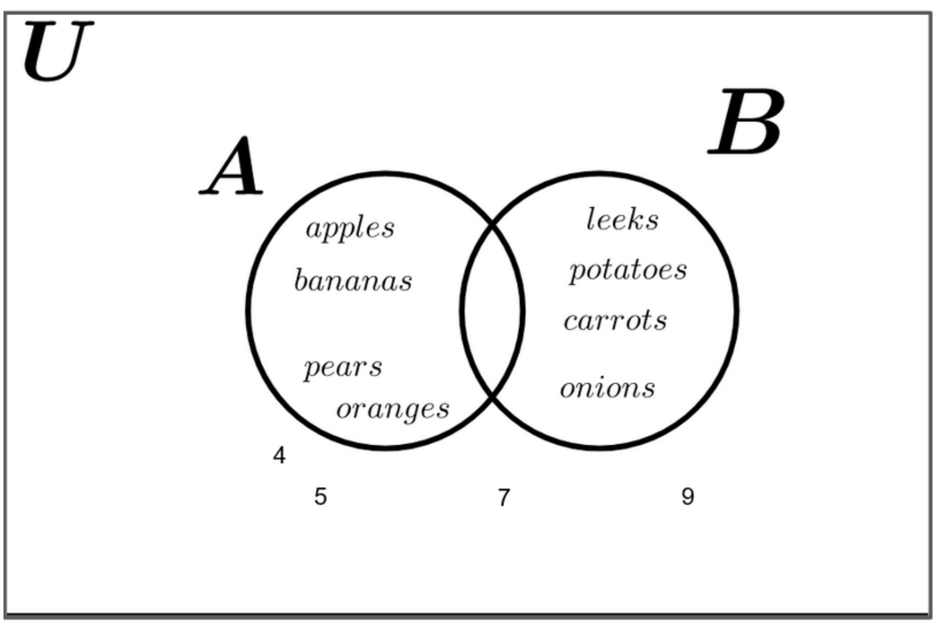
Re: Discussion Assignment Unit 1

by Muhammad Fawad Alam - Wednesday, 13 September 2023, 8:15 PM



The Venn diagram consists of sets A = {bananas, pears, apples, oranges}, B={leeks, potatoes, carrots, onions}, U={bananas, pears, apples, oranges, leeks, potatoes, carrots, onions,4,5,7,9}

i. A ∪ B

This stands for A union B which is every element that is present in set A and set B. Therefore,

A ∪ B = {bananas, pears, apples, oranges, leeks, potatoes, carrots, onions}

ii. A ∩ B

This stands for A intersection B which is every element that is present both in set A and set B. Therefore,

A ∩ B=∅

iii. (A ∩ B) ∪ U

This stands for A intersection B union U which is firstly every element present in set A and set B and then unioned with U, the universal set. Therefore, using the answer from ii, we can tell that A ∩ B is an empty set. Then we can union it with the universal set, meaning every element that is present in the Venn diagram. In other words, (A ∩ B) ∪ U = U

Therefore,

(A ∩ B) ∪ U = {bananas, pears, apples, oranges, leeks, potatoes, carrots, onions,4,5,7,9}

iv. The Power set of A.

The power set of A means the set that contains all the subsets of A. This would include the empty set, the elements of A and all the subsets of A.

P(A) = {∅, {bananas}, {pears}, {apples}, {oranges}, {bananas, pears}, {bananas, apples}, {bananas, oranges}, {pears, apples}, {pears, oranges}, {apples, oranges}, {bananas, pears, apples}, {bananas, pears, oranges}, {bananas, apples, oranges}, {pears, apples, oranges}, {bananas, pears, apples, oranges}}

Due to this, the cardinality is 16 since the numbers of elements in the original set A is 4 and it follows the 2^n rule.

v. A'

This stands for the compliment of A meaning every element that is outside of A. Therefore,

A' = {leeks, potatoes, carrots, onions,4,5,7,9}

vi. ∅∩B

This stands for an empty set intersection B. An empty set has no elements so regardless of the elements in B, it will always be empty. In other words,
∅∩B = ∅

Therefore,
∅∩B = ∅

vii. A × B

This stands for the cartesian product of A and B. THis means that the all the possible ordered pairs (a,b) with a ∈A and b ∈B .

Therefore,
A x B = {(bananas, leeks), (bananas, potatoes), (bananas, carrots), (bananas, onions), (pears, leeks), (pears, potatoes), (pears, carrots), (pears, onions), (apples, leeks), (apples, potatoes), (apples, carrots), (apples, onions), (oranges, leeks), (oranges, potatoes), (oranges, carrots), (oranges, onions)}

viii. A-B

This means that all the elements in set A which are not in the elements of set B

Therefore,

A-B= {bananas, pears, apples, oranges}

ix. (A − B) ∪ (B − A)

This means the union of all the elements in set A which are not in the elements of set B with all the elements in set B which are not in the elements of set B. This would still mean the elements from set A and set B.

Therefore ,

(A − B) ∪ (B − A) = {bananas, pears, apples, oranges, leeks, potatoes, carrots, onions}

x. Prove any one De Morgan identity for A and B.

One of the De morgan identities is (A ∪ B)′ = A′ ∩ B′.

We can prove this by saying the following

$$x \,\epsilon (A \cup B)'$$

$$x \notin (A \cup B)$$

$$x \notin A \; and \; x \notin B$$

$$x \,\epsilon A' \; and \; x \,\epsilon B'$$

$$Therefore$$

$$x \,\epsilon A' \cap B'$$

References

Mathispower4u. (2022). *Sets (Discrete Math)*. YouTube. https://youtube.com/playlist?list=PLROOIV7hGpZjq7vdgGK7IRyMi_TZ4oVRa&si=qOzl-b9RvE1YmxTT

551 words

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Re: Discussion Assignment Unit 1

by Immanuel Dhliso - Wednesday, 13 September 2023, 9:11 PM

Discussion Assignment 1

Set A = {lion, elephant, rhino, buffalo}
Set B = {pap, boerewors, biltong, iKota}
Universal set U = {lion, elephant, rhino, buffalo, pap, boerewors, biltong, iKota, car, bike, bus, train}

i. A ∪ B: This is the union of sets A and B. It’s like throwing everything from both sets into one big set. So A ∪ B = {lion, elephant, rhino, buffalo, pap, boerewors, biltong, iKota}
ii. A ∩ B: This is the intersection of sets A and B. It’s like finding what both sets have in common. But in this case, A and B don’t have anything in common. So, A ∩ B = ∅
iii. (A ∩ B) ∪ U: This is the union of the intersection of sets A and B with the universal set U. Since A and B don’t intersect (A ∩ B = ∅), we just get back the universal set U.
iv. The Power set of A: The power set of a set is like all possible teams you can form with the items in the set. For set A it would include {}, {lion}, {elephant}, {rhino}, {buffalo}, {lion, elephant}, {lion, rhino}, …, {lion, elephant, rhino, buffalo}

v. A’: This is everything in the universal set U that’s not in set A. So, it’s like U minus A. So, A’ = {pap, boerewors, biltong, iKota, car, bike, bus, train}

vi. ∅∩B: This is the intersection of an empty set with set B. But an empty set doesn't have anything to intersect with B. So ∅∩B = ∅
vii. A × B: This is all possible pairs you can make with one item from set A and one item from set B.
viii. A-B: This is everything that's in A but not in B. Since there's nothing in B that's also in A in this case, we just get back set A.
ix. (A − B) ∪ (B − A): This is everything that's only in A or only in B but not in both. This interesting concept called De Morgan's law. It's all about playing around with sets, which are just collections of different things.
So, let's say we have two sets, A and B. According to De Morgan's law, if we combine everything in A and B (that's what we call a union) and then look at what's not in that combined set (that's the complement), it's the same as if we first looked at what's not in A and what's not in B separately, and then found where those two sets intersect. And it works the other way around too! If we first find where A and B intersect and then look at what's not in that intersection, it's the same as if we first looked at what's not in A and what's not in B separately, and then combined those two sets. So, for our sets A and B, the complement of (A union B) is the same as not-A intersect not-B, and the complement of (A intersect B) is the same as not-A union not-B.
510 words

