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Next item →

1. Which of the following statements is not always true about bijections? 1 / 1 point

- ○ Bijections map one set to another without any leftover elements in either set.
- ◉ A function f: X → Y is a bijection if every 'y' in Y is associated with exactly one 'x' in X.
- ○ If a function f: X → Y is a bijection, it always means that the inverse function f^{-1}: Y → X is also a bijection.
- ○ A function is a bijection if and only if it is both an injection (one-to-one) and a surjection (onto).

Correct
Good job! This statement would be true for an "injection" (or a "one-to-one" function) but not specifically a bijection. A bijection also needs to be "onto", meaning that every element in Y is accounted for by the function.

2. Which one of the following is the contrapositive of the statement "If it is raining, then I will stay at home"? 1 point

- ○ If it is not raining, then I will not stay at home.
- ○ If I am not at home, then it is not raining.
- ○ I will stay at home only if it is raining.
- ◉ If I don't stay at home, it is not raining.

Incorrect
You're close, try to construct the contrapositive with the correct implication direction. The contrapositive reverses and negates both the hypothesis and conclusion of the original statement.

3. Given Boolean function f = x OR NOT(y AND z), which of the following represents this function using DeMorgan's Laws? 1 / 1 point

- ○ f = x OR (y OR z)
- ○ f = NOT x OR (y AND z)
- ◉ f = x OR (NOT y OR NOT z)
- ○ f = x AND (NOT y OR NOT z)

Correct
Excellent! You correctly applied DeMorgan's laws. The function f = x OR NOT(y AND z) by DeMorgan's can indeed be represented as f = x OR (NOT y OR NOT z).

4. What is the intersection of two disjoint sets A and B? 1 / 1 point

- ◉ The empty set (∅)
- ○ Set A
- ○ The universal set U
- ○ Set B

Correct
Excellent! The intersection of two disjoint sets is indeed the empty set, as there are no common elements between A and B.

5. If p: "It is raining." and q: "I carry an umbrella." Which of the following represents the proposition "It is not raining and I do not carry an umbrella"? 1 / 1 point

- ○ p AND q
- ○ p OR NOT q
- ○ NOT p AND q
- ◉ NOT p AND NOT q

Correct
Great job! This proposition correctly represents "It is not raining and I do not carry an umbrella", with both parts being negated and connected with an AND.

6. Given the function l(x) = 2x^2 - 4x + 3, choose all correct statements: 1 / 1 point

- ☐ The function l(x) intersects the y-axis at y = -3.
- ☑ The minimum value of l(x) occurs when x = 1.

Correct
Well done! The minimum (or maximum) value of a quadratic function occurs at x = -b/2a. For this function, that would indeed be x = 1.

- ☑ The value of l(2) is equal to 3.

Correct

Yes, correct! When you substitute x=2 into the function l(x), the result is indeed 3.

- [ ] l(x) has one distinct real root.

7. Which of the following logical statements are equivalent to the implication $p \rightarrow q$? 1 point

- [ ] $p \vee \neg q$
- [ ] $\neg q \rightarrow \neg p$
- [ ] $p \wedge q$
- [x] $\neg p \vee q$

Correct
You're correct! The logical statement "$\neg p \vee q$" is indeed equivalent to the implication $p \rightarrow q$ in propositional logic. The implication can be read as: "if not p, then q" or "not p or q".

You didn't select all the correct answers

8. Which of the following statements is true about a bijective function? 1 / 1 point

- ( ) A bijective function maps each element of the domain to exactly two elements of the co-domain.
- ( ) A bijective function always maps each element of the domain to the same element of the co-domain.
- (•) A bijective function has an inverse that is also a function.
- ( ) A bijective function always has a co-domain larger than its domain.

Correct
Excellent! By definition, a function is bijective if it has a well-defined inverse that is also a function.

9. Solve the following logarithmic equation for x, if it exists: log2(x) + log2(x-1) = 1. Find it to two decimal points 1 / 1 point

2.00

Correct
Fantastic work! From the properties of logarithms, we combine log2(x) and log2(x-1) to form log2(x(x-1)) = 1. Setting the equation 2^1 = x(x-1), the solution is indeed x = 2.

10. Consider the proposition p: "All swans are white". Which of the following represents the negation of p? 1 / 1 point

- (•) There exists a swan that is not white.
- ( ) No swans are white.
- ( ) All swans are not white.
- ( ) Some swans are not white.

