MATHS

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DISCRETE MATHEMATICS

Worked Example

1. Verify the

Closure property

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2. Verify the

Commutative property

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3. Verify the

Associative property

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4. Verify the

Existence of identity

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5. Verify the

Existence of inverse for the arithmetic operation + on the set of all odd integers Z_0.

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6. Let S set of all even number Z_e and be $+$,

Verify the :

Closure property

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7. Let S set of all even number Z_e and be $+$,

Verify the :

Commutative property

Watch Video Solution

8. Let S set of all even number Z_e and $be +$,

Verify the :

Associative property

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9. Let S set of all even number Z_e and $be +$,

Verify the :

Identity property

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10. Let S set of all even number Z_e and $be+$,

Verify the :

Inverse element.

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11. Let S set of all even number Z_e and $be+$,

Verify the :

Closure property

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12. Verify the

Commutative property

13. Verify the

Associative property

14. Verify the

Existence of identity

15. Verify the

Existence of inverse of C with respect to +.

16. Verify the

Closure property

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17. Verify the

Commutative property

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18. Verify the

Associative property

 Watch Video Solution

19. Verify the

Existence of identity

 Watch Video Solution

20. Verify the

Existence of inverse for the arithmetic operation + on the set of all odd integers Z_0.

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21. Verify the

Closure property

Watch Video Solution

22. Verify the

Commutative property

Watch Video Solution

23. Verify the

Associative property

Watch Video Solution

24. Verify the

Existence of identity

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25. Verify the

Existence of inverse for the set Z with following operation.

$a \cdot b = a + b + 2f \text{ or } alla, b \in Z$

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26. Verify the

Closure property

27. Verify the

Commutative property

28. Verify the

Associative property

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29. Verify the

Existence of identity

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30. Let $A = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ be any two bollean matrices of the same type find

$A \vee B$ and $A \wedge B$

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31. Verify the

Closure property

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32. Verify the

Commutative property

33. Verify the

Associative property

34. Verify the

Existence of identity

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35. Verify the

Existence of inverse for the operation $+_4$ on Z_4.

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36. Let S be [1], [2], [3], [4], [5], [6] = $Z_7 - [0] \cdot$ be $\times_7$ verifty

Closure property

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37. Let S be [1], [2], [3], [4], [5], [6] = $Z_7 - [0] \cdot$ be $\times_7$ verifty

Commutative property

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38. Let S be [1], [2], [3], [4], [5], [6] = $Z_7 - [0] \cdot$ be $\times_7$ verifty

Associative property

Watch Video Solution

39. Let S be [1], [2], [3], [4], [5], [6] = $Z_7 - [0] \cdot$ be $\times_7$ verifty

Existence property

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40. Identify the valid statement from the following

Mount Everest is the highest mountain in the world.

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41. Identify the valid statement from the following

4+5=9

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42. Identify the valid statement from the following

$9 + 6 > 10$

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43. Identify the valid statement from the following

$(100 - 10) = 80$

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44. Identify the valid statement from the following

How beautiful the moon is !

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45. Identify the valid statement from the following

Bring the book to me

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46. Identify the valid statement from the following

What are you coming home?

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47. What the statement in words corresponding to $-p, p \vee q, q \vee -p$ where p is "it is cold" and q is "It is raining".

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48. How many rows are needed for the following statement formulae.

$(p \vee -q) \wedge (p \wedge r)$

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49. How many rows are needed for the following statement formulae.

$(p \wedge -t) \vee (p \vee -q) \vee (p \wedge -r)$

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50. Consider $p \rightarrow q$: If today is Sunday their 3 is a prime number

Her p: Today's Sunday, q:3 is a prime number.

The truth of $p \rightarrow q$ is T because the conculsion of has truth value T. Consequences.

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51. Write the

Conditional statement

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52. Write the

Converse statement

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53. Write the

Inverse statement

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54. Write the

Contrapositive statement. For the two statement p and q given as:

p:3 is a factor of 18

q: Madurai is in Karnataka state.

