2.

Consider the crypto system below and compute H(K—C)
$P = \{a, b, c\}$ with $P_P(a) = 1/3$ $P_P(b) = 1/6$ $P_P(c) = 1/2$
$K = (k_1, k_2, k_3)$ with $P_K(k_1) = \frac{1}{2}$ $P_K(k_2) = \frac{1}{4}$ $P_K(k_3) = \frac{1}{4}$
$C = \{1, 2, 3, 4\}$
$e_{k_1}(a) = 1$ $e_{k_1}(b) = 2$ $e_{k_1}(c) = 2$
$e_{k_2}(a) = 2$ $e_{k_2}(b) = 3$ $e_{k_2}(c) = 1$
$e_{k_3}(a) = 3$ $e_{k_3}(b) = 4$ $e_{k_3}(c) = 4$

Compute:
$P_c(1) = \frac{7}{24}$
$P_c(2) = \frac{5}{12}$
$P_c(3) = \frac{1}{8}$
$P_c(4) = \frac{1}{6}$
Since $H(X) = -\sum_{i=1}^{n} p_i log_2 p_i$, find H(p), H(k), and H(c)
$H(K) = -(\frac{1}{2}log_2\frac{1}{2} + \frac{1}{4}log_2\frac{1}{4} + \frac{1}{4}log_2\frac{1}{4}) = 1.5$
$H(P) = -(\frac{1}{3}log_2\frac{1}{3} + \frac{1}{6}log_2\frac{1}{6} + \frac{1}{2}log_2\frac{1}{2}) = 1.459$
$H(C) = -(\frac{7}{24}log_2\frac{7}{24} + \frac{5}{12}log_2\frac{5}{12} + \frac{1}{8}log_2\frac{1}{8} + \frac{1}{6}log_2\frac{1}{6}) = 1.851$
$H(K) + H(P) - H(C) = 1.5 + 1.459 - 1.851 = 1.108$