Urn $A$ contains 6 red and 4 black balls and urn $B$ contains 4 red and 6 black balls. One ball is drawn at random from urn $A$ and placed in urn $B$. Then one ball is drawn at random from urn $B$ and placed in urn $A$. If one ball is now drawn at random from urn $A$, the probability that it is found to be red is .....

There may be following cases:

**Case I :** Red from $A$ to $B$ and red from $B$ to $A$ then prob. of drawing a red ball from $A = \frac{6}{10} \times \frac{5}{11} \times \frac{6}{10} = \frac{180}{1100} = \frac{18}{110}$

**Case II :** Red from $A$ to $B$ and black from $B$ to A then prob. of drawing a red from $A = \frac{6}{10} \times \frac{6}{11} \times \frac{5}{10} = \frac{180}{1100} = \frac{18}{110}$

**Case III :** Black from $A$ to $B$ and red from $B$ to $A$ then prob. of drawing red from $A = \frac{4}{10} \times \frac{4}{11} \times \frac{7}{10} = \frac{56}{550}$

**Case IV :** Black from $A$ to $B$ and black from $B$ to $A$ then prob. of drawing red from $A = \frac{4}{10} \times \frac{7}{11} \times \frac{6}{10} = \frac{168}{1100} = \frac{84}{550}$

$\therefore$ The required prob $= \frac{18}{110} + \frac{18}{110} + \frac{56}{550} + \frac{84}{550}$

$= \frac{90+90+56+84}{550} = \frac{320}{550} = \frac{32}{55}$