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Leading

MATH

Success

TIPS4RM

TIPS4RM

Targeted Implementation
and Planning Supports for
Revised Mathematics

Mathematical Processes

Sample Adjusted Lessons

Grade 9 Applied



Ontario

Mathematical Process	Grade 9 Applied TIPS4RM Lesson
Reasoning and Proving	Unit 4 Day 1
Reflecting	Unit 1 Day 3
Selecting Tools and Computational Strategies	Unit 2 Day 1
Connecting	Unit 8 Day 8
Representing	Unit 7 Day 4



Math Learning Goals

- Investigate ratio as a tool for comparing quantities, both qualitative and quantitative.
- Estimate answers and devise and explain informal solutions (e.g., constant of proportionality, unit rate, equivalent ratios) in a variety of contexts (e.g., numerical, geometric, measurement, probability).

Materials

- 2 computers with GSP®4
- 60 colour tiles of 2 colours
- BLM 4.1.1, 4.1.2

Assessment Opportunities

Minds On ...

Groups of 3 → Graffiti

Use heterogeneous groupings. Prepare chart paper for each of the following terms: *ratio*, *rate*, *unit rate*, *equivalent ratios*. Each group uses a different-coloured marker, cycles through the chart paper stations (2 minutes per chart), and writes characteristics of the term.

Whole Class → Presentation

As a class, summarize the important points for each term students need to know for the carousel activity.

[Middle Mania.gsp](#)

When assigning groups, sort them by colour. This activity establishes the class's prior knowledge.

Action!

Groups of 3 → Carousel

Prepare sufficient sets of each of the three stations. Students use a pencil and calculator and record their findings on BLM 4.1.1.

Using the same groups as in the **Minds On** section, students rotate through the three stations. Direct the groups to move to the next station after 15 minutes.

Learning Skills (Teamwork)/Observation/Checklist: Observe and record students' collaboration skills.

Use different colours to distinguish each station set (one of each type). A group of students will complete one colour set of stations.

Use two sets of cards (BLM 4.1.2) and the GSP®4 file Midpoint Segments for station setup.

Consolidate Debrief

Whole Class → Summarizing

Lead a class discussion using guiding questions (BLM 4.1.1). Using information from the discussion, define *ratio*, *rate*, and *unit rate*, using examples from the activity.

The student notes should connect the prior knowledge from the graffiti with the knowledge from the carousel.

Home Activity or Further Classroom Consolidation

Find examples of ratio, rate, and unit rate in your environment to post on the bulletin board.

The bulletin board becomes a class portfolio showing that proportions are pervasive. Collect further examples in other lessons in the unit.

*Application
Concept Practice*



Mathematical Process Goals

- Reason and prove within the context of an investigation.
- Communicate hypothesis and reasoning.

Materials

- BLM 4.1.1(A)
- calculators
- 3 sets of BLM 4.1.2
 - picture only cards
 - picture and mass cards
 - picture, mass, daily food intake cards

Assessment Opportunities

Minds On... Groups of 3 → Graffiti

Prepare additional charts for the following terms: *fraction*, *decimal*, and *percent*.

Whole Class → Presentation

As a class, summarize the important points for each term students need to know for the Who Eats More? activity.

Action!

Think/Pair/Share → Making Connections

Each student arranges a set of animal picture cards (TIPS4RM BLM 4.1.2 pictures only) in order of who eats more. Pairs of students share and compare their order, and explain the reasoning behind their choice.

Distribute cards with pictures and mass for each animal (TIPS4RM BLM 4.1.2). Given the new information, pairs re-arrange the cards in order of who eats more (if necessary).

Review the term ‘conjecture.’ Ask if this new information confirms their original conjecture of who eats more?

Distribute cards with pictures, mass, and daily food intake for each animal. Pairs work with another pair to hypothesize the order of who eats more using BLM 4.1.1(A) and explain any changes in their ordering.

Facilitate sharing of hypotheses/conjectures and the reasoning behind them. Accept all suggestions and help students decide what evidence they need to confirm or refute their hypotheses. Lead students to:

- explore the concept of using a ratio to determine who eats more, using examples that are accessible, e.g. how much does the bat eat relative to its weight?
- use decimals and percent as other ways to represent ratios, and use these as necessary to determine who eats more?

Review the meaning of ‘counter-example.’

