16. (i) P(a member voting same way twice is a preservative) $= \dfrac{\text{P(same way twice and Preservative)}}{\text{P(same way twice)}}$

$= \dfrac{\frac{3}{5}}{\frac{3}{5}+\frac{2}{5}\times\frac{1}{2}} = \dfrac{3}{4}$

P(member votes same way a third time given voted same way twice) is

$\text{P(member is a Preservative)} + \text{P(Member is a Progessive)}\times 0.5 = \dfrac{3}{4} + \dfrac{1}{4}\times\dfrac{1}{2} = \dfrac{7}{8}$

(ii)

number of votes in favour of Preservative policy) $= 60(1-\alpha)+\beta$ where β is the number of Progressives voting for the policy, I.e. $\beta = \text{B}(40, 0.5) \approx \text{N}(20, 10)$

so number of votes is $X = 60(1-\alpha)+\beta \approx \text{N}(60(1-\alpha)+20, 10)$

so P(getting a majority) $= \text{P}(X > 50) = \text{P}(80 - 60\alpha + z\sqrt{10} > 50) = \text{P}\left(z > \dfrac{60\alpha - 30}{\sqrt{10}}\right) < 0.8$ if

$\dfrac{60\alpha - 30}{\sqrt{10}} > 0.8416 \Rightarrow \alpha > \dfrac{0.8416\sqrt{10}+30}{60} = 0.544$

so least value of α which will result in an election being called is 0.544
