

Addition Concept Connection: WE ALWAYS ADD (AND SUBTRACT) LIKE KINDS

Issue	Use of Connection
Whole numbers	We don't add pigs to horses until we give them a larger name: <u>livestock</u> .
Common fractions	Common denominators give denominators a larger name (usually).
Decimal fractions	We line up the decimal points (NOT the right-hand edge) to add like kinds.
Algebra terms	We only add like terms. $x + x + 3x = 5x$; $2y^3 + 5y + 6y^3 = 8y^3 + 5y$, and these are unlike terms

Comparing Common Fractions and Comparing Decimal Fractions

We can use the same general strategy for comparing two or three (or more) common fractions or decimal fractions. That strategy is

1. Set the fractions up as if to add.
2. Get a common denominator.

The idea of a common denominator is not normally in our thinking when we set up decimal fractions to add. In this case we attach zeroes to the ends of decimal fractions that don't have as many digits to the right of the decimal point as the others. We haven't changed the size of the decimal fractions, and if we hurry no one will catch us violating rules about rounding and significant digits.

	.1854		.1854
SO	.2	BECOMES	.2000
	.186		.1860

Now there are common denominators (just read them to confirm), and comparison is easy. The *original* numbers must be written as the answers, not the forms with extra zeroes, in the required order of size.

We Always Add Like Kinds.

1. Whole number addition

Action: We add ones together, tens together, hundreds together, and so on. When adding ones together produces new tens, they are added with the tens.

Manifestation: We line up whole numbers right-justified to add, keeping columns neat.

2. Arithmetic word problems

Action: We add pigs to pigs and cows to cows.

Manifestation: We can add pigs to cows when they have a common name (animals).

3. Common fraction addition

Action: We add fractions that have like denominators.

Manifestation: Fractions with unlike denominators are given common denominators before addition is attempted.

4. Multiplication genesis

Action: We combine groups of equal size: $7 + 7 + 7 = 3 \bullet 7$

Manifestation: $7 + 7 + 7 + 5 + 5 = 3 \bullet 7 + 2 \bullet 5$

5. Decimal fraction addition

Action: We add tenths together, hundredths together, etc.

Manifestation: Lining up decimal fractions with decimal points in a row, keeping columns neat.

6. Radicals

Action: We can add $\sqrt{2} + \sqrt{2} + \sqrt{2} = 3\sqrt{2}$

Manifestation: $2\sqrt{3} + 4\sqrt{5} + 3\sqrt{5} + 8\sqrt{3} = 10\sqrt{3} + 7\sqrt{5}$

7. Similar terms

Action: We add $x^2 + x^2 + x^2 = 3x^2$

Manifestation:
$$\left\{ \begin{array}{l} x^2 + x^2 + x^2 + x + x + x + x + x^3 + x^3 \\ \hspace{15em} = 3x^2 + 4x + 2x^3 \end{array} \right.$$