Муниципальное автономное учреждение дополнительного образования

Центр дополнительного образования

# «Комплекс заданий по теме «Системы счисления»

методическая разработка

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Педагог дополнительного образования

Сухой лог

2024 год

**Немного теории:**

1. ***Метод разложения по степеням основания (перевод чисел из двоичной системы счисления в десятичную).***

***Таблица степеней основания 10***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| … | 1000000 | 100000 | 10000 | 1000 | 100 | 10 | 1 |

Возьмем число в десятичной системе счисления, например, 2547, оно раскладывается по разрядам

|  |  |  |  |
| --- | --- | --- | --- |
| 1000 | 100 | 10 | 1 |
| **2** | **5** | **4** | **7** |

254710 = 2\*1000+5\*100+4\*10+7\*1

Аналогично для перевода двоичных чисел в десятичные используется

***Таблица степеней основания 2***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| … | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

Пример: переведем число 1101012 в десятичную систему счисления

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 32 | 16 | 8 | 4 | 2 | 1 |
| **1** | **1** | **0** | **1** | **0** | **1** |

1101012 = 1\*32+1\*16+0\*8+1\*4+0\*2+1\*1= 5310

1. ***Метод последовательного деления на 2 (перевод чисел из десятичной системы счисления в двоичную).***

Десятичное число делится на 2 до тех пор, пока в частном не будет 0. Остатки от деления записываются справа налево, именно они и составляют двоичное число.

Пример: Возьмем то же число 5310.

53/2=26 остаток 1

26/2=13 остаток 0

13/2=6 остаток 1

6/2=3 остаток 0

3/2=1 остаток 1

1/2=0 остаток 1

Ответ: 5310=1101012

1. ***Метод Горнера для перевода двоичных чисел в десятичные.***

Необходимо суммировать цифры двоичного числа слева направо, умножая ранее полученный результат на 2.

Пример: 5310=1101012

0\*2+1=1; 1\*2+1=3; 3\*2+0=6; 6\*2+1=13; 13\*2+0=26; 26\*2+1=53

**Задание 1.** Ученики договорились о двоичном шифре. Расшифруйте информацию о том, что нужно взять в школу.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **А** | **Б** | **В** | **Г** | **Д** | **Е/Ё** | **Ж** | **З** | **И/Й** | **К** |
| 00001 | 00010 | 00011 | 00100 | 00101 | 00110 | 00111 | 01000 | 01001 | 01010 |
| **Л** | **М** | **Н** | **О** | **П** | **Р** | **С** | **Т** | **У** | **Ф** |
| 01011 | 01100 | 01101 | 01110 | 01111 | 10000 | 10001 | 10010 | 10011 | 10100 |
| **Х** | **Ц** | **Ч** | **Ш** | **Щ** | **Ъ/Ь** | **Ы** | **Э** | **Ю** | **Я** |
| 10101 | 10110 | 10111 | 11000 | 11001 | 11010 | 11011 | 11100 | 11101 | 11110 |

1. 01010010110011001001
2. 0111100110011010000101011
3. 1000010011101110101000001
4. 0101001101010010010001001
5. 0111100001011110101001001
6. 0000110010010110000110001
7. 010110000110001100100100101010
8. 101110011010000100100011000111
9. 000101001101100000010010000001
10. 100011001001001010100011010000

**Задание 2.** Какое из чисел больше

1. 165310 или 110000011012
2. 9910 или 11001012
3. 100010 или 10002
4. 201810 или 111111000112
5. 78910 или 11000111102

**Задание 3.** Сколько единиц в двоичной записи числа

1. 111110
2. 21210
3. 1000010
4. 99910
5. 51110

**Задание 4.** Сколько нулей в двоичной записи числа

1. 300010
2. 6410
3. 201810
4. 55510
5. 100000010

**Задание 5.** В двоичной записи какого числа больше 1

1. 54410 или 2110
2. 3110 или 3210
3. 7810 или 37810
4. 111110 или 555510
5. 10010 или 9610

**Задание 6.** В двоичной записи какого числа больше 0

1. 12910 или 3910
2. 2510 или 3010
3. 5410 или 5510
4. 100010 или 20010
5. 179910 или 201910

