



# MATHS

## BOOKS - MODERN PUBLISHERS MATHS (HINGLISH)

### MATHEMATICAL REASONING

#### Illustrative Examples

1. Which of the following sentences are statements? Give reasons for your answer :

The sum of 5 and 7 is greater than 10.



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2. Which of the following sentences are statements? Give reasons for your answer.(i)

There are 35 days in a month.(ii) Mathematics is difficult.(iii) The sum of 5 and 7 is greater than 10.(iv) The square of a number is an even number.(v)



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3. Which of the following sentences are statements? Give reasons for your answer :

Mathematics is easy.



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4. Check whether the following sentences are statements. Give reasons for your answer:

Mathematics is fun



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5. Which of the following sentences are statements? Give reasons for your answer :

Answer this question.



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6. Find out which of the following sentences are statements and which are not. Justify your answer: All real numbers are complex numbers.



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7. Which of the following sentences are statements? Give reasons for your answer :

The square of a number is an even number.



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8. Write the negation of the following statements :

Srinagar is a city.



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9. Write the negation of the following statement:  $\sqrt{2}$  is not a complex number.



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10. Write the negation of the following statement: all triangles are not equilateral triangles.



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11. Write the negation of the following statements :

The number 2 is greater than 7.

A.  $p$ : The number 2 is not greater than 7

B.  $\sim p$ : The number 2 is less than or equal to 7

C.  $\sim p$ : It is false that the number 2 is greater than 7.

D. None of above

**Answer: B**



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**12.** Write the negation of the following statement: Every natural number is an integer.

A.  $\sim p$  : There exists a natural number which is not an integer.

B.  $\sim p$ : Atleast one natural number is not an integer.



C.  $\sim p$ : Some natural numbers are not integers.

D. None of above

**Answer: The given statement is :**

**$p$  : Every natural is an integer.**

**The negation of this statement is :**

**$\sim p$  : There exists a natural number which is not an integer.**

**or**

**$\sim p$ : Atleast one natural number is not an integer.**

**or**

**$\sim p$ : Some natural numbers are not integers.**



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**13.** Write the negation of the following statements.(i) Both the diagonals of a rectangle have the same length.(ii)  $\sqrt{2}$  is rational.



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**14.** Write the negation of the following statement:  $\sqrt{7}$  is rational.



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**15.** Write the negation of the following statements and check whether the resulting statements are true: Australia is a continent.



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**16.** Write the negation of the following statements and check whether the resulting statements are true :

There does not exist a quadrilateral which has all its sides equal .



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**17.** Write the negation of the following statements and check whether the resulting statements are true: Every natural number is greater than 0.



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**18.** Write the negation of the following statements and check whether the resulting

statements are true :

The sum of 3 and 4 is 9.



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**19.** Identify the quantifier in each of the following statements :

For every real number ,  $x+3 > x$



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20. Identify the quantifier in each of the following statements :

There exists a real number  $x$  such that  $\sqrt{x}$  is a natural number.



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21. Identify the quantifier in each of the following statements :

Some real numbers are rational .



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**22.** Identify the quantifier in each of the following statements :

All birds can fly.



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**23.** 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) For every real number

$x$ ,  $x$  is less than  $x + 1$ . (iii) There exists a capital for  $e$



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**24.** Identify the quantifier in the following statements and write the negation of the statements.

For every real number  $x$ ,  $x$  is less than  $x + 1$ .



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**25.** 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) For every real number  $x$ ,  $x$  is less than  $x^2 + 1$ . (iii) There exists a capital for e



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**26.** Write each of the statements in the form "if  $p$ , then  $q$ " (i)  $p$  : It is necessary to have a

password to log on to the server. (ii)  $q$  : There is traffic jam whenever it rains. (iii)  $r$  : You can access the website only if you pay a subscription fee.



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27. Write each of the following statements in the form if  $p$  then  $q$ : There is traffic jam whenever it rains.



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**28.** Write each of the following statements in the form if  $p$  then  $q$ : You can access the website only if you pay a subscription fee.



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**29.** Write each of the following statements in the form if then The banana trees will bloom if it stays warm for a month A quadrilateral is a parallelogram if its diagonals bsect each other. To get  $A^+$  in the class, it is necessary that you do all the exercises of the book.



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**30.** Write the constrapositive of the following statements: If a number is divisible by 9, then it is divisible by 3. If you are born in India, then you are a citizen of India If a triangle is equilateral it is isosceles.



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**31.** Write the contrapositive of the following statements :

(i) if you born in india, then you are a citizen of India.

(ii) If a triangle is equilateral, then it is isosceles.



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**32.** Write the constrapositive of the following statements: If a number is divisible by 9, then

it is divisible by 3. If you are born in India, then you are a citizen of India. If a triangle is equilateral it is isosceles.



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**33.** Write the converse of the following statements. (i) If a number  $n$  is even, then  $n^2$  is even. (ii) If you do all the exercises in the book, you get an A grade in the class. (iii) If two integers  $a$  and  $b$  are such that  $a > b$ , then  $a - b$  is



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34. Write the converse of the following statements: If two integers  $a$  and  $b$  are such that  $a > b$  then  $a - b$  is always a positive integer. If  $x$  is prime number, then  $x$  is odd. If two lines are parallel, then they do not intersect in the same place.



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**35.** 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 the four sides of a rectangle are equal, then the rectangle is a square.



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**36.** Given below are two pairs of statements. Combine these two statements using if and



only if:  $p$ : if the sum of the digits of a number is divisible by 3, then the number is divisible by 3.  $q$ : if a number is divisible by 3, then the sum of its digits is divisible by 3.



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**37.** For the given statements identify the necessary and sufficient conditions.  $t$ : If you drive over 80 km per hour, then you will get a fine



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**38.** Determine the truth value of the following

:

$$5 + 4 = 9 \text{ iff } 8 - 2 = 6$$



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**39.** Determine the truth value of the following

:

Apple is a fruit iff Delhi is in Japan.



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## Questions From Ncert Exemplar

1. Translate the following statement into symbolic form :

" Jack and Jill went up the hill ".



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2. Negation of 'Paris is in France and London is in England' is



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3. Write the negation of the following statement :

7 is greater than 4 or 6 is less than 7.



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4. Write the converse of the following statement :

if  $x < y$ , then  $x + 5 < y + 5$ .



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5. Translate the following statement in symbolic form :

" If  $x = 7$  and  $y = 4$  ", then  $x + y = 11$ .



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6. Translate the following statement in symbolic form :

"ABC is an equilateral triangle if and only if its each interior angle is  $60^\circ$  ".



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7. Check the validity of the following statement:  $p$ : 100 is a multiple of 4 and 5.



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## Exercise 14 A Very Short Answer Type Questions

1. Which of the following are statements and which are not? Give reasons for your answers.

Rajendra Prasad was the first President of India.



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2. Which of the following are statements and which are not ? Give reasons for your answers.

