EXERCISE

SHORT ANSWER TYPE QUESTIONS

Q1. Which of the following sentences are statements? Justify:

(*i*) A triangle has three sides.
(*ii*) 0 is a Complex Number.
(*iii*) Sky is red.
(*iv*) Every set is an infinite set.
(*v*) $15 + 8 > 23$
(*vi*) $y + 9 = 7$
(*vii*) Where is your bag?
(*viii*) Every square is a rectangle.
(*ix*) Sum of opposite angles of a cyclic quadrilateral is 180°.
(*x*) $\sin^2 x + \cos^2 x = 0$

Sol. We know that is either true or false but not both simultaneously

(*i*) It is true. Hence, it is a statement.
(*ii*) It is true. Hence, it is a statement.
(*iii*) It is false. Hence, it is a statement.
(*iv*) It is false. Hence, it is a statement.
(*v*) It is false. Hence, it is a statement.
(*vi*) $y + 9 = 7$, here the value of y is not given. So it is true for $y = -2$ and false for any other value of y. Hence, it is not a statement.
(*vii*) Since it is a question. Hence, it is not a statement.
(*viii*) It is true. Hence, it is a statement.
(*ix*) It is true. Hence, it is a statement.
(*x*) It is false. Hence, it is a statement.

Q2. Find the component statements for the following compound statements.

(*i*) Number seven is prime and odd.
(*ii*) Chennai is in India and is the Capital of Tamil Nadu.
(*iii*) The number 100 is divisible by 3, 11 and 5.
(*iv*) Chandigarh is the Capital of Haryana and U.P.
(*v*) $\sqrt{7}$ is a rational number or an irrational number.
(*vi*) 0 is less than every positive integer and every negative integer.

(*vii*) Plants use sunlight, water and carbon-dioxide for photosynthesis.

(*viii*) Two lines in a plane either intersect at one point or they are parallel.

(*ix*) A rectangle is a quadrilateral or a 5-sided polygon.

Sol. (*i*) p : Number 7 is prime.
q : Number 7 is odd.

(*ii*) p : Chennai is in India.
q : Chennai is the Capital of Tamil Nadu.

(*iii*) p : 100 is divisible by 3.
q : 100 is divisible by 11.
r : 100 is divisible by 5.

(*iv*) p : Chandigarh is Capital of Haryana.
q : Chandigarh is Capital of U.P.

(*v*) p : $\sqrt{7}$ is a rational number.
q : $\sqrt{7}$ is an irrational number.

(*vi*) p : 0 is less than every positive integer.
q : 0 is less than every negative integer.

(*vii*) p : Plants use sunlight for photosynthesis.
q : Plants use water for photosynthesis.
r : Plants use carbon-dioxide for photosynthesis.

(*viii*) p : Two lines in a plane intersect at one point.
q : Two lines in a plane are parallel.

(*ix*) p : A rectangle is a quadrilateral.
q : A rectangle is a 5-sides polygon.

Q3. Write the component statements of the following compound statements and check whether the compound statement is true or false.

(*i*) 57 is divisible by 2 or 3.

(*ii*) 24 is a multiple of 4 and 6.

(*iii*) All living things have two eyes and two legs.

(*iv*) 2 is an even number and a prime number.

Sol. (*i*) Here the given statement is the form $p \vee q$ which has the truth value T whenever either p or q or both have the truth value T.
Hence, it is a true statement and its component statements are
p : 57 is divisible by 2. (False)
q : 57 is divisible by 3. (True)

(*ii*) Here, the given statement is of the form $p \wedge q$ which has the truth value T whenever both p and q have the truth value T.

Hence, it is a true statement and its component statements are:

p : 24 is a multiple of 4. (True)

q : 24 is a multiple of 6. (True)

(*iii*) It is a false statement. Since $p \wedge q$ has truth value F whenever either p or q or both have the truth value F. Its component statements are

p : All living things have two eyes. (False)

q : All living things have two legs. (False)

(*iv*) It is true statements and its component statements are

p : 2 is an even number. (True)

q : 2 is a prime number. (True)

Q4. Write the negation of the following simple statements.

