Ling 473 Assignment 2

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1 Probability in words

Given 2 set A and B where we select one word from each set A = { monkey, donkey, yak, kangaroo, aardvark, antelope, puma, cheetah } B = {whale, shark, dolphin, eel }

1.1 P(E) either word contains a 'y'

Nothing in B contains Y so its just odd A contains Y

$$P(E) = P(E\|A)*P(A)+P(E\|B)*P(B) = 3/8*1+0*1 = 3/8 = 0.375 \quad (1)$$

1.2 P(F) both words contain an 'e'

$$P(F) = P(F\|A) * P(F\|B) = 4/8 * 2/4 = 8/32 = 0.25 \quad (2)$$

1.3 P(G) both words contain the same number of letters

Since B only has 3,5, and 7letter words and A only has 3,4,6,7,8 letters we just need to calculate odds of both having 3.

$$P(G) = P(bothhave3) = 1/8 * 1/4 = 1/32 = 0.03125 \quad (3)$$

1.4 P(H) either of the words contain more than two vowels

No words in B contain more than two vowels and 4 in A do.

$$P(H) = P(H\|A) + B(H\|B) = 4/8 + 0 = 1/2 = 0.5 \quad (4)$$

1.5 P(E or H) either word contains a Y or has more than two vowels

P(E and H) = Empty

$$P(EUH) = P(E) + P(H) - P(E \wedge H) = 3/8 + 1/2 - 0 = 7/8 = 0.875 \quad (5)$$

1.6 P(F and H) either has more than two vowels and both words contain an 'e'

$$P(FandH) = P(F\|H)P(H) = 1/4 * 1/2 = 1/8 = 0.125 \quad (6)$$

1.7 P(E and F and G)

P(E $\|FandG) = 0 since no words that both have e share the same length P(EandFandG) = P(E\|\|FandG)P(F\|\|G)P(G) = 0$(7)

1.8 P(H or G)

No overlap in H or G so P(G and H) = 0

$$P(HorG) = P(H)+P(G)-P(GandH) = 0.5+0.03125-0 = 0.53125 \quad (8)$$

1.9 P(H or Fc) no more than one word contains and e or either word contains more than two vowels

P(Fc) = 1 - P(F) = 1 - 0.25 = 0.75 P(H and Fc) = 1/2

$$P(HorFc) = P(Fc) + P(H) - P(FcH) = 0.75 + 0.5 - 0.5 = .75 \quad (9)$$

1.10 Mutually Exclusive Table

E and H are mutually exclusive F and G are mutually G and H are mutually exclusive No events are independent

	E	F	G
H	X		X
G		X	
F			

2 Probability of glyph in Dongba

32 distinct and 22 have been deciphered. A new inscription is found consisting of 8 glyph that may re-appear.

2.1 P(U) Linguist will fully understand the new inscription

Since glyph may repeat we treat each draw as an independent event. P(Understood) = P(u)= 22/32

$$P(8 symbols are understood) = P(U)^8 = 0.6875^8 = 0.04990931624 \quad (10)$$

2.2 P(D) Linguist will fully understand at least half of the glyphs

In other words the probability that they understand 5, 6, 7, 8.

$$P(G) = \sum_{i=5}^{8} p(u)^i * (1-p(u))^(8-i) \quad (11)$$

$$P(G) = .6875^5 * 0.3125^3 + .6875^6 * 0.3125^2 + .6875^7 * 0.3125^1 + .6875^8 * 0.3125^0 = 0.0875944 \quad (12)$$

2.3 Extra Credit: Given that all 8 are distinct what is the probability that they will understand at least half of them unique.

Since each is distinct we can treat just like a card game and make this a probability without replacement problem

$$P(Understand3) = 22/32 * 21/31 * 20/30 * 19/29 = 0.2034204672 \quad (13)$$

$$P(Understand5) = 22/32 * 21/31 * 20/30 * 19/29 * 18/28 = 0.1307703003 \quad (14)$$

$$P(Understand6) = 22/32*21/31*20/30*19/29*18/28*17/27 = 0.08233685577 \quad (15)$$

$$P(Understand7) = 22/32*21/31*20/30*19/29*18/28*17/27*16/26 = 0.05066883432 \quad (16)$$

$$P(Understand8) = 22/32*21/31*20/30*19/29*18/28*17/27*16/26*15/25 = 0.0304 \quad (17)$$

P(At Least Half) = 0.2034204672+ 0.1307703003 + 0.08233685577 + 0.05066883432 + 0.0304 = 0.4975964576