

**JEE MAIN + ADVANCED**

**MATHEMATICS**

**TOPIC NAME**

**MATHEMATICAL**

**REASONING**

**(PRACTICE SHEET)**

## LEVEL

Question based on

### Statements

- Q.1** Which of the following is a statement-  
 (A) May you live long!  
 (B) May God bless you!  
 (C) The sun is a star  
 (D) Hurrah! we have won the match
- Q.2** Which of the following is not a statement-  
 (A) Please do me a favour  
 (B) 2 is an even integer  
 (C)  $2 + 1 = 3$   
 (D) The number 17 is prime
- Q.3** Which of the following is not a statement-  
 (A) 3 is an even number  
 (B) New Delhi is in India  
 (C) Every square is a rectangle  
 (D) Today is Monday
- Q.4** Which of the following is not a statement-  
 (A) Give me a glass of water  
 (B) Asia is a continent  
 (C) The earth revolved round the sun  
 (D) The number 6 has two prime factors 2, 3
- Q.5** Which of the following is not a proposition-  
 (A)  $\sqrt{3}$  is a prime  
 (B)  $\sqrt{2}$  is irrational  
 (C) Mathematics is interesting  
 (D) 5 is an even integer

Question based on

### Compound Statements

- Q.6** Negation of " $2 + 3 = 5$  and  $8 < 10$ " is -  
 (A)  $2 + 3 \neq 5$  and  $< 10$   
 (B)  $2 + 3 = 5$  and  $8 \not< 10$   
 (C)  $2 + 3 \neq 5$  or  $8 \not< 10$   
 (D) None of these
- Q.7** Negation of "Ram is in Class X or Rashmi is in Class XII" is-  
 (A) Ram is not in Class X but Ram is in class XII  
 (B) Ram is not in Class X and Rashmi is not in Class XII  
 (C) either Ram is not in Class X or Ram is not in Class XII  
 (D) None of these
- Q.8** The negation of the compound statement  $p \vee (\sim p \vee q)$  is-  
 (A)  $(p \wedge \sim q) \wedge \sim p$     (B)  $(p \wedge \sim q) \vee \sim p$   
 (C)  $(p \vee \sim q) \vee \sim p$     (D) None of these

- Q.9** The negation of  $q \vee \sim (p \wedge r)$  is-  
 (A)  $\sim q \wedge \sim (p \wedge r)$     (B)  $\sim q \wedge (p \wedge r)$   
 (C)  $\sim q \vee (p \wedge r)$     (D)  $q \vee \sim (p \wedge r)$

- Q.10**  $\sim (p \wedge q)$  is equal to-  
 (A)  $\sim p \vee \sim q$     (B)  $\sim p \wedge \sim q$   
 (C)  $\sim p \wedge q$     (D)  $p \wedge \sim q$

- Q.11**  $\sim [(\sim p) \wedge q]$  is equal to-  
 (A)  $p \vee (\sim q)$     (B)  $p \vee q$   
 (C)  $p \wedge (\sim q)$     (D)  $\sim p \wedge \sim q$

- Q.12**  $\sim (p \vee q)$  is equal to-  
 (A)  $\sim p \vee \sim q$     (B)  $\sim p \wedge \sim q$   
 (C)  $\sim p \vee q$     (D)  $p \vee \sim q$

- Q.13**  $\sim [p \vee ((\sim q))]$  is equal to-  
 (A)  $\sim p \vee q$     (B)  $(\sim p) \wedge q$   
 (C)  $\sim p \vee \sim p$     (D)  $\sim p \wedge \sim q$

- Q.14** If p, q, r are simple statement, then  $(p \wedge q) \wedge (q \wedge r)$  is true then-  
 (A) p, q, r are all false  
 (B) p, q, r are all true  
 (C) p, q are true and r is false  
 (D) p is true and q and r are false

