

6th Grade Equivalent Ratio and Proportional Relationships Explorations

Models- **tape diagram** (good when quantities have the same units)

table (vertical or horizontal “ratio” table)

double number line (good when quantities have different units or same)

graph on coordinate axes

DO

- present ratios in rows and columns initially; it helps students connect to prior knowledge of the multiplication table
- use whole numbers in ratios A:B at all or until students are competent (rational # ratios occur in 7th grade)
- promote student thinking and dialogue with ratios in context (top of RP p. 6)
- involve measurement conversions w/ ratios (12 in to 1 ft)
- graph ratio tables on coordinate axes
- emphasize vocabulary “for each” “for every” “per” (two bananas for every 3 apples)
- explore proportional relationships (not *proportions*)
- start by iterating (repeated addition) then move to **scalar (multiplication)...** **multiplication and division roles are a big understanding for 6th grade**
- let kids explore, provide multiple opportunities and contexts, encourage different strategies for solving a ratio problem as this is a conceptual understanding year

DON'T

- use *proportions* (equation showing two ratios) and cross multiplying to solve
- get stuck on or over-emphasize part to whole thinking as it breaks down with slope and similarity, or even in some examples depending on context
- treat ratio as a fraction ($A:B \neq A/B$, some additive properties are also not the same)
- force the unit rate as an efficiency (let kids discover unit rate through multiple exposures and effective questioning)

7th Grade Rational Number Ratios, Proportions, Unit Rate & Slope

Models- **table** (vertical or horizontal “ratio” table)

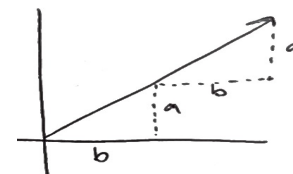
graph on coordinate axes (including linear not through the origin as not directly proportional)

tape diagram (tapping into prior knowledge)

double number line (tapping into prior knowledge)

DO

- have students identify unit rates
- use unit rates in computations
- use rational number ratios (1½ cup of flour for every ⅓ stick of butter)
- work with equations in two variables (two apples for every banana → $a=2b$)
- solve multi-step ratio and percent problems such as percent increase (RP p. 10)
- have students determine IF a relationship IS proportional (RP p. 8)
- introduce proportions ($a/b=c/d$) *if using cross multiplication, students need to be able to explain why this works*
- connect $y=(a/b)x$ to a “unit rate triangle” or “slope triangle” on coordinate axes



- connect to geometry- scale drawings and scale factors (RP p. 11)
- connect to statistics- inferences about a population based on a random sample (RP p. 11)
- $\frac{3}{2}$ miles for every hour

DON'T

- $\frac{3 \text{ miles}}{2 \text{ hour}}$

8th Grade *Bridging to Linear Functions*

Ratio and Proportions to Linear Functions Crib Sheet from the CCSS Progression Documents

Models- **table** (vertical or horizontal “ratio” table)
graph on coordinate axes (including linear not through the origin as not directly proportional)

DO:

- explore functions algebraically, graphically, numerically in tables, and verbally with students explaining the correspondence
- promote students to “develop flexibility in interpreting and translation among representations, students compare two functions represented in different ways” (HSF p.8)

$$y = (m)x + b$$

↑
constant rate of change (from previous 6-7 ratio understanding)

← new what does “b” mean in context?

- explore the meaning of functions through non-examples (if we graphed your distance from home vs. time of day, and the result wasn’t a function, what would that mean? why is this problematic?)*not from Progression Doc
- connect slope to slope triangles from 7th (HSF p.5, RP p. 9)
- connect slope to 6th and 7th understanding of ratio
- connect define slope as rate of change
- have students find slope from graph (discovery)
- connect to geometry- similarity (as a scale factor from 7th grade), dilation as similarity
- connect to geometry- Pythagorean Thm –similar right triangles as slope triangles
- connect to statistics-bivariate data population sampling

DON’T

- start with defining slope as the “rise over the run” (not math terms, not contextualized) (HSF pp.3-4)
- introduce function notation and vertical shift “b” at the same time)* not from Progression Doc

This crib sheet is intended as a quick reference guide to outline the focus and coherence of the CCSS for the Ratio and Proportion (RP) and Function (HSF) domains in 6th-8th grade. These documents are research-based, focused learning progressions that preceded the drafting of Common Core State Standards.

The progressions not only include the learning levels, expectations, and thresholds for each grade level within a domain, they also include mathematical models that guide instruction. Thus, progression documents can be used to inform/illustrate the mathematics at the grade level one is teaching as well as provide students’ background knowledge in each domain. These documents will always say draft to remain “living documents.” The Progression Documents are free and available online.

DO- connect new learning to prior knowledge

DON’T- treat every concept as a new thing (I do, you do....)

The standards treat ratio and rate as the same (some texts and authors use “ratio” when the units of the compared items are the same and “rate” when they are different)

