# Hw 1

## P1

- $\{\Omega, \mathcal{F}, P\}$
  - $A \in \mathcal{F}, B \in \mathcal{F}, C \in \mathcal{F}$
  - $P(A) = 0.5$
  - $P(B) = 0.2$
  - $P(C) = 0.1$

$P(\overline{A \cup B}) = 0.45$

$\overline{P(A \cup B)} = 1 - 0.45$

$P(A \cup B) = 0.55$ ]

either $A$ or $B$ occur

$P(A) + P(B) - P(A \cap B) = P(A \cup B)$

$0.55 = 0.5 + 0.2 - P(A \cap B)$

$P(A \cap B) = 0.15$

1. $P(A \cup B) = 0.55$

2. $P(A \cap \bar{B}) = 0.15$

3. $P(A) - P(A \cap B) = 0.35$

4. A & B are <u>not</u> mutually exclusive, as $P(A \cap B) > 0$

P2.

- fair 4-sided dice

1. P that on four rolls, at least <u>1</u> is a 4

$P(\text{at least 1 4}) = 1 - P(\text{no 4})$

$1-\left(\frac{3}{4}\right)^4 = 1-\frac{81}{256} = \frac{175}{256}$

$0.683$

2. P(at least 1 4 in 20):

$1-$ P(no 4 in 20)

$1-\left(\frac{3}{4}\right)^{20} = 0.997$

3. $0.90 = 1-\left(\frac{3}{4}\right)^x$

$0.10 = \left(\frac{3}{4}\right)^x$

$\log_{\left(\frac{3}{4}\right)} 0.10 = x = 8$ rolls

P3. six-sided die- even faces twice as likely as

odd faces

• even - $\frac{2}{9}$ each side  • odd - $\frac{1}{9}$ each side

$P(\text{even}) = \frac{6}{9} = \frac{2}{3}$  $P(\text{odd}) = \frac{3}{9} = \frac{1}{3}$

$P(\text{outcome} < 4)$

$P(3) + P(2) + P(1) = \frac{1}{9} + \frac{2}{9} + \frac{1}{9} = \frac{4}{9}$

PU

• n power plants

• power plant i of n fails w/ probability $P(i)$ independent of other power plants

• 2 power plants sufficient & necessary to prevent black-out

• Probability doesn't fail $= 1 - P_i$

P5

a) probability of an ace $= \frac{4}{52} = \frac{1}{13}$

b) jack of a spade $= \frac{1}{52}$

c) jack of spades or six of diamonds $= \frac{2}{52} = \frac{1}{26}$

d) any suite not spades or hearts

$= \frac{26}{52} = \frac{1}{2}$

P6)

$P(H_1) = \frac{13}{52} = \frac{1}{4}$

$P(H_2) = \frac{12}{51} \cdot \frac{13}{52} + \frac{13}{51} \cdot \frac{39}{52}$

$\frac{156}{2652} + \frac{507}{2652} = \frac{663}{2652} = \frac{1}{4}$