Exercise 2.16

Start with:

$$e_{x:\overline{n}|} = \mathrm{E}\big[\min(K_x, n)\big] = \sum_{k=0}^{\infty} \min(k, n)\,_{k|}q_x = \sum_{k=1}^{n-1} k\,_{k|}q_x + n \sum_{k=n}^{\infty} \,_{k|}q_x$$

Now by noting that

$$\sum_{k=1}^{n-1} k\,_{k|}q_x = \sum_{k=1}^{n-1} k\left(\,_k p_x - \,_{k+1}p_x\right) = \sum_{k=1}^{n-1} \,_k p_x - (n-1)\,_n p_x$$

and that

$$\sum_{k=n}^{\infty} \,_{k|}q_x = \,_n p_x,$$

we get the desired result:

$$e_{x:\overline{n}|} = \sum_{k=1}^{n-1} \,_k p_x - (n-1)\,_n p_x + n\,_n p_x = \sum_{k=1}^{n} \,_k p_x$$