Students compare the arrangements created using three sets of cards. They select the arrangement that best illustrates who eats more, and prepare to justify their choice.

Mathematical Process/Reasoning and Proving/Checklist: Observe students as they explain their logic and reasoning.

Mathematical Process Focus: Reasoning and Proving

See TIPS4RM, Mathematical Processes, pp. 3–4.

Possible guiding prompts:

- How can we verify this conjecture?
- Explain the reasoning behind your prediction.
- Why does this work?
- Explain your thinking.
- Give an example of when this statement is false.

Listen to what students say and look at what they write to identify misunderstandings, and misconceptions. Differentiate instruction accordingly.

Word Wall:

- conjecture
- counter-example

Consolidate Debrief Whole Class → Summarizing

Ask selected groups to present their answers for Task 5 on BLM 4.1.1(A).

Emphasize:

- using ratios to compare
- strategies for comparing, using various forms (decimal, percent, and ratio)
- process of investigating, including the different ways to interpret given data and how to interpret and answer the question “Who eats more?”

Home Activity or Further Classroom Consolidation

Select three animals of your choice. Hypothesize where the animals should be placed in the sequence of who eats more relative to their weight. Search for the data to confirm or deny your hypothesis.

Application Concept Practice



Mathematical Process Goals

- Investigate using ratios as a tool for comparing quantities, both qualitative and quantitative.
- Select tools and computational strategies to estimate answers, e.g., constant of proportionality, unit rate, equivalent ratios.
- Select strategies for solving problems.
- Communicate solutions.

Materials

- BLM TIPS4RM 4.1.1 (Stations 2 and 3)
- GSP[®]4
- 60 colour tiles of 2 colours
- bags

Assessment Opportunities

Minds On... Whole Class → Discussion

Ask students to provide an example from the previous day’s work that was a ratio, a rate, and a unit rate. Clarify any misconceptions.

Mathematical Process Focus: Reasoning and Proving

See TIPS4RM, Mathematical Processes, pp. 3–4.

[Middle Mania.gsp](#)

Use the GSP[®]4 file Midpoint Segments for station setup.

Action! Groups of 3 → Carousel

Students rotate through the two stations: What’s in the Bag? and GSP[®]4 Middle Mania. They record their findings on BLM 4.1.1.

Consolidate Debrief Whole Class → Summarizing

Lead a class discussion using guiding questions on BLM 4.1.1.

Groups of 3 → Mind Map

Students create a mind map that uses “Comparing Quantities” as a central idea. Branches should include ratio and rate.





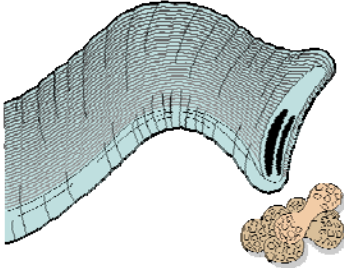

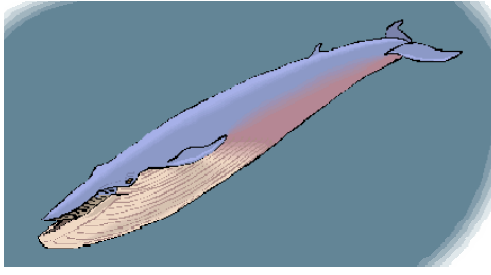

Home Activity or Further Classroom Consolidation

Find examples of ratio, rate, and unit rate in your environment to post on the bulletin board.

The bulletin board becomes a class portfolio showing that proportions are pervasive. Collect further examples in other lessons in the unit.

Application

BLM 4.1.1(A): Who Eats More?

<p>Vampire Bat</p>  <p>Daily Food Intake: 28 g Weight: 28 g</p>	<p>Queen Bee</p>  <p>Daily Food Intake: 9 g Weight: 0.113 g</p>
<p>Tiger</p>  <p>Daily Food Intake: 6.4 kg Weight: 227 kg</p>	<p>Hamster</p>  <p>Daily Food Intake: 11 g Weight: 100 g</p>
<p>Elephant</p>  <p>Daily Food Intake: 180 kg Weight: 4100 kg</p>	<p>Hummingbird</p>  <p>Daily Food Intake: 2 g Weight: 3.1 g</p>
<p>Blue Whale</p>  <p>Daily Food Intake: 4.5 tons Weight: 118 tons</p>	<p>Giant Panda</p>  <p>Daily Food Intake: 15 kg Weight: 125 kg</p>

Adapted from: NCTM "World's Largest Math Event 2000."

