1. Evaluate :
   a) $\epsilon_{ijk} \delta_{jk}$
   Solution : There are two possible cases, $j = k$ and $j \neq k$. If $j = k$, the $\epsilon$ term is zero and the whole product is zero. If $j \neq k$, the $\delta$ is zero. In either case, the value of the product is zero.
   b) $\epsilon_{jk2} \epsilon_{k2j}$
   Solution : We can use the $\epsilon - \delta$ relationship if we permute cyclically one set of indices :
   $\epsilon_{jk2} \epsilon_{k2j} = \delta_{kk} \delta_{22} - \delta_{k2} \delta_{2k} = 3 \cdot 1 - \delta_{22} = 3 - 1 = 2$

2. Express in terms of Kronecker deltas :
   a) $\epsilon_{ijk} \epsilon_{pjq}$ b) $\epsilon_{abc} \epsilon_{pqc}$
   Solutions :
   In a), we have a repeated index ($j$) in the same location, so we expand with respect to $j$ :
   $\epsilon_{ijk} \epsilon_{pjq} = \delta_{ip} \delta_{kq} - \delta_{iq} \delta_{kp}$
   In b), expand with respect to $c$ :
   $\epsilon_{abc} \epsilon_{pqc} = \delta_{ap} \delta_{bq} - \delta_{aq} \delta_{cp}$

   Solution : Expand each triple product according to the BAC - CAB rule :
   $A \times (B \times C) + B \times (C \times A) + C \times (A \times B) = [B (A \cdot C) - C (A \cdot B)] + [C (A \cdot B) - A (B \cdot C)] + [A (B \cdot C) - B (C \cdot A)]$
   I have color coded terms that cancel showing that the entire expression sums to zero.

4. Prove $(A \times B) \cdot (C \times D) = (A \cdot C) (B \cdot D) - (A \cdot D) (B \cdot C)$
   Since we are taking the dot product of the vectors formed by $A \times B$ and $C \times D$, we want to produce the i component of each vector, so we write :
   $(A \times B) \cdot (C \times D) \rightarrow \epsilon_{ijk} A_j B_k \epsilon_{imn} C_m D_n = \epsilon_{ijk} \epsilon_{imn} A_j B_k C_m D_n$
   Expand using the $\epsilon - \delta$ relationship :
   $\epsilon_{ijk} \epsilon_{imn} A_j B_k C_m D_n = \delta_{jm} \delta_{kn} A_j B_k C_m D_n - \delta_{jn} \delta_{km} A_j B_k C_m D_n$
   In the first term on the right, $j = m$ and $k = n$; in the second term, $j = n$ and $k = m$. Making these substitutions :
   $\delta_{jm} \delta_{kn} A_j B_k C_m D_n - \delta_{jn} \delta_{km} A_j B_k C_m D_n = A_m B_n C_m D_n - A_n B_m C_m D_n$
   Grouping according to subscripts we obtain :
   $A_m B_n C_m D_n - A_n B_m C_m D_n = (A_m C_m) (B_n D_n) - (B_m C_m) (A_n D_n)$
   $= (A \cdot C) (B \cdot D) - (A \cdot D) (B \cdot C)$