1. Which one of the following is a proposition?

(A) $x+5=x^2$ (B) Are you going out somewhere?

(C) Oh My God! It was the best performance. (D) There are nine planets in solar system.

2. Which one of the following is not a proposition?

(A) The only odd prime number is 2. (B) God bless you.
(C) Everyone born on Monday has purple hair. (D) Sugar is a hydrocarbon.

3. Which of the following option is true?
(A) If the moon is a planet, horses will fly
(B) 3 +2 = 8 whenever 5+2 = 7
(C) 0 > 3 and 3 is an even integer
(D) -2 > 3 or 3 is a negative integer

4. Which of the following is true?

(A) Cows can fly iff Delhi is the capital of India.

(B) Cows can fly unless 2+3=6.

(C) 2+3=6 iff Delhi is the capital of India.

(D) Cows can't fly whenever 2+3=5

5. Consider the statement, "If N is divisible by 30, then N is divisible by 2 and 3 and 5." Which of the following is equivalent to this statement?

(A) If N is not divisible by 30, then N is divisible by 2 or divisible by 3 or divisible by 5.

(B) If N is not divisible by 30, then N is not divisible by 2 and not divisible by 3 and not divisible by 5.

(C) If N is divisible by 2 or divisible by 3 or divisible by 5 then N is divisible by 30.

(D) If N is not divisible by 2 or not divisible by 3 or not divisible by 5 then N is not divisible by 30.

6. In the following truth table, which of the logical connective is used?

p	q	$p\ ?\ q$
T	T	T
T	F	F
F	T	F
F	F	T

(A) $\wedge$ (B) $\vee$ (C) $\oplus$ (D) $\leftrightarrow$

7. Let p: you have a valid password. q: You can log on to the server. Which of the following is logical expression for "It is necessary to have a valid password to log on to the server"?

(A) $p \vee q$ (B) $\neg p \vee \neg q$ (C) $\neg q \vee p$ (D) $\neg p \vee q$

8. Let p: You read the newspaper every day. q: You will be informed. Which of the following is logical expression for "If you read the newspaper every day, you will be informed, and conversely"?

(A) $q \rightarrow p$ (B) $p \wedge q$ (C) $p \rightarrow q$ (D) $p \leftrightarrow q$

9. $(p \rightarrow q) \vee (r \rightarrow q) \equiv$

(A) $(p \vee r) \rightarrow q$ (C) $p \rightarrow (q \wedge r)$

(B) $(p \wedge r) \rightarrow q$ (D) $p \rightarrow (q \vee r)$

10. What is the negation of the statement "Khusboo got more than 90% marks in MTH401"?

(A) Khushboo got more than 95% marks in MTH401.

(B) Khushboo got less than 90% marks in MTH401.

(C) Khushboo didn't get more than 90% marks in MTH401.

(D) Khushboo didn't get any mark in MTH401.

11. Which of the following proof is used for proving the statement "If x is irrational, then $\frac{1}{x}$ is irrational"?

(A) Direct proof (B) Proof by Contraposition (C) Trivial Proof (D) Mathematical Induction

What will be the value of x in a computer program for the expression $(2x > x^2) \rightarrow (x := x + 1)$, if $x = 2$ is encountered?

(A) 1 (B) 2 (C) 3 (D) 4

13. Let $P(x)$: $x + 1 > x^4,\ x \in integers$ then $\exists x\ \neg P(x)$ and $\forall x\ \neg P(x)$ has truth value as

(A) T, T (B) F, F (C) F, T (D) T, F

14. In the following truth table, which of the logical connective is used?

p	q	$p\ ?\ q$
T	T	F
T	F	F
F	T	F
F	F	T

(A) $\rightarrow$ (B) $\downarrow$ (C) $\oplus$ (D) $\leftrightarrow$

15. A counter example to the statement $\forall x\ [(x^2 \geq 1) \rightarrow (x \geq 1)]$, where the domain consists of all real numbers, is

(A) -1 (B) 0 (C) 2 (D) 1

16. Which of the following is not a contradiction?

(A) $p \wedge \neg p$ (B) $p \wedge F$ (C) $p \vee F$ (D) $\neg p \wedge F$

17. The restricted existential quantification $\exists x\ \neq 2\ (x^2 = 4)$ can also be written as

(A) $\exists x\ (x \neq 2\ \rightarrow x^2 = 4)$ (B) $\exists x\ (x \neq 2\ \wedge x^2 = 4)$

(C) $\forall x\ (x \neq 2\ \rightarrow x^2 = 4)$ (D) $\forall x\ (x \neq 2\ \wedge x^2 = 4)$

18. Which of the following compound propositions is logically equivalent to $p \leftrightarrow q$?

(A) $p \leftrightarrow \neg q$ (B) $\neg p \leftrightarrow q$ (C) $p \rightarrow q$ (D) $\neg p \leftrightarrow \neg q$