**Задание 7.**

Используя таблицу степеней основания 2, переведите из двоичной системы счисления в десятичную следующие числа:

|  |  |
| --- | --- |
| 1. 1112 2. 11102 3. 110112 4. 1010102 5. 10010112 6. 111001112 7. 1101101112 8. 10111100102 9. 111111000002 10. 1000100010002 | =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Задание 8.**

Используя метод деления на 2, переведите из десятичной системы счисления в двоичную следующие числа:

|  |  |
| --- | --- |
| 1. 34 2. 59 3. 629 4. 936 5. 1875 6. 3913 7. 11649 8. 39578 | =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Задание 9.**

Используя метод Горнера, переведите из двоичной системы счисления в десятичную следующие числа:

|  |  |
| --- | --- |
| 1. 1002 2. 101012 3. 11001112 4. 1000010002 5. 110010011002 | =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Задание 10.**

Сколько целых десятичных чисел принадлежит промежутку [111012 … 1000112]

Ответ:\_\_\_\_\_\_\_\_\_\_\_\_

**Задание 11.**

Сколько целых четных десятичных чисел принадлежит промежутку

[110002 … 1111102]

Ответ:\_\_\_\_\_\_\_\_\_\_\_\_

**Задание 12.**

Какое число нарисовано?

Переведите числа в строках из десятичной системы счисления в двоичную, закрасьте ячейки, содержащие 1. Расположите цифры двоичного числа по разрядам, указанным внизу таблицы.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| а.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **247** |  |  |  |  |  |  |  |  | | **21** |  |  |  |  |  |  |  |  | | **33** |  |  |  |  |  |  |  |  | | **65** |  |  |  |  |  |  |  |  | | **226** |  |  |  |  |  |  |  |  | | **68** |  |  |  |  |  |  |  |  | | **72** |  |  |  |  |  |  |  |  | | **79** |  |  |  |  |  |  |  |  | |  | *128* | *64* | *32* | *16* | *8* | *4* | *2* | *1* |   Ответ:\_\_\_\_\_\_\_\_\_\_\_\_ | б.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **239** |  |  |  |  |  |  |  |  | | **161** |  |  |  |  |  |  |  |  | | **162** |  |  |  |  |  |  |  |  | | **228** |  |  |  |  |  |  |  |  | | **46** |  |  |  |  |  |  |  |  | | **36** |  |  |  |  |  |  |  |  | | **68** |  |  |  |  |  |  |  |  | | **132** |  |  |  |  |  |  |  |  | |  | *128* | *64* | *32* | *16* | *8* | *4* | *2* | *1* |   Ответ:\_\_\_\_\_\_\_\_\_\_\_\_ |
| в.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **231** |  |  |  |  |  |  |  |  | | **36** |  |  |  |  |  |  |  |  | | **68** |  |  |  |  |  |  |  |  | | **244** |  |  |  |  |  |  |  |  | | **23** |  |  |  |  |  |  |  |  | | **17** |  |  |  |  |  |  |  |  | | **145** |  |  |  |  |  |  |  |  | | **247** |  |  |  |  |  |  |  |  | |  | *128* | *64* | *32* | *16* | *8* | *4* | *2* | *1* |   Ответ:\_\_\_\_\_\_\_\_\_\_\_\_ | г.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **23** |  |  |  |  |  |  |  |  | | **37** |  |  |  |  |  |  |  |  | | **69** |  |  |  |  |  |  |  |  | | **133** |  |  |  |  |  |  |  |  | | **245** |  |  |  |  |  |  |  |  | | **149** |  |  |  |  |  |  |  |  | | **149** |  |  |  |  |  |  |  |  | | **247** |  |  |  |  |  |  |  |  | |  | *128* | *64* | *32* | *16* | *8* | *4* | *2* | *1* |   Ответ:\_\_\_\_\_\_\_\_\_\_\_\_ |

**Задачи сложения и вычитания**

**Немного теории:**

1. ***Таблица сложения в двоичной системе счисления***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| + | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 |

Перенос 1 в старший разряд

Примеры сложения:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 1 | 1 |  | Перенос из предыдущего разряда |
| + | 1 | 1 | 1 | 1 |  |
| 1 | 0 | 1 | 1 | Сложили четное количество единиц, результат всегда 0 с переносом в старший разряд |
| 1 | 1 | 0 | 1 | 0 |  |

Сложили нечетное количество единиц, результат всегда 1 с переносом в старший разряд