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Re: Discussion Assignment Unit 1

by Marco Longo - Wednesday, 13 September 2023, 11:13 PM

Consider sets:
A: {10,11,12,13}
B:{aa,bb,cc,dd}
U:{10,11,12,13,aa,bb,cc,dd, box, jar, can, corn}

Then explain the answers to the following questions to your peers:
i.The union of sets A and B includes all unique elements from both sets:
A ∪ B = {10, 11, 12, 13, aa, bb, cc, dd}
ii. The intersection of sets A and B includes elements that are common to both sets:
A ∩ B = {}
iii. (A ∩ B) ∪ U
First the intersection of sets A and B, A ∩ B = {}
Replacing, we can calculate the union of this empty set with the universal set U:
({} ∪ U) = U
So, (A ∩ B) ∪ U is equal to the universal set U:
(A ∩ B) ∪ U = U = {10, 11, 12, 13, aa, bb, cc, dd, box, jar, can, corn}
iv. The Power set of A.
The power set of a set A is the set of all possible subsets of A, including the empty set and the set itself. In this case, the set A is {10, 11, 12, 13}.
To calculate the power set of A, you need to consider all possible combinations of its elements:
The empty set: {}
Individual elements: {10}, {11}, {12}, {13}
Pairs of elements: {10, 11}, {10, 12}, {10, 13}, {11, 12}, {11, 13}, {12, 13}
Triplets of elements: {10, 11, 12}, {10, 11, 13}, {10, 12, 13}, {11, 12, 13}
The set A itself: {10, 11, 12, 13}
P(A) = {{}, {10}, {11}, {12}, {13}, {10, 11}, {10, 12}, {10, 13}, {11, 12}, {11, 13}, {12, 13}, {10, 11, 12}, {10, 11, 13}, {10, 12, 13}, {11, 12, 13}, {10, 11, 12, 13}}.
There are a total of 16 subsets in the power set of A.
v. A'
The complement of set A (A') with respect to the universal set U, as defined earlier, contains all elements from the universal set U that are not in set A.
A' = {aa, bb, cc, dd, box, jar, can, corn}
vi. ∅∩B
The intersection of the empty set (∅) with any set, including set B, will always result in the empty set (∅).
∅ ∩ B = ∅
vii. A × B
Consists of all possible ordered pairs where the first element of the pair is from set A and the second element is from set B.
A = {10, 11, 12, 13} B = {aa, bb, cc, dd}
the Cartesian product A × B contain all possible ordered pairs combining elements from A and B:

A × B = {(10, aa), (10, bb), (10, cc), (10, dd), (11, aa), (11, bb), (11, cc), (11, dd), (12, aa), (12, bb), (12, cc), (12, dd), (13, aa), (13, bb), (13, cc), (13, dd)}

viii. A-B

Contains all elements that are in set A but not in set B.

A = {10, 11, 12, 13} B = {aa, bb, cc, dd}

So, when you calculate A - B, you get:

A - B = {10, 11, 12, 13}

These are the elements that are in set A but not in set B.

ix. (A − B) ∪ (B − A)

It involves the set difference operation and the union operation.

A - B: Elements that are in A but not in B. A - B = {10, 11, 12, 13}

B - A: Elements that are in B but not in A. B - A = {aa, bb, cc, dd}

(A - B) ∪ (B - A) = ({10, 11, 12, 13}) ∪ ({aa, bb, cc, dd})

The union operation combines both sets, and since the sets are disjoint (they have no common elements), you simply merge them:

({10, 11, 12, 13}) ∪ ({aa, bb, cc, dd}) = {10, 11, 12, 13, aa, bb, cc, dd}

So, the result of (A - B) ∪ (B - A) is {10, 11, 12, 13, aa, bb, cc, dd}.

x. Prove any one De Morgan identity for A and B.

De Morgan's Law for the union of sets A and B

A∪B=A′∩B′

Where A' represents the complement of set A, and B' represents the complement of set B.

Complements of sets A and B:

A' = U - A = {10, 11, 12, 13, aa, bb, cc, dd, box, jar, can, corn} - {10, 11, 12, 13} = {aa, bb, cc, dd, box, jar, can, corn}

B' = U - B = {10, 11, 12, 13, aa, bb, cc, dd, box, jar, can, corn} - {aa, bb, cc, dd} = {10, 11, 12, 13, box, jar, can, corn}

Now, let's replace each side (LEFT) and (RIGHT) of De Morgan's Law for the union:

LEFT:

A∪B={10,11,12,13}∪{aa,bb,cc,dd} = {10,11,12,13,aa,bb,cc,dd}

RIGHT:

A′∩B′={aa,bb,cc,dd,box,jar,can,corn}∩{10,11,12,13,box,jar,can,corn}= {10,11,12,13,aa,bb,cc,dd}

A∪B=A′∩B′

10,11,12,13,aa,bb,cc,dd} = {10,11,12,13,aa,bb,cc,dd}

Levin, O. (2021). Discrete mathematics: An open introduction (3rd ed.). Creative Commons Attribution 4.0 International License.

802 words

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Re: Discussion Assignment Unit 1

by Jeremiah Bankole - Thursday, 14 September 2023, 3:13 AM

Hello Marco,

You have submitted a very good response to the question asked. Good job with the explanation provided for each solution given. However, the De Morgan identity used appears to be wrong. It's meant to be (AuB)' = A'nB'. I hope you understand? Don't hesitate to reach out for more clarification or concern. Thanks for your contribution.

Jeremiah.

59 words

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Re: Discussion Assignment Unit 1

by Amina Bozgert - Wednesday, 13 September 2023, 11:40 PM

Discussion Forum Unit 1

Discrete Mathematics

Bhaskar Palit (Instructor)

To reply the questions about the sets A, B, and U, we have to define the components of each set. Let's consider the following sets:
A = {8, 9, 11, 18}
B = {21, 11, 72, 8}
U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}

Now let's explain the answers to the questions:

1- A ∪ B (Union of A and B): The union of two sets A and B is the set that contains all the elements from both sets without any repetition. In this case, A ∪ B = {8, 9, 11, 18, 21, 72}.

2- A ∩ B (Intersection of A and B): The intersection of two sets A and B is the set that contains the elements that are common to both sets. In this case, A ∩ B = {8, 11}.

3- (A ∩ B) ∪ U (Union of the intersection of A and B with U): First, we find the intersection of A and B, which is {8, 11}. Then, we take the union of the A and B set with U, which gives us U itself. Therefore, (A ∩ B) ∪ U = U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}.

4- Power set of A: The power set of a set A is the set of all possible subsets of A, including the empty set and A itself. In this case, the power set of A is P(A) = {{}, {8}, {9}, {11}, {18}, {8, 9}, {8, 11}, {8, 18}, {9, 11}, {9, 18}, {11, 18}, {8, 9, 11}, {8, 9, 18}, {8, 11, 18}, {9, 11, 18}, {8, 9, 11, 18}}.

