We compute and analyze the differences between the normal, orthometric, and normal-orthometric heights in New Zealand. The computation of the normal to normal-orthometric height correction along the levelling lines is based on the levelling data and the gravity disturbances. Since the gravity values along the levelling lines in New Zealand were not measured, we compute the gravity disturbances using the EGM2008 coefficients complete to degree 2159 of spherical harmonics. The geoid-to-quasigeoid correction (i.e., the difference between the normal and orthometric heights) is computed approximately, adopting Helmert’s definition of orthometric heights. In this case, the approximate geoid-to-quasigeoid correction is computed as a function of the topographic height and the simple planar Bouguer gravity anomaly at the observation point. In addition, the new detail digital terrain and rock density models of New Zealand is used to calculate the effect of the anomalous topographical density distribution on the corrections between these three types of heights.