CUDA Kernel Execution Configuration Questions / Questions de Configuration d'Exécution des Noyaux CUDA

Question 1:

Given a matrix of size nx = 1024 and ny = 1024, and a 2D grid with block dimensions dimx = 16, dimy = 16:
1. What will be the grid dimensions grid.x and grid.y?
2. How many total threads will be launched in the kernel?

Answer / Réponse:
grid.x = 64, grid.y = 64, Total threads = 1048576
Explanation / Explication:
The grid dimensions are calculated as:
grid.x = ceil(nx / dimx) = ceil(1024 / 16) = 64
grid.y = ceil(ny / dimy) = ceil(1024 / 16) = 64

Total threads = grid.x * grid.y * block.x * block.y = 64 * 64 * 16 * 16 = 1048576.

Question 2:

Given a matrix of size nx = 2048 and ny = 2048, and a 2D grid with block dimensions dimx = 32, dimy = 32:
1. What will be the grid dimensions grid.x and grid.y?
2. How many total threads will be launched in the kernel?

Answer / Réponse:
grid.x = 64, grid.y = 64, Total threads = 4194304
Explanation / Explication:
The grid dimensions are calculated as:
grid.x = ceil(nx / dimx) = ceil(2048 / 32) = 64
grid.y = ceil(ny / dimy) = ceil(2048 / 32) = 64

Total threads = grid.x * grid.y * block.x * block.y = 64 * 64 * 32 * 32 = 4194304.

Question 3:

Given a matrix of size nx = 8192 and ny = 8192, and a 2D grid with block dimensions dimx = 64, dimy = 64:
1. What will be the grid dimensions grid.x and grid.y?
2. How many total threads will be launched in the kernel?

Answer / Réponse:
grid.x = 128, grid.y = 128, Total threads = 67108864
Explanation / Explication:

The grid dimensions are calculated as:
grid.x = ceil(nx / dimx) = ceil(8192 / 64) = 128
grid.y = ceil(ny / dimy) = ceil(8192 / 64) = 128

Total threads = grid.x * grid.y * block.x * block.y = 128 * 128 * 64 * 64 = 67108864.

Question 4:

Given a matrix of size nx = 16384 and ny = 8192, and a 2D grid with block dimensions dimx = 32, dimy = 32:
1. What will be the grid dimensions grid.x and grid.y?
2. How many total threads will be launched in the kernel?

Answer / Réponse:
grid.x = 512, grid.y = 256, Total threads = 134217728
Explanation / Explication:
The grid dimensions are calculated as:
grid.x = ceil(nx / dimx) = ceil(16384 / 32) = 512
grid.y = ceil(ny / dimy) = ceil(8192 / 32) = 256

Total threads = grid.x * grid.y * block.x * block.y = 512 * 256 * 32 * 32 = 134217728.

Question 5:

Given a matrix of size nx = 512 and ny = 512, and a 2D grid with block dimensions dimx = 8, dimy = 8:
1. What will be the grid dimensions grid.x and grid.y?
2. How many total threads will be launched in the kernel?

Answer / Réponse:
grid.x = 64, grid.y = 64, Total threads = 262144
Explanation / Explication:
The grid dimensions are calculated as:
grid.x = ceil(nx / dimx) = ceil(512 / 8) = 64
grid.y = ceil(ny / dimy) = ceil(512 / 8) = 64

Total threads = grid.x * grid.y * block.x * block.y = 64 * 64 * 8 * 8 = 262144.