Conversions to Denary/Decimal/Base 10 from Binary (or Base 2) and Hexadecimal (Base 16)

Example 1 - Convert Binary(Base 2) to Decimal/Denary/Base 10

- Convert the 8-bit binary number 1000 1010 to denary.

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2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	0	0	0	1	0	1	0

= (1 * 128) + (0 * 64) + (0 * 32) + (0 * 16)+(1 * 8) +(0 * 4) +(1 * 2) + (0 * 1)

= 128 + 0 + 0 + 0 + 8 + 0 + 2 + 0

= 128 + 8 + 2

= 128 + 10

= 138

Example 2- Convert Binary(Base 2) to Decimal/Denary/Base 10

- Convert the 8-bit binary number 0000 1011 to denary.

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2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
0	0	0	0	1	0	1	1

= (0 * 128) + (0 * 64) + (0 * 32) + (0 * 16)+(1 * 8) +(0 * 4) +(1 * 2) + (1 * 1)

= 0 + 0 + 0 + 0 + 8 + 0 + 2 + 1

= 8 + 3

= 11

Example 3 - Convert Binary(Base 2) to Decimal/Denary/Base 10

- Convert the 8-bit binary number 0011 0010 to denary.

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2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
0	0	1	1	0	0	1	0

= (0* 128) + (0 * 64) + (1 * 32) + (1 * 16)+(0 * 8) +(0 * 4) +(1 * 2) + (0 * 1)

= 0 + 0 + 32 + 16 + 0 + 0 + 2+ 0

= 48 + 2

= 50

Questions about conversions of 8-bit binary to denary & show your working

- (1) Convert 8-bit binary number 1000 1010 to denary.

- (2) Convert 8-bit binary number 1010 1111 to denary.

- (3) Convert 8-bit binary number 0001 1000 to denary.

Example 4 - Convert Hexadecimal (Base 16) to Decimal/Denary/Base 10

- Convert the 2-bit hexadecimal number 24 to denary.

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16^1	16^0
16	1
2	4

= (2 * 16) + (4 * 1)

= 32 + 4

= 36

Example 5 - Convert Hexadecimal (Base 16) to Decimal/Denary/Base 10

- Convert the 2-bit hexadecimal number 87 to denary.

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16^1	16^0
16	1
8	7

= (8 * 16) + (7 * 1)

= 128 + 7

= 135

DENARY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	20

Example 6- Convert Hexadecimal (Base 16) to Decimal/Denary/Base 10

- Convert the 2-bit hexadecimal number A3 to denary.

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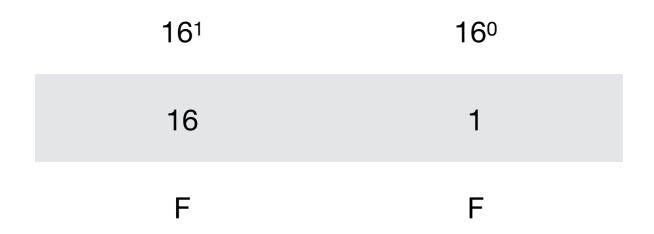
16^1	16^0
A	3
2	4

= (A* 16) + (3 * 1)

= (10 * 16) + (3*1)

= 160 + 3

= 163

DENARY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	20

Example 7 - Convert Hexadecimal (Base 16) to Decimal/Denary/Base 10

- Convert the 2-bit hexadecimal number FF to denary.

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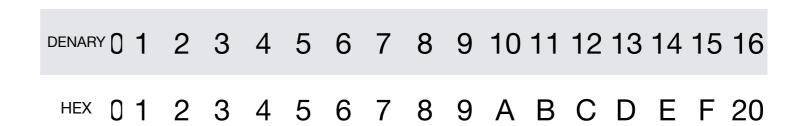| 16^1	16^0
16	1

F	F

= (15 * 16) + (15 * 1)

= 240 + 15

= 255

DENARY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	20

Questions about conversions hexadecimal to denary & show your working

- (1) Convert the hexadecimal number 78 to denary.

- (2) Convert the hexadecimal number A5 to denary.

- (3) Convert the hexadecimal number EF to denary

DENARY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	20

Questions and Answers about conversions of 8-bit binary to denary & show your working

- (1) Convert 8-bit binary number 1000 1010 to denary.

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	0	0	0	1	0	1	0

(1*128) + (1*8) + (1*2)

= 128 + 8 +2

= 138

- (2) Convert 8-bit binary number 1010 1111 to denary.

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	0	1	0	1	1	1	1

(1*128) + (1*32)+(1*8)+(1*4)+(1*2)+(1*1)

= 128 + 32 + 8 + 4 + 2 + 1

= 128 + 32 + 15

= 175

- (3) Convert 8-bit binary number 0001 1000 to denary.

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
0	0	0	1	1	0	0	0

(1*16) + (1*8)

= 16 + 8

= 24

Questions and Answers about conversions hexadecimal to denary & show your working

DENARY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	20

- (1) Convert the hexadecimal number 78 to denary.

16^1	16^0
16	1
7	8

(7*16) + (8*1)

= 112 + 8

= 120

- (2) Convert the hexadecimal number A5 to denary.

16^1	16^0
16	1
A	5

(A * 16) + (5 * 1)

= (10 * 16) + (5 * 1)

= 160 + 5

= 165

- (3) Convert the hexadecimal number EF to denary.

16^1	16^0
16	1
E	F

(E*16) + (F*1)

= (14 * 16) + (15 * 1)

= 224 + 15

= 239