

Name: [REDACTED]

ENEL 319 Assignment #1

Problem 1

a = "acceptable"
f = "fail"

a) $S = \{fff, ffa, faf, faa, aff, afa, aaf, aaa\}$

b) $A = \{\text{circuit from } Z \text{ fails}\}$ (so when z is f)

$$A = \{fff, faf, aff, aaf\}$$

c) $B = \{\text{circuit from } X \text{ acceptable}\}$ (so when x is a)

$$B = \{aff, afa, aaf, aaa\}$$

d) Are A and B mutually exclusive?

No, $A \cap B \neq \emptyset$ (null) but, $A \cap B = \{aff, aaf\}$

Also, $A \cup B \neq A + B$

To be mutually exclusive: $A \cap B = \emptyset$ (null) and

$A \cup B = A + B$ must be true

e) to be collectively exhaustive:

$$S = A \cup B$$

A and B are not collectively exhaustive because

$$\{fff, ffa, faf, faa, aff, afa, aaf, aaa\}$$

$$\neq \{fff, faf, aff, afa, aaf, aaa\}$$

f) $D = \{\text{more than one circuit is acceptable}\}$

$$D = \{faa, afa, aaf, aaa\}$$

g) $E = \{\text{at least 2 circuits fails}\}$

$$E = \{fff, ffa, faf, aff\}$$

$$h) D \cup E = \{fff, ffa, faf, faa, aff, afa, aaf, aaa\}$$
$$= D + E$$

Yes, D and E are mutually exclusive

$$i) S = D \cup E = \{fff, ffa, faf, faa, aff, afa, aaf, aaa\}$$

Yes, D and E are collectively exhaustive.

Problem 2

a) $A = \{2, 3\}$

b) $B = \{0, 1, 2, 3, 4, 5, 6\}$

c) $C = \{x \mid x^2 - 5x + 6 = 0\}$
 $= \{2, 3\}$

$$\begin{aligned}x^2 - 5x + 6 &= 0 \\(x-2)(x-3) &= 0 \\x=2 \quad x=3\end{aligned}$$

d) $D = \{x \mid x \text{ is the number of heads when six coins are tossed}\}$
 $= \{0, 1, 2, 3, 4, 5, 6\}$

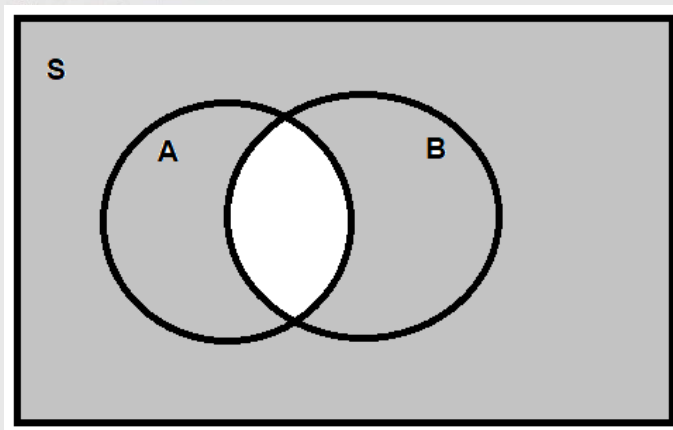
$$A = C$$

$$B = D$$

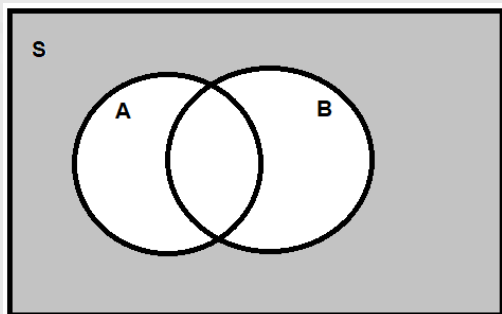
Problem 4:

$$C = \overline{A \cap B}$$

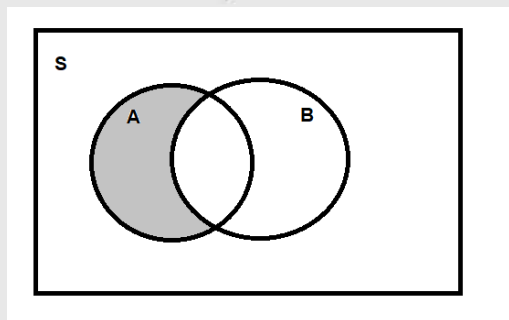
a)



b) $D = \overline{A \cup B}$



c) $A \cap \overline{B}$



Problem 6

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

$$\begin{aligned} a) &= P(A) + P(B) - P(A \cap B) = 0.25 + 0.18 - 0.15 \\ &= 0.28 \end{aligned}$$

$$\begin{aligned} b) &= P(\overline{A \cup B}) = 1 - P(A \cup B) = 1 - (P(A) + P(B) - P(A \cap B)) \\ &= 1 - (0.25 + 0.18 - 0.15) \\ &= 0.72 \end{aligned}$$

$$\begin{aligned} c) &P(A \cap \overline{B}) = P(A) \cap (1 - P(B)) \\ &= P(A) - P(A \cap B) = 0.25 - 0.15 \\ &= 0.1 \end{aligned}$$