### DIFFERENTIATED INSTRUCTION DETAILS

**Knowledge of Students**

<table>
<thead>
<tr>
<th>Differentiation based on student:</th>
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<tr>
<td>□ Readiness</td>
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**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

**Assessment Tools:**

- □ Checklist

*Mathematical Process

### 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:**


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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

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

**AFF (Pre-assessment): Sentence Building**

**MINDS ON**

**Consolidation and Connection**

**ACTION**
- Introducing new learning or extending/refocusing prior learning
- Providing opportunities for practice and application of learning (guided ↔ independent)

**CONSOLIDATION AND CONNECTION**
- Helping students demonstrate what they have learned
- Providing opportunities for consolidation and reflection

**CONSOLIDATION AND CONNECTION**

**AffL (Self): Exit Card/Rating Scale**

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

**AFF: Mathematical Processes—Selecting Tools and Computational Strategies/Learning Contract Checklist**

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

**AFF (Pre-assessment): Sentence Building**

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

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

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

**Small Groups/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.

**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: Proportional Reasoning; see the Internet Resource section on the reverse of this folder.

**Small Groups/Pairs → Learning Contract**

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

**Small Groups → Solving Problems Presentation**

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
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**Small Groups/Pairs → Learning Contract**

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**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., ratio, 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.

**Small Groups → 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°.