

## Fraction Subtraction (FS) data

### Description:

Fraction Subtraction data (Tatsuoka, 1990, 2002) consists of responses of 536 examinees to items measuring fraction subtraction skills. Below are the items and skills measured.

Item no.	Item	Skills	Item no.	Item	Skills
1	$5/3 - 3/4$	$\alpha_4, \alpha_6, \alpha_7$	11	$4 \frac{1}{3} - 2 \frac{4}{3}$	$\alpha_2, \alpha_5, \alpha_7$
2	$3/4 - 3/8$	$\alpha_4, \alpha_7$	12	$1 \frac{1}{8} - 1/8$	$\alpha_7, \alpha_8$
3	$5/6 - 1/9$	$\alpha_4, \alpha_7$	13	$3 \frac{3}{8} - 2 \frac{5}{6}$	$\alpha_2, \alpha_4, \alpha_5, \alpha_7$
4	$3 \frac{1}{2} - 2 \frac{3}{2}$	$\alpha_2, \alpha_3, \alpha_5, \alpha_7$	14	$3 \frac{4}{5} - 3 \frac{2}{5}$	$\alpha_2, \alpha_7$
5	$4 \frac{3}{5} - 3 \frac{4}{10}$	$\alpha_2, \alpha_4, \alpha_7, \alpha_8$	15	$2 - 1/3$	$\alpha_1, \alpha_7$
6	$6/7 - 4/7$	$\alpha_7$	16	$4 \frac{5}{7} - 1 \frac{4}{7}$	$\alpha_2, \alpha_7$
7	$3 - 2 \frac{1}{5}$	$\alpha_1, \alpha_2, \alpha_7$	17	$7 \frac{3}{5} - 4/5$	$\alpha_2, \alpha_5, \alpha_7$
8	$2/3 - 2/3$	$\alpha_7$	18	$4 \frac{1}{10} - 2 \frac{8}{10}$	$\alpha_2, \alpha_5, \alpha_6, \alpha_7$
9	$3 \frac{7}{8} - 2$	$\alpha_2$	19	$4 - 1 \frac{4}{3}$	$\alpha_1, \alpha_2, \alpha_3, \alpha_5, \alpha_7$
10	$4 \frac{4}{12} - 2 \frac{7}{12}$	$\alpha_2, \alpha_5, \alpha_7, \alpha_8$	20	$4 \frac{1}{3} - 1 \frac{5}{3}$	$\alpha_2, \alpha_3, \alpha_5, \alpha_7$

Note:  $\alpha_1$  = convert a whole number to a fraction;  $\alpha_2$  = separate a whole number from a fraction;  $\alpha_3$  = simplify before subtracting;  $\alpha_4$  = find a common denominator;  $\alpha_5$  = borrow from whole number part;  $\alpha_6$  = column borrow to subtract the second numerator from the first;  $\alpha_7$  = subtract numerators; and  $\alpha_8$  = reduce answers to simplest form.

### Format:

Binary responses of 536 examinees to 20 (or 10) items.

1 – correct response

0 – incorrect response

### References

Tatsuoka, K. K. (1990). Toward an integration of item-response theory and cognitive error diagnosis. In N. Frederiksen, R. Glaser, A. Lesgold, & M. Shafto (Eds.), *Diagnostic monitoring of skill and knowledge acquisition* (pp. 453-488). Hillsdale, NJ: Erlbaum.

Tatsuoka, C. (2002). Data analytic methods for latent partially ordered classification models. *Journal of the Royal Statistical Society, Series C, Applied Statistics*, 51, 337-350.