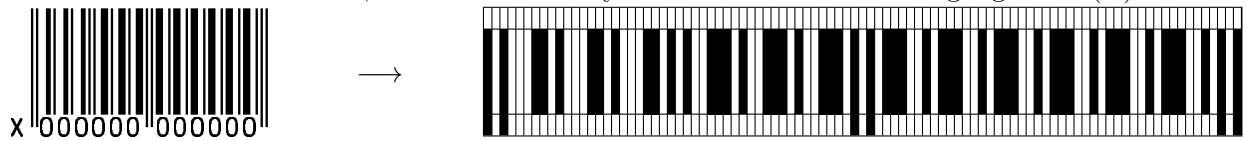**Problem #5 (20 points).** The barcode language EAN-13 (or GTIN-13) is used in almost every country in the world, yet nobody speaks it. It has 10 main dialects or subcodes, but this problem is not concerned with subcode zero, which is effectively the same as the older language UPC(A).

 $\longrightarrow$

This is not a barcode: it belongs to a possible subcode of EAN-13 which is not in use. (On the right the machine-readable part of the code has been enlarged and transferred onto a grid for ease of observation.)

 $\longrightarrow$
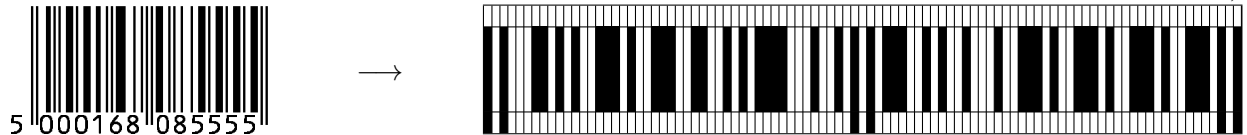
This is a barcode: it belongs to subcode 5. This barcode is from a packet of biscuits from the UK, and the number starts with the country code or system number for the UK, which is 50. Usually the first part of the code (5-000168) identifies the producer and the next part (08555) is chosen by the producer and identifies the product. The last digit is always a checksum.

Here are some more system numbers:

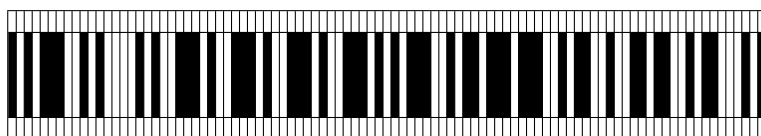|					
20–29	in-store functions	539	Ireland	84	Spain
30–37	France	64	Finland	978	ISBN (books)
40–44	Germany	73	Sweden	??	Norway

(a) Here are some facts about barcodes A–I, in no particular order. Give the letter of the barcode in each case, and answer any other questions:
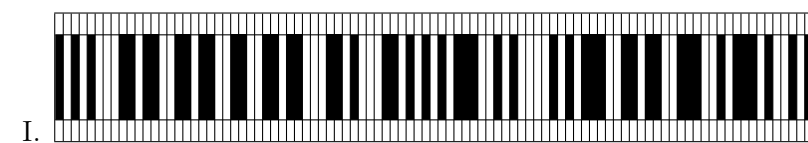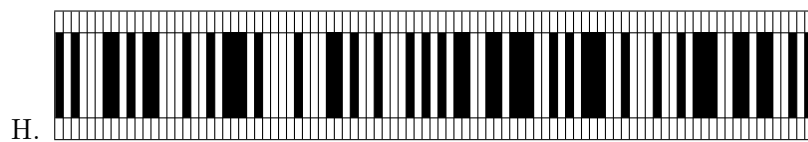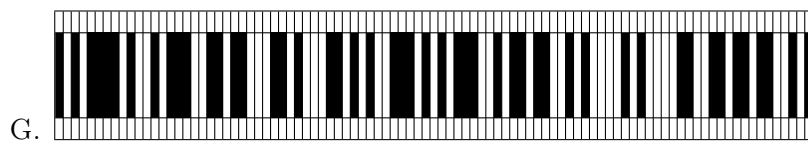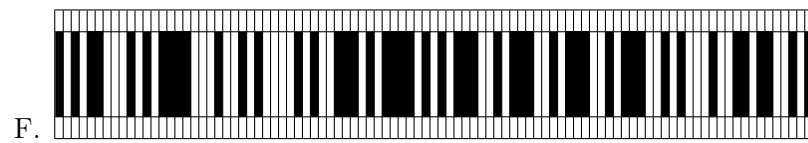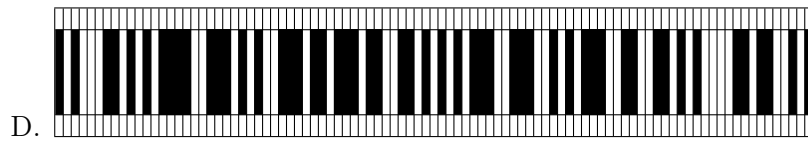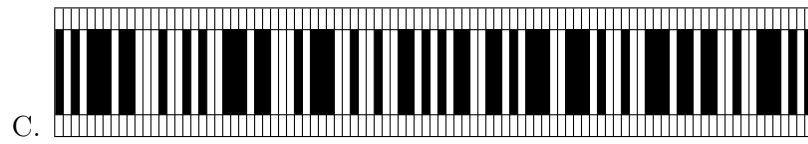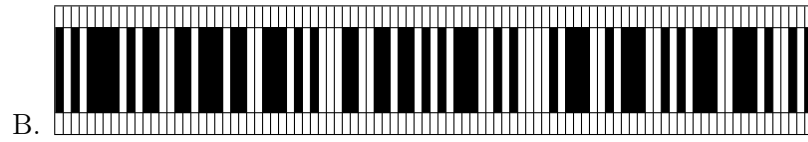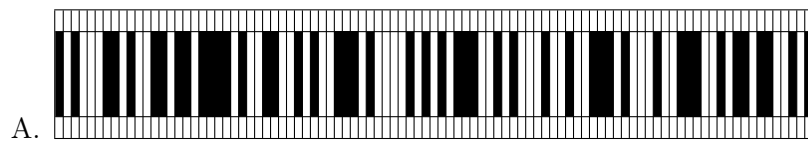
1. toilet paper (Spain) is barcode E;

2. smoked salmon (Ireland), product code = 02661, checksum = ?;

3. *The Lost Symbol* (ISBN book);

4. pork steak (packed in the store), cost = 4 euros and 16 cents;

5. mop head (from where?), full code = 4-023103-075702;

6. cholesterol-lowering spread (Finland);

7. sirloin steak (packed in the store), cost = ?;

8. *Korsordboken* (puzzle magazine, Sweden), full code = ?;

9. *Mots Codés* (puzzle magazine, France).

(b) Draw the (imaginary) barcode 1-453927-348790 in the grid that you will find on one of your sheets. Some of it has been filled in to help you.

(c) The barcode below is from *Dagbladet*, a newspaper from Norway. Write out the full code. What is the system number or country code for Norway?   —*Hugh Dobbs*
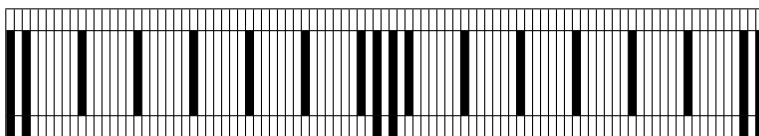
A.

B.

C.

D.

E.

F.

G.

H.

I.

(b)