(*i*) The number 17 is prime.

(*ii*) $2 + 7 = 6$

(*iii*) Violets are blue.

(*iv*) $\sqrt{5}$ is a rational number.

(*v*) 2 is not a prime number.

(*vi*) Every real number is an irrational number.

(*vii*) Cow has four legs.

(*viii*) A leap year has 366 days.

(*ix*) All similar triangles are congruent.

(*x*) Area of a circle is same as the perimeter of the circle.

Sol. (*i*) The number 17 is not prime.

(*ii*) $2 + 7 \neq 6$

(*iii*) Violets are not blue.

(*iv*) $\sqrt{5}$ is not a rational number.

(*v*) 2 is a prime number.

(*vi*) Every real number is not an irrational number.

(*vii*) Cow does not have four legs.

(*viii*) A leap year does not have 366 days.

(*ix*) There exist similar triangles which are not congruent.

(*x*) Area of a circle is not same as the perimeter of the circle.

Q5. Translate the following statements into symbolic form.

(*i*) Rahul passed in Hindi and English.

(*ii*) x and y are even integers.

(*iii*) 2, 3 and 6 are factors of 12.

(*iv*) Either x or $x + 1$ is an odd integer.

(*v*) A number is either divisible by 2 or 3.

(*vi*) Either $x = 2$ or $x = 3$ is a root of $3x^2 - x - 10 = 0$.

(*vii*) Students can take Hindi or English as an optional paper.

Sol. (*i*) p : Rahul passed in Hindi.
q : Rahul passed in English.
$p \wedge q$: Rahul passed in Hindi and English.

(*ii*) p : x is an even integer.
q : y is an even integer.
$p \wedge q$: x and y are even integer.

(*iii*) p : 2 is a factor of 12.
q : 3 is a factor of 12.
r : 6 is a factor of 12.
$p \wedge q \wedge r$: 2, 3 and 6 are factors of 12.

(*iv*) p : x is an odd integer.
q : $x + 1$ is an odd integer.
$p \vee q$: Either x or $x + 1$ is an odd integer.

(*v*) p : a number is divisible by 2.
q : a number is divisible by 3.
$p \vee q$: a number divisible by 2 or 3.

(*vi*) p : $x = 2$ is a root of the equation $3x^2 - x - 10 = 0$.
q : $x = 3$ is a root of the equation $3x^2 - x - 10 = 0$.
$p \vee q$: Either $x = 2$ or $x = 3$ is the root of equation $3x^2 - x - 10 = 0$.

(*vii*) p : Hindi is the optional paper.
q : English is the optional paper.
$p \vee q$: Either Hindi or English is optional paper.

Q6. Write down the negation of the following Compound Statements.

(*i*) All rational numbers are real and complex.

(*ii*) All real numbers are rational or irrationals.

(*iii*) $x = 2$ and $x = 3$ are roots of the quadratic equation $x^2 - 5x + 6 = 0$

(*iv*) A triangle has either 3-sides or 4-sides.

(*v*) 35 is a prime number or a composite number.

(*vi*) All prime integers are either even or odd.

(*vii*) $|x|$ is equal to either x or $-x$.

(*viii*) 6 is divisible by 2 and 3.

Sol. (*i*) p : All rational numbers are real
$\sim p$: All rational numbers are not real.
q : All rational numbers are complex.
$\sim q$: All rational numbers are not complex.
$\sim (p \wedge q) = (\sim p \vee \sim q)$: All rational numbers are neither real nor complex.

(*ii*) p : All real numbers are rationals.
q : All real numbers are irrationals.

The negation of the above statements is
$\sim (p \vee q) = (\sim p \wedge \sim q)$: All the real numbers are not rational and all real numbers are not irrational.

(*iii*) $p : x = 2$ is root of the equation $x^2 - 5x + 6 = 0$.
$q : x = 3$ is root of the equation $x^2 - 5x + 6 = 0$
The negation of the above statements is
$\sim (p \wedge q) = (\sim p \vee \sim q)$: $x = 2$ is not the root of the equation $x^2 - 5x + 6 = 0$ or $x = 3$ is not the root of the equation $x^2 - 5x + 6 = 0$.