5- A' (Complement of A): The complement of a set A, denoted as A', is the set of all elements in the universal set U that are not in A. In this case, A' = {1, 2, 3, 4, 5, 6, 7, 10}.

6- ∅ ∩ B (Intersection of the empty set with B): The intersection of any set with the empty set is always the empty set. Therefore, ∅ ∩ B = {} (empty set).

7- A × B (Cartesian product of A and B): The Cartesian product of two sets A and B is the set of all possible ordered pairs where the first element comes from A and the second element comes from B. In this case, A × B = {(8, 21), (8, 11), (8, 72), (8, 8), (9, 21), (9, 11), (9, 72), (9, 8), (11, 21), (11, 11), (11, 72), (11, 8), (18, 21), (18, 11), (18, 72), (18, 8)}.

8- A - B (Set difference of A and B): The set difference of two sets A and B is the set that contains the elements of A that are not in B. In this case, A - B = {9, 18}.

9- (A - B) ∪ (B - A) (Union of the set difference of A and B with the set difference of B and A): First, we find the set difference of A and B, which is A - B = {9, 18}. Then, we find the set difference of B and A, which is B - A = {21, 72} Finally, we take the union of these two sets, which gives us (A - B) ∪ (B - A) = {8, 9, 18, 21, 72}
10- De Morgan's Law: One of De Morgan's laws states that the complement of the union of two sets is equal to the intersection of their complements. In other words, for sets A and B, (A ∪ B)' = A' ∩ B'. To prove this, we can use the properties of set complement and set intersection. Let's assume f is an arbitrary element:

If f is in (A ∪ B)', it means f is not in A ∪ B. This implies that f is not in A and f is not in B. Therefore, f is in A' and f is in B'. Hence, f is in A' ∩ B'.
If f is in A' ∩ B', it means f is in A' and f is in B'. This implies that f is not in A and f is not in B. Therefore, f is not in A ∪ B. Hence, f is in (A ∪ B)'.
Since we have shown that any element f that belongs to one set also belongs to the other set, we can conclude that (A ∪ B)' = A' ∩ B'.

References:
Doerr, A., & Levasseur, K. (2022). Applied discrete structures (3rd ed.). licensed under CC BY-NC-SA
776 words

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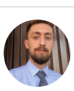

Re: Discussion Assignment Unit 1
by Oday Ayman Kamal Addin - Thursday, 14 September 2023, 12:21 AM

A = {cat, dog, rabbit, hamster} B = {red, green, blue, yellow} U = {cat, dog, rabbit, hamster, red, green, blue, yellow, snake, fish, bird}

A ∪ B

A ∪ B = {cat, dog, rabbit, hamster} ∪ {red, green, blue, yellow} = {cat, dog, rabbit, hamster, red, green, blue, yellow}

A ∩ B

A ∩ B = {cat, dog, rabbit, hamster} ∩ {red, green, blue, yellow} = {}

(A ∩ B) ∪ U

(A ∩ B) ∪ U = {} ∪ {cat, dog, rabbit, hamster, red, green, blue, yellow, snake, fish, bird} = {cat, dog, rabbit, hamster, red, green, blue, yellow, snake, fish, bird}

The Power set of A

The power set of A, denoted as P(A), is the set of all possible subsets of A. P(A) = {{}, {cat}, {dog}, {rabbit}, {hamster}, {cat, dog}, {cat, rabbit}, {cat, hamster}, {dog, rabbit}, {dog, hamster}, {rabbit, hamster}, {cat, dog, rabbit}, {cat, dog, hamster}, {cat, rabbit, hamster}, {dog, rabbit, hamster}}

A'

A' is the set of elements in the universal set U but not in A. A' = U - A = {red, green, blue, yellow, snake, fish, bird}

∅∩**B**

∅∩B = {}

A × B

A × B = {(cat, red), (cat, green), (cat, blue), (cat, yellow), (dog, red), (dog, green), (dog, blue), (dog, yellow), (rabbit, red), (rabbit, green), (rabbit, blue), (rabbit, yellow), (hamster, red), (hamster, green), (hamster, blue), (hamster, yellow)}

A - B

A - B = {cat, dog, rabbit, hamster} - {red, green, blue, yellow} = {cat, dog, rabbit, hamster}

(A - B) ∪ (B - A)

(A - B) ∪ (B - A) = ({cat, dog, rabbit, hamster} - {red, green, blue, yellow}) ∪ ({red, green, blue, yellow} - {cat, dog, rabbit, hamster}) = {cat, dog, rabbit, hamster} ∪ {red, green, blue, yellow} = {cat, dog, rabbit, hamster, red, green, blue, yellow}

De Morgan's Law

De Morgan's Law states that the complement of the union of two sets is equal to the intersection of their complements. (A ∪ B)' = A' ∩ B' Let's prove it: (A ∪ B)' = {red, green, blue, yellow, snake, fish, bird}' = {cat, dog, rabbit, hamster} A' ∩ B' = ({cat, dog, rabbit, hamster, red, green, blue, yellow, snake, fish, bird})' = {cat, dog, rabbit, hamster}

373 words

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Re: Discussion Assignment Unit 1

by Jeremiah Bankole - Thursday, 14 September 2023, 2:59 AM

Now, engage in a discussion with your peers by completing the following task and posting it in the discussion forum:

Create three sets A, B having 4 elements in each, and U, a Universal set of any possible number of elements of your interest. (For example, you can consider the sets A = {a, b, c, d}, B = {1, 2, 3, 4} and U = {a, b, c, d, 1, 2, 3, 4, apples, mangoes, avocados}.

Note: Do not use the same examples. Create your own sets by changing the numbers and letters.)

Then explain the answers to the following questions to your peers:

i. ***A ∪ B***

ii. ***A ∩ B***

iii. ***(A ∩ B) ∪ U***

iv. ***The Power set of A.***

v. ***A'***

vi. ∅∩***B***

vii. ***A × B***

viii. ***A-B***

ix. ***(A − B) ∪ (B − A)***

x. ***Prove any one De Morgan identity for A and B.***

Your Discussion should be a minimum of 200 words in length.

Use APA citations and references for the textbook and any other sources used; refer to the UoPeople APA Tutorials in the LRC for help with APA.

Values Used:

A = {2, 3, 5, 7}

B = {1, 2, 3, 4}

U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

Let's explore the answers to the questions using the sets A, B, and U provided:

I. ***A ∪ B (Union of A and B):***

This represents the set containing all unique elements from both A and B. In this case,

A ∪ B = {1, 2, 3, 4, 5, 7} because it includes all elements from both sets, and duplicates are removed.

II. ***A ∩ B (Intersection of A and B):***

This represents the set containing elements that are common to both A and B. In this case,

A ∩ B = {2, 3} because these are the only elements that exist in both sets A and B.

III. ***(A ∩ B) ∪ U (Union of the intersection of A and B with U):***

First, find A ∩ B, which is {2, 3}. Then, take the union of this with U, resulting in

{1, 2, 3, 4, 5, 6, 7, 8, 9, 10} since U contains all elements.

IV. **Power set of A**:

The power set of a set is the set of all its subsets, including the set itself and the empty set.