The sun is a star.



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3. Which of the following are statements and which are not ? Give reasons for your answers.

The number 6 has three prime factors.



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4. Which of the following are statements and which are not ? Give reasons for your answers.

The sum of all interior angles of a triangle is  $180^\circ$ .



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5. Check whether the following sentences are statements. Give reasons for your answer:

There is no rain without clouds





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6. Which of the following are statements and which are not ? Give reasons for your answers.

8 is less than 6.



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7. Which of the following are statements and which are not ? Give reasons for your answers.

Who are you ?





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8. Which of the following are statements and which are not ? Give reasons for your answers.

Today is a windy day.



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9. Which of the following are statements and which are not ? Give reasons for your answers.

Where is your bag?



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**10.** Which of the following are statements and which are not ? Give reasons for your answers.

Do your work ?



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**11.** Which of the following are statements and which are not ? Give reasons for your answers.

His birth day is 29th February.



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**12.** Which of the following are statements and which are not ? Give reasons for your answers.

Listen on me, John!



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**13.** Classify the following statements as 'true' or 'false' :

Congruent triangles are also similar .



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**14.** Classify the following statements as 'true' or 'false' :

$$2 + 1 = 3$$



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**15.** Classify the following statements as 'true' or 'false' :

$$2 + 7 = 6$$



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**16.** Classify the following statements as 'true' or 'false' :

$$2 + 3 < 6$$



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**17.** Classify the following statements as 'true' or 'false' :

17 is a prime number.



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**18.** Classify the following statements as 'true' or 'false' :

Number of ways of seating two person in two chairs out of n persons is  ${}^n P_2$



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**19.** Classify the following statements as 'true' or 'false' :

A triangle has four sides.



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**20.** Classify the following statements as 'true' or 'false' :

$\sin(A + B) = \sin A + \sin B$  for all values of A and B.



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**21.** Classify the following statements as 'true' or 'false' :

Moon is a heavenly body.



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**22.** Which of the following are statements ?

Write the truth value of each :

There are only finite number of rational numbers.



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**23.** Which of the following are statements ?

Write the truth value of each :

Similar triangles are also congruent.



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**24.** Which of the following are statements ?

Write the truth value of each :

Square of a number is an even number.



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**25.** Which of the following are statements ?

Write the truth value of each :

Product of ( -1) and 8 is 8.



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**26.** Which of the following are statements ?

Write the truth value of each :

All integers are natural numbers.



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**27.** Which of the following are statements ?

Write the truth value of each :

Zero is a complex number.



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**28.** State sentences are statements. In case of statement, write down the truth value :

(1) Every set is a finite set.

(2) May God bless you !

(3) Square of an odd number is odd.



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**29.** Which of the following are statements ?

Write the truth value of each :

Sum of an even number and an odd number is always an even number.



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**30.** Which of the following are statements ?

Write the truth value of each :

Sides of quadrilateral have equal length.



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**31.** Which of the following are statements ?

Write the truth value of each :

He is an honest man.





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**32.** Check whether the following sentences are statements. Give reasons for your answer: How far is Chennai from here?



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**33.** Which of the following are statements ?

Write the truth value of each :

Sky is blue.



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**34.** Give three examples of sentence which are not statements. Give reasons for the answer.



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## Exercise 14 B Very Short Answer Type Questions

**1.** Write the negation of the following statements :

p : Jaipur is the capital of Rajasthan.

q : The earth is round.

r : The sun is cold.

s : Some even integers are prime.



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2. Write the negation of the following statements :

p : Each natural no is greater than 0.

q : The sum of 2 and 5 is 6.

r : The whole number is an integer.

s : A rectangle is a pentagon or a



quadrilateral.

t : Asia is a continent.

u : All triangle are not equilateral triangles.



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3. Write the negation of the following statements :

p : Both the diagonals of a rhombus have same length.

q:  $\sqrt{7}$  is rational.

$r$ :  $-5$  is greater than  $-3$ .

$s$ :  $5 + 3 = 7$ .



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4. Write the negation of the following statements:(i)  $p$ : For every real number  $x$ ,  $x^2 > x$ .(ii)  $q$ : There exists a rational number  $x$  such that  $x^2 = 2$ .(iii)  $r$ : All birds have wings.(iv)  $s$ : All students study mathematics at the element



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5. Are the following pairs of statements are negation of each other: The number  $x$  is not a rational number. The number  $x$  is not an irrational number.



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6. Write the negation of the following statements :

The number  $x$  is not a rational number.

The number  $x$  is an irrational number.



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## Exercise 14 B Frequently Asked Questions

1. Find the component statements of the following compound statements and check whether they are true or false. (i) Number 3 is prime or it is odd. (ii) All integers are positive or negative. (iii) 100 is divisible by 3, 11 and 5.



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2. Find the component statements of the following compound statements and check whether they are true or false. (i) Number 3 is prime or it is odd. (ii) All integers are positive or negative. (iii) 100 is divisible by 3, 11 and 5.



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3. Find the component statements of the following compound statements and check whether they are true or false. (i) Number 3 is

prime or it is odd. (ii) All integers are positive or negative. (iii) 100 is divisible by 3, 11 and 5.



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4. Find the component statements of the following and check whether they are true or not. (i) A square is a quadrilateral and its four sides equal (ii) All prime numbers are either even or odd (iii) A person who has taken Mathematics or Computer



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5. Find the component statement of the following and check whether they are true or not: all primes are either even or odd.



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6. Find the component statements of the following and check whether they are true or not :

A person who has taken Mathematics or Computer Science can go for MCA.



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7. Find the component statements of the following and check whether they are true or not :

Chandigarh is the capital of Haryana and U.P.



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8. Find the component statement of the following and check whether they are true or



not:  $\sqrt{2}$  is a rational number of an irrational number.



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9. Find the component statement of the following and check whether they are true or not: 24 is a multiple of 2,4, and 8.



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1. Find the component statements of the following compound statement: 0 is a positive number or a negative number.



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2. Find the component statements of the following compound statement: 25 is a multiple of 5 and 8.



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3. Find the component statements of the following compound statement: All rational numbers are real and all real numbers are complex.



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4. Find the component statements of the following compound statement: The sun shines or it rains.



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5. Find the component statements of the following compound statement: The sky is blue and the grass is green.



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6. Find the component statements of the following compound statement: The earth is round or the sun is cold.



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7. Find the component statements of the following compound statements :

Roses are red and lilies are white.



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8. Find the component statements of the following compound statement: It is raining and it is cold.



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9. Find the component statements of the following compound statement: There is something wrong with the bulb or with wiring.



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10. Find the component statement of the following and check whether they are true or not :

45 is a multiple of 3,5 and 9 .



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**11.** Find the component statement of the following and check whether they are true or not :

$x = 1$  and  $x = -1$  are roots of  $x^2 - 1 = 0$ .