(*iv*) p : A triangle has 3-sides.
q : A triangle has 4-sides.
The negation of the above statements is
$\sim (p \vee q) = (\sim p \wedge \sim q)$: A triangle has neither 3-sides nor 4-sides.

(*v*) p : 35 is a prime number.
q : 35 is a composite number.
The negation of the above statements is
$\sim (p \vee q) = (\sim p \wedge \sim q)$: 35 is not a prime number and it is not a composite number.

(*vi*) p : All prime integers are even.
q : All prime integers are odd.
The negation of the above statements is
$\sim (p \vee q) = (\sim p \wedge \sim q)$: All prime integers are not even and all prime integers are not odd.

(*vii*) p : $|x|$ is equal to x.
q : $|x|$ is equal to $-x$.
The negation of the above statements is
$\sim (p \vee q) = (\sim p \wedge \sim q)$: $|x|$ is not equal to x and it is not equal to $-x$.

(*viii*) p : 6 is divisible by 2.
q : 6 is divisible by 3.
The negation of the above statements is
$\sim (p \wedge q) = (\sim p \vee \sim q)$: 6 is not divisible by 2 or it is not divisible by 3.

Q7. Rewrite each of the following statements in the form of conditional statements.

(i) The square of an odd number is odd.

(ii) You will get a sweet dish a ter the dinner.

(iii) You will fail, if you will not study.

(iv) The unit digit of an integer is 0 or 5 if it is divisible by 5.

(v) The square of a prime number is not prime.

(vi) $2b = a + c$ if a, b and c are in A.P.

Sol. (*i*) If p, then $q \Rightarrow$ If the number is odd, then its square is odd number.

(*ii*) q if $p \Rightarrow$ If take the dinner, then you will get sweet dish.

(*iii*) p only if $q \Rightarrow$ If you do not study, then you will fail.

(*iv*) p is sufficient for $q \Rightarrow$ If an integer is divisible by 5, then its unit digits are 0 or 5.

(*v*) q is necessary for $p \Rightarrow$ If any number is prime, then its square is not prime.

(*vi*) q implies $p \Rightarrow$ If a, b, c are in A.P then $2b = a + c$.

Q8. Form the biconditional statement $p \leftrightarrow q$, where

(*i*) p : The unit digits of an integer is zero.
q : It is divisible by 5.

(*ii*) p : A natural number n is odd.
q : Natural number n is not divisible by 2.

(*iii*) p : A triangle is an equilateral triangle.
q : All three sides of a triangle are equal.

Sol. (*i*) $p \leftrightarrow q$: Unit digit of an integer is zero if and only if it is divisible by 5.

(*ii*) $p \leftrightarrow q$: A natural number is odd if and only if it is not divisible by 2.

(*iii*) $p \leftrightarrow q$: A triangle is an equilateral triangle if and only if all three sides of triangle are equal.

Q9. Write down the contrapositive of the following statements

(*i*) If $x = y$ and $y = 3$, then $x = 3$.

(*ii*) If n is a natural number, then n is an integer.

(*iii*) If all three sides of a triangle are equal, then the triangle equilateral.

(*iv*) If x and y are negative integers, then xy is positive.

(*v*) If natural number n is divisible by 6, then n is divisible by 2 and 3.

(*vi*) If it snows, then weather will be cold.

(*vii*) If x is a real number such that $0 < x < 1$ then $x^2 < 1$.

Sol. We know that the contrapositive of $p \rightarrow q$ is $(\sim q) \rightarrow (\sim p)$

(*i*) If $x \neq 3$, then $x \neq y$ or $y \neq 3$.

(*ii*) If n is not an integer, then it is not a natural number.

(*iii*) If the triangle is not equilateral, then all three sides of the triangle are not equal.

(*iv*) If xy is not positive integer, then x or y is not negative integer.