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55. Construct the truth table for $\left(p \bar{\cup} q\right) \wedge \left(p \bar{\cup} -q\right)$.

p	q	$\neg q$	$r: (p \overline{\vee} q)$	$s: (p \overline{\vee} \neg q)$	$r \wedge s$
T	T	F	F	T	F
T	F	T	T	F	F
F	T	F	T	F	F
F	F	T	F	T	F

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56. Show that $p \to q$ and $q \to p$ are not equivalent.

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57. Show that (i) $\sim(p \wedge q) \equiv \sim p \vee \sim q$

(ii) $\sim(p \to q) \equiv p \wedge \sim q$.

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58. Shows that $p \leftrightarrow q = [-p \vee q] \wedge [(-q) \vee p]$

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Solution To Exercise 12 1

1. Determine whether $*$ is a binary operation on the sets given below.

(i) $a * b = a.\,|b|$ on R.

(ii) $a * b$= min (a,b) on A={1,2,3,4,5}

(iii) $(a * b) = a\sqrt{b}$ is binary on R.

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2. Determine whether $*$ is a binary operation on the sets given below.

(i) $a * b = a.\,|b|$ on R.

(ii) $a * b$= min (a,b) on A={1,2,3,4,5}

(iii) $(a * b) = a\sqrt{b}$ is binary on R.

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3. On Z, define $\otimes$ by $(m \otimes n) = m^n + n^m : \forall m, n \in Z.$ Is $\otimes$ binary on Z?

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4. Let $*$ be defined on R by $(a * b) = a + b + ab - 7$. Is $*$ binary on R? If so, find $3 * \left(-\frac{7}{15} \right)$.

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5. Let $A = \{a + \sqrt{5}b : a, b \in Z\}$. Check whether the usual multiplication is a binary operation on A.

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6. Define an operation * on Q as follows: $a \cdot b = \left(\frac{a+b}{2}\right), a, b \in Q$. Examine the closure, communative, and associative properties satisfied by $\cdot onQ$.

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7. Define an operation * on Q as follows: $a \cdot b = \left(\frac{a+b}{2}\right), a, b \in Q.$ Examine the existence of identify and existence of inverse for the operation * on Q.

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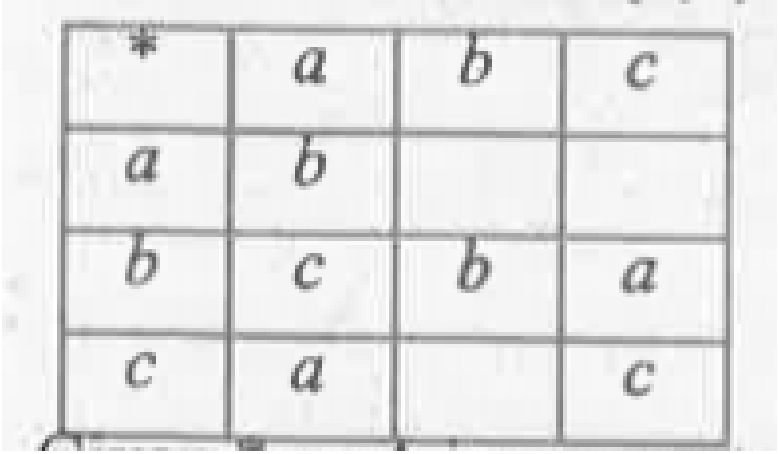
8. Fill in the following table so that the binary operation $*$ on A={a,b,c} is commutative.



*	a	b	c
a	b		
b	c	b	a
c	a		c

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9. Consider the binary operation * defined on the set A= {a,b,c,d} by the following table.

•	a	b	c	d
a	a	c	b	d
b	d	a	b	c
c	c	d	a	a
d	d	b	a	c

commutative and associative?

*	a	b	c	d
a	a	c	b	d
b	d	a	b	c
c	c	d	a	a
d	d	b	a	c

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10. Let $A = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}$,

$B = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}$

$C = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}$ by any three boolean matrices of the same type. Find (i) $A \vee B$, (ii) $A \wedge B$, (iii) $(A \vee A) \wedge C$, (iv) $(A \wedge B) \vee C$.

