



MATHS

NCERT - NCERT MATHEMATICS (ENGLISH)

MATHEMATICAL REASONING

Solved Examples

1. 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 school or a letter from school authorities.(iii) A rectangle is a quadrilateral or a 5-sided polygon.



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2. Write the contra positive of the following statement:(i) If a number is divisible by 9, then it is divisible by 3.(ii) If you are born

in India, then you are a citizen of India.(iii)

If a triangle is equilateral, it is isosceles.



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3. 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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4. Write the negation of the following statements and check whether the resulting statements are true,(i) Australia is a continent.(ii) There does not exist a quadrilateral which has all its sides equal, (iii) Every natural number is greater than 0. (iv) The sum of 3 and 4 is 9.



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5. Check whether the following sentences are statements. Give reasons for your answer.(i) 8 is less than 6.(ii) Every set is a finite set.(iii) The sun is a star.(iv) Mathematics is fun.(v) There is no rain without clouds.(vi) How far is Chennai from here?



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6. 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 every negative integer.(iii) All living things have two legs and two eyes.



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7. 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 holiday or a Sunday.
- (iii) Two lines intersect at a point or are parallel.
- (iv) Students can take French or Sanskrit as their third language.



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- 8.** Find the component statements of the following compound statements.
- (i) The sky is blue and the grass is green.
- (ii) It is raining

and it is cold.(iii) All rational numbers are real and all real numbers are complex.(iv) 0 is a positive number or a negative number.



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9. 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



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



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11. Check whether the following statement is true and false by proving its contrapositive if x, y are integers such that xy is odd then both x and y are odd integers.



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12. 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 wet when it rains or you are in a river.



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13. By giving a counter example, show that the following statement is false. If n is an odd integer, then n is prime.



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14. 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, then ab is a rational number.



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15. 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.



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16. Check whether the following statement is true or not :

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



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17. 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.(ii) p: If the sum of 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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18. 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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19. 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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20. 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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Miscellaneous Exercise

1. 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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2. 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: If it is hot outside, then you feel thirsty.



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3. Write the negation of the following statements:(i) p : For every positive real number x , the number $x - 1$ is also positive.(ii) q : All cats scratch.(iii) r : For every real number x , either $x > 1$ or $x < 1$.



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

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



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5. 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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6. 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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7. 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 sufficient that you do all the homework regularly.

(iii) r : 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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Exercise 14 5

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 : circles is a particular case of an ellipse.

(iv) s : if x and y are integers such that $x > y$

, then $-x < -y$.

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



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2. By giving a counter example, show that the following statements are not true. (i) p: If all the angles of a triangle are equal, then the triangle is an obtuse angled triangle. (ii) q: The equation $x^2 - 1 = 0$ does not have a root lying between 0



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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. 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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5. 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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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.



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



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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 an integer



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2. 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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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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Exercise 14 3

1. State whether the Or used in the following statements is exclusive of' inclusive. Give reasons for your answer.(i) Sun rises or

Moon sets.(ii) To apply for a driving license, you should have a ration card or a passport.

(iii) All integers are positive or negative.



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2. 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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3. 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 every state in india.



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4. 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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Exercise 14 4

1. 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 temperature.

(iv) You cannot comprehend geometry if you do not know how to reason deductively.

(v) x is an even number implies that x is divisible by 4.



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2. 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 each other.(iv) To get an A in the class, it is necessary that you do all the exercises the book.



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3. 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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4. 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) If you have winter

clothes, then you live in Delhi.(b) 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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