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**12.** Find the component statement of the following and check whether they are true or not :

A rhombus is a quadrilateral and a pentagon.



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**13.** Find the component statement of the following and check whether they are true or not :

India is a democracy and a monarchy .



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**14.** Find the component statement of the following and check whether they are true or not :



The earth revolves around the sun or the moon.



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**15.** Find the component statement of the following and check whether they are true or not :

Milk is solid or water is a liquid.



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## Exercise 14 C Frequently Asked Questions

1. Write the component statements of the following compound statements and check whether the compound statement is true or false. (i) A line is straight and extends indefinitely in both directions. (ii) 0 is less than every positive integer and ever



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2. Write the component statements of the following compound statements and check whether the compound statement is true or false. (i) A line is straight and extends indefinitely in both directions. (ii) 0 is less than every positive integer and ever



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3. Write the component statements of the following compound statements and check

whether the compound statement is true or false. (i) A line is straight and extends indefinitely in both directions. (ii) 0 is less than every positive integer and ever



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4. Write the component statements of the following compound statements and check whether the compound statement is true or false:  $\sqrt{2}$  is rational number or an irrational number. The school is closed, if there is a

holiday or Sunday. A rectangle is a quadrilateral or a 5-sided polygon.



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5. Find the component statements of the following compound statements and check whether they are true or false. (i) Number 3 is prime or it is odd. (ii) All integers are positive or negative. (iii) 100 is divisible by 3, 11 and 5.



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6. Write the component statements of the following compounds statements and check whether the compounds statement is true or false.

All prime are either even or odd.



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7. For each of the following compound statements first identify the connecting words and then break it into component statements.

(i) All rational numbers are real and all real

numbers are not complex.(ii) Square of an integer is positive or negati



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8. For each of the following compound statements first identify the connecting words and then break it into component statements.

(i) All rational numbers are real and all real numbers are not complex.(ii) Square of an integer is positive or negati



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**9.** For each of the following compounds statements first identify the connecting words and then break it into component statements :

The sand heats up quickly in the sun and does not cool down fast at night.



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**10.** For each of the following compounds statements first identify the connecting words



and then break it into component statements

:

$x=2$  and  $x=3$  are the roots of the equation :

$$3x^2 - x - 10 = 0.$$



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**11.** Check whether "Or" used in the following compound statement is exclusive or inclusive?

Write the component statements of the compound statements and use them to check

whether the compound statement is true or not. Justify your answer. t: you are



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**12.** Write the negation of the following compound statements :

$$3 + 2 = 5 \text{ and } 7 < 9$$



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**13.** Write the negation of the following compound statements :

27 is divisible by 3 or sky is blue.



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**14.** Write the negation of the following compound statements :

Jaipur is in India and Washington is not in India.



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## Exercise 14 D Short Answer Type Questions

1. For each of the following compound statements, identify the connecting words and then write the component statements :

$x=1$  and  $x=2$  are the roots of the equation :

$$3x^2 - x - 10 = 0.$$



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2. For each of the following compound statements, identify the connecting words and then write the component statements :

13 is not a prime number or 15 is not a composite number.



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3. For each of the following compound statements, identify the connecting words and then write the component statements :

$2 + 3i$  is a real number or  $2 + 3i$  is a complex number.



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4. For each of the following compound statements, identify the connecting words and then write the component statements :

Anush is rich or happy.



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5. For each of the following compound statements, identify the connecting words and then write the component statements :

The sun is cold and the moon revolves around the sun.



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6. For each of the following compound statements, identify the connecting words and

then write the component statements :

The school works or a holiday is declared.



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7. Write the truth value of the following compound statements :

$$5 + 5 = 10 \text{ and } 4 + 8 = 12$$



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8. Write the truth value of the following compound statements :

$$5 + 5 = 10 \text{ or } 4 + 8 = 12$$



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9. Write the truth value of the following compound statements :

$$5 + 5 = 10 \text{ and } 4 + 8 = 13$$



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**10.** Write the truth value of the following compound statements :

$$5 + 5 = 10 \text{ or } 4 + 8 = 13$$



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**11.** Write the truth value of the following compound statements :

$$5 + 5 = 11 \text{ and } 4 + 8 = 12$$



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**12.** Write the truth value of the following compound statements :

$$5 + 5 = 11 \text{ or } 4 + 8 = 12$$



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**13.** Write the truth value of the following compound statements :

$$5 + 5 = 11 \text{ and } 4 + 8 = 13$$



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**14.** Write the truth value of the following compound statements :

$$5 + 5 = 11 \text{ or } 4 + 8 = 13$$



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**15.** Write the truth value of the following compound statements :

Blue whale is a mammal or a rapitale.



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**16.** Write the truth value of the following compound statements :

Sri Lanka is an island country and Yamuna is a river.



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**17.** Write the component statements of the following compounds statements and check whether the compound is true or false.

All rational numbers are real and all real numbers are not complex.



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**18.** Write the component statements of the following compound statements and check whether the compound is true or false.

$x=2$  and  $x = 3$  are the roots of  $3x^2 - x - 10 = 0$ .



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**19.** Write the component statements of the following compound statements and check whether the compound is true or false.

The sand heats up quickly in the sun and does not cool down fast at night.



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**20.** Write the component statements of the following compound statements and check whether the compound is true or false.

Bangalore is the capital of Andhra and Karnataka.



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**21.** Write the component statements of the following compound statements and check whether the compound statement is true or false: 125 is a multiple of 7 or 8. Mumbai is the capital of Gujrat or Maharashtra.



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**22.** Write the component statements of the following compound statements and check whether the compound is true or false.

Mumbai is the capital of Gujrat or Maharashtra.



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**23.** Write the component statements of the following compound statements and check whether the compound statement is true or false:  $\sqrt{2}$  is rational number or an irrational

number. The school is closed, if there is a holiday or Sunday. A rectangle is a quadrilateral or a 5-sided polygon.



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**24.** Write the component statements of the following compounds statements and check whether the compound is true or false.

A square is a polygon or a parallelogram.



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**25.** Write the component statements of the following compound statements and check whether the compound is true or false.

A rectangle is a quadrilateral and hexagon.



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**26.** Identify the type of "Or" used in the following statements and check whether the statements are true or false: (i)  $\sqrt{2}$  is a rational number or an irrational number. (ii) To

enter into a public library children need an identity card from the



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**27.** Identify the type of 'Or' used in the following statements and check whether the statements are true or false.

To enter into public library children need an identify card from the school or a letter from the school authorities.



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28. Identify the type of "Or" used in the following statements and check whether the statements are true or false: (i)  $\sqrt{2}$  is a rational number or an irrational number. (ii) To enter into a public library children need an identity card from the



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**Exercise 14 D Long Answer Type Questions I**

1. For each of the following statements, determine whether an inclusive "Or" or exclusive "Or" is used. Give reasons for your answer. (i) To enter a country, you need a passport or a voter registration card. (ii) The school is closed if it is a h



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2. For each of the following statements, determine whether an inclusive OR or

exclusive OR is used. Give reasons for your answer: Two lines intersected at a point or are parallel. The school is closed if it is a holiday or a Sunday.