(*v*) If natural number 'n' is not divisible by 2 or 3, then n is not divisible by 6.

(*vi*) The weather will not be cold, if it does not snow.

(*vii*) If $x^2 > 1$ then x is not a real number such that $0 < x < 1$.

Q10. Write down the converse of the following statements.

(*i*) If a rectangle 'R' is a square, then R is a rhombus.

(*ii*) If today is Monday, then tomorrow is Tuesday.

(*iii*) If you go to Agra, then you must visit Taj Mahal.

(*iv*) If the sum of squares of two sides of a triangle is equal to the square of third side of the triangle, then the triangle is right angled.

(*v*) If all three angles of a triangle are equal, then the triangle is equilateral.

(*vi*) If $x : y = 3 : 2$, then $2x = 3y$.

(*vii*) If S is a cyclic quadrilateral, then the opposite angles of S are supplementary.

(*viii*) If x is zero, then x is neither positive nor negative.

(*ix*) If two triangles are similar, then the ratio of their corresponding sides are equal.

Sol. (*i*) If the rectangle R is rhombus, then it is square.

(*ii*) If tomorrow is Tuesday, then today is Monday.

(*iii*) If you must visit Taj Mahal, then you go to Agra.

(*iv*) If the triangle is right triangle, then the sum of the squares of two sides of a triangle is equal to the square of third side.

(*v*) If the triangle is equilateral, then all three angles of the triangle are equal.

(*vi*) If $2x = 3y$ then $x : y = 3 : 2$.

(*vii*) If the opposite angles of a quadrilateral are supplementary, then S is cyclic.

(*viii*) If x is neither positive nor negative then $x = 0$.

(*ix*) If the ratio of corresponding sides of two triangles are equal, then triangles are similar.

Q11. Identify the Quantifiers in the following statements.

(*i*) There exists a triangle which is not equilateral.

(*ii*) For all real numbers x and y, $xy = yx$.

(*iii*) There exists a real number which is not a rational number.

(*iv*) For every natural number, x, $x + 1$ is also a natural number.

(*v*) For all real numbers x with $x > 3$, x^2 is greater than 9.

(*vi*) There exists a triangle which is not an isosceles triangle.

(*vii*) For all negative integers, x, x^3 is also a negative integer.

(*viii*) There exists a statement in above statements which is not true.

(*ix*) There exists a even prime number other than 2.

(*x*) There exist a real number x such that $x^2 + 1 = 0$.

Sol. Quantifier means a phrase like 'there exists', 'for all' and 'for every' etc.

(*i*) There exists (*ii*) For all

(*iii*) There exists (*iv*) For every

(*v*) For all (*vi*) There exists

(*vii*) For all (*viii*) There exists

(*ix*) There exists (*x*) There exists

Q12. Prove by direct method that for any integer n, $n^3 - n$ is always even.

Sol. We have two cases:

Case I: If n is even

Let $n = 2k$ where $k \in N$

$\therefore \quad n^3 - n = (2k)^3 - (2k)$

$= 2k(4k^2 - 1) = 2m,$

where $m = k(4k^2 - 1)$

Therefore $(n^3 - n)$ is even.

Case II: If n is odd.

Let $n = (2k + 1)$, $k \in N$

$$\begin{aligned} n^3 - n &= (2k + 1)^3 - (2k + 1) \\ &= (2k + 1)\,[(2k + 1)^2 - 1] \\ &= (2k + 1)\,(4k^2 + 4k + 1 - 1] \\ &= (2k + 1)\,(4k^2 + 4k) = 4k(2k + 1)\,(k + 1) \\ &= 2.2k(2k + 1)(k + 1) \\ &= 2\lambda \text{ where } \lambda = 2k(2k + 1)(k + 1) \end{aligned}$$

Therefore $n^3 - n$ is even.

Hence, $n^3 - n$ is always even.

Q13. Check validity of the following statement.

(*i*) p : 125 is divisible by 5 and 7

(*ii*) q : 131 is a multiple of 3 or 11.

