一.解：

(1). 第一次：$\alpha+\beta$

第二次：$\gamma^2(\alpha+\beta)$

....

$\therefore P_0 = \sum_{i=1}^{\infty} P_i = \sum_{i=1}^{\infty} \gamma^{2i}(\alpha+\beta) = \frac{1-\gamma^{2n}}{1-\gamma^2}(\alpha+\beta) = \frac{\alpha+\beta}{1-\gamma^2}$

(2) $P(A) = \alpha + \beta \cdot a + \gamma \cdot b$

(3) $a = \gamma + \beta \cdot P_0$

$b = 1 - P_0$

$P(新) = \alpha + \beta a + \gamma b$

$= \alpha + \beta(\gamma + \beta \cdot \frac{\alpha+\beta}{1-\gamma^2}) + \gamma \cdot (1 - \frac{\alpha+\beta}{1-\gamma^2})$

$= \alpha + \frac{\gamma^2}{1+\gamma} + \frac{\beta^2+\gamma\beta+\gamma^2\beta}{1+\gamma} = \alpha + \frac{\gamma^2+\beta^2+\gamma\beta+\gamma^2\beta}{1+\gamma}$

$\cancel{= \alpha + \frac{2\gamma^2+\gamma+\beta^2}{1+\gamma}}$

$P(旧) = \frac{1}{1+\gamma}$

从公平性角度考虑，为使比赛更加公平，应给每队参赛者尽可能多且相同的客观条件，让他们展示实力(晋级)

旧赛制一锤定音的方式显然具有更高的偶然性，$\therefore$新赛制更合理.

二.解：

(1). $E(X_n) = (1-p)^n + [1-(1-p)^n]\,E(Y_n)$.

(2) $E(X_n) = (1-p)^n + (1-(1-p)^n)\cdot(1-p)^{\lceil \frac{n}{2} \rceil}(2+E(Y_{\lceil \frac{n}{2} \rceil})) + (1-(1-p)^n)(1-(1-p)^{\lceil \frac{n}{2} \rceil})\cdot$

$(2+E(Y_{\lceil \frac{n}{2} \rceil})\cancel{(1-(1-p)^{\lceil \frac{n}{2} \rceil})} + (1-p)^{\lceil \frac{n}{2} \rceil} + (1-(1-p)^{\lceil \frac{n}{2} \rceil})(1+E(Y_{\lceil \frac{n}{2} \rceil})))$

利用第(1)问对$E(X_n)$替换得 上式右边 $= (1-p)^n + [1-(1-p)^n]\,E(Y_n)$.

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