Question based on

### Conditional Statements

- Q.15** If p and q are simple statement, then  $p \Rightarrow q$  is false when-  
 (A) p is true and q is true  
 (B) p is false and q is true  
 (C) p is true and q is false  
 (D) both p and q are false
- Q.16** If p, q, r are simple statement with truth values T, F, T, then the truth value of  $(\sim p \vee q) \wedge \sim r \Rightarrow p$  is-  
 (A) true    (B) false  
 (C) true if r is false    (D) true if q is true
- Q.17** If  $(p \wedge \sim r) \Rightarrow (q \vee r)$  is false and q and r are both false, then p is-  
 (A) true  
 (B) false  
 (C) may be true or false  
 (D) data insufficient
- Q.18** Negation of the statement : If we control population growth, we prosper-  
 (A) If we do not control population growth, we prosper  
 (B) If we control population, we do not prosper  
 (C) We control population and we do not prosper  
 (D) We do not control population, but we prosper

- Q.19** Negation of the conditional: "If it rains then I shall go to school" is-  
 (A) it rains and I shall go to school  
 (B) it rains and I shall not go to school  
 (C) if does not rain and I shall go to school  
 (D) None of these
- Q.20** Which of the following is always false?  
 (A)  $(p \Rightarrow q) \equiv \sim q \Rightarrow \sim p$   
 (B)  $\sim (p \vee q) \equiv \sim p \vee \sim q$   
 (C)  $\sim (p \Rightarrow q) \equiv p \wedge \sim q$   
 (D)  $\sim (p \vee q) \equiv \sim p \wedge \sim q$
- Q.21** If  $p \Rightarrow (q \vee r)$  is false, then the truth values of p, q, r are respectively-  
 (A) T, F, F (B) F, F, F  
 (C) F, T, T (D) T, T, F
- Q.22** If  $p \Rightarrow (\sim p \vee q)$  is false, the truth values of p and q are respectively-  
 (A) F, T (B) F, F (C) T, T (D) T, F
- Q.23** Which of the following is logically equivalent to  $\sim (\sim p \Rightarrow q)$ ?  
 (A)  $p \wedge q$  (B)  $p \wedge \sim q$   
 (C)  $\sim p \wedge q$  (D)  $\sim p \wedge \sim q$
- Q.24**  $p \Rightarrow q$  can also be written as-  
 (A)  $p \Rightarrow \sim q$  (B)  $\sim p \vee q$   
 (C)  $\sim p \Rightarrow \sim q$  (D) None of these
- Q.25** Negation of the statement  $p \rightarrow (\sim q \wedge r)$  is  
 (A)  $p \wedge (q \vee \sim r)$  (B)  $\sim p \wedge (q \vee \sim r)$   
 (C)  $p \vee (q \vee \sim r)$  (D) None of these
- Q.26** The contra positive of  $(p \vee q) \Rightarrow r$  is-  
 (A)  $r \Rightarrow (p \vee q)$  (B)  $\sim r \Rightarrow (p \vee q)$   
 (C)  $\sim r \Rightarrow \sim p \wedge \sim q$  (D)  $p \Rightarrow (q \vee r)$

Question based on

### Biconditional Statements

- Q.27**  $\sim (p \Leftrightarrow q)$  is-  
 (A)  $\sim p \wedge \sim q$  (B)  $\sim p \vee \sim q$   
 (C)  $(p \wedge \sim q) \vee (\sim p \wedge q)$  (D) None of these
- Q.28** If p and q are simple statement, then  $p \Leftrightarrow \sim q$  is true when-  
 (A) p is true and q is true  
 (B) both p and q are false  
 (C) p is false and q is true  
 (D) None of these