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**3.** For each of the following statements, determine whether an inclusive OR or exclusive OR is used. Give reasons for your answer: Two lines intersected at a point or are

parallel. The school is closed if it is a holiday or a Sunday.



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4. Write the negation of each of the following

:

$$x > 3 \text{ or } x < 3.$$



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5. Write the negation of each of the following

:

Sky is blue and  $7 < 9$ .



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6. Write the negation of each of the following

:

Anil is cruel or he is strict.



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7. Write the negation of the following compound statement: The sand heats up quickly in the sun and does not cool down fast at night.



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8. Let  $p$  : It is raining to-day .

and  $q$  : There is no light in this room.

Give a single verbal sentence, which describe the following :

$p$  and  $q$



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9. Let  $p$  : It is raining to-day .

and  $q$  : There is no light in this room.

Give a single verbal sentence, which describe  
the following :

$p$  or  $q$



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**10.** Let  $p$  : It is raining to-day .

and  $q$  : There is no light in this room.

Give a single verbal sentence, which describe the following :

$\sim p$



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**11.** Let  $p$  : It is raining to-day .

and  $q$  : There is no light in this room.

Give a single verbal sentence, which describe

the following :

$$\sim q$$



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**12.** Let  $p$  : It is raining to-day .

and  $q$  : There is no light in this room.

Give a single verbal sentence, which describe  
the following :

$$\sim p \text{ or } \sim q$$



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## Exercise 14 E Short Answer Type Questions

1. Identify the quantifier in the following and state its type :

For every  $x \in N$ ,  $x + 3$  is greater than  $x$ .



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2. Identify the quantifier in the following and state its type :

There exists  $x \in N$ ,  $x + 3 = 9$ .



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3. Identify the quantifier in the following and state its type :

Some real numbers are rational.



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4. Identify the quantifier in the following and state its type :

Any integer is either positive or negative .



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5. Identify the quantifier in the following and state its type :

Every city in U.S.A. is clean.



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6. Identify the quantifier in the following and state its type :

There exists a living person who is 175 years old.





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7. Write the negation of each of the following statements: For every real number  $x$ ,  $x + 0 = x = 0 + x$  For every real number,  $x$ ,  $x$  is less than  $x + 1$



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8. Write the negation of each of the following statements: For every real number

$x, x + 0 = x = 0 + x$  For every real number,

$x, x$  is less than  $x + 1$



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**9.** Negate each of the following statement:

There exists a number which is equal to its square.



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**10.** Negate each of the following statement: All the students completed their homework.



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**11.** Write the negation of the following statements :

Every child is naughty or intelligent.



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**12.** Write the negation of the following statements :

Some diseases are curable and not infectious.



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**13.** Write the negation of each of the following statements: There exists a capital for every state in India. There exists a number which is equal to its square.



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**14.** Write the negation of the following statements :

All forms of carbon are not found.



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**15.** Write the negation of the following statements :

All cars are not fast and safe.



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## Exercise 14 F Short Answer Type Questions

1. Rewrite the following statement with if then in five different ways conveying the same meaning: If a natural number is odd, then its square is also odd.



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2. Write each of the following statements in the form if then You get job implies that your

credentials are good. You can access the website only if you pay a subscription fee.



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3. Write each of the following statements in the form if then

The banana trees will bloom if it stays warm for a month

A quadrilateral is a parallelogram if its diagonals bsect each other.

To get  $A^+$  in the class, it is necessary that you do all the exercises of the book.



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4. Write each of the following statements in the form 'if p, then q' :

A number is even if it is a multiple of 2.



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5. Write each of the following statements in the form 'if p, then q' :

A quadrilateral is a parallelogram if its diagonals bisect each other.



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6. Write each of the following statements in the form 'if  $p$ , then  $q$ ' :

To pass in examination it is necessary that you work hard.



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7. Write each of the following statements in the form 'if  $p$ , then  $q$ ' :

It is necessary to be rich in order to be happy.



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8. Write each of the following statements in the form if  $p$  then  $q$ : Whenever it rains it is cold.



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9. Write each of the following statements in the form 'if  $p$ , then  $q$ ' :

You earn a living implies you work.



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**10.** Write each of the following statements in the form 'if p, then q' :

The crops will be destroyed if there is a flood.



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**11.** For each of the following compounds statements , first identify the corresponding component statements. Then check whether

the statements are true or not.

If Kota is in India, then  $7 + 7 = 14$ .



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**12.** For each of the following compounds statements , first identify the corresponding component statements. Then check whether the statements are true or not.

If Kota is in England, then  $7 + 7 = 14$ .



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**13.** For each of the following compounds statements , first identify the corresponding component statements. Then check whether the statements are true or not.

If Kota is in India, then  $7 + 7 = 15$ .



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**14.** For each of the following compounds statements , first identify the corresponding component statements. Then check whether

the statements are true or not.

If Kota is in England , then  $7 + 7 = 15$ .



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**15.** Let  $p$  : 'He is rich' and  $q$  : 'He is happy' be the given statements. Write each of the following statements in the symbolic form, using  $p$  and  $q$ .

If he is rich , then he is unhappy.



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**16.** Let  $p$  : 'He is rich' and  $q$  : 'He is happy' be the given statements. Write each of the following statements in the symbolic form, using  $p$  and  $q$ .

It is necessary to be happy in order to be poor.



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**17.** Let  $p$  : 'He is rich' and  $q$  : 'He is happy' be the given statements. Write each of the following statements in the symbolic form,

using  $p$  and  $q$ .

To be poor is to be unhappy.



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**18.** Write the converse of the following statements :

If you do all the exercises in the books , you get an 'A grade' in the class.



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**19.** Write the converse of the following statements: If a number is even then  $n^2$  is even  
If you do all the exercises in the book, you get an A grade in the class.



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**20.** Write the contrapositive of the statement  
:  
"If  $n$  is a prime number, then  $n$  is even".



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**21.** State the converse and contrapositive of each of the following statement: A positive integer is prime only if it has no divisor other than 1 and itself.



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**22.** State the contrapositive of the following statements :

If it is hot outside, then youi feel thirsty.



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**23.** Given the following statements :

If a quadrilateral is a parallelogram, then its diagonals bisect each other.

Identify these as contrapositive or converse of each other.



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**24.** Given the following statements :

A: If the diagonals of a quadrilateral bisect

each other, then the quadrilateral is a parallelogram.

B: If the diagonals of a quadrilateral do not bisect each other, then the quadrilateral is not a parallelogram.

Identify these as contrapositive or converse of each other.



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**25.** Given the following statements :

If the diagonals of a quadrilateral bisect each

other, then it is a parallelogram.

Identify these as contrapositive or converse of each other.



