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Comp 3240

Hw11

#11.1.1

a.) Range of $x = 36$

The probability of selecting one number as range

$P(x) = \frac{1}{36}$

b) probability of $x = 6$

$n(E) = \{(1,5)(5,1),(2,4),(4,2),(3,3)\}$

$= 5$

$P(x=6) = \frac{n(E)}{P(E)} \Rightarrow P(x=6) = \frac{5}{36}$

#11.1.2

a.) Range of value of $A = 0,1,2,3,4$

b.) $x \sim$ Hypergeometric distribution

$A = 4$

$B = 48$

$P(x=0) = \frac{\binom{4}{0}\binom{48}{5}}{\binom{52}{5}} = 0.6588$

$P(x=1) = \frac{\binom{4}{1}\binom{48}{4}}{\binom{52}{5}} = 0.2995$

$P(x=2) \frac{\binom{4}{2}\binom{48}{3}}{\binom{52}{5}} = 0.0399$

#11.1.2

$$P(x=3)\ \frac{\binom{4}{3}\binom{48}{2}}{\binom{52}{5}} = 0.0017$$

$$P(x=4)\ \frac{\binom{4}{4}\binom{48}{1}}{\binom{52}{5}} = 0.00002$$

#11.1.3

a.) Range of # of girls is = range of $g = \{0, 1, 2\}$

b.) distribution of the random variable G_7 is Hypergeometric

$P(G_7 = g)$ = P(getting g girls from 7 to 2-g boys) from 3) = $({}^{7}C_{g}) * ({}^{3}C_{2-g}) / {}^{10}C_{2}$

#11.2.1

a.) $E[G_7] = \sum_{g=0}^{2} g \cdot p(G_7 = g)$

$= 0 \cdot P(G_7 = 0) + 1 \cdot p(G_7 = 1) + 2 \cdot P(G_7 = 2)$

$= 0 \times \frac{1}{15} + 1 \times \frac{7}{15} + 2 \times \frac{7}{15}$

$= \boxed{1.40}$

#11.2.7

a.) wins or loses = $\Sigma x\, P(x) = \frac{1}{6}(2) + \frac{1}{6}(1) + \frac{4}{6}(-1)$

$= \frac{2+1-4}{6} = -\frac{1}{6} = \boxed{0.17}$

#11.3.1

a.)

x	0	1	2	3	4	5
p(x)	$\frac{39C_5}{52C_5}$	$\frac{13C_1 \cdot 39C_4}{52C_5}$	$\frac{13C_2 \cdot 39C_3}{52C_5}$	$\frac{13C_3 \cdot 39C_2}{52C_5}$	$\frac{13C_4 \cdot 39C_1}{52C_5}$	$\frac{13C_5}{52C_5}$

$E(x) = \Sigma x \cdot P(x)$

$= \frac{1069263 + 1425684 + 635778 + 111540 + 6435}{2598960}$

$E(x) = \frac{3248700}{2598960} = \boxed{1.25}$

#11.3.2

a) This is a hypogeometric distribution

$N = 40$

$n = 7$

$k = 5$

$E(F) = n \cdot k / N = 7 \cdot 5 / 40 = \boxed{0.875}$

#11.3.4

a) # of students (x_i) 1, 2, 3, 4

probability, p_i 0.1 0.1 0.1 0.1

$E(x) = 1 \cdot 0.1 + 2 \cdot 0.1 + 3 \cdot 0.1 + 4 \cdot 0.1 + 5 \cdot 0.1 + 6 \cdot 0.1 + 7 \cdot 0.1 + 8 \cdot 0.1 + 9 \cdot 0.1 + 10 \cdot 0.1$

$= \boxed{5.5}$

#11.4.1

a) $P(x=2) = \binom{100}{2} p^2 (1-p)^{100-2}$

$P(x=2) = \binom{100}{2} (0.0001)(1-0.01)^{100-2}$

$= 0.1849$

b) $P(x=0) + P(x=1) = \binom{100}{0} (0.0001)(1-0.01)^{100-0} + \binom{100}{1} (0.0001)(1-0.01)^{100-1}$

$= 0.7358$

$P(x \geq 2) = 1 - [P(x=0) + P(x=1)]$

$= 1 - 0.7358$

$= \boxed{0.2642}$

#11.4.3

a) coin is fair

P (Incorrect conclusion)

= P(less than 4 heads)

$= P(x \leq 3)$

$= \sum_{x=0}^{3} \binom{10}{x} (0.5)^x (0.5)^{10-x}$

$= \boxed{0.1719}$

b) coin is biased

= P(at least 4 heads)

$= P(x \geq 4)$

$= \sum_{x=4}^{10} \binom{10}{x} (0.3)^x (0.7)^{10-x}$

$= \boxed{0.8504}$