

# SCI22 - Belief representation

## Exercises

### Exercise 1

Let  $Bel$  be a belief function on  $\Omega$ . Show that  $Bel$  is increasing, i.e., for all  $A, B \subseteq \Omega$ ,

$$A \subseteq B \Rightarrow Bel(A) \leq Bel(B).$$

### Exercise 2

Let  $Bel$  be a belief function on  $\Omega$  and let  $Pl$  be the corresponding plausibility function. Show directly (without using the facts that  $Bel$  and  $Pl$  are, respectively, completely monotone and completely alternating) that

$$Bel(A \cup B) \geq Bel(A) + Bel(B) - Bel(A \cap B)$$

and

$$Pl(A \cap B) \leq Pl(A) + Pl(B) - Pl(A \cup B),$$

for all  $A, B \subseteq \Omega$ .

### Exercise 3

Let  $m$  be the mass function on  $\Omega = \{a, b, c\}$  defined by :

$$m(\{a\}) = 0.2 \quad m(\{a, b\}) = 0.5 \quad m(\Omega) = 0.3.$$

Compute  $Bel(A)$  and  $Pl(A)$  for all  $A \subseteq \Omega$  and check some properties of functions  $Bel$  et  $Pl$ .

### Exercise 4

Let us consider the following plausibility function on  $\Omega = \{a, b, c\}$  :

$A$	$\emptyset$	$\{a\}$	$\{b\}$	$\{a, b\}$	$\{c\}$	$\{a, c\}$	$\{b, c\}$	$\{a, b, c\}$
$Pl(A)$	0	0.5	0.55	1	0.5	0.8	0.7	1

Compute the corresponding mass function.

### Exercise 5

Let  $\pi$  be the following possibility distribution on  $\Omega = \{a, b, c, d, e, f\}$  :

$\omega$	$a$	$b$	$c$	$d$	$e$	$f$
$\pi(\omega)$	0.1	0.3	0.5	1	0.7	0.3

Compute the corresponding mass function.