Villagers on an island communicate with people on the distant mainland by lighting torches that can be seen at night. By choosing which torches to light, the villagers can send different messages. For example:

 = send water

 = need chocolate

① If there are five torches, how many different messages can be sent? HINT: what is a good strategy for answering a question like this?

② The circles on the right represent torches. By filling in the circles to "light" the torches, can you show all the possible messages? Try to think of a good way to do this so you don't miss any.

③ If you wanted to be able to send 1000 possible messages, how many torches would you need?

④ How many messages could you send with five torches if there were two different colours of fire to use? What if there were 9 different colours of fire?