For set A, the power set is {{}, {2}, {3}, {5}, {7}, {2, 3}, {2, 5}, {2, 7}, {3, 5}, {3, 7}, {5, 7}, {2, 3, 5}, {2, 3, 7}, {2, 5, 7}, {3, 5, 7}, {2, 3, 5, 7}}.

V. A' (Complement of A):

A' represents the set of all elements in the universal set U that are not in A. So,

A' = {1, 4, 6, 8, 9, 10}.

VI. ∅ ∩ B (Intersection of the empty set with B):

The intersection of the empty set with any set is always the empty set. So, ∅ ∩ B = ∅ (the empty set).

VII. A × B (Cartesian product of A and B):

This represents the set of all possible ordered pairs where the first element is from A and the second element is from B.

A × B = {(2, 1), (2, 2), (2, 3), (2, 4), (3, 1), (3, 2), (3, 3), (3, 4), (5, 1), (5, 2), (5, 3), (5, 4), (7, 1), (7, 2), (7, 3), (7, 4)}.

VIII. A - B (Set difference of A and B):

This represents the elements that are in A but not in B. A - B = {5, 7}.

IX. (A - B) ∪ (B - A) (Union of the set difference of A and B with the set difference of B and A):

(A - B) = {5, 7} and (B - A) = {1, 4}. Their union results in {1, 4, 5, 7}.

X. ***De Morgan Identity for A and B:***

One of the De Morgan identities states that the complement of the union of two sets is equal to the intersection of their complements. In symbols:

(A ∪ B)' = (A' ∩ B').

For example,

if A = {2, 3, 5, 7} and B = {1, 2, 3, 4}, then

A U B = {1, 2, 3, 4, 5, 7}

(A ∪ B)' = {6, 8, 9, 10},

and

A’ = {1, 4, 6, 8, 9, 10}

B’ = {5, 6, 7, 8, 9, 10}

(A' ∩ B') = {6, 8, 9, 10} which are indeed equal.

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758 words

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Re: Discussion Assignment Unit 1

by Ozioma Nwobodo - Thursday, 14 September 2023, 4:34 AM

Hi Jeremiah,

Your explanation is clear and well-organized. You correctly applied the concepts of set operations and provided accurate answers to all the questions. You also provided a detailed explanation for each operation, which helps in understanding the reasoning behind the solutions.

Additionally, you effectively used the values you provided (A, B, U) to demonstrate the concepts, which adds a practical dimension to the discussion.

The inclusion of the De Morgan identity added an extra layer of understanding to the topic.
The formula you provided is:

A−B=A∩B′

This is known as the set difference formula. Let's break down the steps used in the calculation:

1. **Set A:** The set A is defined as {2,3,5,7}{2,3,5,7}.
2. **Set B:** The set B is defined as {1,2,3,4}{1,2,3,4}.
3. **Complement of Set B (B'):** The complement of set B (denoted as
   ′B′) contains all elements that are in the universal set U but not in B. In this case, with the given universal set =={1,2,3,4,5,6,7,8,9,10}U={1,2,3,4,5,6,7,8,9,10}, the complement of B is

   ={5,6,7,8,9,10}B′={5,6,7,8,9,10}.
4. **Intersection of A and B' (A \cap B'):** This involves finding the common elements between set A and the complement of set B. In this case,

   ={5,7}A∩B′={5,7}, as these are the elements that appear in both A and B'.
5. **Set Difference (A - B):** The set difference
   A−B represents the elements that are in set A but not in set B. It's essentially removing the elements of B from A. In this case, ={5,7}A−B={5,7}, which is the same result obtained in step 4.

So, the steps followed in the calculation involve understanding the definitions of set operations (complement, intersection, and set difference) and then applying them to the given sets A and B.

Overall, you've correctly applied the set difference formula and provided a clear explanation of each step in the calculation. Great job! I would rate this 10 out of 10.

Overall, your discussion is well-done and fulfills the requirements of the task.

Kee it up!
321 words

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Re: Discussion Assignment Unit 1

by Jeff Hilaire - Thursday, 14 September 2023, 7:32 AM

Hi Jeremiah,
You have provided some interesting insights in your discussion. I particularly like how you described the De Morgan's law along with examples.
24 words

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Re: Discussion Assignment Unit 1

by David Kamya - Thursday, 14 September 2023, 3:19 AM

Create three sets A, B having 4 elements in each, and U, a Universal set of any possible number of elements of your interest. (For example, you can consider the sets A = {a, b, c, d}, B = {1, 2, 3, 4} and U = {a, b, c, d, 1, 2, 3, 4, apples, mangoes, avocados}.

Note: Do not use the same examples. Create your own sets by changing the numbers and letters.)
Then explain the answers to the following questions to your peers:
i. A ∪ B
ii. A ∩ B
iii. (A ∩ B) ∪ U
iv. The Power set of A.
v. A’
vi. ∅∩B
vii. A × B
viii. A-B
ix. (A − B) ∪ (B − A)
x. Prove any one De Morgan identity for A and B.
Your Discussion should be a minimum of 200 words in length.
Use APA citations and references for the textbook and any other sources used; refer to the UoPeople APA Tutorials in the LRC for help with APA.

Below are two sets with different modes of transport
Set A = {car, air-balloon, donkey, horse}
Set B = {plane, car, train, boat}
Set U = {kite, water, pen, Ø, {doctor, lawyer, policeman}, animals, houses, car, horse}
(i) (A U B) is a set notation that lists all elements of set A, set B and those that occur in both. In the above example;
A U B = {car, air-balloon, donkey, horse, plane, train, boat}

(ii) (A ∩ B) would denote a set that lists elements that occur in both set A and set B. In the above example;
A ∩ B = {car}

(iii) (A ∩ B) u U. This gives the union of the intersection elements of sets A and B with set U. (A ∩ B) u U = {kite, water, pen, Ø, {doctor, lawyer, policeman}, animals, houses, car, horse}. In union sets, elements are not repeated.

(iv) Power set of A or P(A). Here the set P(A) would denote the number of subsets of set A.

(v) A’ this is a notation of A complement meaning all elements that are not in set A. A’ = B = {plane, car, train, boat}

(vi) ∅∩B; the empty set is a part of all sets and therefore this statement is meaningless.

(vii) A x B is the Cartesian product of A and B: the set of all ordered pairs (a,b) with a ∈ A and b ∈ B.
412 words

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Re: Discussion Assignment Unit 1

by Ozioma Nwobodo - Thursday, 14 September 2023, 4:46 AM

Your explanation and utilization of set notation and operations are quite clear and accurate. You've demonstrated a good understanding of the concepts. Here's a detailed review:

i. A∪B (Union of A and B):

Correctly stated, this represents the set containing all unique elements from both A and B. The example provided:
= A∪B={car,air−balloon,donkey,horse,plane,train,boat} is accurate.

ii. A∩B (Intersection of A and B):

Again, you're right. This represents the set containing elements that are common to both A and B. In this case,
= A∩B={car}, which is accurate.

iii. (A∩B)∪U (Union of the intersection of A and B with U):

This is also accurate. You correctly explained the process and provided the correct result.

iv. Power set of A or P(A):

While you mentioned the definition of the power set, you didn't compute it for the set A you provided. For the set A = {car, air-balloon, donkey, horse}, the power set P(A) would be ({{}, {car}, {air-balloon}, {donkey}, {horse}, {car, air-balloon}, {car, donkey}, {car, horse}, {air-balloon, donkey}, {air-balloon, horse}, {donkey, horse}, {car, air-balloon, donkey}, {car, air-balloon, horse}, {car, donkey, horse}, {air-balloon, donkey, horse}, {car, air-balloon, donkey, horse}}.

v. (Complement of A):

Correct. This represents the set of all elements in the universal set U that are not in A.
A' ={plane,train,boat}.

vi. $\emptyset \cap B$ (Intersection of the empty set with B):

You correctly stated that this is meaningless, as the intersection with an empty set results in an empty set.

vii. $A \times B$ (Cartesian product of A and B):

You explained this concept well. The Cartesian product would be a set of ordered pairs, which you didn't explicitly list but it's understood.

