Estimate the remaining life (in revolutions) of an OZ series 30-mm angular contact ball bearing if the bearing has been subjected to 200,000 cycles at a radial load of 18 kN, and the new load is 30 kN.

\[ F_1 = 18 \text{ kN} \quad L_1 = 2 \times 10^5 \text{ cycles} \]
\[ F_2 = 30 \text{ kN} \quad L_2 = ? \]

\[ \frac{L_1}{L_2} = \left( \frac{F_2}{F_1} \right) \]

or

\[ F_1^a L_1 = F_2^a L_2 \]

\[ \frac{L_1}{L_2} = \frac{F_1}{F_2} \]

\[ \frac{L_1}{L_2} = 1.00 \]

\[ \frac{F_1}{F_2} = 1.00 \]

\[ K = C^a L_K \]

From the table on page RB-9 of class notes:

\[ C = 20.3 \text{ kN} \]
\[ L_K = 1 \times 10^6 \text{ cycles} \]

\[ K = (20.3)^3 (1 \times 10^6) \]

\[ K = 8.37 \times 10^9 \]
For the initial load conditions

\[ L_1 = 2 \times 10^3 \text{ cycles} \quad \text{life used} \]
\[ L_1 = ? \quad \text{design life @ } F_1 \]
\[ L_2 = ? \quad \text{life remaining} \]
\[ L_2 = ? \quad \text{design life @ } F_2 \]

\[ L_1 = \frac{K}{F_1^a} \quad L_2 = \frac{K}{F_2^a} \]

\[ L_1 = \frac{8.37 \times 10^3}{(18)^3} \quad \text{note, load in kN} \]

\[ L_1 = 1.93 \times 10^6 \text{ cycles} \]

\[ L_2 = \frac{8.37 \times 10^3}{(30)^3} \]

\[ L_2 = 31 \times 10^5 \text{ cycles} \]

\[ \frac{L_2}{L_1} = 1 \]
\[ \frac{200,000}{1.93 \times 10^6} + \frac{L_2}{31 \times 10^5} = 1 \]

\[ L_2 = 2.6 \times 10^5 \]

\[ L_2 = 260,000 \text{ cycles} \]