

# Sri Raghavendra Tuition Center

unit - 12 - 2024 to 2025

12th Standard

Date : 16-May-24

Reg.No. :

**Maths**

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**Place: Kattuputhur - 621 207,**

**Trichy (Dt)**

Time : 00:30:00 Hrs

Total Marks : 47

## I. ANSWER ALL QUESTION

47 x 1 = 47

- 1) A binary operation on a set S is a function from
  - (a)  $S \rightarrow S$     **(b)  $(S \times S) \rightarrow S$**     (c)  $S \rightarrow (S \times S)$     (d)  $(S \times S) \rightarrow (S \times S)$
- 2) Subtraction is not a binary operation in
  - (a) R    (b) Z    **(c) N**    (d) Q
- 3) Which one of the following is a binary operation on N?
  - (a) Subtraction    **(b) Multiplication**    (c) Division    (d) All the above
- 4) In the set R of real numbers "\*" is defined as follows. Which one of the following is not a binary operation on R?
  - (a)  $a*b = \min(a, b)$     (b)  $a*b = \max(a, b)$     (c)  $a*b = a$     **(d)  $a*b = a^b$**
- 5) The operation \* defined by  $a * b = \frac{ab}{7}$  is not a binary operation on
  - (a)  $Q^+$     **(b) Z**    (c) R    (d) C
- 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)  $y = 4$
- 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
- 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 number**

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

- (a) Chennai is in India or  $\sqrt{2}$  is an integer    (b) Chennai is in India or  $\sqrt{2}$  is an irrational number  
**(c) Chennai is in China or  $\sqrt{2}$  is an integer**  
 (d) Chennai is in China or  $\sqrt{2}$  is an irrational number

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

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)  $\neg(p \vee q) \rightarrow (p \wedge q)$     (c)  $(\neg p \vee \neg q) \rightarrow (\neg p \wedge \neg q)$     **(d)  $(\neg p \wedge \neg q) \rightarrow (\neg p \vee \neg q)$**

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

- (a)  $\neg r \rightarrow (\neg p \wedge \neg q)$**     (b)  $\neg r \rightarrow (p \vee q)$     (c)  $r \rightarrow (p \wedge q)$     (d)  $p \rightarrow (q \vee r)$

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

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

Which one of the following is true?

- (a) 

(a)	(b)	(c)	(d)
T	T	T	T

    (b) 

(a)	(b)	(c)	(d)
T	F	T	T

**(c) 

(a)	(b)	(c)	(d)
T	T	F	T

(a)	(b)	(c)	(d)
T	F	F	F

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

- (a) 1    (b) 2    **(c) 3**    (d) 4

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

- (a)  $\neg(p \vee q) \equiv \neg p \wedge \neg q$     (b)  $\neg(p \wedge q) \equiv \neg p \vee \neg q$     **(c)  $\neg(p \vee q) \equiv \neg p \vee \neg q$**     (d)  $\neg(\neg p) \equiv p$

16) 

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

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

(a)	(b)	(c)	(d)
(a)(b)(c)(d)	<b>(a)(b)(c)(d)</b>	(a)(b)(c)(d)	(a)(b)(c)(d)
T T T T	<b>F T T T</b>	F F T T	T T T F

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

(a)  $\neg(p \wedge q) \wedge [p \vee (p \wedge \neg r)]$  (b)  $(p \wedge q) \wedge [p \wedge (p \vee \neg r)]$  (c)  $\neg(p \wedge q) \wedge [p \wedge (p \wedge r)]$

**(d)  $\neg(p \wedge q) \wedge [p \wedge (p \vee \neg r)]$**

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

(a) a tautology (b) a contradiction **(c) logically equivalent to  $p \wedge q$**

(d) logically equivalent to  $p \vee q$

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)	(b)	(c)	(d)
<b>(a)(b)(c)(d)</b>	(a)(b)(c)(d)	(a)(b)(c)(d)	(a)(b)(c)(d)
<b>F T F T</b>	T F T F	T T F F	F F T T

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 tautology.**

21) The binary operation  $*$  defined on a set  $S$  is said to be commutative if \_\_\_\_\_

(a)  $a*b \in S \forall a, b \in S$  **(b)  $a*b = b*a \forall a, b \in S$**  (c)  $(a*b)*c = a*(b*c) \forall a, b \in S$

(d)  $a*b = e \forall a, b \in S$

22) If  $*$  is defined by  $a * b = a^2 + b^2 + ab + 1$ , then  $(2 * 3) * 2$  is \_\_\_\_\_

(a) 20 (b) 40 (c) 400 **(d) 445**

23) The number of binary operations that can be defined on a set of 3 elements is \_\_\_\_\_

**(a)  $3^2$**  (b)  $3^3$  (c)  $3^9$  (d)  $3^1$

24) The identity element of  $\left\{ \begin{pmatrix} x & x \\ x & x \end{pmatrix} \mid x \in \mathbb{R}, x \neq 0 \right\}$  under matrix multiplication is \_\_\_\_\_

(a)  $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$  (b)  $\begin{pmatrix} \frac{1}{4x} & \frac{1}{4x} \\ \frac{1}{4x} & \frac{1}{4x} \end{pmatrix}$  **(c)  $\begin{pmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$**  (d)  $\begin{pmatrix} \frac{1}{2x} & \frac{1}{2x} \\ \frac{1}{2x} & \frac{1}{2x} \end{pmatrix}$

