

H1-4

$\omega$	$X^2(\omega)$	$P\{\omega\}$	$X^2(\omega)P\{\omega\}$
1	1	$1/6$	$1/6$
2	4	$1/6$	$4/6$
3	9	$1/6$	$9/6$
4	16	$1/6$	$16/6$
5	25	$1/6$	$25/6$
6	36	$1/6$	$36/6$

FAIR  
DIE

$$EX^2 = 91/6 \approx 15.1667$$

$\omega$	$X^2(\omega)$	$P\{\omega\}$	$X^2(\omega)P\{\omega\}$
1	1	$1/12$	$1/12$
2	4	$1/12$	$4/12$
3	9	$1/12$	$9/12$
4	16	$3/12$	$48/12$
5	25	$3/12$	$75/12$
6	36	$3/12$	$108/12$

UNFAIR  
DIE

$$EX^2 = 245/12 \approx 20.4167$$

11/4-13

$$① f_{S_3}(x) = P\{S_3 = x\} = \binom{3}{x} p^x (1-p)^{3-x}$$

$$x=0 \Rightarrow f_{S_3}(0) = \binom{3}{0} \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^3 \Rightarrow 1 \cdot 1 \cdot \frac{1}{27} = \boxed{\frac{1}{27}}$$

$$x=1 \Rightarrow f_{S_3}(1) = \binom{3}{1} \left(\frac{2}{3}\right)^1 \left(\frac{1}{3}\right)^2 \Rightarrow 3 \cdot \frac{2}{3} \cdot \frac{1}{9} = \boxed{\frac{6}{27}}$$

$$x=2 \Rightarrow f_{S_3}(2) = \binom{3}{2} \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^1 \Rightarrow 3 \cdot \frac{4}{9} \cdot \frac{1}{3} = \boxed{\frac{12}{27}}$$

$$x=3 \Rightarrow f_{S_3}(3) = \binom{3}{3} \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^0 = 1 \cdot \frac{8}{27} \cdot 1 = \boxed{\frac{8}{27}}$$

$$② ES_3 = x_0 P\{S_3 = 0\} + x_1 P\{S_3 = 1\} + \dots + x_3 P\{S_3 = 3\}$$

$$= 0 \cdot \frac{1}{27} + 1 \cdot \frac{6}{27} + 2 \cdot \frac{12}{27} + 3 \cdot \frac{8}{27} = \frac{54}{27} = \boxed{2}$$