 Watch Video Solution

11. Let $A = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}$,

$B = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}$

$C = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}$ by any three boolean

matrices of the same type. Find (i) $A \vee B$, (ii) $A \wedge B$, (iii) $(A \vee A) \wedge C$, (iv) $(A \wedge B) \vee C$.

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12. Let $A = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}$ $C = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}$ by any three boolean matrices of the same type. Find (i) $A \vee B$, (ii) $A \wedge B$, (iii) $(A \vee A) \wedge C$, (iv) $(A \wedge B) \vee C$.

Watch Video Solution

13. Let $A = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}$ $C = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}$ by any three boolean matrices of the same type. Find (i) $A \vee B$, (ii) $A \wedge B$, (iii) $(A \vee A) \wedge C$, (iv) $(A \wedge B) \vee C$.

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14. Let $M = \left\{ \begin{bmatrix} x & x \\ x & x \end{bmatrix} : x \in R - \{0\} \right\}$ and let * be the matrix multiplication. Determine whether M is closed under *. If so, examine the commutative and associative properties satisfied by * on M.

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15. Let $M = \left\{ \begin{bmatrix} x & x \\ x & x \end{bmatrix} : x \in R - \{0\} \right\}$ and let * be the matrix multiplication. Determine whether M is closed under *. If so, examine the

existence of identify, existence of inverse properties for the operation * on M.

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16. Let A be Q/{1}. Define * on A by x * y=x+y-xy. Is * binary on A? If so, examine the commutative and association properties satisfied by * on A.

Watch Video Solution

17. Let A be Q/{1}. Define * on A by x * y=x+y-xy. Is * binary on A? If so, examine the existence of identity & inverse properties for the operation * on A.

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Solution To Exercise 12 2

1. Let p: Jupiter is a planet and q: India is an island be any two simple statements. Give

verbal sentence describing each of the following statements:

(i) $\sim p$

(ii) $p \wedge \sim q$

(iii) $\sim p \vee q$

(iv) $p \rightarrow \sim q$

(v) $p < \Rightarrow q$

Watch Video Solution

2. Let p: Jupiter is a planet and q: India is an island be any two simple statements. Give

verbal sentence describing each of the following statements:

(i) $\sim p$

(ii) $p \wedge \sim q$

(iii) $\sim p \vee q$

(iv) $p \rightarrow \sim q$

(v) $p < \Rightarrow q$

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3. Let p: Jupiter is a planet and q: India is an island be any two simple statements. Give

verbal sentence describing each of the following statements:

(i) $\sim p$

(ii) $p \wedge \sim q$

(iii) $\sim p \vee q$

(iv) $p \rightarrow \sim q$

(v) $p < \Rightarrow q$

Watch Video Solution

4. Let p: Jupiter is a planet and q: India is an island be any two simple statements. Give

verbal sentence describing each of the following statements:

(i) $\sim p$

(ii) $p \wedge \sim q$

(iii) $\sim p \vee q$

(iv) $p \rightarrow \sim q$

(v) $p < \Rightarrow q$

Watch Video Solution

5. Let p: Jupiter is a planet and q: India is an island be any two simple statements. Give

verbal sentence describing each of the following statements:

(i) $\sim p$

(ii) $p \wedge \sim q$

(iii) $\sim p \vee q$

(iv) $p \rightarrow \sim q$

(v) $p < \Rightarrow q$

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6. Write each of the following sentences in symbolic form using statement variables p and

q.

(i) 19 is not a prime number and all the angles of a triangle are equal.

(ii) 19 is a prime number or all the angles of a triangle are not equal.

(iii) 19 is a prime number and all the angles of a triangle are equal.

(iv) 19 is not a prime number.

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7. Write each of the following sentences in symbolic form using statement variables p and q.

(i) 19 is not a prime number and all the angles of a triangle are equal.

(ii) 19 is a prime number or all the angles of a triangle are not equal.

