Binary Numbers Tutorial Sheet

1. Working in base 2 perform the following calculation, showing all your working.

$$110101_2 + 10111_2 - 100001_2$$

2. Express the following hexadecimal number as a decimal number: $(A32.C)_{16}$.

3. Convert the following decimal number into base 2, showing all your working: $(253)_{10}$.

4. Perform the following binary additions

   (i) $1011 + 1111$

   (ii) $10101 + 10011$

   (iii) $1010 + 11010$

5. Perform the following binary divisions.

   a) $(1001000)_2 \div (1000)_2$

   b) $(101101)_2 \div (1001)_2$

   c) $(1001011000)_2 \div (101000)_2$

   d) $(1100000)_2 \div (10000)_2$

6. Perform the following binary additions

   (i) $1011 + 1111$

   (ii) $10101 + 10011$

   (iii) $1010 + 11010$

   (iv) $101010 + 10101 + 101$

7. Perform the binary additions

   - $(10111)_2 + (111010)_2$
   - $(1101)_2 + (1011)_2 + (1111)_2$

8. Perform the following binary additions.

   a) $(110101)_2 + (1010111)_2$

   b) $(1010101)_2 + (101010)_2$

   c) $(11001010)_2 + (10110101)_2$

   d) $(1011001)_2 + (111010)_2$

9. Perform the following binary multiplications.

   a) $(1001)_2 \times (1000)_2$

   b) $(101)_2 \times (1101)_2$

   c) $(111)_2 \times (1111)_2$

   d) $(10000)_2 \times (11001)_2$

10. Perform the following binary multiplications.

a) $(1001000)_2 \div (1000)_2$

b) $(101101)_2 \div (1001)_2$

c) $(1001011000)_2 \div (101000)_2$

d) $(1100000)_2 \div (10000)_2$

11. Perform the following binary division exercises.

a) $(1001000)_2 \div (1000)_2$

b) $(101101)_2 \div (1001)_2$

c) $(1001011000)_2 \div (101000)_2$

d) $(1100000)_2 \div (10000)_2$

12. A number is expressed in base 5 as $(234)_5$. What is it as decimal number? Suppose you multiply $(234)_5$ by 5. what would be the answer in base 5.

13. Perform the following binary additions

(i) $1011 + 1111$

(ii) $10101 + 10011$

(iii) $1010 + 11010$

(iv) $101010 + 10101 + 101$

14. Perform the binary additions

- $(10111)_2 + (111010)_2$
- $(1101)_2 + (1011)_2 + (1111)_2$

15. Perform the binary multiplications

- $(1101)_2 \times (101)_2$
- $(1101)_2 \times (1101)_2$

16. Suppose 2341 is a base-5 number Compute the equivalent in each of the following forms:

(i) decimal number

(ii) hexadecimal number

(iii) binary number

17. Perform the following binary additions

(i) $1011 + 1111$

(ii) $10101 + 10011$

(iii) $1010 + 11010$