BLM 4.1.1(A): Who Eats More? (continued)

Task 1

Individually

Using the cards in Envelope 1:

- a) Arrange them in order of which animal you believe eats more, from most to least.

Most

Least

In Pairs

- b) Explain the reason why you placed the animals in this order.

Task 2

Pairs

Using the cards in Envelope 2:

- a) Arrange them in order of which animal you believe eats more, from most to least.

Most

Least

- b) Explain your reasons for this arrangement if it was different from the arrangement in [Task 1](#).

BLM 4.1.1(A): Who Eats More? (continued)

Task 3

Pairs

Using the cards in Envelope 3:

- a) Arrange them in order of which animal you believe eats more, from most to least.

Most

Least

- b) Explain your reasons for this arrangement if it was different from the arrangement in [Task 2](#).

Task 4

Groups of 4

- a) Explain the reasoning used in [Task 3](#).

Using the cards from Envelope 3:

- b) Arrange them in a different order of which animal you believe eats more, by using the data in another way.

Most

Least

- c) Explain your reasons for this arrangement.

BLM 4.1.1(A): Who Eats More? (continued)

Task 5

Pairs

- a) Compare the arrangements created in [Task 3](#) and [Task 4](#). Select the arrangement that you believe best illustrates who eats more.

Task 3

Most

Least

Task 4

Most

Least

Justify your choice.

Task 6

Individually

- a) Pick three other animals.
- b) Predict their placement relative to the arrangement selected in [Task 5](#).

Most

Least

- c) Explain how you determined their placement.
- d) Gather evidence to prove or disprove your prediction.



75 min

Math Learning Goals

- Activate students’ prior knowledge of terminology related to identifying geometry shapes.
- Determine students’ readiness to identify geometric figures in composition, and use appropriate calculations for perimeter and area.

Materials

- BLM 1.3.1, 1.3.2, 1.3.3
- placemat
- overhead projector

Assessment Opportunities

Minds On ...

Whole Class → Orientation

Outline the procedure for the day, including the purposes of each component of the lesson. [**Minds On** – activate prior knowledge of shapes, **Action** – review their measurement skills, and **Consolidate** – demonstrate these skills in an activity]. Explain that assessment allows you to plan upcoming lessons according to their current levels of understanding and that the results do not influence their grade in the course.

Small Groups → Pass the Paper

Each group lists the geometric figures in the diagram (BLM 1.3.1). Circulate and provide direction and guidance, as necessary.

Students pass one piece of paper around the group, writing a response each time they receive the paper. Responses should include rectangles, squares, triangles, trapezoids, circles (semi-circles) and may include adjectives, as in ‘equilateral triangle.’

Learning Skill (Teamwork)/Observation/Mental Note: Observe students as they work. Encourage effective communication by referring to groupwork skills.

Pass the Paper is typically a timed activity, usually no more than 2 minutes.

Action!

Pairs → Scale Drawings

Students answer the questions on BLM 1.3.2. Circulate to encourage discussion and to clarify information regarding the diagrams.

Whole Class → Discussion

Using an overhead of BLM 1.3.2, lead a discussion in which students share their answers.

Consolidate Debrief

Individual → Calculate Area

Students draw line segments on the composite figure on BLM 1.3.3. Point out that they must be able to calculate the area of each shape created.

Individual and Groups → Placemat

Describe the procedure for completing a placemat activity. Students individually respond to the question on BLM 1.3.3 for 5 minutes. The members of each group share their procedures, then complete the centre portion of the placemat, providing a model solution to the question. Designate a scribe for each group. Collect the placemats for assessment.

Curriculum Expectation/Placemat/Checkbric: Circulate and observe students as they complete a solution, recording individual strengths and needs.

Whole Class → Discussion

Facilitate group sharing.

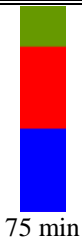
Ask students to label their “place” on the placemat for reference.

The results of individual work allows you to differentiate appropriately for further instruction.

Application Differentiated

Home Activity or Further Classroom Consolidation

Choose another example from daily life of a figure that is represented by more than one geometric shape. Include a sketch and estimate the dimensions for the figure used.



Mathematical Process Goals

- Reflect and monitor thought processes used to solve a problem.