19. When to prove P→Q true, we proof P false, that type of proof is known as--------

(A) Direct Proof (B) Contradiction proof (C) Vacuous proof (D) Trivial Proof

20. Choose the proposition logically equivalent to: $\neg\forall x\big(P(x) \rightarrow Q(x)\big)$

(A) $\exists x\big(P(x) \vee \neg Q(x)\big)$ (B) $\exists x\big(\neg P(x) \vee Q(x)\big)$

(C) $\exists x\big(P(x) \wedge \neg Q(x)\big)$ (D) $\exists x\big(\neg P(x) \wedge Q(x)\big)$

1. For p, q with truth values (T, T, F, F) and (T, F, T, F) respectively, the truth table of $(p \leftrightarrow q) \oplus (p \leftrightarrow \neg q)$ has the truth values

(A) T, T, F, F (B) Tautology

(C) F, T, T, F (D) Contradiction

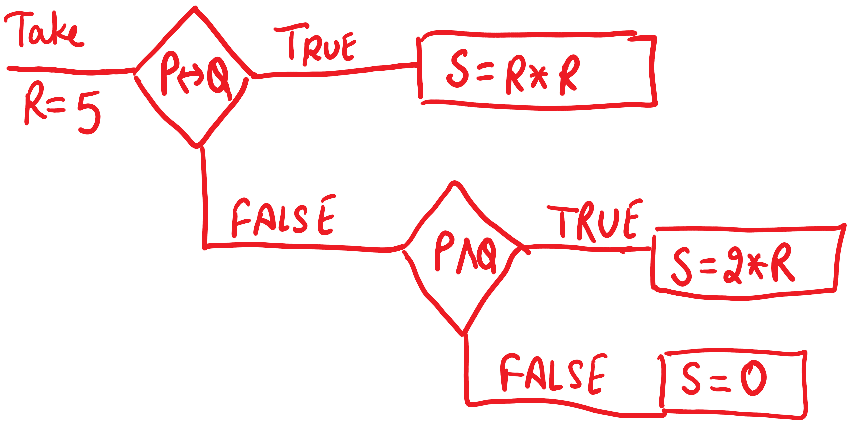
2. For p, q with truth values (T, T, F, F) and (T, F, T, F) respectively, the truth table of $(p \rightarrow q) \rightarrow (q \rightarrow p)$ has the truth values

(A) T, T, F, T (B) Tautology

(C) T, T, T, F (D) Contradiction

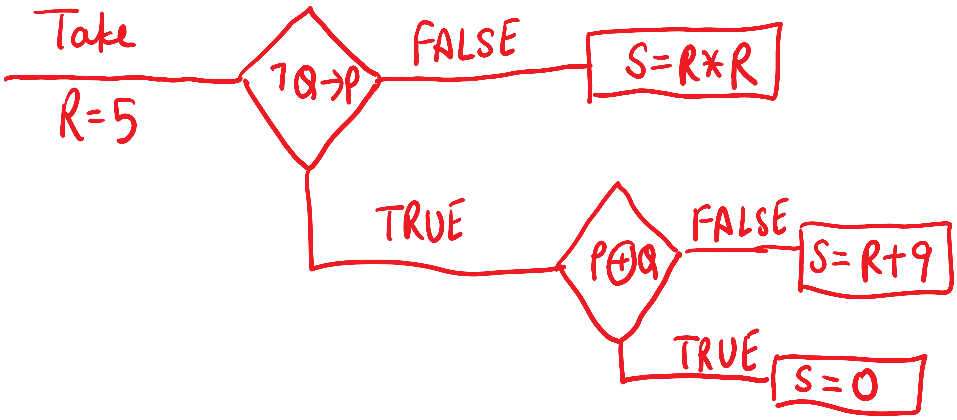
3. Let P: If Rohan wins the toss, Saurabh hits a 6 on first ball; Q: If Raju wins the toss, Mohit gets out on first ball. Now if P is true and Q is false then which of the following can be true?
(A) Raju wins the toss and Mohit got out on first ball.
(B) Raju did not win the toss.
(C) Rohan wins the toss and Saurabh hits a 6 on first ball.
(D) Rohan wins the toss and Saurabh got out.

4. Let P: 5+10=15, Q: 5*10=40
and the value of S, using the following flow chart of a computer program, is



(A) 25 (B) 5 (C) 10 (D) 0

5. Let P: 2+3=5, Q: 2*3=6
and the value of S, using the following flow chart of a computer program, is



(A) 5 (B) 25 (C) 14 (D) 0

6. Which of the following propositions is a tautology?

(A) $(a \vee b) \rightarrow (b \wedge c)$ (B) $(a \wedge b) \rightarrow (b \vee c)$ (C) $(a \vee b) \leftrightarrow (b \wedge c)$ (D) None of these

7. p and q are two propositions. Which of the following logical expressions are equivalent?