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 2 | 2 | 1 |  | Перенос из предыдущего разряда |
| + |  | 1 | 0 | 1 |  |
|  | 1 | 1 | 1 |  |
|  |  | 1 | 1 |  |
|  |  | 1 | 0 |  |
| 1 | 0 | 0 | 0 | 1 |  |

1. ***Таблица вычитания в двоичной системе счисления***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| - | 1 | 0 | 0 | 1 | 1 |
|  | 1 | 0 | 1 | 0 |
|  |  | 1 | 0 | 0 | 1 |

Заем 2 из старшего разряда

Пример вычитания

Заем числа 2 из старшего разряда. Если ноль продолжаем занимать до первой единицы.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1 | +2  -1 | +2  -1 | +2 |  | Заем из старшего разряда | |
| - | 1 | 0 | 0 | 0 | 1 |  |
|  | 1 | 0 | 1 | 1 |  |
|  | 0 | 0 | 1 | 1 | 0 |  |

**Задание 13.**

Сложите двоичные числа столбиком

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| а.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + |  |  |  | 1 | 0 | 1 | 1 | 0 | |  |  |  |  | 1 | 1 | 0 | 0 | 1 | |  |  |  |  |  |  |  |  |  | | б.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | |  | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | |  |  |  |  |  |  |  |  |  | |
| в.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + |  | 1 | 1 | 0 | 1 | 0 | 0 | 1 | |  |  | 1 | 1 | 0 | 0 | 0 | 0 | 0 | |  |  |  |  |  |  |  |  |  | | г.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + |  |  | 1 | 0 | 1 | 1 | 1 | 0 | |  |  |  | 1 | 0 | 1 | 1 | 1 | 0 | |  |  |  |  |  |  |  |  |  | |
| д.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + |  | 1 | 1 | 0 | 1 | 1 | 1 | 1 | |  |  | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |  |  |  |  |  |  |  |  |  | | е.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + |  | 1 | 0 | 1 | 1 | 0 | 1 | 1 | |  |  |  |  | 1 | 1 | 0 | 0 | 1 | |  |  |  |  |  |  |  |  |  | |
| ж.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | |  |  |  | 1 | 0 | 1 | 1 | 0 | 1 | |  |  |  |  |  |  |  |  |  | | з.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + |  | 1 | 0 | 1 | 1 | 1 | 1 | 0 | |  | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | |  |  |  |  |  |  |  |  |  | |
| и.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |  |  | 1 | 0 | 1 | 0 | 1 | 0 | 1 | |  |  |  |  |  |  |  |  |  | | к.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | + | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | |  |  | 1 | 1 | 1 | 1 | 0 | 1 | 1 | |  |  |  |  |  |  |  |  |  | |

**Задание 14.**

Вычтите двоичные числа столбиком

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| а.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | - | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | |  | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |  |  |  |  |  |  |  |  |  | | б.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | - |  |  |  | 1 | 0 | 0 | 1 | 1 | |  |  |  |  |  | 1 | 0 | 0 | 1 | |  |  |  |  |  |  |  |  |  | |
| в.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | - |  |  | 1 | 0 | 1 | 1 | 0 | 0 | |  |  |  |  | 1 | 0 | 0 | 1 | 0 | |  |  |  |  |  |  |  |  |  | | г.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | - |  |  | 1 | 0 | 1 | 0 | 0 | 1 | |  |  |  |  | 1 | 0 | 0 | 1 | 0 | |  |  |  |  |  |  |  |  |  | |
| д.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1  - | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | |  | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | |  |  |  |  |  |  |  |  |  | | е.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | - | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |  |  |  | 1 | 1 | 1 | 1 | 1 | 1 | |  |  |  |  |  |  |  |  |  | |
| ж.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1  - | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | |  |  | 1 | 1 | 1 | 1 | 0 | 0 | 1 | |  |  |  |  |  |  |  |  |  | | з.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | - | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |  |  | 1 | 1 | 0 | 1 | 0 | 1 | 1 | |  |  |  |  |  |  |  |  |  | |
| и.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1  - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |  | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | |  |  |  |  |  |  |  |  |  | | к.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | - | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | |  |  |  |  | 1 | 0 | 1 | 0 | 1 | |  |  |  |  |  |  |  |  |  | |