Sol. (*i*) Given that:

p : 125 is divisible by 5 and 7.

Let q : 125 is divisible by 5.

and r : 125 is divisible by 7.

Here q is true and r is false.

$\Rightarrow \quad q \wedge r$ is false.

Hence, p is not valid.

(*ii*) Given that: q : 131 is a multiple of 3 or 11.

Let p : 131 is a multiple of 3.

and r : 131 is a multiple of 11.

Here p is not true and r is also not true i.e., false.

So, $p \vee r$ is false.

Hence, q is not valid.

Q14. Prove the following statement by contradiction method

p : The sum of an irrational number and a rational number is irrational.

Sol. Let p is false i.e., the sum of an irrational number and a rational number is rational.

Let $\sqrt{\lambda}$ is irrational and n is rational number

$\Rightarrow \quad \sqrt{\lambda} + n = r$ (rational)

$\Rightarrow \quad \sqrt{\lambda} = r - n$

We observe that $\sqrt{\lambda}$ is irrational where as $(r - n)$ is rational which is a contradiction.

So, our supposition is wrong.

Hence, p is true.

Q15. Prove by direct method that for any real number x, y if $x = y$ then $x^2 = y^2$.

Sol. Let $p : x = y, x, y \in R$

On squaring both sides we have

$x^2 = y^2 : q$ (say)

$\Rightarrow \quad p = q$

Hence, proved.

Q16. Using contrapositive method prove that, if n^2 is an even integer, then n is also an even integer.

Sol. Let $p : n^2$ is an even integer.

q : n is also an even integer.

Also let $\sim q$ is true i.e. n is not an even integer.

$\Rightarrow n^2$ is not an even integer

$\Rightarrow \sim p$ is true. [$\because$ square of an odd integer is odd]

Hence, $\sim q$ is true $\Rightarrow \sim p$ is true.

OBJECTIVE TYPE QUESTIONS

Q**17.** Which of the following is statement?

(*a*) x is a real number.

(*b*) Switch of the fan.

(*c*) 6 is a natural number.

(*d*) Let me go.

Sol. Since, statement is a sentence which is either true or false.

So, 6 is a natural number which is true. Hence, (*c*) is correct option.

Q**18.** Which of the following is not statement?
(*a*) Smoking is injurious to health.
(*b*) 2 + 2 = 4.
(*c*) 2 is only the even prime number.
(*d*) Come here.

Sol. To given order can not be a statement.
So 'Come here' is not a statement.
Hence, the correct option is (*d*).

Q**19.** The connective in the statement '2 + 7 > 9 or 2 + 7 < 9' is
(*a*) and (*b*) or (*c*) > (*d*) <

Sol. In '2 + 7 > 9 or 2 + 7 < 9' the connective is 'or'.
Hence, the correct option is (*b*).

Q**20.** The connective in the statement "Earth revolves round the Sun and Moon is a satellite of Earth" is
(*a*) or (*b*) Earth (*c*) Sun (*d*) and

Sol. Connective word is "and".
Hence, the correct option is (*d*).

Q**21.** The negation of the statement "A circle is an ellipse" is
(*a*) An ellipse is a circle.
(*b*) An ellipse is not a circle.
(*c*) A circle is not an ellipse.
(*d*) A circle is an ellipse.

Sol. Let p : A circle is an ellipse.
$\sim p$: A circle is not an ellipse.
Hence, the correct option is (*c*).

Q**22.** The negation of the statement "7 is greater than 8" is
(*a*) 7 is equal to 8. (*b*) 7 is not greater than 8.
(*c*) 8 is less than 7. (*d*) none of these.

Sol. Let p : 7 is greater than 8.
$\therefore$ $\sim p$: 7 is not greater than 8.
Hence, the correct option is (*b*).

Q**23.** The negation of the statement "72 is divisible by 2 and 3" is
(*a*) 72 is not divisible by 2 or 72 is not divisible by 3.
(*b*) 72 is not divisible by 2 and 72 is not divisible by 3.
(*c*) 72 is divisible by 2 and 72 is not divisible by 3.
(*d*) 72 is not divisible by 2 and 72 is divisible by 3.