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## Exercise 14 G Short Answer Type Questions

1. Rewrite each of the following statements in the form  $p$  if only if  $q$ :  $s$ : If a tumber is half empty, then it is half full and if a tumber is half full, the it is half empty.



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2. Rewrite each of the following statements in the form 'p if and only if q'.

Give below are pairs of statements. Combine them using 'if and only if' :

p : If Anil is intelligent, then he scores 92%.

q : If Anil scores 92%, then he is intelligent.



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**3.** Rewrite each of the following statements in the form 'p if and only if q'.

Give below are pairs of statements. Combine them using 'if and only if' :

p : If two lines are parallel, then their slopes are equal.

q : If the slopes of two lines are equal, then they are parallel.



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4. Rewrite each of the following statements in the form 'p if and only if q'.

Determine the truth value of each of the following statements :

$$3 + 3 = 6 \text{ iff } 2 + 2 = 4$$



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5. Rewrite each of the following statements in the form 'p if and only if q'.

Determine the truth value of each of the



following statements :

$$3 + 3 = 6 \text{ if } 4 + 3 = 8$$



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6. Rewrite each of the following statements in the form 'p if and only if q'.

Determine the truth value of each of the following statements :

$$3 + 3 = 7 \text{ iff } 3 + 4 = 7$$



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7. Rewrite each of the following statements in the form 'p if and only if q'.

Determine the truth value of each of the following statements :

$$3 + 3 = 7 \text{ iff } 5 + 2 = 6$$



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8. Using the words necessary and sufficient rewrite the statement The integer  $n$  is odd if and only if  $n^2$  is odd. Also check whether the statement is true.



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## Exercise 14 G Frequently Asked Questions

1. Given below are two statements  $p$  : 25 is a multiple of 5.  $q$  : 25 is a multiple of 8. Write the compound statements connecting these two statements with "And" and "Or". In both cases check the validity of the compound statement.



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2. Check whether the following statement is true or not. If  $x, y \in \mathbb{Z}$  are such that  $x$  and  $y$  are odd, then  $xy$  is odd.



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3. Verify by the method of contradiction that  $\sqrt{7}$  is irrational.



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1. Which of the following statements are true and which are false? In each case give a valid reason for saying so. (i)  $p$  : Each radius of a circle is a chord of the circle. (ii)  $q$  : The centre of a circle bisects each chord of the circle, (iii)  $r$  :



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2. Which of the following statements are true and which are false? In each case give a valid

reason for saying so. (i)  $p$  : Each radius of a circle is a chord of the circle. (ii)  $q$  : The centre of a circle bisects each chord of the circle, (iii)  $r$  :



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3. Which of the following statements are true and which have are false? In each case give a valid reason for saying so  $r$ : Circle is a particular case of an ellipse  $s$ : *If  $x$  and  $y$  are*

integers such that  $x > y$ , then  $x < -y$ .

$\sqrt{11}$  is a rational number.



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4. Which of the following statements are true and which are false? In each case give a valid reason for saying so

$r$ : Circle is a particular case of an ellipse

$s$ : If  $x$  and  $y$  are integers such that  $x > y$ , then  $x < -y$ .

$\sqrt{11}$  is a rational number.



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5. Which of the following statements are true and which have are false? In each case give a valid reason for saying so

$r$ : Circle is a particular case of an ellipse

$s$ : *If  $x$  and  $y$  are integers such that  $x > y$ , then  $x < -y$ .*

$t$ :  $\sqrt{11}$  is a rational number.



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6. Which of the following sentences are statements? Give reasons for your answer :



The square of a number is an even number



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

"If  $n$  is an odd positive integer, then  $n$  is prime."



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8. Show that the statement For any real numbers  $a$  and  $b$ ,  $a^2 = b^2$  implies that  $a = b$  is not true by giving a counter example



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9. By giving a counter example, show that the following statement is not true.

$p$  : The equation  $x^2 - 1 = 0$  does not have a root lying between 0 and 2.



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## Exercise 14 H Large Answer Type Questions I

1. Check whether the following statement is true or false by proving its contra positive. If  $x, y \in \mathbb{Z}$  such that  $xy$  is odd, then both  $x$  and  $y$  are odd.



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2. Check whether the following statement is true or not. If  $x, y \in \mathbb{Z}$  are such that  $x$  and  $y$  are

odd, then  $xy$  is odd.



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3. Show that the statement :

"Given a positive number  $x$ , there exists a rational number  $r$  such that  $0 < r < x$  is true.



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4. Show by the method of contradiction  $\sqrt{2}$  is irrational.



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5. Show, by the method of contradiction :

$p$  : If  $x$  is a real number such that  $x^3 + 8x = 0$ , then  $x = 0$ .



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**Objective Type Questions A Multiple Choice Questions**

1. Kohima is in Nagaland is a :

A. Conditional statement

B. Statement

C. Bi-conditional statement

D. None of these

**Answer: b**



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2. Which one is not a statement :

A. The sun is a star.

B. 8 is less than 5

C. Mathematics is a fun

D. Moon is a heavenly body.

**Answer: c**



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3. Write the negation of the statement "  $\sqrt{7}$  is rational".

A.  $\sqrt{7}$  is a complex number

B.  $\sqrt{7}$  is an integer

C.  $\sqrt{7}$  is a natural number

D.  $\sqrt{7}$  is not rational.

**Answer: d**



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4.  $p \wedge q$  is true when :

A.  $p$  and  $q$  are both true

B.  $p$  and  $q$  are both false

C.  $p$  is true and  $q$  is false

D.  $p$  is false and  $q$  is true

**Answer: a**



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5.  $p \vee q$  is false when :

A.  $p$  and  $q$  are both true

B.  $p$  and  $q$  are both false

C.  $p$  is true and  $q$  is false

D.  $p$  is false and  $q$  is true

**Answer: b**



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**Objective Type Questions B Fill In The Blanks**

1. Negation of  $p$ :  $\sqrt{5}$  is rational is .....



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2. Find the component statements of the following compound statement: 25 is a multiple of 5 and 8.



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3. If the statements  $p$  and  $q$  are both true, then  $p \rightarrow q$  is .....



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4. If  $p$  and  $q$  are both false, then  $p \rightarrow q$  is .....



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5. The contrapositive statement of the statement "If  $x$  is prime number, then  $x$  is odd" is



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## Objective Type Questions C True False Questions

1. Classify : "True or False"

$$2 + 7 = 6$$



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2. Classify : "True or False"

17 is a prime number.



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3. Classify : "True or False"

$\sqrt{2}$  is not a rational number.



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4. Are that following pair of statements negation of each other?

(i) The relation  $xy = yx$  is true for every real number  $x$  and  $y$  . .

(ii) There exists real number  $x$  and  $y$  for which the relation  $xy = yx$  is not true .



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5. Classify : "True or False"

If  $p$  and  $q$  are false, then  $p \wedge q$  is true.





