Use your own laptop, run Matlab and try the following examples with a single Matlab command and see what happens:

Introduction to MATLAB Basics

1. **Basic Operations**

```
1+1
2*3
3^2
10/5
```

2. **Matrices and vectors**

```
>> [3 2]

ans =

     3     2


>> [1:10]

ans =

     1     2     3     4     5     6     7     8     9    10


>> [1, 2 3 4; 5 6, 7 8 ; 9 10 11 12]

ans =

     1     2     3     4
     5     6     7     8
     9    10    11    12

>> [2:0.5:5]

ans =

    2.0000    2.5000    3.0000    3.5000    4.0000    4.5000    5.0000



>> [6:-2:-6]

ans =

     6     4     2     0    -2    -4    -6
```

3. **Use the apostrophe (')**

```
>> [2:0.5:5]'

ans =

    2.0000
    2.5000
    3.0000
    3.5000
    4.0000
    4.5000
    5.0000

>> [6:-2:-6]'

ans =

     6
     4
     2
     0
    -2
    -4
    -6
```

4. **Let's see what happens when we use: ones, zeros**

```
>> ones

ans =

     1



>> ones(3)

ans =

     1     1     1
     1     1     1
     1     1     1

>> zeros

ans =

     0

>> zeros(3)

ans =
```

Cont.

```
     0     0     0
     0     0     0
     0     0     0
```

5. **Now we can assign a calculation into a variable:**

```
>> a=3

a =

     3

>> b=1+5

b =

     6

>> c=a+b

c =

     9

>> d =c^2

d =

    81

>> varatimesb=a*b

varatimesb =

    18
```

6. **Let's assign matrices to variables**

```
>> A = [4 3 8 1]

A =

     4     3     8     1

>> A(1)

ans =

     4
```

Cont.

```
>> A(3)

ans =

     8

>> B = [4 6; 9 1]

B =

     4     6
     9     1

>> B(2,2)

ans =

     1

>> B(1,2)

ans =

     6

>> B(1,1)

ans =

     4
```

7. **Submatrices**

```
>> C = [1 5 3; 2 7 9; 8 4 6; 0 0 0]

C =

     1     5     3
     2     7     9
     8     4     6
     0     0     0

>> C(2,3)

ans =

     9

>> C(2, [2])

ans =

     7
```

Cont.

```
>> C([3 4], 3)

ans =

     6
     0

>> C([2 4], [2 3])

ans =

     7     9
     0     0
```

8. **These expressions are equivalent**

```
>> C(2,1:3)

ans =

     2     7     9

>> C(2,1:end)

ans =

     2     7     9

>> C(2,:)

ans =

     2     7     9
```

9. **Let's learn how to use: sum, diag**

```
>> F = [1 5 3; 6 4 1; 0 0 0]

F =

     1     5     3
     6     4     1
     0     0     0

>> S = sum(F)

S =

     7     9     4
```

Cont.

```
>> S1 = sum(F,2)

S1 =

     9
    11
     0

>> diag(F)

ans =

     1
     4
     0
```

10. **Expanding the scalar**

```
>> 1:3.^2

ans =

     1     2     3     4     5     6     7     8     9

>> 2.^1:3

ans =

     2     3

>> 2.^1:5

ans =

     2     3     4     5

>> [1 2; 3 4] + 5

ans =

     6     7
     8     9


>> [ones(3,3) zeros(3,3)]

ans =

     1     1     1     0     0     0
     1     1     1     0     0     0
     1     1     1     0     0     0
```

Cont.

```
>> [ones(3,3) ; zeros(3,3)]

ans =

     1     1     1
     1     1     1
     1     1     1
     0     0     0
     0     0     0
     0     0     0
```

11. **Let's write some constant**

```
x = 'hello'

x =

hello


>> x(2)

ans =

e

>> x(4:5) = 'p!'

x =

help!
```

12. **Variables**

```
>> D = [1 2; 3 4]

D =

     1     2
     3     4

>> D(5,5) = 1

D =

     1     2     0     0     0
     3     4     0     0     0
     0     0     0     0     0
     0     0     0     0     0
     0     0     0     0     1
```

Cont.

13. **Functions**

```
>> z=4

z =

     4

>> cos(z)

ans =

   -0.6536

>> sin(z)

ans =

   -0.7568

>> exp(z)

ans =

   54.5982

>> log(z)

ans =

    1.3863

>> sqrt(z)

ans =

     2
```

14. **Testing, this will return 0 when false and 1 when true**

```
>> 1==2

ans =

     0

>> 3~=5

ans =

     1
```

Cont.

```
>> 5<=6

ans =

     1

>> 7>=10

ans =

     0

>> 1~=2 & 8==(4+4)

ans =

     1

>> ~(2<=8)

ans =

     0
```

15. **Some extra exercises**

```
>> A=[2; 3]*[1 2;3 4]

Inner matrix dimensions must agree.

>> A=[1 2;3 4]*[2; 3]

A =

     8
    18

>> A =[    16     2     3    13;
5    11    10     8;
9     7     6    12;
4    14    15     1]

A =
    16     2     3    13
     5    11    10     8
     9     7     6    12
     4    14    15     1


>> A(1:3,2)

ans =
```

Cont.

```
     2
    11
     7
```

```
>> y1 = linspace(-2,2,7)

y1 =

   -2.0000   -1.3333   -0.6667         0    0.6667    1.3333    2.0000
```

```
>> for v = 1.0:-0.2:0.0
   disp(v)
end
     1

    0.8000

    0.6000

    0.4000

    0.2000

     0
```

The End.