1.

$$\begin{aligned}
\text{new frequencey} &= .4 * .3 \\
&= .12 \\
\text{CPI}_{\text{new}} &= \frac{(.4 - .12) * 2 + (.2 - .12) * 4 + .18 * 4 + .22 * 8 + .12 * 4}{1 - .12} \\
&= 4.36 \\
\text{CPI}_{\text{old}} &= .4 * 2 + .2 * 4 + .18 * 4 + .22 * 6 \\
&= 3.64 \\
\text{Time}_{\text{old}} &= Ops_{\text{old}} * 3.64 * CCT_{\text{old}} \\
&= 3.64 * Ops_{\text{old}} * CCT_{\text{old}} \\
\text{Time}_{\text{new}} &= Ops_{\text{new}} * 4.36 * CCT_{\text{new}} \\
&= 4.36 * (1 - .12) * Ops_{\text{old}} * CCT_{\text{old}} \\
&= 3.83 * Ops_{\text{old}} * CCT_{\text{old}}
\end{aligned}$$

This change would not improve preformance, because the execution time ends up increasing.

2.

$$\begin{aligned}
\text{CPI} &= .35 * 1 + .25 * 2 + .15 * 2 + .25 * 3 \\
&= 1.9 \\
\text{CPI}_{\text{new}} &= \frac{(.35 - .0875) * 1 + (.25 - .0875) * 2 + .15 * 2 + .25 * 5 + .0875 * 1}{1 - .0875} \\
&= 2.438 \\
\text{Time}_{\text{old}} &= Ops_{\text{old}} * 1.9 * CCT_{\text{old}} \\
&= 1.9 * Ops_{\text{old}} * (1.3 * CCT_{\text{new}} \\
&= 2.47 * Ops_{\text{old}} * CCT_{\text{new}} \\
\text{Time}_{\text{new}} &= Ops_{\text{new}} * 2.438 * CCT_{\text{new}} \\
&= 2.438 * (1 - .0875) * Ops_{\text{old}} * CCT_{\text{new}} \\
&= 2.225 * Ops_{\text{old}} * CCT_{\text{new}} \\
\frac{\text{Time}_{\text{old}}}{\text{Time}_{\text{new}}} &= \frac{2.438}{2.225} \\
&= 1.12
\end{aligned}$$

the new version is faster by 12%