3   Number Bases

From now on, a number written with a subscript will mean that that number is written using a the subscript as a base. That is, 11_6 means 11 base 6 – that is, the number encoded as 11 in a $1 \leftarrow 6$ machine, which is the number 7. A number without a base means ordinary base 10. So, for example, $20_6 = 12$ and $113_6 = 45$.

5. Write these numbers in base 10:

   (a) 15_7
   (b) 35_7
   (c) 45_7
   (d) 412_7

6. Write these numbers in base 7:

   (a) 13
   (b) 48
   (c) 63
   (d) 625
   (e) 1000

   Extra problems:

7. Write in decimal (base 10) notation the numbers 10101_2, 10101_3, 211_4, 126_8.

8. Write the number 100_{10} in base 2, base 3, base 4, base 5, base 6, base 7, base 8, base 9.

4   Alien Arithmetic

1. Add $11121_3 + 122110_3$ (in base 3).

2. Multiply 102_3 by 201_3 (in base 3).

3. Calculate:

   (a) $341_5 + 203_5$

   (b) $144_5 + 213_5$

   (c) $413_5 - 22_5$

   (d) $22_5 \times 31_5$

4. Calculate

   (a) $1100_2 + 1101_2$

   (b) $1011_2 - 101_2$

   (c) $100011_2 - 10100_2$

   (d) $1011_2 \times 101_2$

   (e) $10101_2 \div 11_2$

5. Calculate

   (a) $101102_3 + 22012_3$

   (b) $10120_3 - 212_3$

   (c) $2012_3 \times 112_3$

   Extra Problems

6. Count to 100_3 in base 3.

7. Write down the addition and multiplication tables in base 4.

8. Write down the addition and multiplication tables in base 5.