Aritmetik İşlemlerde Oluşan Hatalar

(ÖRNEK)

$$\Delta(c) = \Delta(a \pm b) = \Delta(a) + \Delta(b)$$

$$\Delta(ab) = |a|\,\Delta(b) + |b|\,\Delta(a)$$

$$\Delta\left(\frac{a}{b}\right) = \frac{|b|\,\Delta(a) + |a|\,\Delta(b)}{|b|^2}$$

$$\Delta(a^m) = m|a|^{m-1}\,\Delta(a)$$

$$\delta(c) = \delta(a \pm b) = \frac{|a|\,\delta(a) + |b|\,\delta(b)}{|a \pm b|}$$

$$\delta(ab) = \delta(a) + \delta(b)$$

$$\delta\left(\frac{a}{b}\right) = \delta(a) + \delta(b)$$

$$\delta(a^m) = m.\delta(a)$$

ÖRNEK:

$$X = \frac{a + b^2}{\sqrt{d} - a.c}$$

$$a = 1,4 \pm 0,003$$

$$b = 2,4 \pm 0,01$$

$$c = 0,5 \pm 0,02$$

$$d = 1,6$$

$$\Delta(b^2) = 2|b|\Delta(b) = 2 \times 2,4 \times 0,01 = 0,048$$

$$\Delta(a + b^2) = \Delta(a) + \Delta(b^2) = 0,003 + 0,048 = 0,051$$

$$\Delta(\sqrt{d}) = \frac{1}{2}|d|^{-\frac{1}{2}}\Delta(d) = 0$$

$$\Delta(a.c) = |a|\Delta(c) + |c|\Delta(a)$$

$$= 1,4 \times 0,02 + 0,5.0,003$$

$$= 0,028 + 0,0015 = 0,0295$$

$$\Delta(\sqrt{d} - ac) = \Delta(\sqrt{d}) + \Delta(a.c) = 0 + 0,0295 = 0,0295$$

$$\Delta X = \frac{(pay)\times\Delta(payda)+(payda)\Delta(pay)}{|payda|^2}$$

$$= \frac{(a+b^2)\Delta(\sqrt{d}-ac)+(\sqrt{d}-ac)\Delta(a+b^2)}{|\sqrt{d}-ac|^2}$$

$$\Delta X = \frac{(1,4+2,4^2)\times 0,0295+(\sqrt{1,6}-1,4\times 0,5)\times 0,051}{|\sqrt{1,6}-1,4\times 0,5|^2}$$

$$\Delta X = \frac{(1,4+5,76)\times 0,0295+(1,2649-0,7)\times 0,051}{|1,2649-0.7|^2}$$

$$\Delta X = \frac{7.16\times 0,0295+0.5649\times 0,051}{0.5649^2}$$

$$\Delta X = \frac{0,2112+0,0288}{0,3191} = \frac{0.24}{0,3191} = 0.7521$$

$$\Delta x = 0,7521$$

$$X = \frac{1,4 + 2,4^2}{\sqrt{1,6} - 1,4 \times 0,5} = \frac{1,4 + 5,76}{1,2649 - 0,7} = 12,6748$$

$$X == 12,6748 \pm 0,7521$$

$$\delta(a)=\frac{0,003}{1,4}=0,0021,$$

$$\delta(b)=\frac{0,01}{2,4}=0,0041,$$

$$\delta(c)=\frac{0,02}{0,5}=0,04,$$

$$\delta(d)=0$$

$$X=\frac{a+b^2}{\sqrt{d}-a.c}$$

$$\delta(b^2)=2.0,0041=0,0082$$

$$\delta(a+b^2)=\frac{|a|\delta(a)+|b|^2\delta(b^2)}{|a+b^2|}$$

$$=\frac{1,4\times0,0021+5,76\times0,0082}{|1,4+5,76|}$$

$$=\frac{0,00294+0,0472}{7.16}=0,007$$

$$\delta(a)=\frac{0,003}{1,4}=0,0021\ ,$$

$$\delta(b)=\frac{0,01}{2,4}=0,0041,$$

$$\delta(c)=\frac{0,02}{0,5}=0,04,$$

$$\delta(d)=0$$

$$X=\frac{a+b^2}{\sqrt{d}-a.c}$$

$$\delta(\sqrt{d})=\delta(d^{\frac{1}{2}})=\frac{1}{2}\delta(a)\ \ \frac{1}{2}.0=0$$

$$\delta(a\times c)=\delta(a)+\delta(c)=0,0021+0,04=0,0421$$

$$\delta(\sqrt{d}-ac)=\frac{\sqrt{d}.\delta(\sqrt{d})+a.c.\delta(a.c)}{\sqrt{d}-ac}=\frac{\sqrt{1,6}.0+1,4\times 0,5\times 0,0421}{\sqrt{1,6}-1,4\times 0,5}$$

$$=\frac{0+0,02947}{0,56491}=0,0522$$

$$\delta(\sqrt{d}-ac)=0,0522$$

$$\delta(a) = \frac{0,003}{1,4} = 0,0021,$$

$$\delta(b) = \frac{0,01}{2,4} = 0,0041,$$

$$\delta(c) = \frac{0,02}{0,5} = 0,04,$$

$$\delta(d) = 0$$

$$X = \frac{a + b^2}{\sqrt{d} - a.c}$$

$$\delta(X) = \delta(pay) + \delta(payda)$$
$$= 0,007 + 0,0522 = 0,0592$$

$$X == 12,6748 \pm 0,7521$$

$$\delta(X) = \frac{0,7519}{12,6748} = 0,0593$$