Question based on

### Tautology & contradiction (Fallacy)

- Q.29** The conditional  $(p \wedge q) \Rightarrow p$  is-  
 (A) a tautology  
 (B) a fallacy i.e. contradiction  
 (C) neither tautology nor fallacy  
 (D) None of these
- Q.30** The statement  $p \Rightarrow \sim (p \wedge \sim q)$  is-  
 (A) contradiction (B) a tautology  
 (C) either (A) or (B) (D) neither (A) nor (B)
- Q.31**  $(p \wedge \sim q) \wedge (\sim p \vee q)$  is-  
 (A) a contradiction (B) a tautology  
 (C) either (A) or (B) (D) neither (A) nor (B)
- Q.32**  $\sim (p \Rightarrow q) \Leftrightarrow \sim p \vee \sim q$  is-  
 (A) a tautology  
 (B) a contradiction  
 (C) neither a tautology nor a contradiction  
 (D) cannot come to any conclusion
- Q.33** The statement  $(p \Rightarrow \sim p) \wedge (\sim p \Rightarrow p)$  is a-  
 (A) Tautology and contradiction  
 (B) Neither tautology nor contradiction  
 (C) contradiction  
 (D) Tautology
- Q.34** The false statement in the following is-  
 (A)  $p \wedge (\sim p)$  is a contradiction  
 (B)  $(p \Rightarrow q) \Leftrightarrow (\sim q \Rightarrow \sim p)$  is a contradiction  
 (C)  $\sim (\sim p) \Leftrightarrow p$  is a tautology  
 (D)  $p \vee (\sim p)$  is a tautology
- Q.35**  $(p \wedge \sim q) \wedge (\sim p \wedge q)$  is -  
 (A) a tautology  
 (B) a contradiction  
 (C) both a tautology and a contradiction  
 (D) neither a tautology nor a contradiction
- Q.36** Which of the following is a contradiction-  
 (A)  $(p \wedge q) \wedge \sim (p \vee q)$  (B)  $p \vee (\sim p \wedge q)$   
 (C)  $(p \Rightarrow q) \Rightarrow p$  (D) None of these
- Q.37** If p and q are two statements then negation of compound statement  $p \rightarrow \sim (q \vee p)$  is -  
 (A)  $(q \vee p) \rightarrow p$  (B)  $\sim (q \vee p) \rightarrow p$   
 (C)  $(q \vee p) \rightarrow \sim p$  (D) none of these
- Q.38** If truth values of p, q and r are T, T, F respectively, then truth value of  $p \rightarrow (q \vee r)$  is -  
 (A) T (B) F  
 (C) cannot say (D) none of these
- Q.39** The negations of 'If Ram is tall. Then he is handsome' is -  
 (A) Ram is not tall and he is handsome  
 (B) Ram is tall and he is not handsome  
 (C) Ram is not tall and he is not handsome  
 (D) None of these
- Q.40** If truth values of p, q and r are F, F, T respectively, then truth value of  $\sim p \Leftrightarrow \sim (q \wedge r)$  is -  
 (A) T (B) cannot say  
 (C) F (D) none of these
- Q.41** If p and q are two statements. Then  $(p \wedge \sim q) \vee (\sim p \vee q)$  is -  
 (A) Tautology  
 (B) Fallacy  
 (C) Neither Tautology Nor Fallacy  
 (D) None of these

