

Quiz 2

ECEn 370

Name: _____

1. Consider a single roll of a four sided die, with faces numbered 1 through 4. Let ζ be the outcome of the experiment (i.e. ζ is the number rolled). Define two events:
 $E = \{ \zeta \mid \zeta = 1 \text{ or } \zeta = 2 \} = \{1,2\}$ and $F = \{ \zeta \mid \zeta = 3 \text{ or } \zeta = 4 \} = \{3,4\}$.
 E is the event that *either* a 1 or 2 was rolled, and F is the event that *either* a 3 or 4 appeared.

a) Define the sample space, $\Omega = \{ 1, 2, 3, 4 \}$

b) Describe the minimum size (i.e. with fewest elements) sigma field, \mathcal{F} , on Ω which contains E and F .

$$\mathcal{F} = \{ \phi, E, F, \Omega \}$$

Because E and F are disjoint and $E \cup F = \Omega$, all unions, intersection, and complements return one of these four events already in the sigma field.

c) Is \mathcal{F} the power set?

No. The power set would have $2^4 = 16$ events since there are 4 outcomes.

2. Sam claims to have a loaded (unfair) four sided die with the following outcome probabilities:

$$P[\zeta = 1] = 0.5, P[\zeta = 2] = 0.4, P[\zeta = 3] = 0.1, P[\zeta = 4] = 0.1.$$

Since the outcomes are disjoint and exhaustive,

$$P[\zeta = 1 \cup \zeta = 2 \cup \zeta = 3 \cup \zeta = 4] = P[\Omega] = P[1] + P[2] + P[3] + P[4] = 1.1.$$

This violates axiom 2, $P[\Omega] = 1$.