Assignment 03: Ones and Zeros and Some Other Numbers

1. Use `linspace()` to generate a vector **u** with 10^4 samples of $|\tan(x)|$ for x between $-\pi/2$ and $\pi/2$, then use logical indexing to create a vector **v** containing all nonzero entries of **u** less than or equal to 10. Finally, use `prod()` to find the geometric mean of the elements of **v**.

   You can take an absolute value using the `abs()` function.

2. Create a logical 256-by-256 matrix L such that L_{mn} is 1 if
   $$|m-100|+|n-100|<40 \text{ and } \sqrt{(m-100)^2+(n-100)^2}>15$$
   then show the output with `imshow(L)`.

   Hint: Generate 256-by-256 matrices A and B such that A_{mn} = m and B_{mn} = n, then use relational operations on A and B as well as logical operations to generate L.

3. Find the probability of three six-sided dice yielding a sum greater than or equal to 11.

   Hint: Generate three vectors, each of which span a different dimension (You can generate the third using `reshape()`. With every example I've done so far, I've only used reshape to make 2D objects, but you can reshape into higher dimensions as well).

   Then, using broadcasting, generate a multi-dimensional array with all possible sums, then find how many of those meet this criterion.

Extra: Create a logical 256-by-256 matrix U such that U_{mn} is true if
$$\sqrt{\frac{(m-88)^2}{2}+(n-76)^2}>15$$
And at least one of the following hold true:

- $\max\left(|m-128|,\frac{4|n-106|}{5}\right)<40$
- $\sqrt{\frac{(m-88)^2}{2}+(n-76)^2}<20$
- $\max\left(|m-177|,\frac{|n-96|}{4}\right)<9$
- $\sqrt{(m-103)^2+\frac{(n-156)^2}{5}}<15$
- $\sqrt{(m-128)^2+\frac{3(n-56)^2}{2}}<40$
- $\sqrt{(m-153)^2+\frac{(n-156)^2}{5}}<15$

Then make a new figure by typing `figure;` and display your output using `imshow()`.