

Matlab control

第三行計算變數a與b的比值，當b為0時，該比值未定義，以Inf表示。請在條件指令中，將計算條件設定為判斷r是否等於Inf，在不同條件下分別執行不同命令。

This program calculates the ratio of a to b in line 3. When b is zero, the ration is undefined and represented by Inf. Please check if r is Inf or not in line 4.

```
1— a = 2;  
2— b = 0;  
3— r = a / b;  
4— if             
5—     display('invalid division')  
6— else  
7—     display(r)  
8— end
```

第三行計算變數a與b的比值，當比值r很接近0時，以r的絕對值是否小於eps來判斷r是否趨近於0，請依此原則設定if指令條件，在不同條件下分別執行不同命令。

This program calculates the ratio of a to b in line 3. Try to check if the absolute value of r is less than eps or not.

```
1 — a = -10^-6;  
2 — b = 10^10;  
3 — r = a / b;  
4 — if   
5 —     display('near zero')  
6 — else  
7 —     display(r)  
8 — end
```

`abs(r) < eps`

$$f(x) = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } 0 \leq x \end{cases}$$

當輸入值小於0時，函數f將輸出值設定為-x，否則設定為x

Set the output of f to -x, if x is less than zero, and to x otherwise

```
1 - x = 2;  
2 - if   
3 -     y = -x;  
4 -   
5 -     y = x;  
6 - end  
7 - display(y)
```

x < 0

else

$$f(x) = \begin{cases} -1 & \text{if } x < -1 \\ -x & \text{if } -1 \leq x < 0 \\ x & \text{if } 0 \leq x < 1 \\ 1 & \text{if } 1 \leq x \end{cases}$$

函數f的定義域有四個區間，根據輸入值x在不同區間，進行不同運算，f稱為piecewise函數，請在四行使用elseif完成函數f的計算

There are for distinct intervals in the domain of f. As a piecewise function, according to the interval of x, f has different ways to determine the output. Please use elseif in line 4 to implement function f

```

1- x = 2;
2- if x < -1
3-     y = -1;
4-
5-     y = -x;
6- elseif x < 1
7-
8- else
9-     y = 1;
10- end
11- display(y)

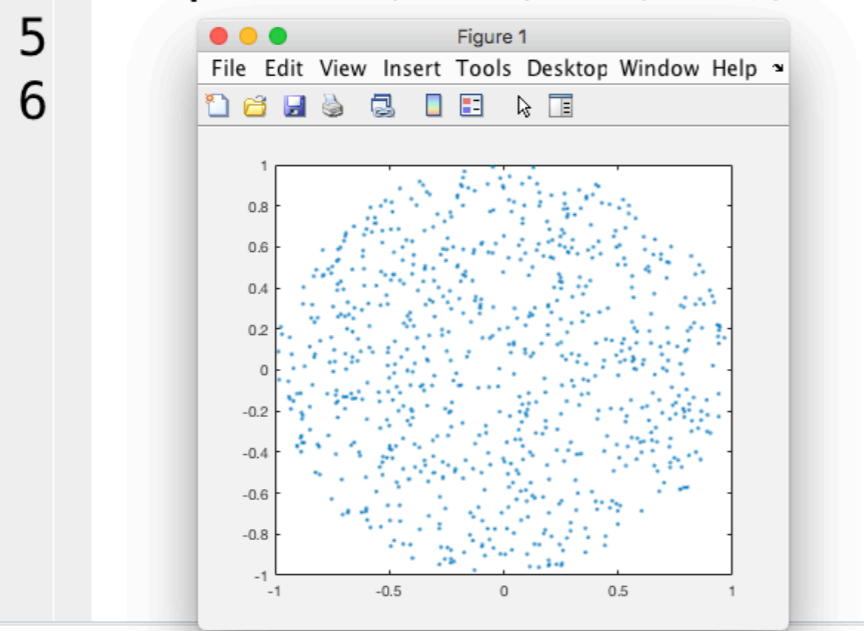
```

elseif x < 0
y = x

x包含1000個分佈在[-1 1]x[-1 1]的二維點座標，請計算**r**向量，使向量元素代表二維點與原點的距離平方，使用**find**函數找出向量**r**中小於1的元素位置，本題繪製單位圓內的二維點

x is a matrix containing 1000 2D points within [-1 1]x[-1 1]. Please calculate vector **r** that consists of elements representing square distances of correspondent points to the origin, and use function **find** to determine indices where elements in **r** are less than 1. This script also plot all points within a unitary circle.

```
1 x = rand(2,1000)*2 - 1;  
2 r =           ;  
3 ind =           ;  
4 plot(x(1, ind), x(2, ind), 'b.')
```



