

* 2018 학년도 대수능 수학 4형 17번.

확률변수 X 의 확률분포도

X	0.121	0.221	0.321	합계
$P(X=x)$	a	b	$\frac{2}{3}$	1

$E(X) = 0.271$. $V(X)$ 를 구하는 과정.

$$\begin{cases} a+b = \frac{1}{3} \\ 0.121a + 0.221b + 0.321 \times \frac{2}{3} = 0.271 \Rightarrow 121a + 221b + 214 = 271 \end{cases}$$

$$\therefore \begin{cases} 121a + 221b = 57 \\ 3a + 3b = 1 \end{cases} \Rightarrow \begin{cases} 363a + 663b = 171 \\ 363a + 363b = 121 \end{cases} \Rightarrow \begin{cases} b = \frac{50}{300} = \frac{1}{6} \\ a = \frac{1}{6} \end{cases}$$

$V(X) = E(X^2) - \{E(X)\}^2$ (제곱평균제)

$Y = 10X - 2.21$ $((0.121 \times \frac{1}{6} + 0.221 \times \frac{1}{6} + \dots) - (0.271)^2 \text{ 계산은 약간은 비현실적.}$

이정도 타이밍에 박스 활용. !!!)

Y	-1	0	1	Σ
$P(Y=y)$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{4}{6}$	1

$E(Y) = 10 \cdot E(X) - 2.21 = 2.71 - 2.21 = 0.5$ $((-1) \times \frac{1}{6} + 0 \times \frac{1}{6} + 1 \times \frac{4}{6} = \frac{3}{6} = \frac{1}{2} = 0.5)$

$E(Y^2) = 1 \times \frac{1}{6} + 0 \times \frac{1}{6} + 1 \times \frac{4}{6} = \frac{5}{6}$

$\therefore V(Y) = E(Y^2) - \{E(Y)\}^2 = \frac{5}{6} - \frac{1}{4} = \frac{10-3}{12} = \frac{7}{12}$

$= V(10X - 2.21) = 100 \times V(X) = \frac{7}{12}$

$\therefore V(X) = \frac{7}{1200}$

2018 학년도 대수능 수학 가형 19번.

$\left. \begin{array}{l} \textcircled{1} \rightarrow 6\text{개.} \\ \textcircled{2} \rightarrow 3\text{개.} \\ \text{빈 주머니} \end{array} \right\} \text{주사위} \left\{ \begin{array}{l} 1, 2 \rightarrow \textcircled{1} \text{을 주머니로} \\ 3, 4, 5, 6 \rightarrow \textcircled{2} \text{을 주머니로} \end{array} \right. \left. \begin{array}{l} \text{주머니 속의 총의 총 무게가 최중으로} \\ \text{6보다 크거나 같을 때 총의 개수를 확률 변수 } X. \end{array} \right.$

$\rightarrow X=3$ 부터 가능, 6까지 가능.

(i) $X=3$, $\left. \begin{array}{l} \textcircled{2} + \textcircled{2} + \textcircled{2} \end{array} \right\} \rightarrow {}_3C_3 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^0 = \left(\frac{8}{27}\right) = (가)$

(ii) $X=4$, $\left\{ \begin{array}{l} \textcircled{2} + \textcircled{2} + \textcircled{1} + \textcircled{1} \rightarrow {}_3C_2 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right) \times \frac{1}{3} \\ \textcircled{2} + \textcircled{2} + \textcircled{1} + \textcircled{2} \rightarrow {}_3C_2 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right) \times \frac{2}{3} \\ \textcircled{2} + \textcircled{1} + \textcircled{1} + \textcircled{2} \rightarrow {}_3C_1 \left(\frac{2}{3}\right) \left(\frac{1}{3}\right)^2 \times \frac{2}{3} \end{array} \right. = \left(\frac{4}{27}\right) = (나)$

(iii) $X=5$, $\left\{ \begin{array}{l} \textcircled{2} + \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{1} \rightarrow {}_4C_1 \left(\frac{2}{3}\right) \left(\frac{1}{3}\right)^3 \times \frac{1}{3} \\ \textcircled{2} + \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{2} \rightarrow {}_4C_1 \left(\frac{2}{3}\right) \left(\frac{1}{3}\right)^3 \times \frac{2}{3} \\ \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{2} \rightarrow {}_4C_0 \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^4 \times \frac{2}{3} \end{array} \right. = {}_4C_1 \left(\frac{2}{3}\right) \left(\frac{1}{3}\right)^3 = \left(\frac{8}{81}\right) = (다)$

(iv) $X=6$, $\left\{ \begin{array}{l} \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{1} \\ \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{1} + \textcircled{2} \end{array} \right\} \rightarrow {}_5C_0 \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^5 = \frac{1}{243}$