Sol. Let p : 72 is divisible by 2 and 3
and q : 72 is divisible by 2
r : 72 is divisible by 3
$\therefore$ $\sim q$: 72 is not divisible by 2
$\sim r$: 72 is not divisible by 3
So $\sim (q \wedge r) : \sim q \vee \sim r$

$\Rightarrow$ 72 is not divisible by 2 or 72 is not divisible by 3.

Hence, the correct option is (*b*).

Q**24.** The negative of the statement "Plants take in CO_2 and give out O_2" is

(*a*) Plants do not take in CO_2 and do not give out O_2.

(*b*) Plants do not take in CO_2 or do not give out O_2.

(*c*) Plants take in CO_2 and do not give out O_2.

(*d*) Plants take in CO_2 or do not give out O_2.

Sol. Let p : Plants take in CO_2 and give out O_2.

q : Plants take in CO_2.

and r : Plants give out O_2.

$\sim q$: Plants do not take in CO_2.

$\sim r$: Plants do not give out O_2.

$\therefore \sim (q \wedge r) = (\sim q \vee \sim r)$: Plants do not take in CO_2 or do not give out O_2.

Hence, the correct option is (*b*).

Q**25.** The negation of the statement "Rajesh or Rajni lived in Bengaluru" is

(*a*) Rajesh did not live in Bengaluru or Rajni lives in Bengaluru.

(*b*) Rajesh live in Bengaluru and Rajni did not live in Bengaluru.

(*c*) Rajesh did not live in Bengaluru and Rajni did not live in Bengaluru.

(*d*) Rajesh did not live in Bengaluru or Rajni did not live in Bengaluru.

Sol. Let p : Rajesh or Rajni lives in Bengaluru

and q : Rajesh lived in Bengaluru

r : Rajni lived in Bengaluru

$\sim q$: Rajesh did not live in Bengaluru

$\sim r$: Rajni did not live in Bengaluru

$\therefore \sim (q \vee r) = (\sim q \wedge \sim r)$: Rajesh did not live in Bengaluru and Rajni did not live in Bengaluru.

Hence, the correct option is (*c*).

Q**26.** The negation of the statement "101 is not a multiple of 3" is

(*a*) 101 is a multiple of 3.

(*b*) 101 is a multiple of 2.

(*c*) 101 is an odd number.

(*d*) 101 is an even number.

Sol. Let p : 101 is not a multiple of 3.

$\sim p$: 101 is a multiple of 3.

Hence, the correct option is (*a*).

Q**27.** The contrapositive of the statement "If 7 is greater than 5, then 8 is greater than 6" is

(a) If 8 is greater than 6, then 7 is greater than 5.
(b) If 8 is not greater than 6, then 7 is greater than 5.
(c) If 8 is not greater than 6, then 7 is not greater than 5.
(d) If 8 is greater than 6, then 7 is not greater than 5.

Sol. Let p : 7 is greater than 5
q : 8 is greater than 6
$\therefore$ $p \to q$ i.e., $\sim p$: 7 is not greater than 5.
and $\sim q$: 8 is not greater than 6.
So $\sim p \to \sim q$: If 8 is not greater than 6, then 7 is not greater than 5.
Hence, the correct option is (c).

Q**28.** The converse of the statement "If $x > y$, then $x + a > y + a$" is
(a) If $x < y$, then $x + a < y + a$
(b) If $x + a > y + a$, then $x > y$
(c) If $x < y$, then $x + a > y + a$
(d) If $x > y$, then $x + a < y + a$

Sol. Let $p : x > y$
and $q : x + a > y + a$
$p \to q$
Converse of the above statement is $q \to p$.
Therefore, if $x + a > y + a$ then $x > y$.
Hence, the correct option is (b).

Q**29.** The converse of the statement "If Sun is not shining, then Sky is filled with clouds" is
(a) If Sky is filled with clouds, then the Sun is not shining.
(b) If Sun is shining, then Sky is filled with clouds.
(c) If Sky is clear, then Sun is shining.
(d) If Sun is not shining, then Sky is not filled with clouds.

