1. Let $A = \{(a, b) \mid a, b \in \mathbb{N}, a \leq b\}$. Show A is countable by giving a coherent explicit listing (or explanation of a listing) of the elements.

2. Find a bijection $f : \mathbb{Z} \to (\mathbb{Z} - \{2\})$. You do not need to prove it is a bijection. You'll probably need a piecewise defined function.

3. Suppose a hotel has a countably infinite number of rooms numbered $1, 2, 3, ...$ all of which are full. None of the guests can leave but they can be sent to other rooms.

   (a) One new guest arrives. Explain how the hotel can fit him in.

   (b) Countably infinitely many new guests arrive. Explain how the hotel can fit them all in.

   (c) Countably infinitely many groups each with countably infinitely many new guests arrive. Explain how the hotel can fit them all in.