

OGAP PROPORTIONALITY FRAMEWORK (11/2008)

Structures of Problem

Mathematical Topics and Context

Ratios
Rates (Density)
Rates ($D=RT$)
Rates (Buy/Consume)
Similarity
Scale
Probability
Percents
Linear equations
Linear patterns and relationships
Slope
Frequency distributions

Problem Types

Ratio
Rate
Comparison
Missing value
Scale factor
Qualitative
Non-proportional

Multiplicative Relationships

Both integral
Both non-integral
Some non-integral

Numbers

All integers
All non-integers
Both integer and non-integer

Internal structure

Parallel structure
Non-parallel structure

Ratio Relationships

Part: Whole
Part: Part

Ratio Referents

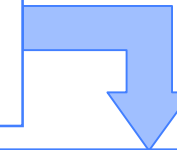
Implied
Explicit

Representations

Graph
Table
Model

Students move back and forth between proportional strategies, and non-proportional reasoning, depending upon the structure of the problem, the context in which the problem is situated, and the strength of their proportional reasoning.

(Cramer, Post & Currier, 1993; Karplus, Pulos & Stage, 1983; VMP OGAP Pilots, 2006 & 2007)



Evidence of Student Work

Proportional Strategies

- Finds and applies unit rate
- Compares simplified fractions, rates, or ratios
- Applies multiplicative relationship
- Sets up proportions and uses cross-products
- Uses $y=kx$ (either symbolic or graphic representations)
- Applies the correct ratio referent in ratio problem

Transitional Proportional Strategies

- Builds up/down
- Uses models
- Makes an error when applying a proportional strategy
 - equivalent fractions or ratios
 - cross-product
 - multiplicative relationship

Non-proportional Reasoning

- Guesses or uses random operations
- Uses additive reasoning
- Uses whole-number reasoning
- Solves non-proportional situations proportionally
- Misinterprets vocabulary and related concept

Underlying Issues, Errors, Misconceptions

- Errors in the applications of cross-product
- Uses additive strategy in solution
- Misinterprets meaning of quantities
- Remainders are not treated correctly
- Units inconsistent or absent
- Errors in equation
- Computational error
- Rounding error
- Uses incorrect ratio referent