Center Distance, Pitch Diameters and Ratios of Spur Gears

I. To determine the pitch diameters of a gear set, we must find two basic things:
   a. Required ratio
   b. Required center distance

II. Knowing this, first figure out the pitch diameter of the pinion (smaller gear) using the formula:

$$PD_1 = \frac{CD \times 2}{Ratio + 1}$$

Where: PD_1 = Pitch diameter of pinion (small gear)
CD = Center distance

III. Then, find the pitch diameter of the larger gear, PD2, by using the formula:

$$PD_2 = PD_1 \times Ratio$$

Where: PD_1 = Pitch diameter of pinion (small gear)
PD_2 = Pitch diameter of gear (large gear)
CD = Center distance

IV. Then check the center distance by using the formula:

$$CD = \frac{PD_1 + PD_2}{2}$$

Where: PD_1 = Pitch diameter of pinion (small gear)
PD_2 = Pitch diameter of gear (large gear)
CD = Center distance