1. Simple 1

0.5 = 000.100

$$x[5:0] \times 0.5 \;=\; x[5:0] \gg 1$$

Or

0.5 = 010.000 >> 2

010.000 = (1×2^{1})

$$x \times 0.5 \;=\; x \times 2 \,/\, 4$$

$$x[5:0] \times 0.5 \;=\; (x[5:0] << 1) >> 2$$

Ex

$$2[5:0] \times 0.5 \;=\; (2[5:0] << 1) >> 2$$ = 001.000 = 1

$$\equiv$$

(010.000 << 1) >> 2

= 100.000 >> 2

= 001.000 = 1

Simple 2

0.75 = 000.110 = $(1 \times 2^{-1}) + (1 \times 2^{-2})$

$$x[5:0] \times 0.75 = x[5:0] \gg 1 + x[5:0] \gg 2$$

Ex

$$4[5:0] \times 0.75 = (4[5:0] \gg 1) + (4[5:0] \gg 2) \;=\; 3$$

100.000 >> 1 + 100.00 >> 2 = 010.000 + 001.000

= 011.000

Simple 3_1

000.0011 = 0.1875 = $(1 \times 2^{-3}) + (1 \times 2^{-4})$

$$1.\; y[5:0] = x[5:0] \times 0.1875 = x[5:0] \gg 3 + x[5:0] \gg 4$$

$$0.9375[5:0] = \; [000.111]1 = 5[5:0] \times 0.1875 = 5[5:0] \gg 3 + 2[5:0] \gg 4$$

$$101.000 \gg 3 \;=\; 000.101$$

$$+101.000 \gg 4 \;=\; [000.010]1$$

$\{carry = 0\,,\; y[5:0]\}$ = 0[000.111]1 = 0.875

Or?

$\{carry = 0\,,\; y[5:0]\}$ = 00[001.111] = 1.75; this how I think synthesis works

Simple 3_2

000.0011 = 011.000 >> 4

011.000 = $(1 \times 2^1) + (1 \times 2^0)$

$2.\, y[5:0] = x[5:0] \times 0.1875 = \big((x[5:0] \ll 1) + (x[5:0])\big) \gg 4$

$5[5:0] \times 0.1875 = (5[5:0] \ll 1 + 5[5:0]) \gg 4$

$101.000 \ll 1 = 1[010.000]$

$+\ 101.000$

= 1[111.000] >> 4 = 1[000.011]1 = 0.375

Or?

= 1[111.000] >> 4 = [000.111]1 = 0.875; this how I think synthesis works

2. Simple 1

$2.125 \times 3.5 = 7.4375$

$ideal$: $010.001 \times 011.100 = [111.011]1$

$when\ applied$: $010.001 \times 011.100 = 00111[011.100]$

$x[5:0] \times y[5:0] \ll 3$

$= 00111[100.000]$

Or?

$= 00[111.011]100$; this how I think synthesis works.