Overall, your explanation is comprehensive and clear. It demonstrates a solid understanding of set operations.

Keep it up!

288 words

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Re: Discussion Assignment Unit 1

by Jeff Hilaire - Thursday, 14 September 2023, 7:29 AM

Good job on your assignment, David!
Although you did not answer all the questions, you did provided some useful explanations regarding union and intersection of the sets.

27 words

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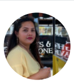

Re: Discussion Assignment Unit 1

by Sandhya Shah - Thursday, 14 September 2023, 4:34 AM

1) $A \cup B$ - The union of sets A and B, denoted as $A \cup B$.

The given representation denotes the union of two sets, A and B, encompassing all components that belong to either set A or set B, or to both sets.

Let A be the set containing the elements 10, 20, and 30, and let B be the set containing the elements 30, 40, and 50.

The union of sets A and B is equal to the set {10, 20, 30, 40, 50}.

2) $A \cap B$ - The intersection of sets A and B, denoted as $A \cap B$.

The aforementioned scenario denotes the point of convergence between two sets, A and B, encompassing all elements that are mutually present in both sets A and B.

Let A be the set containing the elements 10, 20, and 30, and let B be the set containing the elements 30, 40, and 50.

The intersection of sets A and B is equal to the set containing the element 30.

3) (A ∩ B) ∪ U -The union of the intersection of sets A and B with the universal set U.

The procedure initially identifies the intersection between sets A and B, followed by combining this intersection with the universal set U to form a union.

Consider the sets A = {10, 20, 30}, B = {30, 40, 50}, and U = {10, 20, 30, 40, 50, 60}.

The intersection of sets A and B, denoted as (A ∩ B), is equal to the set containing the element 30. Therefore, the union of (A ∩ B) and the universal set U is equal to the set containing the elements 30, 10, 20, 40, 50, and 60.

4) The power set of set A.

The power set of a given set A is defined as the collection of all feasible subsets of A, which encompasses both the empty set and the set A itself.

Given the set A = {10, 20}, it follows that the power set of A is {{}, {10}, {20}, {10, 20}}.

5) A’ - The complement of set A, denoted as A', is defined as the set of all elements that are not in A.

The symbol A' denotes the complement of set A, encompassing any components that are not part of set A but are present in the universal set.

Given the sets A = {10, 20, 30} and U = {10, 20, 30, 40, 50}, it follows that the complement of set A, denoted as A', is equal to {40, 50}.

6) ∅∩B -The intersection of set B with the empty set is denoted as ∅ ∩ B.

The result of the intersection between the empty set (∅) and any set B is consistently an empty set (∅).

Given that ∅ represents the empty set and B is defined as the set containing the elements 30, 40, and 50, it can be concluded that the intersection of the empty set and B, denoted as ∅ ∩ B, is also the empty set.

7) A × B -The Cartesian product of sets A and B, denoted as A × B, is defined as the set of all ordered pairs (a, b) where an is an element of A and b is an element of B.

The symbol × denotes the Cartesian product of sets A and B, which is defined as the set containing all conceivable ordered pairs, where the first element is selected from set A and the second element is selected from set B.

Given the sets A = {10, 20} and B = {y, z}, the Cartesian product A × B can be expressed as {(10, y), (10, z), (20, y), (20, z)}.

8) A-B - The set difference operation, denoted as A - B, refers to the elements that are present in set A but not in set B.

The mathematical notation A - B denotes the set difference operation, which encompasses all items that belong to set A but do not belong to set B.

Given two sets A = {10, 20, 30} and B = {30, 40, 50}, the set difference A - B may be determined as {10, 20}.

9) (A − B) ∪ (B − A)- The symmetric difference of sets A and B, denoted as (A - B) ∪ (B - A), is defined as the set that contains all elements that are in either A or B, but not in both.

The symmetric difference of sets A and B is defined as the set that contains all elements that belong to either A or B, but do not belong to their intersection.

Given two sets A = {10, 20, 30} and B = {30, 40, 50}, the union of the set difference (A - B) and (B - A) is equal to {10, 20, 40, 50}.

10) De Morgan's Law, one of the most important identities in math and logic, says that the negative of the conjunction of two propositions is the same as the disjunction of their negations.

De Morgan's Law encompasses two fundamental identities:

The complement of the union of sets A and B is equal to the intersection of the complements of sets A and B.

The complement of the intersection of sets A and B is equal to the union of the complements of sets A and B.

An illustrative instance employing the initial identity:

Let A be the set containing the elements 10, 20, and 30, and let B be the set containing the elements 30, 40, and 50.

The complement of the union of sets A and B, denoted as (A ∪ B)', is equal to the set containing the elements 10, 20, 40, and 50, which are not present in the union of sets A and B.

The intersection of the complement of set A with the complement of set B is equal to the set containing the elements 10, 20, 40, and 50.

References:

Al Doerr., & Levasseur, K. (2022). Applied discrete structures (3rd ed.). licensed under CC BY-NC-SA

Jamaloodeen, M., Pinzon, K., Pragel, D., Roberts, J., & Siva, S. (2021). Discrete Math (3rd ed.). licensed under CC BY-NC

Levin, O. (2021). Discrete mathematics: An open introduction (3rd ed.). licensed under CC 4.0

1047 words

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Re: Discussion Assignment Unit 1

by Ozioma Nwobodo - Thursday, 14 September 2023, 4:49 AM

Hi Sandhya,

Your detailed explanations of set operations and De Morgan's Law are well-structured and thorough.
Here's a review of your work:

A ∪ B - Your explanation of the union operation is clear and concise. You provide a good example to illustrate it.

A ∩ B - Again, you explain the intersection operation effectively. Your example demonstrates the concept well.

(A ∩ B) ∪ U - You break down the steps of this operation nicely and provide a clear example.

Power set of A - You correctly define the power set and provide an accurate example for set A.

A' - Your explanation of set complement is on point. The example is also accurate.

∅∩B - You correctly state that the intersection with an empty set results in an empty set.

A × B - While you define the Cartesian product well, you didn't list out the ordered pairs. This could enhance your explanation.

A - B - Your explanation of set difference is accurate, and the example is well-chosen.

(A − B) ∪ (B − A) - You provide a clear explanation of symmetric difference and give an accurate example.

De Morgan's Law - You explain this law comprehensively, providing both the general principle and an illustrative example.

Your examples are well-suited to illustrate the concepts, and your explanations are clear and easy to follow. You also include appropriate references, which adds credibility to your response.

Overall, your explanations are very effective.

