MATHEMATICS CLASS XI
CHAPTER – 14 MATHEMATICAL REASONING

Q.1. Find the component statements of the following and check whether they are true or not.

(i) $\sqrt{2}$ is a rational number or an irrational number.

(ii) All integers are positive or negative.

(iii) All prime are either even or odd.

Q.2. Write the component statements of the following compound statements and check whether the compound statement is true or false.

(i) 125 is a multiple of 7 or 8.

(ii) Mumbai is the capital of Gujarat or Maharashtra.

(iii) The school is closed, if there is a holiday or Sunday.

Q.3. Identify the quantifier in each of the following statements.

(i) for every real number x,x + 4 is greater than x.

(ii) There exists a real number, which is twice of itself.

Q.4. Identify the quantifier in the following statements and write the negation of the statements.

(i) There exists a number which is equal to its square.

(ii) Dor every real number x, x is less than x + 1.

(iii) There exists a capital for every state in India.

Q.5. Write the negation of the following statements

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(i) For all positive integers x, we have x + 2> 8.

(ii) For every real number x, x is less than x + 1.

(iii) Everyone in Germany speaks German.

(iv) Every narural number is an integer.

Q.6. Find the component statements of the following compound statements.

(i) There is something wrong with the bulb or with wiring.

(ii) It is raining and it is cold.

(iii) The roof is red and the wall is white.

(iv) The sun shines or it rains.

Q.7. Find the components statements of the following and check whether they are true or not '24 is a multiple of 2,4 and 8'.

Q.8. For each of the following statements, determine whether an inclusive 'OR' or exclusive 'OR' is used. Give reasons for your answer.

(i) Sun rises or Moon sets.

(ii) All integers are positive or negative.

(iii) Two lines intersect at a point or are parallel.

(iv) The school is closed, if it is a holiday or a Sunday.

Q.9. Write the negation of the following simple statements.

(i) The number 17 is prime.

(ii) A leap year has 366 days.

(iii) All similar triangles are congruent.

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

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Q.10. 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 integers.

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

Q.11. Write the inverse of the following statements.

(i) If 2 + 2 = 4, then Jawahar Lal Nehru is the first Prime Minister of India.

(ii) If you get a job, then your credentials are good.

Q.12. Given below are two pairs of statements. Combine these two statements using 'if and only if '.

(i) p : If a rectangle is a square, then all its four sides are equal.

q : If all four sides of a triangle are equal, then the rectangle is square.

(ii) p : If the sum of digits is divisible by 3, then the number is divisible by 3.

q : If a number is divisible by 3, then the sum of its digit is divisible by 3.

Q.13. Write the truth value of the following compound statement.

(i) 0 is less than every positive and negative integer.

(ii) 2 is a positive number or negative number.

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(iii) If the number R = 57423 is divisible by 3, then the sum of digits forming R is divisible forming R is divisible by 3.

(iv) 4 × 5 = 20, if and only if 5 × 4 = 10.

Q.14. Write the truth value of each of the following biconditional statements.

(i) 3 < 2 if and only if 2 < 1.

(ii) 3 + 5 > 7 if and only if 4 + 6 < 10.

Q.15. Write down the negation of

(i) It is raining and it is cool.

(ii) Ramesh is cruel or he is strict.

(iii) If Δ ABC is isosceles then the base angles A and B are equal.

(iv) India will be prosperous, if and only if its citizens are industrious.

Q.16. Write the negation of the following statements.

(i) Paris in France and London in England.

(ii) 2 + 3 = 5 and 8 < 10.

Q.17. Write the negation of the statement 7 is greater than 4 or 6 is less than 7.

Q.18. Write the negation of the following statements.

(i) If I become a doctor, then I will open a hospital.

(ii) If 2 + 3 = 5, then 5 is an odd number.

Q.19. Write the negation of the following statements.

(i) A triangle is equilateral if and only if it is equiangular.

(ii) Sets A and B are equal if and only if (A $\subseteq$ B and B $\subseteq$ A)

Q.20. Consider the statement S : 80 is a multiple of 5 and 4. Check its validity.

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Q.21. If p and q are two statements given by

p : 25 is a multiple of 5.

Q : 25 is a multiple of 8.

Write the compound statement by using the connective 'and' and check its validity.

Q.22. Check the validity of the following statement.

'square of an integer is positive or negative'.

Q.23. Check the validity of the following statement.

'If x and y are odd integers, then xy is an odd integer'.

Q.24. Using the words 'The necessary and sufficient' rewrite the statement.

'The integer n is odd, if and only if n^2 is odd'.

Also, check the validity of given statement.

Q.25. Show that the following statement is true by using contrapositive method.

'If x, y are integers such that xy is odd, then both x and y are odd integers'.

Q.26. Show that statement 'p : If x is a real number such that $x^3 + 4x = 0$, then x is 0' is true by method of contradiction.

Q.27. By giving a counter example, show that the following statement is false.

' If n is an odd integer, then n is prime'

Q.28. If a number is divisible by 25, then it is divisible by 5.

Q.29. If a triangle is equilateral, then it is isosceles.

Q.30. If r is the radius of circle, then its area is πr^2 .

Q.31. If it is cold, then it rains.

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Q.32. If p and q are two statement given by

p : 25 is a multiple of 5.

q : 25 is a multiple of 8.

Write the compound statement by using the connective 'and' check its validity.

Q.33. Write down the negation of each of the following.

(i) 3 + 5 = 8 and 2 + 4 > 7

(ii) If he works hard, he will pass the examination.

(iii) If it rains, he will not go for a walk.

(iv) Preeti is tall, and therefore, she is slim.

Q.34. Show the statement p : 'If x is a real number such that $x^3 + x = 0$, then 'x is 0' is true by

(i) direct method.

(ii) method of contrapositive.

Q.35. Write down the negation of each of the following

(i) 2 is even and -2 is negative.

(ii) 5 is prime of 15 is even.

(iii) if 7 < 5, then 7 is not a prime number.

(iv) The payment will be made, if and only if the work is finished in time.

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