

1. Evaluate each of the following expressions using 5-digit finite precision arithmetic, of the form $0.d_1d_2d_3d_4d_5 \times 10^n$ as well as the corresponding "exact" value.

a. $a = \frac{1}{5} \oplus \frac{5}{7}$ and $A = \frac{1}{5} + \frac{5}{7}$

$$A = \frac{1}{5} + \frac{5}{7} = \frac{7}{35} + \frac{25}{35} = \frac{32}{35} = 0.9142857143$$

$$a = 0.20000 + 0.71428 = 0.91428 \quad \text{chopped}$$

$$0.91429 \quad \text{rounded}$$

b. $b = \frac{1}{5} \ominus \frac{5}{7}$ and $B = \frac{1}{5} - \frac{5}{7}$

$$B = \frac{1}{5} - \frac{5}{7} = \frac{7}{35} - \frac{25}{35} = -\frac{18}{35} = -0.5142857143$$

$$b = 0.20000 - 0.71428 = -0.51428 \quad \text{chopped}$$

$$-0.51429 \quad \text{rounded}$$

c. $c = \frac{1}{5} \otimes \frac{5}{7}$ and $C = \frac{1}{5} \times \frac{5}{7}$

$$C = \frac{1}{5} \times \frac{5}{7} = \frac{1}{7} = 0.1428571429$$

$$c = 0.20000 \times 0.71428 = 0.14285 \quad \text{chopped}$$

$$0.20000 \times 0.71429 = 0.14286 \quad \text{rounded}$$

d. $d = \frac{1}{5} \oslash \frac{5}{7}$ and $D = \frac{1}{5} \div \frac{5}{7}$

$$D = \frac{1}{\frac{5}{7}} = \frac{7.1}{5.5} = \frac{7}{2.5} = 0.28000$$

$$d = \frac{0.20000}{0.71428} = 0.28000 \quad \text{chopped}$$

$$\frac{0.20000}{0.71429} = 0.28000 \quad \text{rounded}$$

e. Compute the relative and absolute errors of a with A , b with B , c with C and d with D , respectively.

	rel error	abs error
a, A	0.57142×10^{-5}	0.62500×10^{-5}
b, B	0.57142×10^{-5}	0.11111×10^{-4}
c, C	0.71428×10^{-5}	0.50000×10^{-4}
d, D	0	0