- Q.42** If the truth value of compound statement  $P \Leftrightarrow (p \wedge q)$  is true. Then the truth values of  $p$  and  $q$  are -  
 (A) T, F (B) F, T (C) T, T (D) F, F
- Q.43** If  $p$  and  $q$  are two statements having truth values T and F respectively. Then the truth value of  $(p \wedge q) \rightarrow p \Leftrightarrow (p \vee \sim q) \wedge p$  is -  
 (A) T (B) F  
 (C) Cannot say (D) None of these
- Q.44** The statement  $p \rightarrow (q \rightarrow p)$  is equivalent to -  
**[AIEEE-2008]**  
 (A)  $p \rightarrow (p \vee q)$  (B)  $p \rightarrow (p \wedge q)$   
 (C)  $p \rightarrow (p \leftrightarrow q)$  (D)  $p \rightarrow (p \rightarrow q)$
- Q.45** Let  $p$  be the statement 'x is an irrational number',  $q$  be the statement 'y is a transcendental number', and  $r$  be the statement "x is an irrational number iff y is a transcendental number."  
**Statement-1** :  $r$  is equivalent to either  $q$  or  $p$ .  
**Statement -2** :  $r$  is equivalent to  $\sim(p \leftrightarrow \sim q)$   
**[AIEEE-2008]**  
 (A) Statement-1 is true, Statement -2 is true; Statement-2 is a correct explanation for Statement-1  
 (B) Statement-1 is true, Statement -2 is true; Statement-2 is not a correct explanation for Statement-1  
 (C) Statement-1 is true, Statement -2 is false  
 (D) Statement-1 is false, Statement-2 is true
- Q.46** **Statement-1** :  $\sim(p \leftrightarrow \sim q)$  is equivalent to  $p \leftrightarrow q$ .  
**Statement -2** :  $\sim(p \leftrightarrow \sim q)$  is a tautology  
**[AIEEE-2009]**  
 (A) Statement-1 is true, Statement -2 is true; Statement-2 is a correct explanation for Statement-1  
 (B) Statement-1 is true, Statement -2 is true; Statement-2 is not a correct explanation for Statement-1  
 (C) Statement-1 is true, Statement -2 is false  
 (D) Statement-1 is false, Statement-2 is true
- Q.47** Let  $S$  be a non- empty subset of  $R$ . Consider the following statement : **[AIEEE-2010]**  
 $P$  : There is a rational number  $x \in S$  such that  $x > 0$

- Which of the following statements is the negation of the statement  $P$  ?  
 (A) There is a rational number  $x \in S$  such that  $x \leq 0$ .  
 (B) There is no rational number  $x \in S$  such that  $x \leq 0$ .  
 (C) Every rational number  $x \in S$  satisfies  $x \leq 0$ .  
 (D)  $x \in S$  and  $x \leq 0 \Rightarrow x$  is not rational

- Q.48** Consider the following statements  
 $P$  : Suman is brilliant  
 $Q$  : Suman is rich  
 $R$  : Suman is honest  
 The negation of the statement "Suman is brilliant and dishonest if and only if Suman is rich" can be expressed as : **[AIEEE-2011]**  
 (A)  $\sim P \wedge (Q \leftrightarrow R)$   
 (B)  $\sim (Q \leftrightarrow (P \wedge R))$   
 (C)  $\sim Q \leftrightarrow \sim P \wedge$   
 (D)  $\sim (P \wedge R) \leftrightarrow Q$
- Q.49** The negation of the statement "If I become a teacher, then I will open a school", is :  
**[AIEEE-2012]**  
 (A) Either I will not become a teacher or I will not open a school  
 (B) Neither I will become a teacher nor I will open a school  
 (C) I will not become a teacher or I will open a school  
 (D) I will become a teacher and I will not open a school
- Q.50** Consider :  
**Statement-I** :  $(p \wedge \sim q) \wedge (\sim p \wedge q)$  is a fallacy.  
**Statement-II** :  $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$  is a tautology. **[JEE Main - 2013]**  
 (A) Statement-I is true; Statement-II is false.  
 (B) Statement-I is false, Statement-II is true.  
 (C) Statement-I is true; Statement-II is true; Statement-II is a correct explanation for Statement-I.  
 (D) Statement-I is true; Statement-II is true; Statement-II is not a correct explanation for Statement-I.

## ANSWER KEY

### LEVEL

<b>Q.No.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>Ans.</b>	C	A	D	A	C	C	B	A	B	A	A	B	B	B	C
<b>Q.No.</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
<b>Ans.</b>	A	A	C	B	B	A	D	D	B	A	C	C	C	A	D
<b>Q.No.</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>
<b>Ans.</b>	A	C	C	B	B	A	C	A	B	A	A	C,D	A	A	D
<b>Q.No.</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>										
<b>Ans.</b>	C	C	B,D	D	D										