CP365 Assignment W1D1

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A(1). Let $u = (1, 2, 3, 4)$ and $v = (0, 1, -1, 5)$. Then the angle between the two vectors is $\cos^{-1} \frac{u \cdot v}{||u|| \times ||v||} = \cos^{-1} \frac{19}{\sqrt{30} \times 3\sqrt{3}} \approx \cos^{-1} 0.66759195048 = 0.839826582$

A(2). The equation of one such plane is $n^T \mathbf{x} = 0$. Two vectors in the plane: $(0, 0, 0)$ and $(-1, 1, 0)$.

A(3). Let $u = (-1, 1, 0, -1, 2)$ and $v = (5, 4, 3, 2, 1)$. Than the inner product $u \cdot v = -1$. The module of the two vectors $|u| = \sqrt{7}$ and $|v| = \sqrt{55}$. Thus $|u \cdot v| = 1 \leq |u||v| = \sqrt{385} \approx 19.6$

B(1). Let X be the outcome of a die roll. Then $P(X = 1) = \frac{2}{7}$, and the probability of rolling a pair of one is $P = P(X = 1)^2 = \frac{4}{49}$. We also know that $P(X = 2) = \frac{1}{7}$. Thus the probability of rolling a pair of two is $P = P(X = 2)^2 = \frac{1}{49}$.

B(2). The expected gain (after giving out the bet) of betting on 1 is $E = 5P(X = 1) + 0 \sum_{i=2}^{6} P(X = i) = 5 \times \frac{2}{7} + 0 \times 5 \times \frac{1}{7} = \frac{10}{7}$.

The expected gain (after giving out the bet) of betting on 2 is $E = 5P(X = 2) + 0 \sum_{i=3}^{6} P(X = i) + 0P(X = 1) = 5 \times \frac{1}{7} + 0 \times 4 \times \frac{1}{7} + 0 \times \frac{2}{7} = \frac{5}{7}$.