Great job!
246 words

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Re: Discussion Assignment Unit 1
by Sandhya Shah - Thursday, 14 September 2023, 5:06 AM

Hi Ozioma, Thank you for bringing it up, after completing my discussion task. I noticed my mistakes when I looked at the work of my peers.
26 words

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Re: Discussion Assignment Unit 1
by Jeff Hilaire - Thursday, 14 September 2023, 7:26 AM

Hi Sandhya,
You have done a good job answering the questions to the exercise. You show understanding of subject by describing the union and intersection relations between the sets.
29 words

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Re: Discussion Assignment Unit 1
by Jeff Hilaire - Thursday, 14 September 2023, 5:03 AM

For the purpose of this assignment, I am going to create three different sets following the example in the assignment. Set A will have four letters, set B will have four numbers, and set U will be a combination of the two previous sets and the names of four fruits. Consider the three following sets:
A = {W, X, Y, Z}
B = {6, 7, 8, 9}
U = {W, X, Y, Z, 6, 7, 8, 9, Bananas, Strawberries, Watermelons}
Now let's consider the answers to the questions:

i. A ∪ B
A ∪ B, which is read as A **union** B, contains elements that are in either sets to create the union of the two sets. In this case, A ∪

B would be equal to:
A ∪ B = {W, X, Y, Z, 6, 7, 8, 9}

ii. A ∩ B
A **intersection** B are the set of elements that are precisely the same in both sets. In our case, A ∩ B would be equal to
A ∩ B = ∅

iii. (A ∩ B) ∪ U
The intersection of A and B, combined with the union of U would equal to:
(A ∩ B) ∪ U = { W, X, Y, Z, 6, 7, 8, 9, Bananas, Strawberries, Watermelons}

iv. The Power set of A.
The power of set A would the set of the subsets of A. In this case, we will have:
Power of set A = {{}, {W}, {X}, {Y}, {Z}, {W,X}, {W,Y}, {W,Z}, {X,Y}, {X,Z}, {W,X,Y}, {W,X,Z}, {W,Y,Z}, {X,Y,Z}, {W,X,Y,Z)

v. A'
v. A' can be read as the complement of set A and it is made up of all the elements that are not in set A. In this case,
v. A' = {6, 7, 8, 9}

vi. ∅∩B
The intersection of an empty set with the set B would equal to:
∅∩B = ∅

vii. A × B
The Cartesian product of sets A and B will be the set of all the ordered pairs. In this case,
A × B = {(W,6), (W,7), (W,8), (W,9), (X,6), (X,7), (X,8), (X,9), (Y,6), (Y,7), (Y,8), (Y,9), (Z,6), (Z,7), (Z,8), (Z,9).

viii. A-B
The difference of the two sets A and B is the set of elements present in B, not in B. In this case,
A-B = {W, X, Y, Z}

ix. (A − B) ∪ (B − A)
The symmetric difference of A and b will be the set of elements present in either A or B. In this case,
(A − B) ∪ (B − A) = {W, X, Y, Z, 6, 7, 8, 9}

x. Prove any one De Morgan identity for A and B.
According to De Morgan's law, the complement of the union of two sets is the intersection of their complements and the complement of the intersection of two sets is the union of their complements.

References
Doerr, A., & Levasseur, K. (2022). Applied discrete structures (3rd ed.). licensed under CC BY-NC-SA
Levin, O. (2021). Discrete mathematics: An open introduction (3rd ed.). licensed under CC 4.0
510 words

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Re: Discussion Assignment Unit 1
by Ahmed Alareqi - Thursday, 14 September 2023, 7:53 AM

good work.
2 words

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Re: Discussion Assignment Unit 1
by Altug Gurer - Thursday, 14 September 2023, 5:25 AM

For this assignment, we can define various sets of possible items found in a grocery store that could be on sale on any given day of the week. For items on sale on one day, we can define the set: A = {"apple", "orange", "banana"} For items on sale on the other day, we can define the set: B = {"salad", "apple", "orange"}. We can also define the universal set to be defined as: U = {"apple", "orange", "banana", "salad", "lettuce", "pineapple", "grapes"}.

i) A ∪ B = {"apple", "orange", "banana", "salad"}. This is true because the union of A and B includes the elements found in either A or B.

ii) A ∩ B = {"apple", "orange"}. This is true because the intersection of A and B consists of the elements found in both A and B, which is only the elements "apple" and "orange."

iii) (A ∩ B) ∪ U = {"apple", "orange", "banana", "salad", "lettuce", "pineapple", "grapes"}. The result is just the universal set because we are finding the union of the universal set with A ∩ B, which is just every element.

iv) The Power set of A = {∅, {"apple"}, {"orange"}, {"banana"}, {"apple", "orange"}, {"apple", "banana"}, {"banana", "orange"}, {"apple", "orange", "banana"}. This is true because the power set of set A consists of all the possible subsets of A.

v) A' = {"salad", "lettuce", "pineapple", "grapes". This is true because the complement of the set A consists of all the elements found in the universal set, U, but not found in A.

vi) ∅∩B = ∅. This is true because the intersection of the null set and set B is just the null set, because there is no intersection of the two that exist.

vii) A × B = {{"apple", "salad"}, {"apple", "apple"}, {"apple", "orange"}, {"orange", "salad"}, {"orange", "apple"}, {"orange", "orange"}, {"banana", "salad"}, {"banana", "apple"}, {"banana", "orange"}}. This is true because the Cartesian Product of A and B is the set of all combinations, where each combination is a set. The first element in each set element is from set A, and the second element is from set B.

viii) A-B = {"banana"}. This is true because A-B is the difference between set A and B, so we take all the elements in A and remove any that are found in set B.

ix) (A − B) ∪ (B − A) = ∅. This is true because the intersection of A-B and B-A does not exist in cases like this. Therefore, the answer is just the null set.

x) Prove any one De Morgan identity for A and B.

For this, I can prove the De Morgan identity of $\overline{(A \cup B)} = \bar{A} \cap \bar{B}$. To start off with the left side, A ∪ B is {"apple", "orange", "banana", "salad"}. It's complement, $\overline{(A \cup B)}$, would be {"lettuce", "pineapple", "grapes"}. Next, let's work on the right side.

$\bar{A}$ is {"salad", "lettuce", "pineapple", "grapes"}.

$\bar{B}$ is {"banana", "lettuce", "pineapple", "grapes"}. The intersection of the two is {"lettuce", "pineapple", "grapes"}. As a result, we see that the two sets are equal, which proves De Morgan's Law.

510 words

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Re: Discussion Assignment Unit 1

by Amr Khudair - Thursday, 14 September 2023, 7:39 AM

Great job on your discussion post! You did a very thorough job of explaining the set theory concepts, and I can tell that you have a good understanding of the material. I also like that you included examples to illustrate your points.

I especially liked the way you proved the De Morgan identity. You did a great job of breaking it down into smaller steps and explaining why the two sets are equal. I think this is a concept that can be difficult to understand, but you made it very easy to follow.

Overall, I think this is a very well-written and informative discussion post. You did a great job of explaining the concepts in a clear and concise way, and I learned a lot from reading it.

I also appreciate the way you organized your post. It was easy to follow and understand.

Keep up the good work!

I have a few questions about your post:

- In your proof of De Morgan's Law, you used the fact that the intersection of the null set and set B is just the null set. Can you explain why this is the case?
- Can you give an example of a situation where the intersection of A-B and B-A does not exist?

I'm looking forward to hearing from you!

