1. A memory has **2048 cells** with **16 bits** stored for each cell.

   a. **How many bits** can the memory hold?

   b. **How big** does the **memory address** have to be?

2. Show how the **decimal number "1000"** would be stored as a **16-bit binary number at memory address 24**. Assume that the memory holds 8 bits in each cell and uses Little Endian byte ordering:

As a 16-bit binary number:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

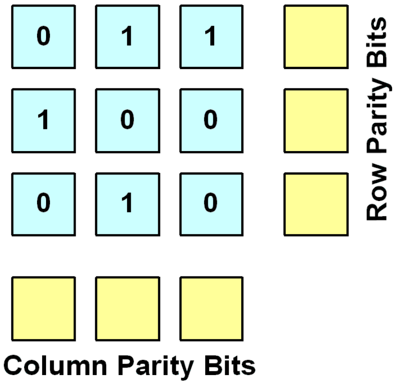
Stored in memory:

Addess 23								Addess 24								Addess 25							

3. (a) **Fill in the parity bits** for the codeword at right so that each row and column has an even parity sum.

   (b) What is the Hamming Distance of this codeword?

   (c) What is the maximum number of error bits that this code could **correct**?



0	1	1	
1	0	0	
0	1	0	

4. **Create a valid Hamming codeword** for the 9 data bits shown in question 1. Assume that the 9 data bits are arranged as follows:

0	1	1	1	0	0	0	1	0

5. **Which bit is bad** in the following Hamming Codeword?

0	1	1	1	0	0	0

6. **What is the average access time** for a system with a 3-level cache that has the following characteristics::

Level	**Access Time**	**Hit Rate**
1	0.25ns	75%
2	3ns	95%
3	40ns	100%

7. Draw the **algebraic** and **logic diagramming symbols** for the following types of Boolean operations:

Boolean Operator	**Algebraic Symbol**	**Logic Diagramming Symbol**
AND		
OR		
NAND		
NOT		
XOR		

8. **Draw a truth table** to show the result of the following expression for all possible input combinations of A, B and C:

$$\overline{A} + (B \bullet C)$$

9. **Complete** the following Boolean **identities**:

$$A \cdot 0 = \square \quad A \cdot 1 = \square \quad A \cdot \overline{A} = \square$$

$$A + 0 = \square \quad A + 1 = \square \quad A + \overline{A} = \square$$

10. Write a Boolean expresson in “**Sum of Products**” form for three inputs, A, B and C. The expression must produce a **TRUE** output whenever the **A and B inputs are different** from each other and the **C input is also TRUE**. You don’t need to simplify the expression.

11. **Draw a Boolean logic circuit** for your “Product of Sums” expression for the above question.