

Thus $x \ominus y$ has at most $k-p$ significant digits. The remaining p digits (so that we have k -digit number) are assigned usually as zeroes. Any further calculations have at most $k-p$ significant digits.

6) Approximating roots of a quadratic equation.

The quadratic equation $ax^2 + bx + c = 0$ has 2 roots given by

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

If $4ac$ is very small (compared to b^2) then the result of the square root is a number approximately equal to b .

Thus, we have to subtract b and a number approximately equal to b .

Ex: Use 4-digit rounding arithmetic to find the roots of the quadratic equation

$$x^2 - \frac{369}{4}x + \frac{1}{2} = 0$$

regular

$$x_{1,2} = \frac{\frac{369}{4} \pm \sqrt{\left(\frac{369}{4}\right)^2 - 4 \cdot \frac{1}{2}}}{2} = \frac{92.25 \pm \sqrt{8508.0625}}{2}$$

$$x_1 = 0.0054203727 \quad x_2 = 92.24457963$$