Table 3.1 Co-channel Reuse Ratio for Some Values of N

	Cluster Size (*N*)	Co-channel Reuse Ratio (*Q*)
$i = 1,\ j = 1$	3	3
$i = 1,\ j = 2$	7	4.58
$i = 0,\ j = 3$	9	5.20
$i = 2,\ j = 2$	12	6

Let i_0 be the number of co-channel interfering cells. Then, the signal-to-interference ratio (*S/I* or *SIR*) for a mobile receiver which monitors a forward channel can be expressed as

$$\frac{S}{I} = \frac{S}{\sum_{i=1}^{i_0} I_i} \tag{3.5}$$

where S is the desired signal power from the desired base station and I_i is the interference power caused by the ith interfering co-channel cell base station. If the signal levels of co-channel cells are known, then the *S/I* ratio for the forward link can be found using Equation (3.5).

Propagation measurements in a mobile radio channel show that the average received signal strength at any point decays as a power law of the distance of separation between a transmitter and receiver. The average received power P_r at a distance d from the transmitting antenna is approximated by

$$P_r = P_0\left(\frac{d}{d_0}\right)^{-n} \tag{3.6}$$

or

$$P_r(\text{dBm}) = P_0(\text{dBm}) - 10n\log\left(\frac{d}{d_0}\right) \tag{3.7}$$

where P_0 is the power received at a close-in reference point in the far field region of the antenna at a small distance d_0 from the transmitting antenna and n is the path loss exponent. Now consider the forward link where the desired signal is the serving base station and where the interference is due to co-channel base stations. If D_i is the distance of the ith interferer from the mobile, the received power at a given mobile due to the ith interfering cell will be proportional to $(D_i)^{-n}$. The path loss exponent typically ranges between two and four in urban cellular systems [Rap92b].