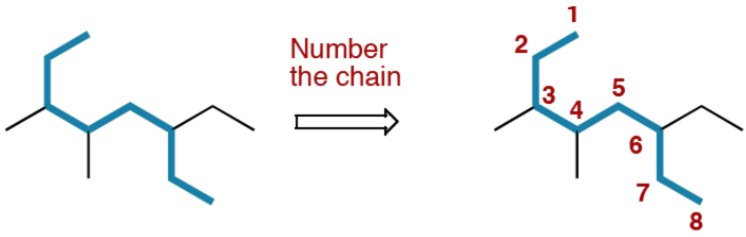
Nomenclature (Naming) Rules

IUPAC has designed a systematic naming system for organic structures. Names are made up of a parent chain (designating the longest carbon chain), a prefix (the stuff attached), and an ending (this defines a functional group).

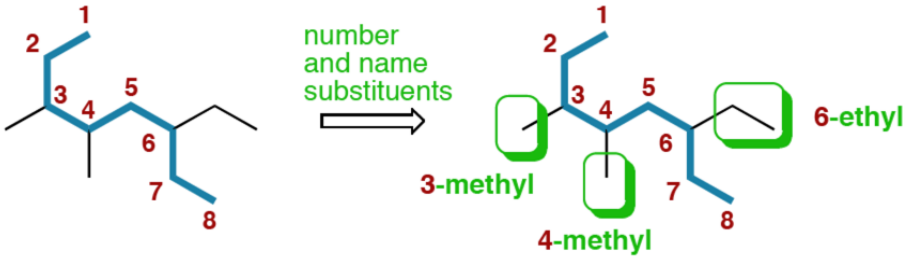
ALKANES:

Rule #1 - Find the longest continuous chain of carbons. If there is more than one possibility, choose the chain that is more branched.

Rule #2 - Number the chain beginning at the end of the nearest branch. If there are substituents equal distance from either end, look for the next nearest branch to an end.



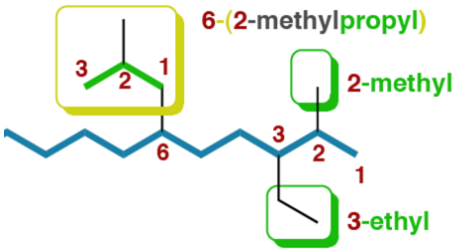
Rule #3 - Identify the groups (substituents) with a number and a name.



Rule #4 - Write the name for the molecule with groups listed alphabetically using prefixes (di, tri, tetra, penta, hexa, etc) to designate the number of each. Hyphens go between letters and numbers. Ignore all prefixes (except iso) when alphabetizing.

6-ethyl-3,4-dimethyloctane

Complex substituents - sometimes molecules have substituents (not part of the parent chain) that have additional branching. While there are some common names for 3- or 4-carbon complex side chains (e.g. Isobutyl), IUPAC has a systematic way of naming these groups as well. Basically, you follow similar rules as naming, but do it on a sub-part of the molecule. The main difference is that you always start numbering the side chain starting at the point of attachment as carbon number 1. Start at the point of attachment as number 1 and find the longest continuous carbon chain. This is the parent substituent. Number and name any branching groups according to this. All of the subname is enclosed in parentheses and placed into the full name of the molecule.



3ethyl-2-methyl-6-(2-methylpropyl)decane

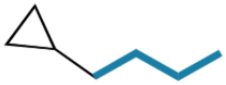
complex substituent - could also be called *iso*butyl

Cycloalkanes

Alkanes can be joined at the ends to make ring compounds. In order to do this, two hydrogens must be lost. Thus, the general formula for cycloalkanes is C_nH_{2n}.

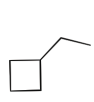
Rule 1: Count the number of C's in the ring. If greater than or equal to the largest substituent chain, the ring is the parent. If a substituent is larger, that is the parent.

ethylcyclopentane

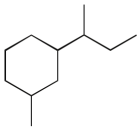


1-cyclopropylbutane

Rule 2: for multi-substituted rings - start numbering at a point of attachment - number in the direction that gives the lowest numbers. Substituents are numbered according to their alphabetical priority - halogens included.

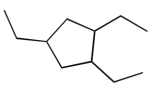


ethylcyclobutane

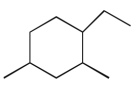


1-(*sec*-butyl)-3-methylcyclohexane

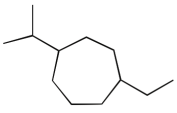
1,2-dimethylcyclohexane



1,2,4-triethylcyclopentane



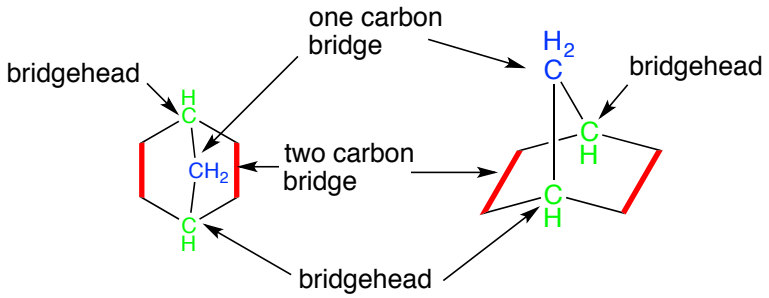
1-ethyl-2,4-dimethylcyclohexane



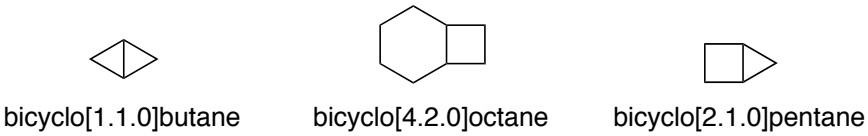
1-ethyl-4-isopropylcycloheptane

Bicyclic Structures

We name compounds containing two fused or bridged rings as bicycloalkanes. Use the name of the alkane corresponding to the total number of carbon atoms in the rings as the parent name. The carbon atoms common to both rings are called bridgeheads, and each bond, or each chain of atoms, connecting the bridgehead atoms is called a bridge.



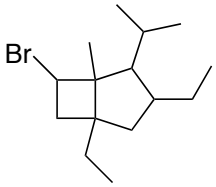
Use brackets to denote the number of carbon atoms in each bridge (in order of decreasing length).



bicyclo[1.1.0]butane bicyclo[4.2.0]octane bicyclo[2.1.0]pentane

bicyclo[2.2.2]octane 7-methylbicyclo[2.2.1]heptane

If substituents are present, number the bridged ring system beginning at one bridgehead, proceeding first along the longest bridge to the other bridgehead, then along the next longest bridge back to the first bridgehead. The shortest bridge is numbered last:



7-bromo-3,5-diethyl-2-isopropyl-1-methylbicyclo[3.2.0]heptane