

Math Misconceptions

Even math textbooks occasionally have mistakes. We will address two of them here.

Rounding off:

Myth: If the digit controlling the rounding is less than 5, the number will “round down,” and if the number is 5 *or more*, the number will round up.

Fact: **Less** than five rounds down, **more** than five rounds up, but if the number is **exactly** 5, with no following digits, it will round up half the time and down half the time. It should round so as to leave the digit in the rounded position as an even number.

If you have a column of numbers, and you round each number to achieve an estimate, the estimate total should be very close to the actual total. Observe the two examples below.

1.) Actual numbers	Estimate	2.) Actual numbers	(Myth) Estimate	(Fact) Estimate
28	30	25	30	20
73	70	55	60	60
91	90	45	50	40
32	30	75	80	80
46	50	15	20	20
<u>+59</u>	<u>+60</u>	<u>+65</u>	<u>+70</u>	<u>+60</u>
329	330	280	310	280

Notice that in the second example, the traditionally taught method (Myth) builds in an error with each rounding. (Confession time – We balanced the column of fives so they had the same number rounding up as rounding down. The traditional method will always produce an error, but probably not as dramatic as our example.) In the “real world,” this error is almost inconsequential, but in a statistics setting, it can cause dramatic errors.

Square Root:

Myth: Some books (and teachers) erroneously state that the radical sign means you should list both square roots of a positive number.

Fact: The radical sign ($\sqrt{\quad}$) should be translated as “the **Principal** square root of.” This means the positive value.

Every positive number, x , has two square roots – a positive value represented by \sqrt{x} , and a negative value represented by $-\sqrt{x}$. Some books state that $\sqrt{4}$ equals ± 2 , when actually $\sqrt{4}$ equals 2 and $-\sqrt{4}$ equals -2. If you want to get ± 2 , you must ask for $\pm\sqrt{4}$. The quadratic formula has two answers. In every correct listing of the quadratic formula, you will find a \pm sign in front of the radical.

Some of our adult education materials contain this error. In Contemporary’s Number Power Series, Book 3, “Algebra,” we find on page 32 the statements, “ $\sqrt{64} = \pm 8$ ” and “ $\sqrt{36} = \pm 6$.” This error continues on examples contained on the following pages.

Just keep this in mind:

$$\sqrt{25} = 5$$

$$-\sqrt{25} = -5$$

and

$$\pm\sqrt{25} = \pm 5$$

In the “real world,” negative square roots are almost never used. If you want them, you must request them ($-\sqrt{x}$ or $\pm\sqrt{x}$).

In an equation such as $x^2 = 25$, however, the exponent indicates you will find two answers, so you must indicate this in the next step as $x = \pm\sqrt{25}$. Thus, the answers are $x = 5$ and $x = -5$.