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**6. Classify : "True or False"**

Write the truth value of the following:

$5 + 5 = 10$  or  $4 + 8 = 12$ .



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## Ncert File Exercise 14 1

**1. Which of the following sentences are statements? Give reasons for your answer.(i)**



There are 35 days in a month.(ii) Mathematics is difficult.(iii) The sum of 5 and 7 is greater than 10.(iv) The square of a number is an even number.(v)



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2. Which of the following sentences are statements ? Give reason for your answer.

There are 36 days in a month.



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3. Which of the following sentences are statements ? Give reason for your answer.

The sum of 5 and 7 is greater than 10.



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4. Which of the following sentences are statements ? Give reason for your answer.

The square of a number is an even number.



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5. Which of the following sentences are statements ? Give reason for your answer.

The sides of a quadrilateral have equal length.



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6. Which of the following sentences are statements ? Give reason for your answer.

Answer this question.



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7. Which of the following sentences are statements ? Give reason for your answer.

The product of ( -1) and 8 is 8.



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8. Which of the following sentences are statements ? Give reason for your answer.

The sum of all interior angles of a triangle is  $180^\circ$ .



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9. Which of the following sentences are statements ? Give reason for your answer.

Today is a windy day.



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10. Find out which of the following sentences are statements and which are not. Justify your answer: All real numbers are complex numbers.



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11. Which of the following sentences are statements ? Give reason for your answer.

All real numbers are complex numbers.



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## Ncert File Exercise 14 2

1. Write the negation of the following statements:(i) Chennai is the capital of Tamil

Nadu,(ii)  $\sqrt{2}$  is not a complex number(iii) All triangles are not equilateral triangle.(iv) The number 2 is greater than 7.(v) Every natural number is



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2. Write the negation of the following statement:  $\sqrt{2}$  is not a complex number.



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3. Write the negation of the following statement: all triangles are not equilateral triangles.



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4. Write the negation of the following statements : The number 2 is greater than 7.



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5. Write the negation of the following statement: Every natural number is an integer.



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6. Are the following pairs of statements negations of each other: (i) The number  $x$  is not a rational number. The number  $x$  is not an irrational number. (ii) The number  $x$  is a rational number. The number  $x$  is an irrational number.





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7. Are the following pairs of statements negations of each other: (i) The number  $x$  is not a rational number. The number  $x$  is not an irrational number. (ii) The number  $x$  is a rational number. The number  $x$  is an irrational number.



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**8.** Find the component statements of the following compound statements and check whether they are true or false. (i) Number 3 is prime or it is odd. (ii) All integers are positive or negative. (iii) 100 is divisible by 3, 11 and 5.



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**9.** Find the component statements of the following compound statements and check whether they are true or false. (i) Number 3 is

prime or it is odd. (ii) All integers are positive or negative. (iii) 100 is divisible by 3, 11 and 5.



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**10.** Find the component statements of the following compound statements and check whether they are true or false. (i) Number 3 is prime or it is odd. (ii) All integers are positive or negative. (iii) 100 is divisible by 3, 11 and 5.



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## Ncert File Exercise 14.3

1. For each of the following compound statements first identify the connecting words and then break it into component statements.

(i) All rational numbers are real and all real numbers are not complex.  
(ii) Square of an integer is positive or negative



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2. For each of the following compound statements first identify the connecting words and then break it into component statements.

(i) All rational numbers are real and all real numbers are not complex.(ii) Square of an integer is positive or negative



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3. Write the negation of the following compound statement: The sand heats up

quickly in the sun and does not cool down fast at night.



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4. For each of the following compound statements first identify the connecting words and then break it into component statements.

$x=2$  and  $x=3$  are the roots of the equations

$$3x^2 - x - 10 = 0$$



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5. Negate each of the following statement:

There exists a number which is equal to its square.



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6. Identify the quantifier in the following statements and write the negation of the statements.

For every real number  $x$ ,  $x$  is less than  $x+1$  .



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7. Identify the quantifier in the following statements and write the negation of the statements.

There exists a capital for every state in India.



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8. Identify the quantifier in the following statements and write the negation of the statements.

There exists a number which is equal to its square.



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9. Check whether the following pair of statements are negation of each other. Give reasons for your answer.(i)  $x + y = y + x$  is true for every real numbers  $x$  and  $y$ .(ii) There exists real numbers  $x$  and  $y$  for which  $x + y = y + x$



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**10.** State whether the "Or" used in the following statements is "exclusive " or "inclusive" . Give reasons for your answer.

Sun rises or Moon sets.



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**11.** State whether the "Or" used in the following statements is "exclusive " or "inclusive" . Give reasons for your answer.

To apply for a driving licence, you should have a ration card or a passport.



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**12.** State whether the "Or" used in the following statements is "exclusive " or "inclusive" . Give reasons for your answer.

All integers are positive or negative.



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## Ncert File Exercise 14.4

1. Rewrite the following statement with if then in five different ways conveying the same meaning: If a natural number is odd, then its square is also odd.



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2. Write the contrapositive and converse of the following statements.

If  $x$  is a prime number, then  $x$  is odd.



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3. Write the contrapositive and converse of the following statements.

If the two lines are parallel, then they do not intersect in the same plane.



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4. Write the contrapositive of the following statements: Something is cold implies that it

has low temperature You cannot comprehend geometry if you do not know how to reason deductively.



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5. Write the contrapositive of the following statements: Something is cold implies that it has low temperature You cannot comprehend geometry if you do not know how to reason deductively.



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6. Write the contrapositive and converse of the following statements. (i) If  $x$  is a prime number, then  $x$  is odd. (ii) If the two lines are parallel, then they do not intersect in the same plane, (iii) Something is cold implies that it has low tempe



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7. Write each of the following statements in the form "if-then" (i) You get a job implies that



your credentials are good. (ii) The Banana trees will bloom if it stays warm for a month. (iii) A quadrilateral is a parallelogram if its diagonals bisect



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**8.** Write each of the following statements in the form if then The banana trees will bloom if it stays warm for a month A quadrilateral is a parallelogram if its diagonals bsect each other.

To get  $A^+$  in the class, it is necessary that you do all the exercises of the book.



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**9.** State the converse and contrapositive of each of the following statement: If a quadrilateral is a parallelogram then its diagonals bisect each other.



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**10.** Write each of the following statements in the form if then

The banana trees will bloom if it stays warm for a month

A quadrilateral is a parallelogram if its diagonals bsect each other.

To get  $A^+$  in the class, it is necessary that you do all the exercises of the book.



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**11.** Given statements in (a) and (b). Identify the statements given below as contrapositive or

converse of each other. (a) If you live in Delhi, then you have winter clothes. (i) If you do not have winter clothes, then you do not live in Delhi. (ii)



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**12.** Given statements . Identify the statements given below as contrapositive or converse of each other.

If a quadrilateral is a parallelogram, then its diagonals bisect each other.

