

log-spacing-notes

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1 Notes about log-spacing

```
In [1]: from pylab import *
```

Example for 5 values per decade. This is called the R5 or Renard series (not used much in ECE-related ares). See [Wikipedia: Renard series](#) for more background.

```
In [7]: # R5 series. NOTE: the R5 values are rounded differently
t = array([10**(i/5.0) for i in range(6)])
for i in t: print('%4.2f' % i)
```

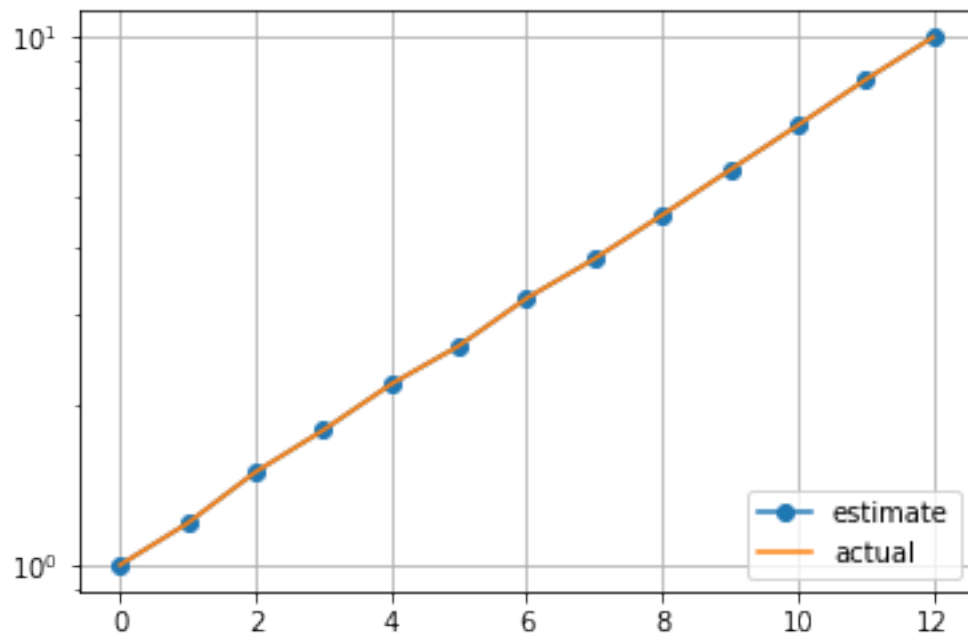
```
1.00
1.58
2.51
3.98
6.31
10.00
```

```
In [5]: #round to 2 digits
te = around(10.0 * t) / 10.0 # "array round" from numpy library

#
for i in te: print('%2.1f' % i)
semilogy(te, 'o-', label='estimate')
semilogy(t, '-', label='actual')
legend(loc='lower right'); grid(True)
```

```
1.0
1.2
1.5
1.8
2.2
2.6
3.2
3.8
4.6
```

5.6
6.8
8.3
10.0



The E12 series is a common set of values for resistors and capacitors.
 Note that some numbers are rounded slightly differently than pure log-spacing.

```
In [4]: # log-spaced numbers, 12 per decade
t = array([10**(i/12.0) for i in range(13)])
t = around(10.0 * t) / 10.0 #round to 1 decimal
# official E12 series
e12 = [1.0, 1.2, 1.5, 1.8, 2.2, 2.7, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2, 10.0]

# round each to 2 digits and print
print('log    E12')
print('----|-----')
for i, j in zip(t, e12):
    if i == j:
        flag = ''
    else:
        flag = ' ***'
    print('%4.1f  %4.1f %s' % (i, j, flag))
```

log	E12	
1.0	1.0	
1.2	1.2	
1.5	1.5	
1.8	1.8	
2.2	2.2	
2.6	2.7	***
3.2	3.3	***
3.8	3.9	***
4.6	4.7	***
5.6	5.6	
6.8	6.8	
8.3	8.2	***
10.0	10.0	

Devices with 5% tolerance are typically sold using the **E24** series of values, since the spacing is about 10% between values. This allows each value's tolerance to be $\pm 5\%$ without having overlapping nominal values.

1% values are sold using the **E96** series.

This web page very nicely illustrates the relationship between the E6, E12, E24, E48, E96, and E192 series.

[Logwell Standard EIA values](#)

The E12 series is probably the most useful series to *memorize* for an ECE.