

Differentiated Instruction Teaching/Learning Examples



GRADE 8 MATHEMATICS: RATIO AND PROPORTION

Two 50-minute periods

1. Think-Pair-Share Sentence Building (Cooperative Learning)*
2. Learning Contract**
3. Solving Problems Presentation
4. Exit Card—Self-Assessment (Setting Objectives and Providing Feedback)*

*Marzano's Categories of Instructional Strategies (See Resources, below)
 **Differentiated Instruction Structure

DIFFERENTIATED INSTRUCTION DETAILS

Knowledge of Students

Differentiation based on student:

- Readiness
 Interests
 Preferences:
 Styles
 Intelligences
 Other (e.g., environment, gender, culture)



Need to Know

- Student readiness—proportional reasoning

How to Find Out

Use a pre-assessment strategy, e.g.:

- Make a statement such as, "If you were as strong as an ant, you could lift a car." Ask the students to show this mathematically. Use the results to determine student readiness.
- Refer to TIPS4RM, Grade 8: Unit 8—Proportional Reasoning for instructional activities to help determine students' readiness for this concept; see the Internet Resource section, below
- Minds On: Build a Sentence activity

Differentiated Instruction Response

- Learning materials (content)
 Ways of learning (process)
 Ways of demonstrating learning (product)
 Learning environment

CURRICULUM CONNECTIONS

Overall Expectation: Number Sense and Numeration

- Solve problems involving proportional reasoning in a variety of meaningful ways

Specific Expectation:

- Identify and describe real-life situations involving two quantities that are directly proportional; solve problems involving proportions using concrete materials, drawings and variables

Learning Goals:

- Identify proportional and non-proportional situations
- Solve problems involving proportions making connections to everyday examples

ASSESSMENT AND EVALUATION

Assessment/Success Criteria

Thinking

- Reasoning and Proving[≠]: Explains that proportions involve multiplicative comparisons
- Problem Solving[≠]: Solves problems involving proportions

Communication

- Communicating[≠]: Explains proportional reasoning in a variety of contexts

Application

- Selecting Tools and Computational Strategies[≠]: Selects and uses strategies to solve problems

[≠] Mathematical Process

Assessment Tools:

- Checklist

PRIOR LEARNING

Prior to this lesson, students will have an understanding of:

- Equivalent fractions
- Connecting fractions, decimals and percents
- Ratio as a comparison of two quantities with the same units

MATERIALS AND RESOURCES

Materials:

Linking Cubes
 Computer—Geometer's Sketchpad®

Appendix A (pp. 1–3): Proportional Reasoning Learning Contract—one set per student
 Appendix B (pp. 1–5): Proportion Cards—one set per pair or group
 Appendix C: Learning Contract and Presentation Checklists—one per student
 Appendix D: Ratio and Proportion Exit Card—one per student

Internet Resource:

TIPS4RM (Targeted Implementation and Planning Supports for Revised Mathematics)—Grade 8, Unit 8, Proportional Reasoning:
www.edu.gov.on.ca/eng/studentsuccess/lms/tips4rm.html#grade8

Resources:

Ministry of Education (2005). *The Ontario Curriculum, Grades 1–8: Mathematics*.
 Schwartz, David M. (2005). *If Dogs Were Dinosaurs*. New York, NY: Scholastic Press.
 Schwartz, David M. (1999). *If You Hopped Like a Frog*. New York, NY: Scholastic Press.
 Smith, David. (2002). *If the World Were a Village: A Book About the World's People*. Toronto, Ontario: Kids Can Press.

Teaching/Learning Sequence: Grade 8 Mathematics—Ratio and Proportion

MINDS ON

- Establishing a positive learning environment
- Connecting to prior learning and/or experiences
- Setting the context for learning

Individuals/Pairs → Think-Pair-Share—Sentence Building

Students individually choose one of the following groups to make a sentence. They may add other words, numbers and symbols.

- a) 8, eat, spiders, equals
- b) 2:5, proportion, girls, class
- c) ratio, pennies, pockets, 14

Students:

- Pair with another student who has chosen the same words to build a sentence
- Share their sentences with their partner and refine as required
- Share one sentence with the class

Note the various levels of student readiness for proportional reasoning.

CONNECTIONS

L: Literacy
ML: Mathematical Literacy
AfL, AoL: Assessment for/of Learning

AfL (Pre-assessment): Sentence Building

ACTION

- Introducing new learning or extending/reinforcing prior learning
- Providing opportunities for practice and application of learning (guided → independent)

Small Groups/Pairs → Learning Contract

Students work on a Learning Contract that includes Non-Negotiable Tasks (Building Knowledge and Skills), Negotiable Tasks (Solving Problems) and Optional Tasks (Thinking About Ratio and Proportion). See the Proportional Reasoning Learning Contract (Appendix A) and Proportion Cards (Appendix B).



Note: For more ideas and cross-curricular connections see TIPS4RM: Grade 8, Unit 8: Proportional Reasoning; see the Internet Resource section on the reverse of this folder.

Partner or group students for this task based on pre-assessment of readiness.

Support students at early stages of readiness by helping them select appropriate Negotiable Tasks and by explaining the proportional reasoning involved.

Encourage students to explain solutions, use various ways to demonstrate understanding and to focus on problem solving rather than computations. See the Learning Contract Checklist on the Learning Contract and Presentation Checklists (Appendix C).

AfL: Mathematical Processes—Problem Solving and Selecting Tools and Computational Strategies/Learning Contract Checklist

CONSOLIDATION AND CONNECTION

- Helping students demonstrate what they have learned
- Providing opportunities for consolidation and reflection

Small Groups → Solving Problems Presentation

Students, in small groups, present their Solving Problems solutions from the Negotiable Tasks and explain the proportional reasoning involved.

Observe students' presentations, noting how they present their arguments and explain their solutions using mathematical language (e.g., ratios, proportion, percentage, scale). See the Presentation Checklist on the Learning Contract and Presentation Checklists (Appendix C).

Students participate in a Gallery Walk to view the assignments completed by those who chose an Optional Task.

Individuals → Exit Card/Rating Scale

Students complete a Ratio and Proportion Exit Card (Appendix D) in order to demonstrate their learning and self-assess their understanding of the learning goal. Look for reasoning involving part-to-part and part-to-whole comparisons. Use this information to determine next instructional steps.

Note: The solution to Question 2 on the Ratio and Proportion Exit Card is 45° , 60° , 75° .

AfL: Mathematical Processes—Communicating, Reasoning and Proving/ Presentation/ Presentation Checklist

AfL (Self): Exit Card/Rating Scale

AfL: Mathematical Processes—Selecting Tools and Computational Strategies/ Exit Card/Learning Contract Checklist