Binary Numbers: Tutorial Sheet A

1. Express the following decimal numbers as binary numbers.

   i) $(73)_{10}$ ii) $(15)_{10}$ iii) $(22)_{10}$

   All three answers are among the following options.

   a) $(10110)_2$ b) $(1111)_2$ c) $(1001001)_2$ d) $(1000010)_2$

2. Express the following binary numbers as decimal numbers.

   a) $(101010)_2$ b) $(10101)_2$ c) $(111010)_2$ d) $(11010)_2$

3. Express the following binary numbers as decimal numbers.

   a) $(110.10101)_2$ b) $(101.0111)_2$ c) $(111.01)_2$ d) $(110.1101)_2$

4. Express the following decimal numbers as binary numbers.

   a) $(27.4375)_{10}$ b) $(5.625)_{10}$ c) $(13.125)_{10}$ d) $(11.1875)_{10}$

5. Perform the following binary multiplications.

   a) $(1001)_2 \times (1000)_2$
   b) $(101)_2 \times (1101)_2$
   c) $(111)_2 \times (1111)_2$
   d) $(10000)_2 \times (11001)_2$

6. Perform the following binary subtractions (using bit-borrowing).

   a) $(110101)_2$ - $(1010111)_2$
   b) $(1010101)_2$ - $(101010)_2$
   c) $(11001010)_2$ - $(10110101)_2$
   d) $(1011001)_2$ - $(111010)_2$

7. Write the following binary numbers as decimal numbers
   (101) = 5 (1010) = 10 (1111) = 15 (010101) = 21 (110100) = 50
8. Using binary multiplication compute the following
   $(101)_2 \times (1010)_2$
9. Using Binary division compute the following (110100)/(1010)
10. Perform the following binary additions.

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

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

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

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

11. Express the following binary numbers as decimal numbers

    (i) 11011

    (ii) 100101

12. Express the following decimal numbers as binary numbers

    (i) 6

    (ii) 15

    (iii) 37

13. Perform the following binary additions

    (i) $1011 + 1111$

    (ii) $10101 + 10011$

    (iii) $1010 + 11010$

14. Express the following binary numbers as decimal numbers

    (i) 11011

    (ii) 100101

15. Express the following decimal numbers as binary numbers

    (i) 6

    (ii) 15

    (iii) 37

16. Perform the following binary additions

    (i) $1011 + 1111$

    (ii) $10101 + 10011$

    (iii) $1010 + 11010$

17. Express the following decimal numbers as binary numbers.

    i) $(73)_{10}$ ii) $(15)_{10}$ iii) $(22)_{10}$

    All three answers are among the following options.

a) $(10110)_2$ b) $(1111)_2$ c) $(1001001)_2$ d) $(1000010)_2$

18. Express the following binary numbers as decimal numbers.

a) $(101010)_2$ b) $(10101)_2$ c) $(111010)_2$ d) $(11010)_2$

19. Express the following binary numbers as decimal numbers.

a) $(110.10101)_2$ b) $(101.0111)_2$ c) $(111.01)_2$ d) $(110.1101)_2$

20. Express the following decimal numbers as binary numbers.

a) $(27.4375)_{10}$ b) $(5.625)_{10}$ c) $(13.125)_{10}$ d) $(11.1875)_{10}$

21. Express the following binary numbers as decimal numbers.

a) $(101010)_2$ b) $(10101)_2$ c) $(111010)_2$ d) $(11010)_2$

22. Express the following binary numbers as decimal numbers.

a) $(110.10101)_2$ b) $(101.0111)_2$ c) $(111.01)_2$ d) $(110.1101)_2$

23. Express the following decimal numbers as binary numbers.

a) $(27.4375)_{10}$ b) $(5.625)_{10}$ c) $(13.125)_{10}$ d) $(11.1875)_{10}$

24. Perform the following binary additions

(i) $1011 + 1111$
(ii) $10101 + 10011$
(iii) $1010 + 11010$

25. Perform the following binary additions

(i) $1011 + 1111$
(ii) $10101 + 10011$
(iii) $1010 + 11010$

26. Perform the following binary additions.

a) $(110101)_2 + (1010111)_2$
b) $(1010101)_2 + (101010)_2$
c) $(11001010)_2 + (10110101)_2$
d) $(1011001)_2 + (111010)_2$

27. Perform the following binary subtractions.

a) $(110101)_2$ - $(1010111)_2$
b) $(1010101)_2$ - $(101010)_2$
c) $(11001010)_2$ - $(10110101)_2$
d) $(1011001)_2$ - $(111010)_2$

28. 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) $(1100000)_2 \div (10000)_2$

(a) Which of the following binary numbers is the result of this binary division: $(111001)_2 \div (10011)_2$.

a) $(10)_2$
b) $(11)_2$
c) $(100)_2$
d) $(101)_2$

(b) Perform the following binary subtractions.

a) $(110101)_2$ - $(1010111)_2$
b) $(1010101)_2$ - $(101010)_2$
c) $(11001010)_2$ - $(10110101)_2$
d) $(1011001)_2$ - $(111010)_2$

(c) Which of the following binary numbers is the result of this binary division: $(101010)_2 \div (111)_2$.

a) $(11)_2$
b) $(100)_2$
c) $(101)_2$
d) $(110)_2$

(d) Which of the following binary numbers is the result of this binary division: $(1001110)_2 \div (1101)_2$.

a) $(100)_2$
b) $(110)_2$
c) $(111)_2$
d) $(1001)_2$

29. Express the following binary numbers as decimal numbers

(i) 11011
(ii) 100101

30. Express the following decimal numbers as binary numbers

(i) 6
(ii) 15
(iii) 37

31. Perform the following binary additions

(i) $1011 + 1111$
(ii) $10101 + 10011$
(iii) $1010 + 11010$