216 words

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Re: Discussion Assignment Unit 1

by Ahmed Alareqi - Thursday, 14 September 2023, 5:27 AM

A = {cat, dog, fish, bird} B = {red, blue, green, yellow} U = {cat, dog, fish, bird, red, blue, green, yellow, apple, orange, banana}

The answer to the questions:

i. A ∪ B = {cat, dog, fish, bird, red, blue, green, yellow} - This is the union of sets A and B and includes all elements from both sets.

ii. A ∩ B = ∅ - In this case, it refers to the intersection of sets A and B, in which only elements from both sets are included. The intersection between A and B in this example is an empty set because there are no elements that have something in common between them.

iii. (A ∩ B) ∪ U = U - This is the union of the intersection of sets A and B with the universal set U. Since the intersection of A and B is an empty set in this example, the result is simply the universal set U.

iv. The Power set of A = {{}, {cat}, {dog}, {fish}, {bird}, {cat,dog}, {cat,fish}, {cat,bird}, {dog,fish}, {dog,bird}, {fish,bird}, {cat,dog,fish}, {cat,dog,bird}, {cat,fish,bird}, {dog,fish,bird}, {cat,dog,fish,bird}} - This is the set of all possible subsets of set A.

v. A′ = U - A = {red, blue, green, yellow, apple, orange, banana} - This is the complement of set A with respect to the universal set U and includes all elements in U that are not in A.

vi. ∅∩B = ∅ - This is the intersection of an empty set with set B. Since an empty set has no elements by definition, its intersection with any other set is also an empty set.

vii. A × B = {(cat, red), (cat, blue), (cat, green), (cat,yellow), (dog, red), (dog, blue), (dog, green), (dog,yellow), (fish, red), (fish, blue), (fish, green), (fish,yellow), (bird, red), (bird, blue), (bird, green), (bird,yellow)} - There are all possible ordered pairs in which the first element is from set A and the second element is from set B, which is the Cartesian product of sets A and B.

viii. A-B = {cat,dog,fish,bird} - This is the difference between sets A and B and includes all elements that are in set A but not in set B.

ix. (A − B) ∪ (B − A) = {cat,dog,fish,bird} ∪ {red,yellow,greeen,yellow} = {cat,dog,fish,bird ,red,yellow,greeen,yellow} - This is the symmetric difference between sets A and B and includes all elements that are in either set but not in both.

x. De Morgan's Law states that for any two sets A and B: (A ∪ B)′ = A′ ∩ B′ Let's prove this identity for our example sets: (A ∪ B)′ = ({cat,dog,fish,bird} ∪ {red,yellow,greeen,yellow})′ = ({cat,dog,fish,bird ,red,yellow,greeen,yellow})′ = {apple ,orange ,banana} A′ ∩ B′= ({red ,blue ,green ,yellow ,apple ,orange ,banana})∩({cat ,dog ,fish ,bird ,apple ,orange ,banana})={apple ,orange ,banana}

Hence we have proved that for our example sets: (A ∪ B)’ = A’ ∩ B’

Reference:

Doerr, A., & Levasseur, K. (2022). *Applied discrete structures* (3rd ed.). licensed under CC BY-NC-SA
Levin, O. (2021). *Discrete mathematics: An open introduction* (3rd ed.). licensed under CC 4.0

513 words

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Re: Discussion Assignment Unit 1
by Amr Khudair - Thursday, 14 September 2023, 6:31 AM

Hello Ahmed,

I really appreciate your detailed and clear explanation of the set theory concepts. Your answers are accurate and well-organized, and I can tell that you have a good understanding of the material. I also like that you included references to the sources you used, which is a great way to show your work and give credit to the authors.

I especially liked the way you explained De Morgan's Law. You did a great job of breaking it down into smaller steps and providing clear examples. I think this is a concept that can be difficult to understand, but you made it very easy to follow.

Overall, I think this is a very well-written and informative discussion post. You did a great job of explaining the concepts in a clear and concise way, and I learned a lot from reading it.

Thanks for sharing your knowledge!

147 words

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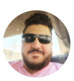

Re: Discussion Assignment Unit 1
by Amr Khudair - Thursday, 14 September 2023, 5:43 AM

In this discussion, let's consider the following sets:

A = {1, 2, 3, 4}
B = {3, 4, 5, 6}
U = {1, 2, 3, 4, 5, 6, 7, 8}

i. A ∪ B (Union of A and B):
The union of two sets, A and B, denoted by A ∪ B, is the set that contains all the elements present in either A or B. In this case, the union of A and B would be {1, 2, 3, 4, 5, 6}, as it contains all the elements from both sets without duplication.

ii. A ∩ B (Intersection of A and B):
The intersection of two sets, A and B, denoted by A ∩ B, is the set that contains all the elements present in both A and B. In this case, the intersection of A and B would be {3, 4}, as these are the common elements between the two sets.

iii. (A ∩ B) ∪ U (Union of the intersection of A and B with U):
First, we find the intersection of A and B, which is {3, 4}. Then, we take the union of this intersection with the set U, resulting in {1, 2, 3, 4, 5, 6, 7, 8}. This set includes all the elements from both the intersection of A and B, as well as the universal set U.

iv. The Power set of A:
The power set of a set A, denoted by P(A), is the set of all possible subsets of A, including the empty set and the set A itself. In this case, the power set of A would be {{}, {1}, {2}, {3}, {4}, {1, 2}, {1, 3}, {1, 4}, {2, 3}, {2, 4}, {3, 4}, {1, 2, 3}, {1, 2, 4}, {1, 3, 4}, {2, 3, 4}, {1, 2, 3, 4}}.

v. A' (Complement of A):
The complement of a set A, denoted by A', is the set that contains all the elements not present in A but present in the universal set U. In this case, the complement of A would be {5, 6, 7, 8}, as these elements are in U but not in A.

vi. ∅∩B (Intersection of the empty set with B):
The empty set (∅) is a set that contains no elements. The intersection of any set with the empty set would also be the empty set. Therefore, ∅∩B = ∅.

vii. A × B (Cartesian Product of A and B):
The Cartesian product of two sets, A and B, denoted by A × B, is the set of all ordered pairs where the first element comes from A and the second element comes from B. In this case, A × B would be {(1, 3), (1, 4), (1, 5), (1, 6), (2, 3), (2, 4), (2, 5), (2, 6), (3, 3), (3, 4), (3, 5), (3, 6), (4, 3), (4, 4), (4, 5), (4, 6)}.

viii. A - B (Relative Complement of B in A):
The relative complement of set B in set A, denoted by A - B, is the set that contains all the elements of A that are not in B. In this case, A - B would be {1, 2}, as these elements are in A but not in B.

ix. (A − B) ∪ (B − A) (Symmetric Difference of A and B):
The symmetric difference of two sets, A and B, denoted by (A − B) ∪ (B − A), is the set that contains all the elements that are in either A or B but not in their intersection. In this case, (A − B) ∪ (B − A) would be {1, 2, 5, 6}, as these elements are present in either A or B but not in both.

x. De Morgan's Law:
One of De Morgan's Laws states that the complement of the union of two sets is equal to the intersection of their complements. Mathematically, it can be expressed as:

(A ∪ B)' = A' ∩ B'

In ourexample, let's consider sets A = {1, 2, 3, 4} and B = {3, 4, 5, 6}. We can prove the above De Morgan's Law as follows:

1. (A ∪ B)' (Complement of the union of A and B):
   The union of A and B is {1, 2, 3, 4, 5, 6}. Taking the complement of this set, we get the elements that are not present in the union. Therefore, (A ∪ B)' = {7, 8}.
2. A' ∩ B' (Intersection of the complements of A and B):
   The complement of A is {5, 6, 7, 8}, and the complement of B is {1, 2, 7, 8}. Taking the intersection of these complements, we find the common elements. Therefore, A' ∩ B' = {7, 8}.

