1. Is it possible that an event is independent of itself? If so, when?

The only events that are independent of themselves are those events that occur with probability 0 Or with probability 1

1. Is it always true that if A and B are independent events, then Ac and Bc are independent events? Show that it is, or give a counterexample.

P(A∩B) = P(A) P(B)  by the definition of independence

= P(A) (1-P(B'))   since P(B) = 1- P(B')

= P(A) - P(A) P(B')    
  
So,

(1)   P(A) P(B') = P(A) - P(A∩B)

Since A∩B'  =  A - A∩B and A∩B ⊂ A,

(2)   P(A∩B') = P(A) - P(A∩B)

From (1) and (2), P(A∩B') = P(A) P(B'), so A and B' are independent