Q2 $\quad L_k = \epsilon_{kab} r_a p_b$ $\quad$ Using summation convention.

$$[\hat{r}_m, \hat{p}_n] = i\hbar\delta_{mn}$$

$$[\hat{L}_m, \hat{L}_n] = \epsilon_{mab}\epsilon_{ncd}[\hat{r}_a\hat{p}_b, \hat{r}_c\hat{p}_d].$$

But $[\hat{r}_a\hat{p}_b, \hat{r}_c\hat{p}_d] = \hat{r}_a\hat{r}_c\underset{\overset{\|}{0}}{[\hat{p}_b, \hat{p}_d]} + \hat{r}_a[\hat{p}_b, \hat{r}_c]\hat{p}_d + \hat{r}_c[\hat{r}_a, \hat{p}_d]\hat{p}_b$

$+\underset{\overset{\|}{0}}{[\hat{r}_a, \hat{r}_c]}\hat{p}_d\hat{p}_b \quad = \quad i\hbar[\hat{r}_a\hat{p}_d(-\delta_{bc}) + \hat{r}_c\hat{p}_b\delta_{ad}]$

So $\quad \epsilon_{mab}\epsilon_{ncd}[\hat{r}_a\hat{p}_b, \hat{r}_c\hat{p}_d] = i\hbar[\delta_{ad}\hat{r}_c\hat{p}_b - \delta_{bc}\hat{r}_a\hat{p}_d]\epsilon_{mab}\epsilon_{ncd}$

$= i\hbar[\hat{r}_c\hat{p}_b\,\underbrace{\epsilon_{mab}\epsilon_{nca}} - \hat{r}_a\hat{p}_d\,\epsilon_{mab}\underbrace{\epsilon_{nbd}}] =$

$= i\hbar[\hat{r}_a\hat{p}_d(\delta_{mn}\delta_{ad} - \delta_{md}\delta_{na}) - \hat{r}_c\hat{p}_b(\delta_{mn}\delta_{bc} - \delta_{mc}\delta_{bn})] =$

$= i\hbar[\delta_{mn}\hat{r}_a\hat{p}_a - \hat{r}_n\hat{p}_m - \delta_{mn}\hat{r}_c\hat{p}_c + \hat{r}_m\hat{p}_n] =$

$= i\hbar(\hat{r}_m\hat{p}_n - \hat{r}_n\hat{p}_m)$

On the other hand $\quad i\hbar\epsilon_{mnk}\hat{L}_k = i\hbar\epsilon_{mnk}\epsilon_{kab}\hat{r}_a\hat{p}_b =$

$= i\hbar(\delta_{ma}\delta_{nb} - \delta_{mb}\delta_{na})\hat{r}_a\hat{p}_b = i\hbar(\hat{r}_m\hat{p}_n - \hat{r}_n\hat{p}_m)$

so they agree $\therefore$ $\quad \underline{[\hat{L}_m, \hat{L}_n] = i\hbar\epsilon_{mnk}\hat{L}_k}$

$\underline{[\hat{r}_m, \hat{L}_n]} = [\hat{r}_m, \epsilon_{nab}\hat{r}_a\hat{p}_b] = \epsilon_{nab}(\hat{r}_a[\hat{r}_m, \hat{p}_b] + \underset{0}{[\hat{r}_m, \hat{r}_a]}\hat{p}_b) =$

$= \epsilon_{nab}\hat{r}_a i\hbar\delta_{mb} = i\hbar\epsilon_{nam}\hat{r}_a = \underline{i\hbar\epsilon_{mna}\hat{r}_a}$