(iii) 19 is a prime number and all the angles of a triangle are equal.

(iv) 19 is not a prime number.

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8. Write each of the following sentences in symbolic form using statement variables p and q.

(i) 19 is not a prime number and all the angles of a triangle are equal.

(ii) 19 is a prime number or all the angles of a triangle are not equal.

(iii) 19 is a prime number and all the angles of a triangle are equal.

(iv) 19 is not a prime number.

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9. Write each of the following sentences in symbolic form using statement variables p and q.

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(iii) 19 is a prime number and all the angles of a triangle are equal.

(iv) 19 is not a prime number.

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10. Determine the truth value of each of the following statements.

(i) If 6+2=5, then the milk is white.

(ii) China is an Europe or $\sqrt{3}$ is an integer.

(iii) It is not true that 5+5=9 or Earth is a planet.

(iv) 11 is a prime number and all the sides of a rectangle are equal.

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14. Which one of the following sentences is a proposition?

(i) 4+7=12

(ii) What are you doing?

(iii) $3^n \leq 81, n \in N$

(iv) Peacock is our national bird

(v) How tall this mountain is?

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15. Which one of the following sentences is a proposition?

(i) 4+7=12

(ii) What are you doing?

(iii) $3^n \leq 81, n \in N$

(iv) Peacock is our national bird

(v) How tall this mountain is?

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16. Which one of the following sentences is a proposition?

(i) 4+7=12

(ii) What are you doing?

(iii) $3^n \leq 81, n \in N$

(iv) Peacock is our national bird

(v) How tall this mountain is?

Watch Video Solution

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(i) 4+7=12

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(iii) $3^n \leq 81, n \in N$

(iv) Peacock is our national bird

(v) How tall this mountain is?

Watch Video Solution

18. Which one of the following sentences is a proposition?

(i) 4+7=12

(ii) What are you doing?

(iii) $3^n \leq 81, n \in N$

(iv) Peacock is our national bird

(v) How tall this mountain is?

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19. Write the converse, inverse, and contrapositive of each of the following implication.

(i) If x and y are numbers such that x=y, then $x^2 = y^2$.

(ii) If a quadrilateral is a square then it is a rectangle.

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20. Write the converse, inverse, and contrapositive of each of the following implication.

(i) If x and y are numbers such that x=y, then $x^2 = y^2$.

(ii) If a quadrilateral is a square then it is a rectangle.

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21. Construct the truth table for the following statements.

$-q \vee \ -q$

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22. Construct the truth table for the following statements.

$-(p \wedge \ -q)$

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23. Construct the truth table for the following statements.

$(p \vee q) \vee \ -q$

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24. Construct the truth table for the following statements.

$(\ -p \rightarrow r) \vee (p \leftrightarrow q)$

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25. Verify whether the following compound propositions are tautologies or contradictions or contingency

$(p \wedge q) \wedge -(p \vee q)$

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26. Verify whether the following compound propositions are tautologies or contradictions or contingency

$((p \vee q) \wedge -p) \rightarrow q$

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27. Verify whether the following compound propositions are tautologies or contradictions or contingency

$(p \to q) \leftrightarrow (-p \to q)$

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28. Verify whether the following compound propositions are tautologies or contradictions or contingency

$((p \to q) \vee (q \to r)) \to (p \to r)$

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29. Show that (i) $\sim(p \wedge q) \equiv \sim p \vee \sim q$

(ii) $\sim(p \rightarrow q) \equiv p \wedge \sim q$.

Watch Video Solution

30. Show that (i) $\sim(p \wedge q) \equiv \sim p \vee \sim q$

(ii) $\sim(p \rightarrow q) \equiv p \wedge \sim q$.

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31. Prove that

$$Q \to P \equiv P \to \ -Q$$

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32. Show that $p \to q$ and $q \to p$ are not equivalent.

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33. Show that $-(p \leftrightarrow q) \equiv p \leftrightarrow \ -q.$

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34. Check whether the statement $p \to (q \to p)$ is a tautology or a contradiction without using the truth table.