(i) If the diagonals of a quadrilateral do not bisect each other, then the quadrilateral is not a parallelogram.

(ii) If the diagonals of a quadrilateral bisect each other, then it is a parallelogram.



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## Ncert File Exercise 14 5

1. Show that the statement p: If  $x$  is a real number such that  $x^3 + 4x = 0$ . then  $x$  is 0 is

true by (i) direct method, (ii) method of contradiction, (iii) method of contrapositive.



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2. Show that the statement For any real numbers  $a$  and  $b$ ,  $a^2 = b^2$  implies that  $a = b$  is not true by giving a counter example



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3. Show that the following statement is true by the method of contrapositive. p: If  $x$  is an integer and  $x^2$  is even, then  $x$  is also even.



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4. By giving a counter-example, show that the following statement is false:

p: If all the sides of a triangle are equal, then the triangle is obtuse angled.



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5. By giving a counter example, show that the following statements are not true.

q : The equations  $x^2 - 1 = 0$  does not have a root lying between 0 and 2.



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6. Which of the following statements are true and which are false? In each case give a valid reason for saying so. (i) p : Each radius of a circle is a chord of the circle. (ii) q : The centre



of a circle bisects each chord of the circle, (iii) r

:



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7. Which of the following statements are true and which are false ? In each case give a valid reason for saying so.

q : The centre of a circle bisects each chord of the circle.



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8. Which of the following statements are true and which are false? In each case give a valid reason for saying so. (i)  $p$  : Each radius of a circle is a chord of the circle. (ii)  $q$  : The centre of a circle bisects each chord of the circle, (iii)  $r$  :



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9. Which of the following statements are true and which have are false? In each case give a valid reason for saying so  $r$ : Circle is a

particular case of an ellipse  $s$ : If  $x$  and  $y$  are integers such that  $x > y$ , then  $x < -y$ .  $t$ :  $\sqrt{11}$  is a rational number.



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**10.** Which of the following statements are true and which are false? In each case give a valid reason for saying so.

$t$ :  $\sqrt{11}$  is a rational number.



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## Miscellaneous Exercise On Chapter 14

1. Write the negation of the following statement:  $p$ : For every positive real number  $x$ , the number  $(x - 1)$  is also positive.



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2. Write the negation of the following statements :

$q$  : All crimes are punishable.



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3. Write the negation of the following statement:  $q$ : For every real number  $x$ , either  $x > 1$  or  $x < 1$ .



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4. Write the negation of the following statement:  $r$ : There exists a number  $x$  such that  $x^2 > 0$ .



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5. State the converse and contrapositive of each of the following statements: (i)  $p$  : A positive integer is prime only if it has no divisors other than 1 and itself. (ii)  $q$  : I go to a beach whenever it is a sunny day. (iii)  $r$  : If it is hot outs



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6. State the converse and contrapositive of each of the following statement: I go to a

beach whenever it is a sunny day.



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7. State the converse and contrapositive of each of the following statement: If it is hot outside, the you feel thirsty.



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8. Write each of the stateemnts in the form "if  $p$ , then  $q$  "

$p$  : It is necessary to have a password to log on to the server.



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9. Write each of the following statements in the form if  $p$  then  $q$ : There is traffic jam whenever it rains.



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**10.** Write each of the following statements in the form if  $p$  then  $q$ : You can access the website only if you pay a subscription fee.



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**11.** Rewrite each of the following statements in the form  $p$  if and only if  $q$ " (i)  $p$ : If you watch television, then your mind is free and if your mind is free, then you watch television. (ii)  $q$ :

For you to get an A grade, it is necessary and suffi



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**12.** Write each of the following using 'if and only if':

(i) In order to get A grade, it is necessary and sufficient that you do all the homework regularly.

(ii) If you watch television then your mind is

free and if your mind is free then you watch television.



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**13.** Rewrite each of the following statements in the form  $p$  if and only if  $q$ : If a quadrilateral is equiangular, then it is a rectangle and if a quadrilateral is a rectangle, then it is equiangular.



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**14.** Given below are two statements  $p$  : 25 is a multiple of 5.  $q$  : 25 is a multiple of 8. Write the compound statements connecting these two statements with "And" and "Or". In both cases check the validity of the compound statement.



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**15.** Check the validity of the statements given below by the method given against it. (i)  $p$ : The sum of an irrational number and a rational number is irrational (by contradiction

method).(ii) q: If  $n$  is a real number with  $n > 3$ ,  
then  $n^2 > 9$



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**16.** Check the validity of the statements given below by the method given against it.(i) p: The sum of an irrational number and a rational number is irrational (by contradiction method).(ii) q: If  $n$  is a real number with  $n > 3$ ,  
then  $n^2 > 9$



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17. Write the following statement in five different ways, conveying the same meaning.

p: If a mangle is equiangular, then it is an obtuse angled triangle.



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## Exercise

1. Which of the following sentences are statement ? Justify

- (i) A triangle has three sides.
- (ii) 0 is a complex number.
- (ii) 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  $180^\circ$ .
- (x)  $\sin^2 x + \cos^2 x = 0$



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2. Write the component statement 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.

(ii) All living things have two eyes and two legs.

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



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3. Write the component statement 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.

(ii) All living things have two eyes and two legs.

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



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4. Translate the following statement into symbolic 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.



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5. Translate the following statement into symbolic 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.



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6. Translate the following statement into symbolic 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.



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

The square of an odd number is odd.

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

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

(iv) The units digit of an integer is 0 or 5 if it is not prime .

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

.

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



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8. The conditional statement of "You will get a sweet dish after the dinner" is



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

The square of an odd number is odd.

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

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

(iv) The units digit of an integer is 0 or 5 if it is not prime .

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

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



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**10.** Rewrite each of the following statements in the form of conditional statements :

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



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**11.** 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 the three side of a triangle are equal, then the triangle is equilateral.

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

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

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

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



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12. 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 the three sides of a triangle are equal, then the triangle is equilateral.

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

(v) If a natural number  $n$  is divisible by 6 then it is divisible by 2 and 3.

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

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



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**13.** By giving a counter-example, show that the following statement is false:

p: If all the sides of a triangle are equal, then the triangle is obtuse angled.



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**14.** Write down the contrapositive of the following statements :

If  $x$  and  $y$  are negative integers, then  $xy$  is positive.



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**15.** 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 which  $x, x + 1$  is also a natural number.
- (v) For all real number  $x$  with  $x > 3$ ,  $x^2$  is greater than 9.
- (vi) There exist a traingle which is not an isosceles traingle.
- (vii) For all negative  $x$ ,  $x^3$  is also a negative integers.
- (viii) There exists a statements in above statements which is not true.

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

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



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**16.** Identify the Quantifiers in the following statements :

For all real numbers  $x$  and  $y$ ,  $xy = yx$



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17. 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 which  $x, x + 1$  is also a natural number.

