Problem 2) a) $\sum_{m=2}^{\infty}[\zeta(m)-1]=\sum_{m=2}^{\infty}\left(\sum_{n=1}^{\infty}\frac{1}{n^m}-1\right)=\sum_{m=2}^{\infty}\sum_{n=2}^{\infty}\frac{1}{n^m}.$

Changing the order of summation over n and m, we'll have

$$\sum_{n=2}^{\infty}\sum_{m=2}^{\infty}\frac{1}{n^m}=\sum_{n=2}^{\infty}\frac{1/n^2}{1-\frac{1}{n}}=\sum_{n=2}^{\infty}\frac{1}{n^2-n}=\sum_{n=2}^{\infty}\frac{-1}{n}+\frac{1}{n-1}$$

$$=-\sum_{n=2}^{\infty}\frac{1}{n}+\sum_{n=1}^{\infty}\frac{1}{n}=-\cancel{\sum_{n=2}^{\infty}\frac{1}{n}}+\left(1+\cancel{\sum_{n=2}^{\infty}\frac{1}{n}}\right)=1$$ ✓

b) $\sum_{m=2}^{\infty}(-1)^m[\zeta(m)-1]=\sum_{m=2}^{\infty}(-1)^m\sum_{n=2}^{\infty}\frac{1}{n^m}=\sum_{n=2}^{\infty}\sum_{m=2}^{\infty}\frac{(-1)^m}{n^m}$ ← geometric series

$$=\sum_{n=2}^{\infty}\frac{1/n^2}{1+\frac{1}{n}}=\sum_{n=2}^{\infty}\frac{1}{n^2+n}=\sum_{n=2}^{\infty}\frac{1}{n}-\frac{1}{n+1}=\sum_{n=2}^{\infty}\frac{1}{n}-\sum_{n=3}^{\infty}\frac{1}{n}=\frac{1}{2}$$ ✓