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35. Using truth table check whether the statements $\sim(p \vee q) \vee (\sim p \wedge q)$ and $\sim p$ are logically equivalent.

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36. Prove $p \to (q \to r) \equiv (p \wedge q) \to r$ without using truth table.

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37. Prove that $p \to (\sim q \vee r) \equiv \sim p \vee (\sim q \vee r)$ using truth table.

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Solution To Exercise 12 3

1. A binary operation on a set S is a function from

A. $S \to S$

B. $(S \times S) \to S$

C. $S \to (S \times S)$

D. $(S \times S) \to (S \times S)$

Answer: B

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2. Subtraction is not binary operation in

A. R

B. Z

C. N

D. Q

Answer: C

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3. Which one of the following is a binary operation on N?

A. Subtraction

B. Multiplication

C. Division

D. All of the above

Answer: B

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4. In the set R of real number $*$ is defined as follows. Which one of the following is not a binary operation on R?

A. $a \cdot b = \min \ (a. b)$

B. $a \cdot b = \max(a, b)$

C. $a \cdot b = a$

D. $a \cdot b = a^b$

Answer: D

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5. The operation $*$ defined by $a * b = \frac{ab}{7}$ is not a binary operation on

A. Q^+

B. Z

C. R

D. C

Answer: B

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6. In the set Q define $a \odot b = a + b + ab$. For what value of y, $3 \odot (y \odot 5) = 7$?

A. $y = \frac{2}{3}$

B. $y = \frac{-2}{3}$

C. $y = \frac{-3}{2}$

D. y=4

Answer: B

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7. If $a * b = \sqrt{a^2 + b^2}$ on the real numbers then $*$ is

A. commutative but not associative

B. associative but not commutative

C. both commutative and associative

D. neither commutative nor associative

Answer: C

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8. Which one of the following statements has the truth value T?

A. sin x is an even function

B. Every square matrix is non-singular

C. The product of complex number and its conjugate is purely imaginary

D. $\sqrt{5}$ is an irrational numbers

Answer: D

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9. Which one of the following statements has truth value F?

A. Chennai is in India or $\sqrt{2}$ is in integer

B. Chennai is in India or $\sqrt{2}$ is irrational number

C. Chennai is in India or China $\sqrt{2}$ is in integer

D. Chennai is in China or $\sqrt{2}$ is in irrational number

Answer: C

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10. If a compound statement involves 3 simple statements, then the number of rows in the truth table is

A. 9

B. 8

C. 6

D. 3

Answer: B

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11. Which one is the inverse of the statement $(p \vee q) \rightarrow (p \wedge q)$?

A. $(p \wedge q) \rightarrow (p \vee q)$

B. $-(p \vee q) \rightarrow (p \wedge q)$

C. $(-p \vee -q) \rightarrow (-p \wedge -q)$

D. $(-p \vee -q) \rightarrow (-p \vee -q)$

Answer: D

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12. Which one is the contrapositive of the statement $(p \vee q) \rightarrow r$?

A. $-r \rightarrow (-p \wedge -q)$

B. $-rtp(p \vee q)$

C. $r \rightarrow (p \wedge q)$

D. $p \rightarrow (q \vee r)$

Answer: A

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13. The truth table for $(p \wedge q) \vee -q$ is given below:

p	q	$(p \wedge q) \vee (\neg q)$
T	T	(a)
T	F	(b)
F	T	(c)
F	F	(d)

Which of the following is true?

A.

	a	b	c	d
a	T	T	T	T

B.

	a	b	c	d
b	T	F	T	T

C.

	a	b	c	d
c	T	T	F	T

D.

	a	b	c	d
d	T	F	F	F

Answer: C

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14. In the last column of the truth table for $\sim(p \vee \sim q)$ the number of final outcomes of the truth value 'F' are

A. 1

B. 2

C. 3

D. 4

Answer: C

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15. Which one of the following is incorrect? For any two propostitions p and q, we have

A. $-(p \vee q) \equiv -p \vee -q$

B. $-(p \wedge q) \equiv -p \vee -q$

C. $-(p \vee q) \equiv p \vee -q$

D. $-(-p) \equiv p$

Answer: C

Watch Video Solution

16.

p	q	$(p \wedge q) \rightarrow \neg p$
T	T	(a)
T	F	(b)
F	T	(c)
F	T	(d)

Which one of the following is correct for the truth value of $(p \wedge q) \rightarrow -p$?