Sol. Let p : Sun is not shining.
q : Sky is filled with clouds.
So, the converse of the statement $p \to q$ is $q \to p$.
i.e., If Sky is filled with clouds, then the Sun is not shining.
Hence, the correct option is (a).

Q**30.** The contrapositive of the statement "If p, then q", is
(a) If q, then p (b) If p, then $\sim q$
(c) If $\sim q$, then $\sim p$ (d) If $\sim p$ then $\sim q$

Sol. Here the statement is "If p, then q"
i.e. $p \to q$
Contrapositive of the statement $p \to q$ is $(\sim q) \to (\sim p)$
i.e., If $\sim q$, then $\sim p$.
Hence, the correct option is (c).

Q**31.** The statement "If x^2 is not even, then x is not even" is converse of the statement.

(a) If x^2 is odd, then x is even.

(b) If x is not even, then x^2 is not even.

(c) If x is even, then x^2 is even.

(d) If x is odd, then x^2 is even.

Sol. Let p : x^2 is not even.

q : x is not even.

So, the converse of the statement $p \rightarrow q$ is $q \rightarrow p$

i.e., If x is not even, then x^2 is not even.

Hence, the correct option is (b).

Q**32.** The contrapositive of statement "If Chandigarh is Capital of Punjab, then Chandigarh is in India" is

(a) If Chandigarh is not in India, then Chandigarh is not the Capital of Punjab.

(b) If Chandigarh is in India, then Chandigarh is Capital of Punjab.

(c) If Chandigarh is not Capital of Punjab, then Chandigarh is not Capital of India.

(d) If Chandigarh is Capital of Punjab, then Chandigarh not in India.

Sol. Let p : Chandigarh is Capital of Punjab

and q : Chandigarh is in India

$\sim p$: Chandigarh is not Capital of Punjab

$\sim q$: Chandigarh is not in India

If ($\sim q$), then ($\sim p$)

i.e. If Chandigarh is not in India, then Chandigarh is not the Capital of Punjab.

Hence, the correct option is (a).

Q**33.** Which of the following is the conditional $p \rightarrow q$?

(a) q is sufficient for p (b) p is necessary for q

(c) p only if q (d) If q then p

Sol. We know that $p \rightarrow q$ is same as p only if q.

Hence, the correct option is (c).

Q**34.** The negation of the statement "The product of 3 and 4 is 9" is

(a) It is false that the product of 3 and 4 is 9.

(b) The product of 3 and 4 is 12.

(c) The product of 3 and 4 is not 12.

(d) It is false that the product of 3 and 4 is not 9.

Sol. The negation of the statement is "It is false that the product of 3 and 4 is 9".

Hence, the correct option is (*a*).

Q**35.** Which of the following is not a negation of "A natural number is greater than zero"?

(*a*) A natural number is not greater than zero.
(*b*) It is false that a natural number is greater than zero.
(*c*) It is false that a natural number is not greater than zero.
(*d*) None of the above

Sol. The negation of the given statement is false.
i.e. It is false that a natural number is not greater than zero.
Hence, the correct option is (*c*).

Q**36.** Which of the following statement is conjuction?

(*a*) Ram and Shyam are friends.
(*b*) Both Ram and Shyam are tall.
(*c*) Both Ram and Shyam are enemies.
(*d*) None of the above.

Sol. Let the two statements p and q be simple statements. If they are connected with and.
Then, the resulting compound statement p and q is called a conjuction of p and q.
Hence, the correct option is (*d*).

Q**37.** State whether the following sentences are statements or not.

(*a*) The angles opposite to equal sides of a triangle are equal.
(*b*) The Moon is a satellite of Earth.
(*c*) May God bless you!
(*d*) Asia is a Continent.
(*e*) How are you?

Sol. (*a*) It is a statement.
(*b*) It is a statement.
(*c*) It is not a statement.
(*d*) It is a statement.
(*e*) It is not a statement.