$x(1, :).^2 + x(2, :).^2$

$\text{find}(r < 1)$

nums儲存1到100間整數的隨機排列，請使用**find**指令找出整數**n**的位置

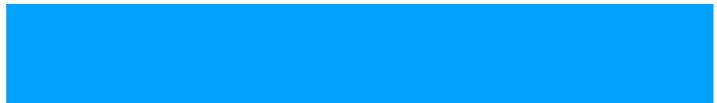
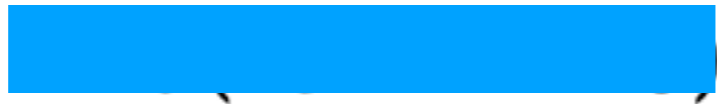
nums stores all randomly permuted integers ranging from 1 to 100.
Please use function **find** to the position of integer **n** in vector **nums**.

```
1 — nums = randperm(100);  
2 — n = 10;  
3 — ind =           ;  
4 — display(nums(ind))
```

find(nums == n)

nums儲存1到100間整數的隨機排列，請使用指令mod，求nums所有元素除以17的餘數，find指令找出所有餘數為0的位置，本題印出17的倍數排列

nums stores a random arrangement of integers between 1 and 100. Please use the command mod to find the remainder of all elements of nums divided by 17. The find command finds all positions where the remainder is 0. This question prints the arrangement of multiples of 17.

```
nums = randperm(100);  
rem = ;  
ind = ;  
display(nums(ind))  
17 68 34 85 51
```

```
mod(nums, 17)  
find(rem == 0)
```

$$\sum_{i=1}^{100} \left(\lceil \frac{i}{3} \rceil + \lfloor \frac{i^2}{5} \rfloor \right)$$

請設定迴圈索引，並使用ceil與floor計算上式總和

Please set the loop index and use ceil and floor to calculate the sum of the above formula

```
s = 0;  
n = 100;  
for i =   
    s =   
end  
display(s)
```

```
s =
```

```
69347
```

1 : n

s + ceil(i / 3) + floor(i^2 / 5)

本題計算n!，請設定變數ans的初始值，並在迴圈內更新ans內容

This question calculates n!. Please set the initial value of the variable ans and update the content of ans in the loop.

```
ans = 1;  
n = 13;  
for i = 1 : n  
    ans = ans * i;  
end  
display(ans)
```

```
ans =
```

```
6.227020800000000e+09
```

```
ans = 1
```

```
ans * i
```

本題計算矩陣A與直列向量x的乘績，請在迴圈主體命令中，計算A的第i橫列與直列向量x的乘績，在最後一行計算驗證A與x的乘積是否等於b

This question calculates the multiplication of matrix A and linear vector x. In the loop body command, calculate the multiplication of the i-th column of A and linear vector x. In the last line, calculate and verify whether the product of A and x is equal to b.

```
n = 50;  
A = rand(n, n);  
x = rand(n, 1);  
b = zeros(n, 1);  
for i = 1 : n  
    b(i) =                     ;  
end  
sum(abs(                    ))
```

ans =

8.348877145181177e-14

$A(i, :) * x$

$A * x - b$

本題計算矩陣A與矩陣B的乘績，請在迴圈主體命令中，計算A的第i橫列與B的第j直列的乘績，在最後一行計算驗證A與B的乘績是否等於C

This question calculates the multiplication of matrix A and matrix B. In the loop body command, calculate the multiplication of the i-th column of A and the j-th column of B. Calculate in the last line to verify whether the product of A and B is equal to C.

```
n = 50;
A = rand(n, n);
B = rand(n, n);
C = zeros(n, n);
for i = 1 : n
    for j = 1 : n
        _____;
    end
end
sum(sum(abs(_____)))

ans =

    4.670042130783258e-12
```

$$C(i, j) = A(i, :) * B(:, j)$$

$$A * B - C$$

本題以A矩陣的第一橫列的A(1, 1)元素為基準，進行列運算，消去第二、三、四列的第一個元素，請在迴圈主體命令中計算比值，進行列運算

This question uses the A(1, 1) element in the first column of the A matrix as the basis to perform column operations and eliminate the first elements in the second, third, and fourth columns. Please calculate the ratio in the loop body command and perform column operations.

```
A = reshape(1 : 16, 4, 4);  
for i = 2 : 4  
    ratio = _____;  
    A(i, :) = _____;  
end  
display(A)
```

A =

```
1    5    9   13  
0   -4   -8  -12  
0   -8  -16  -24  
0  -12  -24  -36
```

A(i, 1) / A(1, 1)

A(i, :) - ratio * A(1, :)