A.

	a	b	c	d
a	T	T	T	T

B.

	a	b	c	d
b	F	T	T	T

C.

	a	b	c	d
c	F	F	T	T

D.

	a	b	c	d
d	T	T	T	F

Answer:

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17. The dual of $\sim(p \vee q) \vee [p \vee (p \wedge \sim r)]$ is

A. $-(p \vee q) \wedge [p \vee (p \wedge -r)]$

B. $(p \wedge q) \wedge [p \wedge (p \vee -r)]$

C. $-(p \wedge p) \wedge [p \wedge (p \wedge r)]$

D. $-(p \wedge q) \wedge [p \wedge (\vee -r)]$

Answer: D

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18. The proposition $p \wedge (\sim p \vee q)$ is

A. a tautology

B. a contradiction

C. logically equivalent to $p \wedge q$

D. logically equivalent to $p \vee q$.

Answer: C

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19. Determine the truth value of each of the following statements:

(a) 4+2=5 and 6+3=9

(b) 3+2=5 and 6+1=7

(c) 4+5 =9 and 1+2=4

(d) 3+2=5 and 4+7=11

A. 4+2=5 and 6+3=9

B. 3+2=5 and 6+1=7

C. 4+5=9 and 1+2=4

D. 3+2=5 and 4+7=11

Answer: A

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20. Which one of the following is not true?

A. Negation of a negation of a statement is the statement itself.

B. If the last column of the truth table contains only T then it is a tautology.

C. If the last column of its truth table contains only F then it is a contradiction.

D. If p and q are any two statements then $p \leftrightarrow q$ is a taulogy.

Answer: D

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Problems For Practice

1. Which of the following is a contradiction?

A. $p \vee q$

B. $p \vee q$

C. $p \wedge (-p)$

D. $p \vee (-p)$

Answer: D

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2. $+$ is not a binary operation on

A. N

B. Z

C. C

D. Q/(0)

Answer: D

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3. The value of $({}_{11}[3] + {}_{11}[5]) + {}_{11}[6]$ is:

A. [0]

B. [1]

C. [2]

D. [3]

Answer: D

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4. $\div$ is a binary operation on:

A. N

B. R

C. Z

D. Q/(0)

Answer: D

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5. Which condictional statement $p \to q$ is equivalent to :

A. $p \vee q$

B. $p \vee (-q)$

C. $-p \vee q$

D. $p \wedge q$

Answer: C

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6. The number of rows of the truth table of $-(p \wedge (-q)) \wedge q$ is:

A. 2

B. 4

C. 6

D. 8

Answer: B

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7. If * defined as a * b $= a^2 + b^2 - ab$ then 3 * (4 * 2) is

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8. If p is true and q is false, then which of the following is not true?

A. $p \to q$ is false

B. $p \vee q$ is true

C. $p \wedge q$ is false

D. $p \leftrightarrow$ is true

Answer: D

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9. $p \leftrightarrow q$ is equivalent to:

A. $p \rightarrow q$

B. $q \rightarrow p$

C. $(p \rightarrow q) \vee (q \rightarrow q)$

D. $(p \rightarrow q) \vee (q \rightarrow p)$

Answer: D

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10. In the set of integers under the operation * defined by $a \cdot b = a + b - 5$ then identity is:

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11. Let p be 'Anand is going to school' q be there are twenty five students in the class'.

Then Anand is not going to school or there are twenty students in the class stands for:

A. $p \vee q$

B. $p \wedge q$

C. $-p$

D. $-p \vee q$

Answer: D

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12. Which of the following is a tautology?