(i) $p \vee \neg q$ (ii) $(p \wedge q) \vee (p \wedge \neg q) \vee (\neg p \wedge \neg q)$ (iii) $(p \wedge q) \vee (p \wedge \neg q) \vee (\neg p \wedge q)$

(A) Only (i) and (ii) (B) Only (i) and (iii) (C) Only (ii) and (iii) (D) All of three

8. The statement $(X \leftrightarrow \neg Y) \vee Y$ is false when

(A) X: True, Y: False (B) X: True, Y: True (C) X: False, Y: True (D) X: False, Y: False

9. For p, q with truth values (T, T, F, F) and (T, F, T, F) respectively, the truth values of $(p|T) \mid (q|T)$ are

(A) T, F, T, F (B) T, T, T, F (C) F, T, F, F (D) F, T, T, F

10. Suppose B (x) is "x owns bicycle" and M (x) is "x owns motorcycle" and S(x) is "x is in your school" and let the domain be all people. Then the statement, "No one in your school owns both a bicycle and a motorcycle" is expressed as

(A) $\neg\forall x\ (B(x) \wedge M(x))$ (B) $\forall x\ (S(x) \wedge \neg B(x) \wedge \neg M(x))$

(C) $\forall x\ \big(S(x) \rightarrow \neg(B(x) \wedge M(x))\big)$ (D) $\neg\forall x\ \big(S(x) \rightarrow (B(x) \wedge M(x))\big)$

11. Suppose $C(x)$ is "x is in correct place" and $E(x)$ is "x is in excellent condition" and $T(x)$ is "x is your tool". Let domain be all universe things. Then the statement "One of your tools is not in the correct place, but is in excellent position" is expressed as

(A) $\exists x\ (T(x) \wedge \neg C(x) \wedge E(x))$ (B) $\exists x\ \big(T(x) \rightarrow (\neg C(x) \wedge E(x))\big)$

(C) $\exists x\ (\neg C(x) \wedge E(x))$ (D) $\exists x\ \big(T(x) \rightarrow \neg\ (C(x) \wedge E(x))\big)$

Let $P(x)$ is "x has studied calculus" and $Q(x)$ is "x has studied C++" and $R(x)$ is "x is in your class" and domain consists of all people. Which of the following English sentence is represented by logical expression $\forall x\ [R(x) \rightarrow (P(x) \wedge Q(x))]$?

(A) Everyone has studied calculus and C++ both.

(B) All students have studied calculus and C++ both.

(C) Few students have studied both calculus and C++.

(D) Every student knows either calculus or C++.

13. Let Q (x) and P(x) be the statements "x is a professor" and "x is ignorant", respectively (where the domain consists of all people). Then the logical expression "$[\forall x\ (P(x) \wedge \neg Q(x))]$" is equivalent to:

(A) People who are ignorant are not professors.

(B) All are ignorant and not professors.

(C) No professor is ignorant.

(D) All are professors and not ignorant.

14. $(p \vee q) \leftrightarrow (\neg p \rightarrow q) \equiv$

(A) Tautology (B) Contradiction (C) p (D) q

15. $\neg[(p \wedge q) \rightarrow r] \wedge r \equiv$

(A) Tautology (B) Contradiction (C) $p \wedge q \wedge r$ (D) $p \vee q$

16. Let $p: n$ is even, $q: 3n + 8$ is even (n is a positive integer) then which of the following is true?

(A) $p \rightarrow q$ only (B) $q \rightarrow p$ only (C) $p \leftrightarrow q$ (D) None is true

17. Let $p: n^2$ is even, $q: 1 - n$ is even (n is an integer) then which of the following is true?

(A) $p \rightarrow q$ only (B) $q \rightarrow p$ only (C) $p \leftrightarrow q$ (D) None is true

18. Consider the compound propositions given below as:

(i) $p \vee \neg(p \wedge q)$ (ii) $(p \wedge \neg q) \vee \neg(p \wedge q)$ (iii) $p \wedge (q \vee p)$

Which of the above propositions are not tautologies?

(A) (i) and (iii) (B) (ii) and (iii) (C) (i) and (ii) (D) All

19. What is the inverse of the conditional statement "A positive integer is a composite only if it has divisors other than 1 and itself?"

(A) A positive integer is a composite if it has divisors other than 1 and itself.

(B) If a positive integer has no divisors other than 1 and itself, then it is not composite.

(C) If a positive integer is not composite, then it has no divisors other than 1 and itself.

(D) A positive integer is not a composite only if it has divisors other than 1 and itself.