Correct
Perfect! The negation of "all swans are white" is indeed "there exists a swan that is not white". This switches from asserting something about every member of a set to asserting that there is at least one member of the set for which it fails to hold.

11. Given the propositions p: "I read books" and q: "I write books". How would you represent the statement "I read books or I do not write books" in terms of p and q? 1 / 1 point

- ( ) p AND NOT q
- ( ) NOT p OR q
- ( ) p AND q
- (•) p OR NOT q

Correct
Correct! This proposition properly represents "I read books or I do not write books", with 'p' representing 'I read books' and 'NOT q' representing 'I do not write books', connected with an 'OR'.

12. Consider the boolean expression F = a'b'c' + abc. Find the value of F when a = 0, b = 1, and c = 0. 1 / 1 point

0

Correct
Great job! Applying the values a = 0, b = 1, and c = 0 to the Boolean expression, we get 0.

13. Given the set A = {1, 2, 3, 4, 5}, what is the cardinality of the Power Set of A? 1 / 1 point

- ( ) 10
- ( ) 5
- (•) 32
- ( ) 25

Correct

Excellent! The cardinality of a power set is 2 to the power of the cardinality of the original set. As there are 5 elements in set A, the cardinality of the power set of A is 2^5, which is 32.

14. Which statements involving set theory are true? 1 / 1 point

- [x] For any two sets A and B, if $A \subseteq B$ then $B \cup A = B$.

Correct
Well done. If A is a subset of B, the union of A and B will always equal B since all elements of A are already included in B. Review the laws of set theory.

- [x] For any two sets A and B, $B \subseteq A \cup B$.

Correct
This answer is correct! By definition, the union of set A and B contains all the elements that are in A and B. So, B is always a subset of $A \cup B$.

- [x] For any two sets A and B, $A \cap B \subseteq A$.

Correct
Well done! The intersection of sets A and B gives the set of elements common to both A and B, so by definition, these elements must be included in A, thus $A \cap B$ is a subset of A.

- [ ] For any two sets A and B, $B \setminus A = \varnothing$ implies A = B.

15. If $(\neg p \vee q)$ is equivalent to $(q \rightarrow p)$, what can we say about the propositions p and q? 1 / 1 point

- (●) If q is true, then p is also true.
- ( ) p and q are always true.
- ( ) p and q are complementary of each other.
- ( ) p and q are always false.

Correct
You've got it! In terms of Boolean logic, the implication $(q \rightarrow p)$ ensures that if q is true, p must also be true. If p were false while q is true, the implication would be false which would violate the equivalence.

16. Which of these Boolean expressions is the dual of AB + CD? 1 / 1 point

- ( ) (AB)(CD)
- ( ) A'B' + C'D'
- (●) (A + B)(C + D)
- ( ) A'+B' . C'+D'

Correct
Excellent! This is correct. The dual of a Boolean expression is derived by switching OR operations with AND operations and vice versa.

17. Given a Boolean expression F(a, b, c, d) = (a + b.d).(c.b.a + c.d), which of the following methods could be used to minimise this expression? 1 / 1 point

- ( ) Karnaugh's map only
- ( ) Neither Karnaugh's map nor Boolean algebra laws
- ( ) Boolean algebra laws only
- (●) Both Karnaugh's map and Boolean algebra laws

Correct
That's correct! Both Karnaugh's map and Boolean algebra laws are excellent tools for simplifying or minimising Boolean expressions. They can be used separately or in conjunction to render the most simplified form of the expression.

18. Consider the sets A = {1, 2, 3, 4} and B = {4, 8, 10}. How many elements are in the set $A \cap B$? 1 / 1 point

1

Correct
Excellent job! Since the intersection of two sets is the set of elements that are common to both sets, the set $A \cap B$ will just contain the common element which is {4}. Therefore, the number of elements in $A \cap B$ is 1.

19. Consider two functions defined $R \rightarrow R$ with f(x) = x^2 + 1 and g(x) = 2x - 1. What is the value of (gof)(1)? 1 / 1 point

3

Correct
Good job! When you substitute x=1 into the function f(x) to get f(1), and then substitute the result into function g(x) to get (gof)(1), the result is indeed 3.