- 25) Which one of the following is not a statement?  
 (a)  $2 + 3 = 5$     **(b) How beautiful is this flower?**    (c) Delhi is the capital of Tamil Nadu  
 (d) A triangle has found angles.
- 26) Which of the following is a tautology?  
 (a)  $p \vee q$     (b)  $p \wedge q$     **(c)  $q \vee \sim q$**     (d)  $q \wedge \sim q$
- 27) Which of the following is a contradiction?  
 (a)  $p \vee q$     (b)  $p \wedge q$     (c)  $q \vee \sim q$     **(d)  $q \wedge \sim q$**
- 28) The identity element in the group  $\{R - \{1\}, x\}$  where  $a * b = a + b - ab$  is \_\_\_\_\_  
**(a) 0**    (b) 1    (c)  $\frac{1}{a-1}$     (d)  $\frac{a}{a-1}$
- 29) Define \* on Z by  $a * b = a + b + 1 \forall a, b \in Z$ . Then the identity element of z is \_\_\_\_\_  
 (a) 1    (b) 0    (c) 1    **(d) -1**
- 30) A binary operation \* is defined on the set of positive rational numbers  $Q^+$  by  $a*b = \frac{ab}{4}$ . Then  $3 * \left(\frac{1}{5} * \frac{1}{2}\right)$  is \_\_\_\_\_  
**(a)  $\frac{3}{160}$**     (b)  $\frac{5}{160}$     (c)  $\frac{3}{10}$     (d)  $\frac{3}{40}$
- 31) If  $a * b = a^2b^2 - ab$  then  $3 * (1 * 1)$   
**(a) 0**    (b) 1    (c) 2    (d) 4
- 32) The number whose multiplication universe does not exist in C.  
**(a) 0**    (b) 1    (c) 0    (d) 1
- 33) Let p: Kamala is going to school  
 q: There are 20 students in the class. Then Kamala is not going to school or there are 20 students in the class is represented by  
 (a)  $p \vee q$     (b)  $p \wedge q$     (c)  $\sim p$     **(d)  $\sim p \vee q$**
- 34) If p is true and q is unknown, then \_\_\_\_\_  
 (a)  $\sim p$  is true    (b)  $p \vee (\sim p)$  is false    (c)  $p \wedge (\sim p)$  is true    **(d)  $p \vee q$  is true**
- 35) '+' is not a binary operation on \_\_\_\_\_  
 (a)  $\sim$     (b) z    (c) c    **(d)  $Q - \{0\}$**
- 36) '-' is a binary operation on \_\_\_\_\_  
 (a)  $\sim$     (b)  $Q - \{0\}$     (c)  $R - \{0\}$     **(d) Z**
- 37) Which of the following is a statement?  
**(a)  $7+2 < 10$**     (b) Wish you all success    (c) All the best    (d) How old are you?

- 38) In  $(\mathbb{N}, *)$ ,  $x * y = \max(x, y)$ ,  $x, y \in \mathbb{N}$  then  $7 * (-7)$
- (a) **7** (b) -7 (c) 0 (d) -49
- 39) In  $(S, *)$ , is defined by  $x * y = x$  where  $x, y \in S$ , then
- (a) **associative** (b) Commutative (c) associative and commutative  
(d) neither associative nor commutative
- 40) The number of commutative binary operations which can be defined on a set containing  $n$  elements is \_\_\_\_\_
- (a)  $n \frac{n(n+1)}{2}$  (b)  $n^{n^2}$  (c)  $n^{\frac{n}{2}}$  (d)  **$n^2$**
- 41) On the set  $\mathbb{R}$  of real numbers, the operation  $*$  is defined by  $a * b = a^2 - b^2$  Then  $(3 * 5) * 4$  is \_\_\_\_\_
- (a) **-240** (b) 240 (c) -72 (d) 72
- 42) In  $\mathbb{Z}$ , we define  $a * b = a + b + 1$ . The identity element with respect to  $*$  is \_\_\_\_\_
- (a) 1 (b) 0 (c) **-1** (d) 2
- 43) Which of the following are logically equivalent?
- (a)  $p \rightarrow q, q \rightarrow p$  (b)  $q \rightarrow p, \neg q \vee p$  (c)  $p \rightarrow q, \neg p \wedge q$  (d)  $q \rightarrow p, q \vee \neg p$
- 44) The number of rows and columns for  $(p \vee q) \vee r$  will be \_\_\_\_\_
- (a) 3, 8 (b) 8, 4 (c) **8, 5** (d) 5, 8
- 45) If  $P \vee q$  is false (F), then \_\_\_\_\_
- (a)  $p$  is false (b)  $q$  is false (c)  **$p$  and  $q$  are false** (d)  $p$  or  $q$  is false
- 46) The value of  $[3] +_8 [7]$  is
- (a) **a [10]** (b) a [8] (c) a [5] (d) a [2]
- 47) In the set  $\mathbb{Q}$  define  $a \times b = a + b + ab$ . For what values of  $y$ ,  $3 \times (y \times 5) = 7$
- (a) **a**