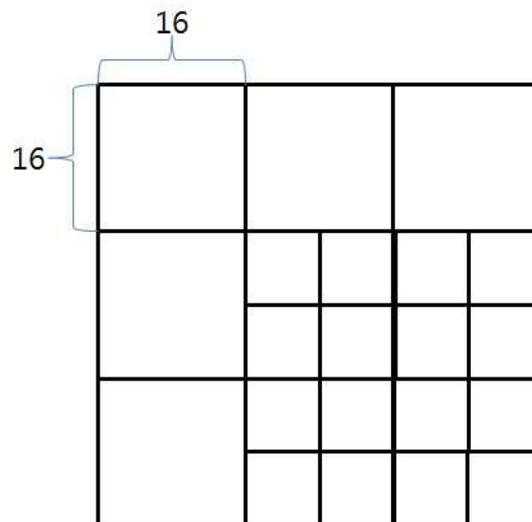
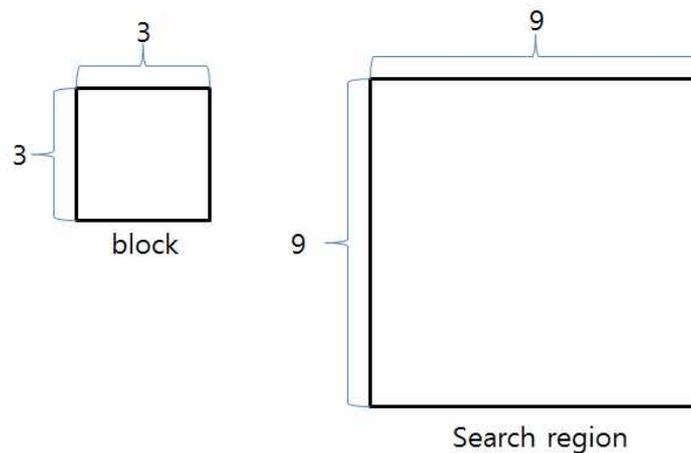


# Multimedia

- The following figure presents a frame partitioned with multiple sub-blocks. Please draw a tree structure of the MacroBlock (MB) partitions for the frame. (Hints: A root of the structure is a frame and its children are  $16 \times 16$  MBs. Set the left-top MB as the leftmost child of your tree.)

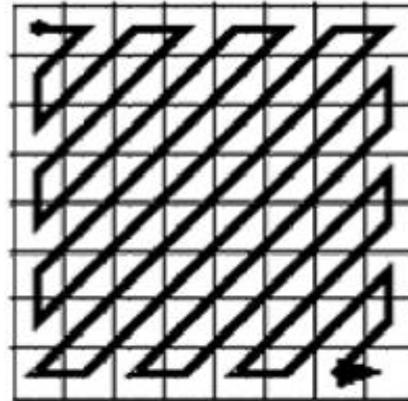


- The images below show a block in the current frame and a search region. What is the total number of iterations to predict the motion vector for this block when using an integer pixel coordinate system.



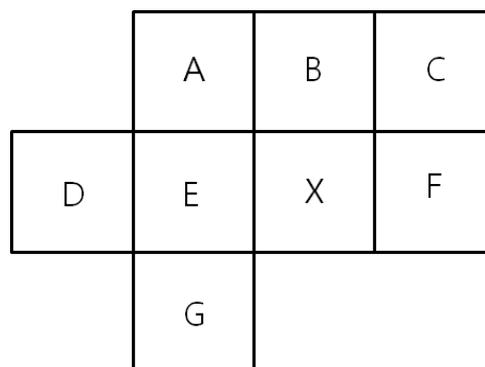
- The following illustrates the transformed 8x8 block (before Quantization) and a zigzag scan order picture.

109	18	-20	19	7	13	9	-7
-15	30	11	-17	-9	-8	0	6
11	24	9	8	-5	6	0	0
13	17	-11	7	3	3	0	1
2	-5	-1	1	2	4	0	0
1	-8	5	6	-2	7	-2	0
1	0	-2	0	1	1	3	0
0	0	1	-1	0	0	1	0



- (1) Draw the 8x8 block after quantization with a factor of 20.
- (2) Write the reordered 1D data after the zigzag scan (using the 8x8 block quantized based on the result of (1))
- (3) What is the DC value after the zigzag scan when using the block quantized in (1)?

- The figure below presents a spatial model (image model) for intra coding using a raster scan order and blocks. Please indicate all the blocks that cannot be used during the prediction step when X is the current block.



- Please describe the color model used for the digital broadcasting.
- Please explain the frame type(s) used to find the backward and forward pictures for a reference picture.
- Please describe each of the following 4 steps involved in video coding: 1) block-based motion compensation for intra and inter mode; 2) image transform; 3) quantization; 4) entropy coding
- What are the five ways of B-frame prediction in H.264?
- Please write your code for codeNum=11 in Exp-Golomb coding.
- Please draw the Wavelet subbands after 3 level transformation.