

Cohen–Macaulay ring

In mathematics, a Cohen–Macaulay ring is a particular type of commutative ring, possessing some of the algebraic-geometric properties of a nonsingular variety, such as local equidimensionality.

They are named for Francis Sowerby Macaulay (1916), who proved the unmixedness theorem for polynomial rings, and for Cohen (1946), who proved the unmixedness theorem for formal power series rings. All Cohen–Macaulay rings have the unmixedness property.

In general, there is the following chain of implications:

regular > complete intersection > Gorenstein > Cohen–Macaulay.

A local Cohen–Macaulay ring is defined as a commutative noetherian local ring with Krull dimension equal to its depth. The depth is always bounded above by the Krull dimension; equality provides some interesting regularity conditions on the ring, enabling some powerful theorems to be proven in this rather general setting.

A non-local ring is called Cohen–Macaulay if all of its localizations at prime ideals are Cohen–Macaulay