BINARY CODES

That is, if q symbols are to be represented in binary form,

the minimum number of bits n required in the code word is given by

2n\_1 < q \_ 2n:

BCD as

5 6 7

(0101 0110 0111)BCD











|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | 0 1 2 3 4 5 6 7 8 9 A B C D E F | NUL SOH STX ETX EOT ENQ ACK BEL BS TAB LF VT FF CR SO SI | | |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 | 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F | DLE DC1 DC2 DC3 DC4 NAK SYN ETB CAN EM SUB ESC FS GS RS US | | |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 | 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F | (space) ! " # $ % & ' ( ) \* + , - . / | | |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 | 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F | 0 1 2 3 4 5 6 7 8 9 : ; < = > ? | |
| |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 | 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F | @ A B C D E F G H I J K L M N O | | |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 | 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F | P Q R S T U V W X Y Z [ \ ] ^ \_ | | |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 | 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F | ` a b c d e f g h i j k l m n o | | |  |  |  | | --- | --- | --- | | **ASCII** | **Hex** | **Symbol** | |  | | | | 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 | 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F | p q r s t u v w x y z { | } ~  | |

1. xy + x’z + yz = xy + x’z
2. (x+y)•(x’+z)•(y+z) = (x+y)•(x’+z) -- (dual)

**Proof:**xy + x’z + yz = xy + x’z + (x+x’)yz  
 = xy + x’z + xyz + x’yz  
 = (xy + xyz) + (x’z + x’zy)  
 = xy + x’z



