

CBSE Class-11 Mathematics
NCERT Solutions
Chapter - 14 Mathematical Reasoning
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.

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

(iv) $x=2$ and $x=3$ are the roots of the equation $3x^2 - x - 10 = 0$.

Ans. (i) The component statement has the connecting word 'and';

Component statements are:

p : All rational numbers are real.

q : All real numbers are not complex.

(ii) The component statement has the connecting word 'or';

Component statements are:

p : Square of an integer is positive.

q : Square of an integer is negative.

(iii) The component statement has the connecting word 'and' ;

Component statements are:

p : The sand heats up quickly in the sun.

q : The sand does not cool down fast at night.

(iv) The component statement has the connecting word 'and' ;

Component statements are:

$p : x = 2$ is a root of the equation $3x^2 - x - 10 = 0$

$q : x = 3$ is a root of the equation $3x^2 - x - 10 = 0$

2. 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.

Ans. (i) Here the **quantifier** is 'There exists'.

The negation of statement is: There exists a number which is not equal to its square.

(ii) Here the **quantifier** is 'For every'.

The negation of statement is: For at least one real number x , x is not less than $x+1$.

(iii) Here the **quantifier** is 'There exists'.

The negation of statement is: There exists a state in India which does not have a capital.

3. Check whether the following pair of statements are negations 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 $x+y = y+x$.

Ans. Let $p : x+y = y+x$ is true for every real number x and y .

And $q : There exists real numbers x and y for which $x+y = y+x$.$

Now $\sim p$: There exists real numbers x and y for which $x+y \neq y+x$ therefore Statement (i) and (ii) are not the negation of each other.

4. State whether the ‘or’ used in the following statements is “exclusive” or inclusive”. Give reasons for your answers.

(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.

Ans. (i) This statement makes use of exclusive ‘or’. Since when sun rises, moon does not set during day-time.

(ii) This statement makes use of inclusive ‘or’. Since you can apply for a driving licence even if you have a ration card as well as passport.

(iii) This statement makes use of exclusive ‘or’. Since all integers are positive as well as negative; but can't be both at the same time.