By comparing the results of both sides of the equation, we can see that (A ∪ B)' = A' ∩ B'. Hence, we have proven De Morgan's Law for the given sets A and B.

Set theory plays a crucial role in various real-world applications. It provides a foundation for mathematical modeling and analysis, helping us understand and solve complex problems. In addition to the grocery store example mentioned earlier, set theory finds applications in fields such as computer science, statistics, economics, and social sciences.

In computer science, sets are used for data organization, searching, and filtering. For instance, databases utilize set operations to retrieve specific information from large datasets. In programming, sets can be implemented as data structures to efficiently store and manipulate collections of elements.

In statistics, set theory is employed in probability theory, where sets represent events, sample spaces, and random variables. It enables the calculation of probabilities, intersections, and unions of events, which are fundamental concepts in statistical analysis.

In economics, set theory helps model economic relationships and analyze market behavior. Sets can represent different groups of consumers, producers, or market segments, allowing economists to study their interactions and make predictions based on set operations and intersections.

In social sciences, set theory aids in analyzing social networks, relationships, and group dynamics. By representing individuals or entities as sets, researchers can study connections, overlaps, and patterns within social structures.

Overall, set theory provides a powerful framework for organizing, analyzing, and understanding relationships between objects and concepts in a wide range of real-world scenarios. Its applications extend beyond mathematics and contribute to various disciplines, enabling us to make informed decisions and solve complex problems in diverse fields.

Reference:

- Doerr, A., & Levasseur, K. (2022). *Applied discrete structures* (3rd ed.). licensed under CC BY-NC-SA

- Levin, O. (2021). *Discrete mathematics: An open introduction* (3rd ed.). licensed under CC 4.0

Question: How do you use set theory in your daily life?

1107 words

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Re: Discussion Assignment Unit 1

by Amina Bozgert - Thursday, 14 September 2023, 6:52 AM

Hi Amr,
Nice job, your assignment is well done and has all requirements. Keep it up.

16 words

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Re: Discussion Assignment Unit 1

by Ahmed Alareqi - Thursday, 14 September 2023, 7:51 AM

In set theory, the union of two sets A and B, denoted by A ∪ B, is the set that contains all the elements present in either A or B. For the given sets A = {1, 2, 3, 4} and B = {3, 4, 5, 6}, their union would be {1, 2, 3, 4, 5, 6}.

Similarly, the intersection of two sets A and B, denoted by A ∩ B, is the set that contains all the elements present in both A and B. In this case, the intersection of A and B would be {3, 4}.

These set operations are fundamental concepts in set theory and are used to analyze and manipulate sets in various applications.

118 words

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Re: Discussion Assignment Unit 1

by Abdul Rahman Abu Arab - Thursday, 14 September 2023, 6:16 AM

- **A = {x, y, z, w}** : This set contains four letters from the alphabet.
- **B = {5, 6, 7, 8}** : This set contains four consecutive natural numbers.
- **U = {x, y, z, w, 5, 6, 7, 8, bread, cheese, milk, eggs}** : This set contains all the elements from A and B as well as four items from the grocery store.

These sets can be used to represent the customers who purchase items from different categories. For example, A can represent the customers who buy fruits, B can represent the customers who buy vegetables, and U can represent all the customers who visit the store. The intersection of A and B can represent the customers who buy both fruits and vegetables. The complement of A can represent the customers who do not buy fruits. The difference between A and B can represent the customers who buy fruits but not vegetables. And so on.

- **A ∪ B = {x, y, z, w, 5, 6, 7, 8}.** This is the union of A and B, which means the set of all elements that belong to either A or B or both.
- **A ∩ B =** ∅ since A and B have no common elements. This is the intersection of A and B, which means the set of all elements that belong to both A and B.
- **(A ∩ B) ∪ U = {x, y, z, w, 5, 6, 7, 8, bread, cheese, milk, eggs}.** This is the union of the intersection of A and B and the universal set U, which means the set of all elements that belong to either (A and B) or U or both. Since A and B have no common elements, their intersection is ∅, and the union of ∅ and U is just U.
- **The power set of A = {∅, {x}, {y}, {z}, {w}, {x, y}, {x, z}, {x, w}, {y, z}, {y, w}, {z, w}, {x, y, z}, {x, y, w}, {x, z, w}, {y, z, w}, {x, y, z, w}}.** This is the set of all subsets of A, which means the set of all possible combinations of elements from A.
- **A’ = {5, 6, 7, 8, bread, cheese, milk, eggs}.** This is the complement of A with respect to U, which means the set of all elements that belong to U but not to A.

- **∅ ∩ B = ∅.** Since ∅ has no elements at all, there are no common elements between ∅ and B.
- **A × B = {(x,5), (x,6), (x,7), (x,8), (y,5), (y,6), (y,7), (y,8), (z,5), (z,6), (z,7), (z,8), (w,5), (w,6), (w,7), (w,8)}.** This is the set of all possible combinations of one element from A and one element from B, where the order matters.
- **A - B = {x, y, z, w}.** This is the difference between A and B, which means the set of all elements that belong to A but not to B.
- **(A − B) ∪ (B − A) = {x, y, z, w, 5, 6, 7, 8}.** This is the symmetric difference between A and B, which means the set of all elements that belong to either A or B but not to both.
- **Prove any one De Morgan identity for A and B**: (A ∪ B)' = A' ∩ B'. This means that the complement of the union of A and B is equal to the intersection of the complements of A and B. To prove this identity, we can use a truth table:

(A ∪ B)' = A' ∩ B'

a	b	A	B	A ∪ B	(A ∪ B)'	A'	B'	A' ∩ B'
T	T	T	T	T	F	F	F	F
T	F	T	F	T	F	F	T	F
F	T	F	T	T	F	T	F	F
F	F	F	F	F	T	T	T	T

As we can see from the table, the values of (A ∪ B)' and A' ∩ B' are always the same for any combination of a and b. Therefore, the identity is true.

Reference:

Levin, O. (2019). *Discrete mathematics: An open introduction (3 edition).* CreateSpace Independent Publishing Platform. http://discrete.openmathbooks.org/pdfs/dmoi-tablet.pdf

690 words

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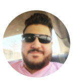

Re: Discussion Assignment Unit 1

by Amr Khudair - Thursday, 14 September 2023, 6:29 AM

Hi Abdul Rahman,

I really appreciate your detailed discussion of sets and set operations. You did a great job of explaining the concepts in a clear and concise way, and I especially liked the examples you used to illustrate the different operations.

I also thought it was helpful that you included a reference to the book you used as a source. This shows that you are careful about giving credit where credit is due, and it also makes it easy for me to find more information on the topic if I want to.

Overall, I thought this was a very well-written and informative discussion post. Thank you for sharing your knowledge!

Here are some specific things I liked about your post:

- You clearly defined the terms you were using, so that even someone who is new to set theory could understand what you were talking about.
- You provided clear and concise explanations of the different set operations.
- You used helpful examples to illustrate the different operations.
- You included a reference to the book you used as a source.

I think this post would be a valuable resource for anyone who is interested in learning more about sets and set operations. Thank you again for sharing your knowledge!

Sincerely,

208 words

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Re: Discussion Assignment Unit 1

by Amina Bozgert - Thursday, 14 September 2023, 6:47 AM

Hi Abdul Rahman,
Nice job, your assignment is well done and has all requirements. Keep it up.

17 words

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Re: Discussion Assignment Unit 1

by Ahmed Alareqi - Thursday, 14 September 2023, 7:53 AM

good work.

2 words

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