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

(vi) There exist a traingle which is not an

isosceles triangle.

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

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

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

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



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**18.** Identify the quantifier in each of the following statements: For every real number  $x$ ,  $x + 4$  is greater than  $x$ . There exists a real number which is twice of itself. There exists a (living) person who is 200 years old. For every  $x \in N$ ,  $x + 1 > x$ .



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**19.** Check whether the following statement is true or false by the method of contrapositive

:

P : If  $x, y$  is an integer such that  $xy$  is odd, then both  $x$  and  $y$  are odd



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## Revision Exercise

1. Write the following statement in five different ways, conveying the same meaning :

p : If a triangle is equiangular, then it is an obtus-angled triangle.



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2. For each of the following compound statements, first identify the corresponding component statements. Then check whether the statements are true or not. (i) If a triangle ABC is equilateral, then it is isosceles. (ii) If a and b are integers,



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3. For each of the following compound statements, first identify the corresponding component statements. Then check whether the statements are true or not. (i) If a triangle ABC is equilateral, then it is isosceles. (ii) If a and b are integers,



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4. Check the validity of the statements given below by the method given against it.

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



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5. Check the validity of the statements given below by the method given against it.

$q$  : If  $n$  is a real number when  $n > 3$ , then  $n^2 > 9$ .



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6. By giving a counter example, show that the following statement are not true :

If  $n$  is an even integer, then  $n$  is not prime.



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7. By giving a counter example, show that the following statement are not true :

The equation  $x^2 - 4 = 0$  does not have a root lying between 0 and 3.



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8. Determine whether the argument used to check the validity of the following statement is correct.

p : If  $x^2$  is irrational , then  $x$  is rational. The statement is true because:- Number  $x^2 = \pi^2$  is irrational therefore  $x = \pi$  irrational.



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[Check Your Understanding](#)

1. What is Mathematical statements? Explain with the example.



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2. Which of the following are statements ?

Mumbai is in India



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**3. Which of the following are statements ?**

Earth is a star.



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**4. Which of the following are statements ?**

Do your home work.



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5. Which of the following are statements ?

Each square is a rhombus.



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6. Which of the following are statements ?

Wish you good luck.



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7. Write the negation of the following :

Jaipur is the capital of Rajasthan .



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8. Write the negation of the following :

3 is greater than 2



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9. Find the component statements of the following statement and check whether they are true or false.

100 is divisible by 3,5 and 11.



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10. Write the truth value of the following :

$5 + 5 = 10$  and  $4 + 8 = 12$



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**11.** Write the truth value of the following :

$$5 + 5 = 11 \text{ or } 4 + 8 = 13$$



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**12.** Identify the quantifier in the following :

For every real number  $x$ ,  $x + 2 > x$



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**13.** Identify the quantifier in the following :

Some real numbers are rational.



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**14.** Determine the truth value of the following

:

"Apple is a fruit iff Delhi is in Japan".



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**15.** Write the following statement in the form

"if  $p$  then  $q$ " :

" The banana tree will bloom if it stays warm for a month " .



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**16.** 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 the four sides

of a rectangle are equal, then the rectangle is a square.



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17. Check the validity of the following statement: Square of an integer is positive or negative



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1. The statement  $\sim(p \leftrightarrow \sim q)$  is

A. equivalent to  $\sim p \leftrightarrow q$

B. a tautology

C. a fallacy

D. equivalent to  $p \leftrightarrow q$

**Answer: D**



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2. The negation of  $\sim s \vee (\sim r \wedge s)$  is equivalent to :

A.  $s \wedge \sim r$

B.  $s \wedge (r \wedge \sim s)$

C.  $s \vee (r \vee \sim s)$

D.  $s \wedge r$

**Answer: D**



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### 3. The Boolean Expression

$(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$  is equivalent to:

A.  $p \wedge q$

B.  $p \vee q$

C.  $p \vee \sim q$

D.  $\sim p \wedge q$

**Answer: B**



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4. The following statement :

$(p \rightarrow q) \rightarrow [(p \rightarrow q) \rightarrow q]$  is :

A. equivalent to  $\sim p \rightarrow \sim q$

B. equivalent to  $p \rightarrow \sim q$

C. a fallacy

D. a tautology

**Answer: D**



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5.  $\sim(p \vee q) \vee (\sim p \wedge q)$  is logically equivalent to

A.  $\sim p$

B.  $p$  and  $q$  are both false

C.  $q$

D. None of these

**Answer: A**



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6. The Boolean expression :

$((p \wedge q) \vee (p \vee \sim q)) \wedge (\sim p \wedge \sim q)$  is equivalent

to :

A.  $p \wedge q$

B.  $(\sim p) \wedge (\sim q)$

C.  $p \wedge (\sim q)$

D.  $p \vee (\sim q)$

**Answer: B**



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## Chapter Test 14

1. Which one is not a statement :

(a) The sun is a star

( b ) 8 is less than 5

(c ) Mathematics is fun

( d ) Moon is a heavenly body.



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2.  $p \wedge q$  is true when :

( a ) p and q are both true

(b)  $p$  and  $q$  are both false

(c)  $p$  is true and  $q$  is false

(d)  $p$  is false and  $q$  is true.



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3. Write the negation of the statement :  $p$ :

There exist a number  $x$  such that  $0 < x < 1$  is

\_\_\_\_\_.



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4. Give three examples of sentences which are not statements. Give reasons for the answers.



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5. Determine the truth value of the following

:  $5 + 4 = 9$  and  $8 - 2 = 6$ .



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6. Let  $p$ : It is raining to-day and  $q$  : There is no light in this room.

Give a single sentence, which describes the following :

(i)  $p \vee q$  (ii)  $p \wedge q$  (iii)  $\sim p$  (iv)  $\sim q$  (v)  $\sim p$  or  $\sim q$ .



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7. Show, by the method of contradiction,  $p: \sqrt{2}$  is irrational .



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8. Write the negation of the statement :

$$(p \Rightarrow q) \wedge r$$

A.  $p \wedge \sim q \vee \sim r$

B.  $(\sim p \wedge q) \wedge (\sim r)$

C.  $(p \wedge \sim q) \wedge r$

D.  $(p \wedge \sim q) \wedge (\sim r)$

**Answer:**



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9. Write the converse of the following statement :

if  $x < y$ , then  $x + 5 < y + 5$ .



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10. By giving counter example , show that the following statements are not true :

(I) In  $n$  is an odd integer, then  $n$  is prime.

(ii) The equation  $x^2 - 4 = 0$  does not a root lying between 0 and 3.



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**11.** Rewrite the following statement with "if-then" in five different ways conveying the same meaning. If a natural number is odd, then its square is also odd.



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**12.** Show that the statement  $p$ : If  $x$  is a real number such that  $x^3 + 4x = 0$ . then  $x$  is 0 is

true by (i) direct method, (ii) method of contradiction, (iii) method of contrapositive.



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