# EXPLODING DOTS

Binary numbers are written using 1s and 0s, but unlike out usual base-10 number system, where each place-value is a power of 10 (ones, tens, hundreds, thousands,…) each place value is a power of 2 (ones, twos, fours, eights,…). In base-10 we have to regroup our digits to handle10 or more in a single place-value. In base-2, we regroup if a place-value has more one.
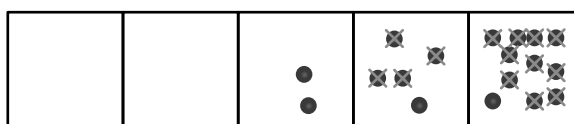
Start with 11 dots in the far-right box. Two dots in a box can merge to form one dot in the box to the left.
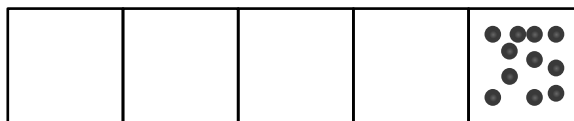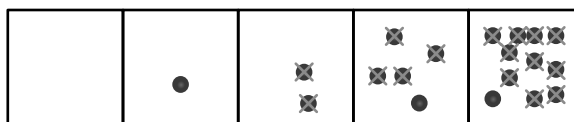
10 dots merged to form 5 dots in the next box to the left.
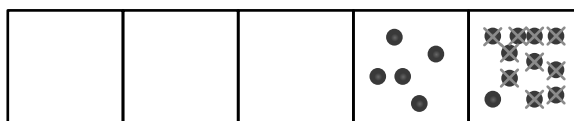
4 dots merged to form 2 dots in the next box to the left.

2 dots merged to form 1 dot in the next box to the left.

No more dots can be merged, so we note the number of dots in each box to get the "bits" for the binary version of the number 11. 1011_2 is the way we write the number 11 in binary.

Convert each number to binary using the boxes below.

9

28

60

Convert each binary number to base 10.

- 10101_2

- 100100_2

- 1111111_2