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1. Addition answer: 11101100, Subtraction answer: 1010101

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| a. | Divisor | 193 | 96 | 48 | 24 | 12 | 6 | 3 | 1 |
|  | Remainder | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

In 16-bit binary, 193 = 11000001

|  |  |
| --- | --- |
| 1100 | 0001 |
| C | 1 |

In 4-digit Hexadecimal, 193 = C1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| b. | Divisor | 51 | 25 | 12 | 6 | 3 | 1 |
|  | Remainder | 1 | 1 | 0 | 0 | 1 | 1 |

In 16-bit binary, 51 = 110011

|  |  |
| --- | --- |
| 0011 | 0011 |
| 3 | 3 |

In 4-digit hexadecimal, 51 = 33

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| c. | Divisor | 1331 | 665 | 332 | 166 | 83 | 41 | 20 | 10 | 5 | 2 | 1 |
|  | Remainder | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |

In 16-bit binary, 1331 = 10100110011

|  |  |  |
| --- | --- | --- |
| 0101 | 0011 | 0011 |
| 5 | 3 | 3 |

In 4-digit hexadecimal, 1331 = 533

1. The largest decimal an unsigned 8-bit binary can represent is 255 according to the formula bn-1
2. The largest decimal an unsigned 4-digit octal can represent is 4095 according to the formula
3. 1. The machine code 00000001010010111001100000100000 represents the MIPS commands add $s3, $t2, $t3. The Hex it represents is 014B9820
   2. The opcode for this machine code instruction is 010
   3. The format type for this instruction is R Type.

|  |  |  |  |
| --- | --- | --- | --- |
|  | MIPS Machine Code | MIPS Instructions | Hex |
| a. | 1000 1101 1011 0010 0000 0000 0000 1101 | LW $s2, 20($t5) | 8DB2000D |

1. The opcode for this instruction is 3510
2. The format type for this instruction is I-type.
3. The instruction is the R-Type instruction “sub $v1, $v0, $v1” and is represented by the binary representation, 0000 0000 0110 0010 0001 1000 0010 0010
4. The instruction is the R-Type instruction “mtlo $at, $v0, $a0” and is represented by the binary representation, 0100 1100 0010 0010 0000 0000 0000 0100
5. sub $t1, $t1, $t2

add $s1, $t0, $t0

1. sub $s0, $s0, $s1

lw $s0, $s0($s6)

sw $s0, 32($s7)

1. lw $t0, 8($s2)

add $s0, $s1, $t0

lw $t1, 12($s2)

add $t1, $t1, $s0

sw $t1, 20($s2)