

*Negation of statement A:* a statement B whose assertion specifically denies the truth of statement A.

1. Negate the below statements and express the negations in English avoiding the use of negation words whenever possible.
  - (a) There is a vaccine in the world that is not safe for cockroaches.
  - (b) All pairs of students who participated in Linear Algebra Mela stood atleast 6 feet apart.
  - (c) In Breakout room 1 online classes in SWMS all students were speaking.
  - (d) During the month of May, Siva Sanitized his hands every hour.
  - (e) There is one person in Immunity's birthday party who is not wearing a mask.
  - (f) Every student in this class has taken Bhojpuri or Maithili in Class XII.
  - (g) Every student in this class has taken Mathematics and Biology in Class XII.
2. Let us introduce **Logical Notation:**
  - $\forall$  to mean for all;
  - $\exists$  to mean there exists;
  - $\implies$  to mean implies; and
  - $\iff$  to mean equivalent.

Here is an example of usage of notation:

Statement : For all  $\epsilon > 0$  there is an  $N$  such that for all  $n \geq N$ ,  $a_n \in (a - \epsilon, a + \epsilon)$ .

Statement in logical Notation:  $\forall \epsilon > 0, \exists N$  such that  $\forall n \geq N, a_n \in (a - \epsilon, a + \epsilon)$ .

- (a) We say  $\lim_{n \rightarrow \infty} a_n = 5$  if

*For every  $\epsilon > 0$  there exists  $N > 0$  such that  $|a_n - 5| < \epsilon$  whenever  $n \geq N$ .*

- i. Provide three examples of sequences that converge to 5.
- ii. Provide three examples of sequences that do not converge to 5.
- iii. Provide an example of sequence that does not converges to any real number.
- iv. Write a logical statement that is equivalent to saying  $\lim_{n \rightarrow \infty} a_n \neq 5$
- v. Write a logical statement that is equivalent to saying that the sequence  $a_n$  does not converge to any real number.