20. In a Boolean expression, which of these law(s) can be used for simplification? 1 / 1 point

- [x] Absorption Law

Correct
That's right! The absorption law removes redundancies in Boolean expressions and can help simplify expressions by absorbing identical terms. It's a great tool in boolean expression simplification.

- [x] DeMorgan's Laws

Correct
Absolutely correct! DeMorgan's laws are fundamental tools for simplifying Boolean expressions. They describe the relationship between 'AND' and 'OR' operations in the context of an entire expression being negated.

- [x] Distributive Law

Correct
Excellent answer! Distributive law is a fundamental law in Boolean algebra that is used to distribute AND or OR operations across other operations. This law significantly aids in simplifying complex Boolean expressions.

- [ ] Law of Gravity

21. A boolean expression has been simplified using the method of Karnaugh's map resulting in minterms m0, m1, and m4. If these minterms were each represented by a 3-bit binary number, what would m4 be represented as in decimal form? 1 / 1 point

4

Correct
Very well done! Binary number representation of m4 as given would be 100. Converting this binary number to decimal gives us 4.

22. Consider sets C = {1, 2, 3, 4, 5} and D = {4, 5, 6, 7, 8}. How many number of elements in the set C ∪ D? 1 / 1 point

8

Correct
Excellent work! The union of the sets C and D includes every distinct element from both sets. In this case, the elements are {1, 2, 3, 4, 5, 6, 7, 8}, totaling 8 distinct elements.

23. Consider two functions defined R ⟶ R with h(x) = x^2 and k(x) = 3x. What is the value of (koh)(2)? 1 / 1 point

12

Correct
Great job! When you substitute x=2 into the function h(x) to get h(2), and then substitute the result into function k(x) to get (koh)(2), you indeed get 12.

24. Let q be a proposition that can be either true (represented by 1) or false (represented by 0). If you calculate the expression ¬q and the result is 0, what was the original value of q? 1 / 1 point

1

Correct
Well done! The expression ¬q gives the negation of the proposition q. If ¬q is 0, this means the original proposition q was true, or in the context of Boolean algebra, 1.

25. When using DeMorgan's laws to simplify a Boolean expression, you get a result that includes the maxterm M8. If this maxterm were represented by a 4-bit binary number, what would M8 be represented as in decimal form? 1 / 1 point

8

Correct
You've got it! The maxterm M8 is represented by the binary 1000. Converting this binary number to decimal gives us the number 8.

26. Consider two functions defined R ⟶ R with m(x) = 2x^2 + 1 and n(x) = x + 2. What is the value of (nom)(2)? 1 / 1 point

11

Correct
Good job! When you substitute x=2 into the function m(x) to get m(2) and then substitute the result into function n(x) to get (nom)(2), the result is indeed 9.

27. Consider the following statement: "If it is raining, then the ground is wet". Assign the proposition 'it is raining' as p and 'the ground is wet' as q. If the statement is true (1), and it is not raining ($p = 0$), what is the truth value of q?

1 point

0

Incorrect

The answer isn't quite right. In logic, the truth of the consequent (q) in an implication does not directly depend on the truth of the antecedent (p), but on the truth of the implication as a whole. Please review this concept again.

28. Consider the proposition $\neg(p \vee q)$. Which of the following are equivalent expressions?

1 / 1 point

- [ ] $p \wedge \neg q$
- [ ] $\neg p \vee q$
- [ ] $\neg p \vee \neg q$
- [x] $\neg p \wedge \neg q$

Correct

Indeed! This is a correct application of DeMorgan's law. The negation of the disjunction ($p \vee q$) is the conjunction of the negations ($\neg p \wedge \neg q$).

29. The graph of a function f(x) passes the Vertical Line Test. What does this tell us about f(x)?

1 / 1 point

- ○ f(x) is a quadratic function.
- ○ f(x) is a one-to-one function.
- ○ f(x) is a linear function.
- ◉ f(x) is a function.

Correct

Correct! If a graph passes the vertical line test, it means that for every input x, there is only one unique output, confirming it represents a function.

30. Let p be a proposition that can be either true (represented by 1) or false (represented by 0). If you have the compound proposition ($p \,.\, {\sim}p$), what is its truth value?

1 / 1 point

0

Correct

Well done! The compound proposition ($p \,.\, {\sim}p$) signifies a proposition 'p' AND the negation of proposition 'p'. This can never be true as both can't hold at the same time.