R 61 Binary to Denary Conversions - Reading

In everyday Maths we use the denary system of counting which is also known as base 10. Look at how it works for the number 217:

100	10	1
2	1	7

The number 217 means:
2*100 +
1*10 +
7*1
217

Each column to the left has the value of 10 times the previous column.

Computers use binary which can contain only 0 or 1. This is also known as base 2. Each column to the left has 2 times the value of the previous column. To convert the number 11011001 from binary to denary do the following process:

1. Put the column titles in for each column:

128	64	32	16	8	4	2	1
1	1	0	1	1	0	0	1

2. Add each of the column titles with a 1 in it:

= 128 + 64 + 16 + 8 + 1 = 217

We can add a subscript to numbers to show which base we are using. We also put a space after every four digits of binary to make it easier to read. For example:

$217_{10} = 1101\ 1001_2$

This means 217 in base 10 equals 1101 1001 in base 2.

We can place as many leading zeros to a number as we like. So 0001 = 1. Because computers store numbers of a certain length, like 8 bits, we often use leading zeros. 32 stored as an 8 bit number would be:

128	64	32	16	8	4	2	1
0	0	1	0	0	0	0	0

32_{10} = 0010 0000 as an 8 bit number

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Binary to Denary Conversions - Questions

1. Match the binary numbers on the left to the denary numbers on the right.

10	3
0	1
11	0
1	2

[4]

2. Convert the following numbers from binary to denary.

a) 100 _____ [1]

b) 110 _____ [1]

c) 0000 0110 _____ [1]

d) 0001 0000 _____ [1]

e) 0010 0100 _____ [1]

f) 1111 1111 _____ [1]

___
10

3. What is the maximum number in denary that can be stored in a 4 bit number? _____ [1]

4. What is the maximum number in denary that can be stored in an 8 bit number? _____ [1]

5. What is the range of denary numbers that an 8 bit number can store?
_____ ~ _____ [1]

6. What does the 2 in the number $1011\ 0110_2$ mean? Fill in **one** circle

- ❍ It is in base 10
- ❍ It is in base 2
- ❍ It is a mistake
- ❍ Multiply the number by 2 [1]

7. Convert the following numbers from binary to denary.

a) 0101 0101 _____ [1]

b) 1010 1010 _____ [1]

c) 0000 1111 _____ [1]

d) 1111 0000 _____ [1]

e) 1101 0010 _____ [1]

f) 0010 1101 _____ [1]

___
10

Binary to Denary Conversions - Answers

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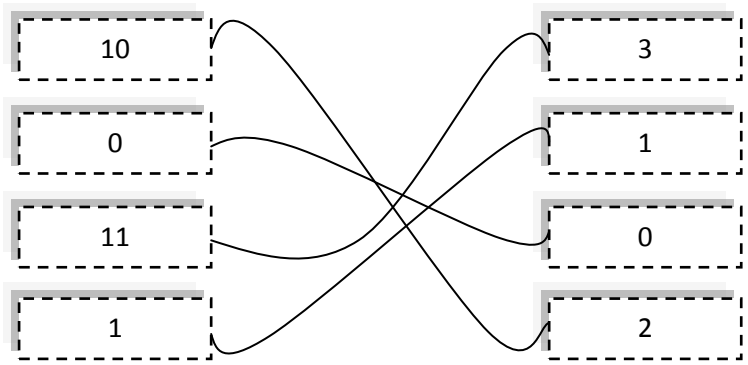
1. Match the binary numbers on the left to the denary numbers on the right.



[4]

2. Convert the following numbers from binary to denary.

a) 100 **4** [1]

b) 110 **6** [1]

c) 0000 0110 **6** [1]

d) 0001 0000 **16** [1]

e) 0010 0100 **36** [1]

f) 1111 1111 **255** [1]

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10

3. What is the maximum number in denary that can be stored in a 4 bit number? **15** [1]

4. What is the maximum number in denary that can be stored in an 8 bit number? **255** [1]

5. What is the range of denary numbers that an 8 bit number can store?
0 ~ **255** [1]

6. What does the 2 in the number 1011 0110_2 mean? Fill in **one** circle.

- ❍ It is in base 10
- ◓ It is in base 2
- ❍ It is a mistake
- ❍ Multiply the number by 2

[1]

7. Convert the following numbers from binary to denary.

a) 0101 0101 **85** [1]

b) 1010 1010 **170** [1]

c) 0000 1111 **15** [1]

d) 1111 0000 **240** [1]

e) 1101 0010 **210** [1]

f) 0010 1101 **45** [1]

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10