

Mathematica Cool Tips

Prefix (@), Postfix (//)

```
In[*]:= f[x]  
Out[*]=  
f[x]
```

```
In[*]:= f@x  
Out[*]=  
f[x]
```

```
In[*]:= x // f  
Out[*]=  
f[x]
```

```
In[*]:= MatrixForm@{1, 2, 3, 4, 5, 6, 7, 8, 9}  
Out[*]//MatrixForm=  

$$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{pmatrix}$$

```

```
In[*]:= {1, 2, 3, 4, 5, 6, 7, 8, 9} // MatrixForm  
Out[*]//MatrixForm=  

$$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{pmatrix}$$

```

One-Time Function (#&)

```
In[*]:= g[x_] := x^3  
  
In[*]:= g[x]  
Out[*]=  
x3
```

```
In[*]:= #^3 &[x]
```

```
Out[*]=  
x^3
```

```
In[*]:= g[x_, y_] := x^2 * (y + 2)
```

```
In[*]:= g[x, y]
```

```
Out[*]=  
x^2 (2 + y)
```

```
In[*]:= (#1^2 * (#2 + 2)) &[x, y]
```

```
Out[*]=  
x^2 (2 + y)
```

Map, MapThread: Avoid using “For” or “Do”

Suppose you want to make list $\{f[1], f[2], f[3], f[4], f[5], f[6]\}$.

```
In[*]:= Table[f[k], {k, 6}]
```

```
Out[*]=  
{f[1], f[2], f[3], f[4], f[5], f[6]}
```

Map may be more useful.

```
In[*]:= Map[f, Range[6]]
```

```
Out[*]=  
{f[1], f[2], f[3], f[4], f[5], f[6]}
```

Map is far more general and handy.

```
In[*]:= kk = {a, b, c, d, e}
```

```
Out[*]=  
{a, b, c, d, e}
```

```
In[*]:= Map[f, kk]
```

```
Out[*]=  
{f[a], f[b], f[c], f[d], f[e]}
```

```
In[*]:= f /@ kk
```

```
Out[*]=  
{f[a], f[b], f[c], f[d], f[e]}
```

Pure function (i.e., one-time function) is also handy in this respect.

```
In[*]:= kk = {a, b, c, d, e}
```

```
Out[*]=  
{a, b, c, d, e}
```

```
In[*]:= Map[(2 + #^2) &, kk]
Out[*]= {2 + a^2, 2 + b^2, 2 + c^2, 2 + d^2, 2 + e^2}
```

In fact, the above particular example can be achieved in a simpler way.

```
In[*]:= 2 + kk^2
Out[*]= {2 + a^2, 2 + b^2, 2 + c^2, 2 + d^2, 2 + e^2}
```

```
In[*]:= Attributes[Power]
Out[*]= {Listable, NumericFunction, OneIdentity, Protected, ReadProtected}
```

```
In[*]:= Attributes[Plus]
Out[*]= {Flat, Listable, NumericFunction, OneIdentity, Orderless, Protected}
```

```
In[*]:= Sin[kk]
Out[*]= {Sin[a], Sin[b], Sin[c], Sin[d], Sin[e]}
```

```
In[*]:= Attributes[Sin]
Out[*]= {Listable, NumericFunction, Protected}
```

Suppose you have two lists.

```
In[*]:= Let[Complex, a, b]
aa = Array[a, 5]
bb = Array[b, 5]
Out[*]= {a1, a2, a3, a4, a5}
Out[*]= {b1, b2, b3, b4, b5}
```

You want to construct a new list such that

$\{F[a_1, b_1], F[a_2, b_2], F[a_3, b_3], F[a_4, b_4], F[a_5, b_5]\}$.

```
In[*]:= MapThread[F, {aa, bb}]
Out[*]= {F[a1, b1], F[a2, b2], F[a3, b3], F[a4, b4], F[a5, b5]}
```

Apply (@@), MapApply (@@@)

```
In[*]:= Clear[f, g]
```

Suppose you have a function with head `g`.

```
In[*]:= g[x, y]
Out[*]=
g[x, y]
```

You can replace the head of the function with any other head, say, F.

```
In[*]:= F@g[x, y]
Out[*]=
F[x, y]
```

Suppose you have a list of functions with different heads. You want to replaced all those heads to, say, F.

```
In[*]:= {f[x], g[x], h[x, y]}
Out[*]=
{f[x], g[x], h[x, y]}
```

MapApply does it for you.

```
In[*]:= F@@@{f[x], g[x], h[x, y]}
Out[*]=
{F[x], F[x], F[x, y]}
```

```
In[*]:= Let[Qubit, S]
```

```
In[*]:= bs = Basis[S@{1, 2}]
Out[*]=
{ $|\_ \rangle$ ,  $|1_{S_2}\rangle$ ,  $|1_{S_1}\rangle$ ,  $|1_{S_1}1_{S_2}\rangle$ }
```

```
In[*]:= InputForm[bs]
```

```
Out[*]//InputForm=
{Ket[<| |>], Ket[<|S[2, $] -> 1|>], Ket[<|S[1, $] -> 1|>], Ket[<|S[1, $] -> 1, S[2
```

```
In[*]:= Bra@@@bs
```

```
Out[*]=
{ $\langle \_ |$ ,  $\langle 1_{S_2} |$ ,  $\langle 1_{S_1} |$ ,  $\langle 1_{S_1}1_{S_2} |$ }
```

```
In[*]:= InputForm[%]
```

```
Out[*]//InputForm=
{Bra[<| |>], Bra[<|S[2, $] -> 1|>], Bra[<|S[1, $] -> 1|>], Bra[<|S[1, $] -> 1, S[2
```

Summary

Functions

- Table
- Apply
- Map

- Thread
- MapThread
- Through
- @, @@, @@@
- f@x, f[x], x//f

Related Links

- S. Wolfram (2017), “An Elementary Introduction to Wolfram Language,” 2nd edition (2017).
- The Wolfram Language: Fast Introduction for Math Students
- The Wolfram Language: Fast Introduction for Programmers