What is vectorized code?

Consider the two code fragments below. Both accomplish the same thing and use vectors, but one fragment is vectorized while the other is not.

% Vectorized code to add two vectors
% a = rand(1,4);
% b = rand(1,4);
% c = a + b;

% Non-vectorized version
a = rand(1,4);
b = rand(1,4);
for k = 1:length(a)
c(k) = a(k) + b(k);
end

Vectorized code refers to operations that are performed on multiple components of a vector at the same time (in one statement). Note that the addition (arithmetic operation) in the left code fragment is performed on all (multiple) components of the vectors a and b in one statement—the operands of the add operation are vectors. The addition on the right code fragment, however, is performed on one component of vector a and one component of vector b at a time—the operands of the add operation are scalars, not vectors. Below is another example on vectorized vs. non-vectorized code:

% Vectorized code to concatenate two vectors
% a = rand(1,3);
b = 7;
c = [a b];

% Non-vectorized version
a = rand(1,3);
b = 7;
n = length(a);
for k = 1:n
c(k) = a(k);
end
c(n+1) = b;

Vector concatenation is vectorized code! In general, vectorized code replaces the loop for moving through a vector one component at a time.

Is using a built-in function the same as using vectorized code? No. For example, if you write the statement s = sum(v), you are calling a function and that is not vectorized code. The function sum may or may not use vectorized code to do the summing, but the function call that you write is just that, a function call—it does not perform an operation on multiple components. Similarly, initializing a vector using functions such as ones and zeros is not considered vectorized code.

Be sure to follow instructions on an exam! On some questions we want to see that you have mastered loops and indexing and therefore do not allow vectorized code. Similarly, we may forbid the use of specific built-in functions on a question. A significant penalty will be applied if you do not follow instructions.