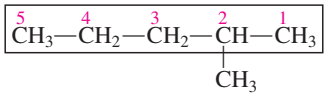
Additional guidelines for numbering carbon atom chains:

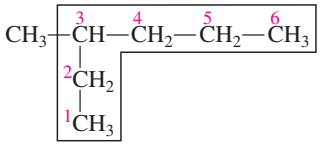
1. If both ends of the chain have a substituent the same distance in, number from the end closest to the second-encountered substituent.
2. If there are substituents equidistant from each end of the chain and there is no third substituent to use as the "tie-breaker," begin numbering at the end nearest the substituent that has alphabetical priority—that is, the substituent whose name occurs first in the alphabet.

Rule 2: *Number the carbon atoms in the parent chain from the end of the chain nearest a substituent (alkyl group).*

There always are two ways to number the chain (either from left to right or from right to left). This rule gives the first-encountered alkyl group the lowest possible number.

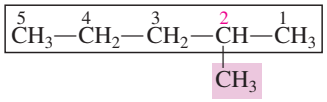


Right-to-left numbering system

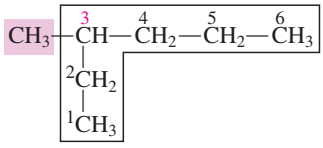


Left-to-right numbering system

Rule 3: *If only one alkyl group is present, name and locate it (by number), and prefix the number and name to that of the parent carbon chain.*



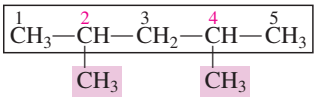
2-Methylpentane



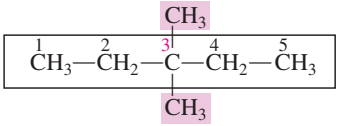
3-Methylhexane

Note that the name is written as one word, with a hyphen between the number (location) and the name of the alkyl group.

Rule 4: *If two or more of the* same kind *of alkyl group are present in a molecule, indicate the number with a Greek numerical prefix (di-, tri-, tetra-, penta-, and so forth). In addition, a number specifying the location of each identical group must be included. These position numbers, separated by commas, precede the numerical prefix. Numbers are separated from words by hyphens.*



2,4-Dimethylpentane

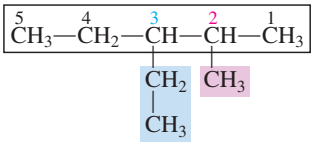


3,3-Dimethylpentane

There must be as many numbers as there are alkyl groups in the IUPAC name of a branched-chain alkane.

Note that the numerical prefix *di-* must always be accompanied by two numbers, *tri-* by three, and so on, even if the same number is written twice, as in 3,3-dimethylpentane.

Rule 5: *When two kinds of alkyl groups are present on the same carbon chain, number each group separately, and list the names of the alkyl groups in alphabetical order.*



3-Ethyl-2-methylpentane

Note that ethyl is named first in accordance with the alphabetical rule.