MATLAB Bootcamp:
Day 2 exercises

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1.

Write a script that converts a Roman numeral to its decimal equivalent. There are two situations that you might design your program for:

a. The "old" style where the order of the symbols does not matter. In this case, IX and XI both mean $10 + 1$ or 11. Use the following conversion table:

Roman	Decimal
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

b. (Harder) The "new" style where the order of the symbols does matter. For example, IX is 9 (10 - 1), while XC is 90 (100 - 10). The conversion table given above still holds and you may assume for this case that the only instances of "order" you will encounter are IV (4), IX (9), XL (40), XC (90), CD (400) and CM (900). MATLAB's 'input' function may be useful.

2.

Compute the value of π using the series

$$\frac{\pi^2 - 8}{16} = \sum_{n=1}^{\infty} \frac{1}{(2n-1)^2 (2n+1)^2}.$$

How many terms are necessary to obtain an accuracy of 10^{-12}? How accurate is the sum of the first 100 terms of this series?

3. A Roulette-like game

Consider a game consisting of a wheel with 40 slots, numbered 1-40 and colored red (even numbers) or black (odd numbers). Before the wheel is spun, a player selects a slot on the wheel. The rules of the game are as follows:

1. If the wheel lands on the number selected, then the player receives the amount wagered times 15.

2. If the wheel lands on a different number, but the same color, then the player keeps his/her money.

3. If the wheel lands on a different color, then the player loses his/her money.

Make a script that allows a player to play this game by guessing a number between 1 and 40. MATLAB's input function will be useful here. To generate random numbers, consider using the MATLAB functions rand() and ceil().

   (Challenge: simulate the expected outcome of this game for a player.)

   (Credit to Jim Maneval for the first two exercises: link)