一、设"射中"为A　选上n级选手为B_n　$n=1,2,3,4$

$$P(A)=P(AB_1)+P(AB_2)+P(AB_3)+P(AB_4)$$
$$=P(A|B_1)\cdot P(B_1)+P(A|B_2)\cdot P(B_2)+P(A|B_3)\cdot P(B_3)+P(A|B_4)\cdot P(B_4)$$
$$=0.9\cdot 0.2+0.8\cdot 0.3+0.5\times 0.35+0.3\times 0.15$$
$$=0.64$$

二、设"色盲"为A　"男"为B

$$P(B|A)=\frac{P(AB)}{P(A)}=\frac{P(A|B)\cdot P(B)}{P(A|B)P(B)+P(A|\overline{B})P(\overline{B})}$$
$$=\frac{0.04\times 0.5}{0.04\times 0.5+0.002\times 0.5}=0.952$$

三、设"合格n次"为A_n　$n=0,1,2$

(1)"第n次合格"为B_n　$n=1,2$

$$P(A_0)=P(\overline{B}_1\overline{B}_2)=P(\overline{B}_1)P(\overline{B}_1|\overline{B}_2)=(1-p)(1-\frac{p}{3})$$
$$P(A_1)+P(A_2)=P(\overline{A}_0)=1-(1-p)(1-\frac{p}{3})=\frac{4p}{3}-\frac{p^2}{3}$$

(2)
$$P(B_1|B_2)=\frac{P(B_1B_2)}{P(B_2)}=\frac{P(B_2|B_1)\cdot P(B_1)}{P(B_2|B_1)P(B_1)+P(B_2|\overline{B}_1)P(\overline{B}_1)}$$
$$=\frac{p\cdot p}{p\cdot p+\frac{p}{3}(1-p)}=\frac{3p}{2p+1}$$

四、(1)
$$P(Z=k)=\begin{cases}0.4^{\frac{k-1}{2}}0.3^{\frac{k-1}{2}}\cdot 0.6=0.12^{\frac{k-1}{2}}\cdot 0.6 & k\text{为奇数}\\ 0.4^{\frac{k}{2}}0.3^{\frac{k-2}{2}}\cdot 0.7=0.12^{\frac{k-2}{2}}\cdot 0.28 & k\text{为偶数}\end{cases}\quad k\in Z^+$$

✓✓

(2) $P(X=k) = P(Z=2k) + P(Z=2k-1) \quad k\in Z^+$

$$= 0.4^k \cdot 0.3^{k-1} \cdot 0.7 + 0.4^{k-1} 0.3^{k-1} \cdot 0.6$$

$$= 0.4^{k-1} 0.3^{k-1} \cdot 0.88 = 0.12^{k-1} \cdot 0.88$$

(3) $P(Y=k) = P(Z=2k) + P(Z=2k+1) \quad k\in Z^+$

$$= 0.4^k \, 0.3^{k-1} \cdot 0.7 + 0.4^k \, 0.3^k \cdot 0.6$$

$$= 0.4^k \, 0.3^{k-1} \cdot 0.88 = 0.12^{k-1} \cdot 0.352$$

$$P(Y=0) = 0.6$$

五. (1) $\int_{-\infty}^{\infty} A e^{-|x|} dx = 2\int_0^{\infty} A e^{-x} dx = -2Ae^{-x}\Big|_0^{\infty}$

$$= 2A = 1$$

$$A = \frac{1}{2}$$

(2) $F(x) = \int_{-\infty}^{x} \frac{e^{-|x|}}{2} dx$

$x \geq 0 \quad F(x) = \frac{1}{2} + \int_0^x \frac{e^{-x}}{2} dx$

$$= 1 - \frac{e^{-x}}{2}$$

$x<0 \quad F(x) = \int_{-\infty}^{x} \frac{e^x}{2} dx = \frac{e^x}{2}$

(3) $P\{x\in[-1,2]\} = F(2) - F(-1)$

$$= 1 - \frac{1}{2e^2} - \frac{1}{2e}$$

六、$P(X=0)=\dfrac{C_{12}^5}{C_{15}^5}=\dfrac{24}{91}$

$P(X=1)=\dfrac{C_{12}^4 \cdot C_3^1}{C_{15}^5}=\dfrac{45}{91}$

$P(X=2)=\dfrac{C_{12}^3 C_3^2}{C_{15}^5}=\dfrac{20}{91}$ 46

$P(X=3)=\dfrac{C_{12}^2 C_3^3}{C_{15}^5}=\dfrac{2}{91}$

$E(X)=\sum_{k=0}^{3} kP(X=k)=1$

七、$E(X)=\int_{-\infty}^{\infty} x\frac{1}{2}e^{-|x|}dx=0$

$D(X)=E\{[X-E(X)]^2\}=E(X^2)=\int_{-\infty}^{\infty} x^2\frac{1}{2}e^{-|x|}dx$

$=\int_0^{\infty} x^2e^{-x}dx$

$=-x^2e^{-x}+2xe^{-x}-2e^{-x}\Big|_0^{\infty}$

$=2$