MATH 4161 Practice for 2nd quiz

OPEN BOOKS, OPEN NOTES, CLOSED FRIENDS AND ENEMIES

(1) The random variables X, Y, and Z are determined by spinning the wheel below. Determine the following values.

(a) $P(X = 2)$

(b) $P(Z = 2 \text{ or } Y = 2)$

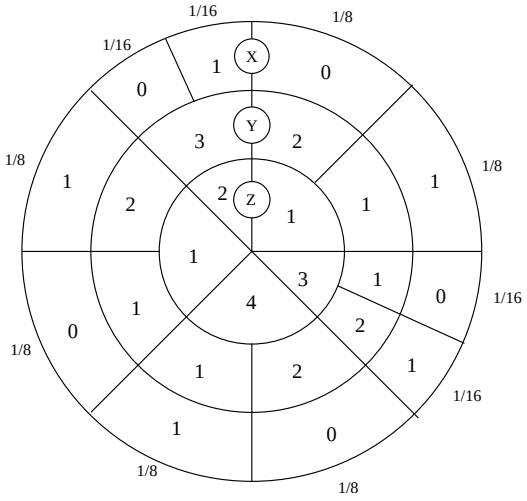
(c) $P(X = 0 \text{ and } (Y = 3 \text{ or } Z = 3))$

(d) $P((X = 0 \text{ and } Y = 3) \text{ or } Z = 3)$

(e) $P(X = 0|Y = 2)$

(f) are X and Z independent?
(g) are X and Y independent?
(h) are Y and Z independent?

(i) is X dependent on Y?
(j) is Y dependent on X and Z?

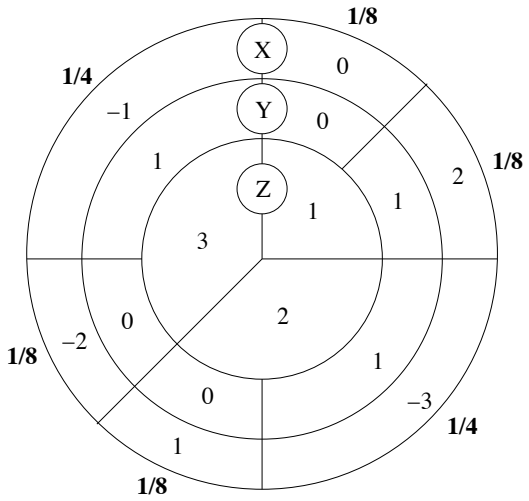


(2) The random variables X, Y, and Z are determined by spinning the wheel below. Determine the following relations.

(a) are X and Z independent?
(b) are Y and Z independent?

(c) is X dependent on Y?
(d) is Y dependent on X?
(e) is Z dependent on Y?
(f) is Z dependent on X?
(g) is X dependent on Y and Z?

(3) Find the probabilities:
(a) $P(X = 0)$
(b) $P(X = 0 \text{ or } Y = 0)$
(c) $P(X = 0 \text{ and } Y = 0)$
(d) $P(X = 0|Y = 0)$
(e) $P(X = 0|Z = 2)$



(4) Find the plaintext corresponding to the cyphertext $PYRA$ given that it was encrypted using the Hill substitution cipher (mod 29) with the key

$$\begin{bmatrix} 3 & 3 \\ 28 & 9 \end{bmatrix}$$

(5) Say that we know that the encrypting matrix for a 2×2 Hill transformation mod 26 is of the form

$$\begin{pmatrix} 3 & 5 \\ * & * \end{pmatrix}$$

but we do not know the last row. We are able to determine that the matrix has determinant 17 and the letters *ft* are sent to the letters **GJ** .

(a) Find the encrypting matrix.
(b) Find the decrypting matrix.
(c) Find the plaintext if we know the cyphertext **MDCK** was encrypted with this transformation.

(6) What is the house advantage for the '6-hardway' bet? That is, how much is the house expected to win on average per \$1 bet in the game of craps? On this bet, the die is rolled until either a 6 or or a 7 appears and the player wins \$9 if double 3's are showing and loses \$1 otherwise.