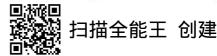
Exercise J.1 a). For d > 0+, Ha(x) = 1-d log = P(x) d = => = 109 1×1 For d -> 1, Ha(x) = 150/109 ZIFE) 1-2 109 ZIPW) we should remark this equalition as continuous form As desired, this is shannon entropy Tor 2 > 100, Hax) = - 109(ZIPIX) = - 100 ZIX) Ac d 1-1 1 2200 = -1 Therefore, Holx) = - log max Rx; [norm equation] desired, this is min - ontropy b). I would upload the figure which is generated by Mortlab c). For Ha(x) = 1 log \(\sum_{x} \) \(\text{P(x)} \) \(\text{L} \) 1) in the range of (011), we consider dH+ (x) = 1 , log \(\bar{\gamma} P_{\times}(x)\) + 1 10 2 Px(x) $= \frac{-2/\hbar}{(1-4)^2} \log \frac{\sum_{x} P_x(x)}{(x-4)^2} \leq 0.$ 2 Similarily, in the range of (1, +10) d H_(x) £0. In a word, this H_LX) is non-increasing in the parameter Hmin (x) = H(x) = log |x| FALCON



W. For the min-entropy Hom (X/r) Him (XIY) = - log max P(XI'I) P(x=0| Y=1) = 4 P(X=017=2) = = And for P(X/+) => P(X=0/Y=0) = = P(X=1/r=0) = 4 P(X=1/r=1) = 5 P(X=1)(=2)=4 P(X=2/7=2)=1 P(x=2 | r=1) = 1 P(X=2/ Y=0) = 4 max P(xIt) = = Therefore Hmin (XII) = -log = 1 Exercise 1.2 a). H(Xn) >(1- €) log 7 Hmin (Xn) = (In order to satisfy above requirement, we set this sequence Any sequence can satisfy this requirement, obviously. b) H (xn) = H min (xn) = log n H (Xn1) > (1- E) log 7 H min (Xn | Yn) = C In order to satisfy above requirement, we set this sequence O Xn and In are i.i.d. Invariable. 2) And then it satisfy a) part requirement is woused.



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Exercise 5.3
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So,
$$W(x_j) = \sum_{j \in Y} W(x_j = x_j) \theta = \sum_{j \in A} W(x_j = a_j) + W(x_j = b_j)$$

$$= -\log \frac{2}{3} - \log \frac{1}{3}$$

$$= -\log \frac{2}{9}$$

$$= \log \frac{9}{2}$$

b). For this statement, we know Na be the number of a' in the string $x^n = (X_1, ---, X_n)$.

In this part, we know DMS (two symbol apphabet fa, b})

Therefore, these variables are xj who belongs to gaz

c) For the definition,
$$W(X^n)$$
 and $W(X^n)$ $W(X^n)$

In award, W (x") as a function of Na

And at the same time, it depends on n. (n = 100000)

Date No.	1
d). Using Chebyshev's inequality, and we assume that L <nd< b<="" td=""><td>b.</td></nd<>	b.
d).	
Using Chebyshev's inequality	
so, we can get these findings. $n w(x_1) = E = Pr(A_E^{(n)}) \leq E = E = E$	-
50, we all get the D (1 (n)) < 2	-
n NOW = E Fr (AE	
Therefore, this typical set is in terms of bounds on Na	
Therefore this typical set is in terms of	
mergate . may	
	-
e). $Pr(Na=0) = 2^{-1}$	
$N_{-1}(\Lambda/\alpha=1)=0$	
) = 2 -3	-
$Pr(Na = 2) = 2^{-3}$	
Therefore, the particular string on that has maximum probability	
Thom form, the particular string & that has man	
moetie me une of xn	
over all sample values of xn	
Next most probable n-strings = a aa	
NENC PIOSO	
	-
Exercise t.4.	
a). For the statement of this question, following the illustration,	
a). For the state ment of IMB gars ive	at the contract of
i). X and Y are independent	
$R^*(X Y) = H(X Y) = H(X)$	
$R^*(X Y) = H(X Y) - H(X)$	
(3) $\chi = \gamma$	
$A_{1} = A_{2} = A_{2}$	
$R^{*}(x x) = 0.$	
A.	
win	
// [*]	
	110
w <u>:</u>	

_	
	b).
-	By explicitly constructing a code for the source (x, r) using codes
-	for the sources Y and X (with side information Y).
	R*(x, r) = D lim . H(x, r) (using the definition)
	n-960 rt
	$\leq \lim_{x \to \infty} H(x x) + H(x)$
1	$n \rightarrow m$
	$\frac{2}{n-3\nu} \frac{1}{n} \frac{H(X Y)}{n} + \frac{1}{n-3\nu} \frac{H(Y)}{n}$
	7 7 7
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
	$\leq R^*(x)T) + R^*(Y)$
	n 0n
	o) For the converse part,
	(XIT)
	$\geq \mathcal{R}^* \left(\times^n \middle \hat{\chi}^n \right)$
	3 RH (x"/2")
	$=H(x^n)Y^nM)$
_	= H (x"M Y") - H(M Y")
_	> H (x" M) x") - L
_	> H (x") - L
_	
_	It is desired, R (XIY) > H(XIY)
_	
_	
_	1). Using the typical set, AE' (XIY) := \((x^n, y^n) \in \gamma^n \times y^n : \frac{1}{n} \log \frac{1}{p_x^n \gamma^n
	1). Using the typical sec, 110
	- H (XIY) < & 4
	$P^{*}(x Y) \leq H(x Y)$
	Therefore, we can prove that $R^{\frac{1}{2}}(x Y) \leq H(x Y)$.
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