Solutions to Quiz 1

(2 marks) 1. (Lab-based) If you make a sequence by using the pattern 0110 repeatedly 100 times, what tests of random-ness can you suggest which will catch the fact that this is not random?

> **Solution:** If we look at triples which occur, then the triple 000 will not appear at all.
>
> Alternatively, we can look for runs and we see that runs of length 3 will not happen!

(2 marks) 2. If we flip a fair coin 3 times write down an expression for the following events using H_i for the event of getting a head on the i-th flip. (Do *not* use any symbols for any other events.)

   1. Head on first flip, Tails on the second flip and Heads on third flip.

   2. The event of getting exactly two heads.

> **Solution:** Note that getting tails on the i-th flip is H_i^c (since it is a fair coin there is no other possibility!).
>
> For part (1) the event is $H_1 \wedge H_2^c \wedge H_3$.
>
> For part (2) The event is
>
> $$(H_1 \wedge H_2 \wedge H_3^c) \vee (H_1 \wedge H_3 \wedge H_2^c) \vee (H_2 \wedge H_3 \wedge H_1^c)$$