Materials

- placemat
- overhead projector
- chart paper

Assessment Opportunities

Minds On... Whole Class → Orientation

Outline the procedure for the day, including the purposes of each component of the lesson. Explain that assessment allows you to plan upcoming lessons according to their current levels of understanding and that the results do not influence their grade.

Small Groups → Pass the Paper

Each group lists the geometric figures in the diagram (TIPS4RM BLM 1.3.1). Circulate and provide direction and guidance, as necessary.

Students pass one piece of paper around the group, writing a response each time they receive the paper. Responses should include rectangles, squares, triangles, trapezoids, circles (semi-circles) and adjectives, e.g., ‘equilateral’ triangle.

Whole Class → Discussion

Students share with the whole class and the teacher records the name of the shapes on separate chart paper.

Small Groups → Graffiti

Assign each group a shape and ask the students to brainstorm and record everything they know about that shape. Students then move to each group’s chart, in turn, and add any additional information. Post the completed charts.

Mathematical Process/Reflecting/Checklist: Circulate and observe students as they reflect on their knowledge of shapes.

Mathematical Process Focus:
Reflecting

See TIPS4RM Mathematical Processes package p. 5

Action!

Pairs/Share → Scale Drawings

Pairs monitor their thinking and discuss effectiveness of the strategies used and share thinking with another pair (TIPS4RM BLM 1.3.2).

Whole Class → Discussion

Using an overhead of TIPS4RM BLM 1.3.2, lead a discussion in which students share their answers.

Students explain and compare their strategies.

Consolidate Debrief

Individual → Calculate Area

Students draw line segments on the composite figure (TIPS4RM BLM 1.3.3). Point out that they must be able to calculate the area of each shape created.

Individual and Groups → Placemat

Describe or review the procedure for completing a placemat activity. Students individually respond to the question on TIPS4RM BLM 1.3.3 for 5 minutes. The members of each group share their procedures, and then complete the centre portion of the placemat, providing a model solution to the question.

Whole Class → Discussion

Lead a discussion in which students share their answers and the thought processes that lead them to these answers (TIPS4RM BLM 1.3.3).

Home Activity or Further Classroom Consolidation

Choose another example from daily life of a figure that is represented by more than one geometric shape. Include a sketch, estimate the dimensions for the figure used and calculate its perimeter and area.

- Possible guiding questions:
- How do you know your answer is correct?
 - How does your thinking compare to your partner’s?
 - How can you verify this answer?

Collect the placemats for assessment.

Designate a scribe for each group.

Application



Math Learning Goals

- Use an inquiry process to determine that a square is the largest rectangle that can be constructed for a given perimeter. (The examples use rectangles with side measures that are whole numbers.)

Materials

- string
- geoboards/dot paper/grid paper
- BLM 2.1.1, 2.1.2

Assessment Opportunities

Minds On ...

Whole Class → Discussion

Introduce the problem using the first page of BLM 2.1.1 The Garden Fence. Use geoboards to represent the rectangles. Demonstrate how to count the perimeter and how to verify the area.

Focus on the Explore stage of the inquiry process.

Action!

Groups of 4 → Investigation

Describe and assign roles to the group members: materials manager (get/return the required materials), chart paper recorder, presenter (for whole-class discussion), coordinator (keeps group on task). All members make their own notes and record their group’s explorations on BLM 2.1.2.

Using manipulatives, students brainstorm a strategy to find the dimensions and largest area, e.g., counting squares, using a formula, scale drawing.

Circulate and help each group, as required, as they record the largest garden and their strategy on chart paper, and prepare to present their solution.

Groups draw their best solution on chart paper and record how they solved the problem, including as many representations and strategies as possible. Post the solutions on chart paper.

Learning Skills (Initiative)/Observation/Rating Scale: Observe how the students individually demonstrate initiative as they conduct their group investigations.

Different groups could be given different lengths of fencing so that there will be sufficient evidence for a square during the consolidation part of the lesson.

Whole Class → Presentation

Groups present their findings.

Encourage students to ask each other questions.

Acknowledge the variety of representations as a signal that they should continue to find a variety of ways to represent the problem.

Consolidate Debrief

Whole Class → Discussion

Summarize the key ideas, ensuring that the following concept is understood: The largest area for a rectangle of a fixed perimeter is a square.

Review the formulas for perimeter and area of a rectangle. Review substituting into perimeter and area of rectangle formulas in context.

