STUDENTS' SOLUTIONS TO SIMILARLY STRUCTURED INEQUALITIES

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This paper describes a study, examining the reactions of 164 Israeli and 167 Italian high school students to similarly structured tasks that asked whether the solutions of pairs of rational and linear inequalities are identical (i.e., the same set of solutions) and why. The pairs of inequalities in the tasks included the following:

Task 1 (a) $x + 10 > 0$ (b) $\frac{(x+10)(x-1)}{(x-1)} > 0$

The solutions: (a) {x | x> (-10)}; (b) {x | (-10)<x<1 or x>1}

Task 2 (c) $x - 20 > 0$ (d) $\frac{(x-20)(x+5)}{(x+5)} > 0$

Inequalities (c) and (d) have the same solution {x |x>20}

Research findings indicate that when solving rational inequalities, students tend to reduce rational expressions while ignoring restrictions imposed by their domain of definition, and they frequently tend to multiply both sides of the inequality by a negative number or by a not-necessarily-positive expression without considering the direction of the inequality sign (e.g. Tsamir & Almog, 2001; Tsamir & Bazzini, 2002). We took these data into account when designing tasks 1 and 2.

Our findings indicate that about 70% of the students correctly judged the equivalency of the given pair of inequalities in each of the tasks, and a substantial number of them volunteered explanations that addressed the role of the domain of definition. However, the design of the tasks, being similar in appearance yet in one case, the domain of definition dictating the final solution, and in the other case not, allowed us to identify students' tendency to regard the two cases as similar. About a quarter of the participants consistently gave "same solution" responses in both cases, usually ignoring the impact of the domain in Task 1, while another quarter of the participants consistently gave "different solutions" responses in both cases, usually over-generalizing the impact of the domain from Task 1 to Task 2. Some educational implications will be suggested in the oral presentation.

References

Tsamir, P., & Almog, N. (2001). Students' Strategies and difficulties: The case of algebraic inequalities. *International Journal of Mathematical Education in Science and Technology.* 32(4), 513-524.

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