

Attributes Determination and Item Construction: A Hands-on Exercise

Presented by

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Attributes for Mixed-Number Fraction Subtraction

- I. Performing basic fraction subtraction operation
- II. Simplifying/Reducing
- III. Separating whole number from fraction
- IV. Borrowing one from whole number to fraction
- V. Converting whole number to fraction

Constraints of the Problems

- (1) Minuend is always greater than the subtrahend.
- (2) When both minuend and subtrahend have fractional parts, they have a common denominator.
- (3) The difference between fractional parts is proper.

Defining the Attributes

- I. Performing basic fraction subtraction operation
 - when subtraction is permissible (i.e., fractional component of the minuend is greater than or equal to that of the subtrahend), taking the difference between the numerators
- II. Simplifying/Reducing
 - expressing the final answer in simplest terms, or dropping the fractional component when the numerator is zero, or dropping the “zero” in the whole number part

III. Separating whole number from fraction

– performing subtraction on the whole number parts of the mixed numbers (Note: the subtrahend can be a whole number)

IV. Borrowing one from whole number to fraction

– when the fractional part of the minuend is less than that of the subtrahend, the whole number part of the minuend is reduced by one, and the numerator of its fractional part is increased by adding the denominator

V. Converting whole number to fraction

– when the minuend is a whole number, rewriting the number such that the whole number part is reduced by one, and the fractional component is expressed with the denominator of the subtrahend in both the numerator and the denominator of the minuend

Examples

1) $\frac{5}{6} - \frac{1}{6}$

Step	Attribute Required
$= \frac{4}{6}$	I. Performing basic fraction subtraction operation
$= \frac{2}{3}$	II. Simplifying/Reducing

$$2) \quad 4 \frac{4}{12} - 2 \frac{7}{12}$$

Step	Attribute Required
$= 3 \frac{16}{12} - 2 \frac{7}{12}$	IV. Borrowing one from whole number to fraction
$= 1 \frac{9}{12}$	I. Performing basic fraction subtraction operation
$= 1 \frac{3}{4}$	III. Separating whole number from fraction
	II. Simplifying/Reducing

$$3) 3 - 1\frac{4}{3}$$

Step

Attribute Required

$$= 2\frac{3}{3} - 1\frac{4}{3}$$

V. Converting whole number

$$= 1\frac{6}{3} - 1\frac{4}{3}$$

IV. Borrowing one from
whole number to fraction

$$= 0\frac{2}{3}$$

I. Performing basic fraction
subtraction operation

III. Separating whole number
from fraction

$$= \frac{2}{3}$$

II. Simplifying/Reducing

Exercises

Part I. Determine which attributes are required

for the following items.

1) $\frac{6}{7} - \frac{4}{7}$

2) $4\frac{5}{7} - 1\frac{4}{7}$

3) $4\frac{1}{3} - 1\frac{4}{3}$

Part II. Construct items that require the following set of attributes.

- 1) I and II
- 2) I, III and V
- 3) I, II, IV and V

Part III. Choose three sets of attributes and construct the corresponding items.

Part IV. In groups of two, determine the attributes required for the items constructed by your partner in Part III. Verify that the original attribute sets can be correctly recovered.