Use the second and third pages of BLM 2.1.1 to consolidate ideas and help students to make convincing arguments.

This shows students an inquiry model.

Home Activity or Further Classroom Consolidation

Solve the following problems:

1. If the perimeter of a rectangle is 72 m, what is the largest area?
2. If the perimeter of a rectangle is 90 m, what is the largest area?

Draw diagrams for both problems.

Concept Practice



Mathematical Process Goals

- Use identified concrete, visual, and electronic learning tools to investigate and solve a problem.
- Understand that various tools can be used to develop an appropriate representation of the same situation.
- Select and use a tool to solve a problem. Justify the use of the particular tool.

Materials

- BLM 2.1.1(A)
- geoboards
- GSP[®]4 software
- colour tiles
- grid paper

Assessment Opportunities

Minds On... Whole Class → Demonstration

Introduce the problem and review how to use the tools at each of the 4 stations (BLM 2.1.1(A)) set up to explore which rectangle has the maximum area for a fixed perimeter.

Clarify any misconceptions about the length of fencing given at each station.

Remind students that it is the perimeter of the rectangle formed by the colour tiles and not the number of colour tiles used.

Mathematical

Process Focus:

Selecting Tools and Computational Strategies

See TIPS4RM Mathematical Processes package pp. 6–7.

Prepare 2 sets of the 4 stations:

- GSP[®]4
- geoboards
- colour tiles
- graph paper

GSP[®]4 includes lengths and widths that are not whole numbers.

Possible guiding questions:

- How did the learning tool contribute to the solution of the problem?
- What are some of the advantages and disadvantages of the tools used to solve the problem?

This lesson could be extended to 2 days so that each group visits all four stations, and the presentations are more extensive.

Action!

Groups of 3 → Carousel

Students spend approximately 15 minutes each at two of the four stations and record data on the chart for the different rectangles they investigated. Then they graph area vs. width for each of the scenarios on the grid provided. From the various rectangles formed, students determine the best dimensions of the rectangle for maximum area and illustrate it along with a description and justification BLM 2.1.1(A).

After students have completed the second station, groups prepare to present the solution for that station by recording the results of this investigation on chart paper, and describing their strategy, the solution to the problem, and the merits of the tool provided at this station.

Mathematical Process/Selecting Tools/Checklist: Observe students and note effective use of tools and strategies at each station.

Consolidate Debrief Whole Class → Presentation

Select groups from each station to present their solution. Facilitate a discussion that considers the different tools used to represent the perimeter and area, and the advantages and disadvantages of each tool (e.g., What are the benefits of GSP[®]4 compared to the other tools? In what ways does the grid paper provide an advantage over the other tools?). Draw attention to the consistency of the resulting graphs and conclusions regardless of tool used.

Summarize the key ideas focussing on the concept: The largest area for a rectangle of a fixed perimeter is a square. Use TIPS4RM BLM 2.1.2 to consolidate ideas and help students make convincing arguments.

Home Activity or Further Classroom Consolidation

Reflect on your experience with different tools and on the presentations today. Which tool do you prefer? Explain why.

Select a tool and determine the largest area for a rectangle whose perimeter is 72 m.

Reflection Application

BLM 2.1.1(A): Garden Fence Problem

Garden Fence Problem: Coloured Tiles Station

Problem

Your neighbour has asked for your advice about building his garden.
He wants to fence the largest possible rectangular garden with
20 metres of fencing.



Garden Fence Problem: Geometer's Sketchpad Station

Problem

Your neighbour has asked for your advice about building his garden.
He wants to fence the largest possible rectangular garden with
22 metres of fencing.



Garden Fence Problem: Geoboard Station

Problem

Your neighbour has asked for your advice about building his garden.
He wants to fence the largest possible rectangular garden with
24 metres of fencing.



