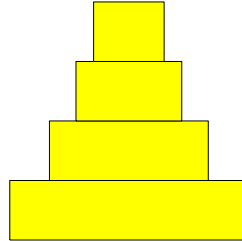# 1 Build your own step pyramid

Complete the script `stepPyramidSkeleton.m` to draw a step pyramid. The base rectangle is L-by-H where $H \leq L$. Each step has the same height H. The next rectangle up is $2/3$ the length of the rectangle below, and so forth. The top step must have a length no less than H.

You will need function `DrawRect`—download it from the *Insight* page of the course website and put it in your current directory (the directory from which you will run your script). Use a `while`-loop.

2 Fibonacci numbers

You should read *Insight* §3.2 before doing the following exercise. Download the following script:

```
% Fibonacci
clc
f_old = 0;
f_cur = 1;
n = 1;
% f_cur is the nth Fibonacci number
while (n<=10)
    fprintf('%2d %10d\n',n,f_cur)
    % Update:
    f_new = f_old + f_cur;
    f_old = f_cur;
    f_cur = f_new;
    n = n+1;
end
```

It displays the first 10 Fibonacci numbers $f_1, \ldots, f_{10}$.

(a) Modify the script so that it prints all Fibonacci numbers that are greater than ten thousand but less than one million.

(b) Modify the script so that it prints the smallest n so that

$$\left| \frac{f_{n+1}}{f_n} - \frac{1+\sqrt{5}}{2} \right| \leq .000001$$

3   Binomial Coefficients

The number of ways that you can select k objects from n objects is given by the binomial coefficient

$$\left(\begin{array}{c} n \\ k \end{array} \right) = \frac{n!}{k!(n-k)!}$$

Thus,

$$\left(\begin{array}{c} 10 \\ 1 \end{array} \right) = \frac{10!}{1!9!} = 10$$

$$\left(\begin{array}{c} 10 \\ 2 \end{array} \right) = \frac{10!}{2!8!} = 45$$

$$\left(\begin{array}{c} 10 \\ 3 \end{array} \right) = \frac{10!}{3!7!} = 120$$

Recall that if `x` houses a positive integer, then the value of `floor(log10(x))+1` is the number of base-10 digits that are required to write the value of `x`. Write a script that produces ten lines of output. The nth line should display the number of digits required to write down each of the binomial coefficients

$$\left(\begin{array}{c} n \\ 1 \end{array} \right), \left(\begin{array}{c} n \\ 2 \end{array} \right), \ldots, \left(\begin{array}{c} n \\ n \end{array} \right)$$

Thus, the nth line of output will display n numbers. Make use of the function `factorial`.

4   ASCII "drawing" in the Command Window

[P3.1.7 from *Insight*]   Write a script to "draw" the following figure in the *Command Window* using `fprintf` statements. Prompt the user to input an integer (`n`) for the number of asterisks on each side of the square. For example, if `n` is 5, then the following figure will be printed. You may assume that `n > 3`.

```
*****
**  *
* * *
*  **
*****
```

Please delete your files from the computer before leaving the lab!