A. $p \vee q$

B. $p \wedge q$

C. $p \vee \ - q$

D. $p \wedge \ - q$

Answer: C

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13. In a set of real numbers an operations * defined by $a \cdot b = \sqrt{a^2 + b^2}$. Then the value of (3 * 5) * 4 is:

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14. Which of the following is not a binary operation on R?

A. $a \cdot b = ab$

B. $a \cdot b = a - b$

C. $a \cdot b = \sqrt{ab}$

D. $a \cdot b = a + b$

Answer: C

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15. Which of the following is/are not statement?

(i) Three plus four is ten (ii) The floor is smooth

(iii) Switch of the light (iv) Are you coming today

A. (i) * (ii)

B. (ii) * (iii)

C. (iii) * (iv)

D. (iv) only

Answer: C

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16. In a compound statement which is made of 4 single statement then the number rows in the truth table is

A. 2

B. 4

C. 8

D. 16

Answer: D

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17. Which of the following are statement?

(i) $7 + 2 < 10$ (ii) Set of rational numbers is finite

(iii) How beautiful you are (iv) wish you all the best

A. (iii) & (iv)

B. (i) & (ii)

C. (ii) & (iii)

D. (i) * (iv)

Answer: B

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18. In congruence modulo $5, \{x \in Z / x = 5k + 2\}$ represents.

A. [0]

B. [5]

C. [7]

D. [2]

Answer: D

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19. In $(S, *)$, is defined by $x * y = x$ where x, $y \in S$, then

A. only associative

B. only commutative

C. associative and commutative

D. neither associative nor commutative

Answer: A

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20. Which one of the following is not a statement?

A. May God bles you

B. Rose is a flower

C. Milk is white

D. 27 is a prime number

Answer: A

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21. If truth value of p is T and q is F then which of the following are having the truth value T.(i) $p \vee q$ (ii) $\sim p \vee q$ (iii) $p \vee (\sim q)$ (iv) $p \wedge (\sim q)$

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22. Show that $p \vee (\sim p)$ is a tautology.

A. tautology

B. contradiction

C. contingency

D. none of these

Answer: A

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23. If the binary operation * is defined $a \cdot b = a^2 - b^2 + ab + 4$ then (2 * 3) * 4 is :

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24. In a binary operation * defined as a * b=3a-b

then the value of (2 * 3) * 4 is

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25. Let $A = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ be any two bollean matrices of the same type find $A \vee B$ and $A \wedge B$

A. $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

Answer: B

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26. $-on$ Z is:

A. commutative

B. associative

C. both commutative and associative

D. neither commutative nor associative

Answer: D

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27. Which of the following is not a binary operation on R?

A. $a \cdot b = a|b| on R.$

B. $a \cdot b = \min \ (a, b) on A = [1, 2, 3, 4, 5]$

C. $a \cdot b = a\sqrt{b} \ \text{ on } \ R$

D. $a \cdot b = m : n$ on R, is usual multiplication

Answer: C

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28. Define $\cdot$ on Q as $a \cdot b = \left(\frac{2a + b}{2} \right), a, b \in Q.$

Then the identify element is :

A. 0

B. $\frac{1}{2}$

C. 1

D. does not exist

Answer: A

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29. Truth table for $p \bar{\cup} q$ is given below

p	q	$p \bar{\vee} q$
T	T	*(i)*
T	F	*(ii)*
F	T	*(iii)*
F	F	*(iv)*

Which of the following is true?

A.

	i	ii	iii	iv
a	F	T	T	F

B.

	i	ii	iii	iv
b	F	F	T	T

C.

	i	ii	iii	iv
c	T	F	T	F

D.

	i	ii	iii	iv
d	F	F	F	F

Answer: A

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30. In the following which is true:

A. $(p \vee q) \vee (-r) \equiv p \vee (q \vee r)$

B. $p \vee (q \vee r) \equiv (p \vee q) \wedge (p \vee r)$

C. $p \leftrightarrow q \equiv (p \rightarrow -q)$

D. $p \vee -q$ is a tautology

Answer: B

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