$$\alpha p_1 + \beta p_2 + \gamma p_3 = \alpha p_1 + (1-\alpha)\left(\frac{\beta p_2 + \gamma p_3}{1-\alpha}\right)$$

$$= \alpha p_1 + (1-\alpha)\left(\frac{\beta p_2 + \gamma p_3}{\beta + \gamma}\right)$$