1 Number Systems

1. Binary
2. DEcimal
3. Hexadecimal
4. Octal

- Decimal Number - What you are probably used to.
- Binary - Zeroes and Ones.
- Hexadecimal - examples: RGB and Colours.

2 Decimal to Binary Conversion(1.4.1)

- Continuously divide the decimal number by 2.
- Keep record of the remainder, either 0 or 1.
- The sequence of remainders is the binary number required.

3 Hexadecimal Numbers

Hex Characters: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

4 Types of Numbers

- Natural Numbers (1,2,3)
- Integers (..-3,-2-1,0,1,2,3..)
- Rational Numbers (e.g 4/7, 12/3)
- Real Numbers (3.14151)

Binary and Hex

1A.1 Coverting from Binomial to Decimal

1A.2 Converting to Decimal

1A.3 Priority of Operation

1A.4

Numbers

1B.1 Real Numbers

1B.2 Rational Numbers

1B.3 Floating Point Aritmetic

1B.4

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Adding Binary Numbers

Complements

- Which of the following are not valid hex numbers?

  a) A5G
  b) 73
  c) EEF
  d) 101

- Express the following decimal number as a hexadecimal number

$$44321$$

- What is highest Hexadecimal number that can be written with two characters, and what is it's equivalent in decimal form? What is the next highest hexadecimal number?

$$FF = 255$$

- Multiply the following Hexadecimal numbers

$$AA3 \times F$$

HibColl Number systems - Exercises

Question 2 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.

Question 3

Can you think of a quick way of doing the last one?

Question 4

Perform the binary additions $(10111)_2 - (111010)_2$

$(1101)_2 + (1011)_2 + (1111)_2$

Question 5

Perform the binary subtractions $(1001)_2 - (111)_2$ $(110000)_2 - (10111)_2$

Question 6

Perform the binary multiplications $(1101)_2 \times (101)_2$

$(1101)_2 \times (1101)_2$

Question 10

Calculate $(BBB)_{16} + (A56)_{16}$ $(BBB)_{16} - (A56)_{16}$ working in hexadecimal

Question 11

Write the hex number $(EC4)_{16}$ in binary. Write the binary number $(11110110101|)_2$ in hex. Question 12

Express the decimal number 753 in binary , base 5 and hexadecimal.

Question 13

Express 42900 as a product of its prime factors, using index notation for repeated factors.

Question 14

Expressing the recuring decimals 0.126126126.... and 0.754545454545 as fractions in their lowest terms.

Question 15 Given that π is an irrational number, can you say whether $\frac{\pi}{2}$ is rational or irrational. or is it impossible to tell?

Question 17 (a) 5/7 lies between 0.714 and 0.715 (b) $\sqrt{(2)}$ is at least 1.41 (c) $\sqrt{(3)}$ 9s at lrast 1.732 and at most 1.7322

Question 18

Write down the numbers 0.0000526 in floating point from 429000000

How is the number 1 expressed in floating point form

Question 19 Deduce that eveyry composite integer n has a prime factor such that $p \leq \sqrt{n}$ Decide whether 899 is a prime

Question 20

What would be the maximum numbber of digits that a decimal fraction with denominator 13 could have in a recurring block in theory?

Can you predict which other fractions with denominator 13 will have the same digits as 1/13 in their recurring block?