Garden Fence Problem: Graph Paper Station

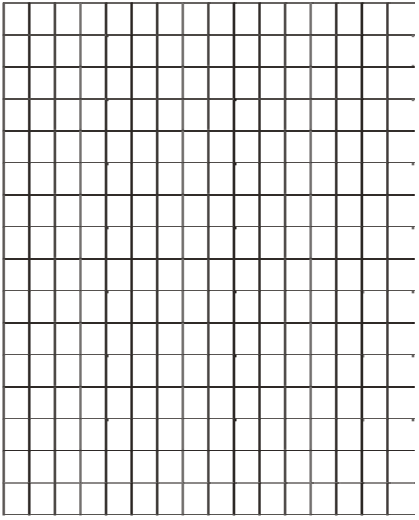
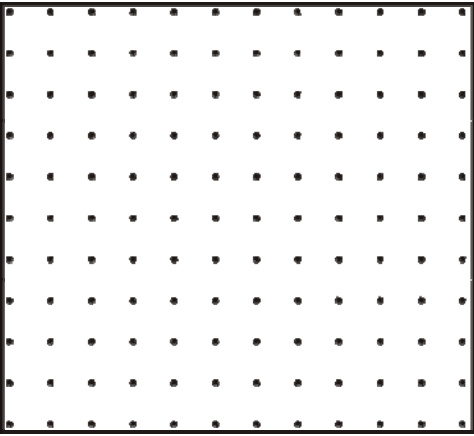
Problem

Your neighbour has asked for your advice about building his garden.
He wants to fence the largest possible rectangular garden with
28 metres of fencing.



BLM 2.1.1(A): The Garden Fence (continued)

Station: _____ (Tool)

<p>Graph</p>  <p>Area</p> <p>Width</p>	<p>Conclusion What are the best dimensions for the garden? Justify your choice.</p>																				
<p>Chart</p> <table border="1" data-bbox="396 1180 734 1625"><thead><tr><th>Perimeter</th><th>Length</th><th>Width</th><th>Area</th></tr></thead><tbody><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td></tr></tbody></table>	Perimeter	Length	Width	Area																	<p>Diagram</p> 
Perimeter	Length	Width	Area																		



75 min

Math Learning Goals

- Use paper folding to illustrate geometric properties.

Materials

- origami paper
- scissors
- BLM 8.8.1 (Teacher)

Assessment Opportunities

Minds On ...

Whole Class → Demonstration

Introduce origami to the class as the art of paper folding. Give each student an origami or square piece of paper. Demonstrate how to fold the paper to form a paper drinking cup (use an overhead of BLM 8.8.1). Students perform the same folds.

Students then unfold their paper cup. Discuss the kinds of geometry they see in the folds.

For example:

- triangle EFB, triangle BFG, triangle DHI, triangle DIJ are congruent and isosceles
- triangle HCG and triangle JAE are right isosceles triangles
- EF is parallel to IH
- JI is parallel to FG
- $JE \parallel DB \parallel GH$

Visit:
www.tammyyee.com/origami.html.

This website is designed for young children but provides a good selection of appropriate origami patterns.

For example:

- fish
- iris (a bit tricky)
- cat (easy!)
- dragon fortune teller

Action!

Pairs → Investigation

Students make two of the same item – leave one folded and the second one unfolded. They tape their unfolded one onto another piece of paper and label all the geometry in preparation for their presentation. Ask students to make measurements to provide evidence that they have correctly identified the geometry.

Consolidate Debrief

Pairs → Presentation

Students present to the class their origami figure and explain the geometry they found in the unfolded shape.

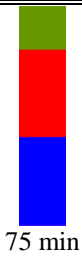
Communicating/Presentation/Rubric: Assess students on their use of appropriate terminology and the clarity of their justifications as they make their presentations.

Home Activity or Further Classroom Consolidation

Look in newspapers, magazines, or on the Internet for a logo that has some geometric properties. Paste a picture of your logo on a piece of paper and identify and describe the geometry in the logo.

Submit your work for assessment.

Differentiated Reflection Reasoning and Proving



Mathematical Process Goals

- Make connections between origami paper folding and geometric properties.
- Apply mathematics to contexts outside of mathematics.
- Communicate connections to different audiences.

Materials

- origami paper
- origami templates
- scissors
- BLM 8.8.2(A)

Assessment Opportunities

Minds On... Whole Class → Introducing Origami

What is Origami?

Read short excerpt of the History of Origami,
<http://library.thinkquest.org/5402/history.html>

Pairs → Reading Different Text Forms

One student reads the instructions to his/her partner. The second student asks questions for clarification. (BLM 8.8.2 (A))*

Students unfold their paper cup, and discuss the kinds of geometry they see in the folds.

*A Geometer’s Sketchpad presentation can be used as a visual to enable students to make connections between the terminology used in the instructions and the geometry found in the origami drinking cup.

Action!

Pairs → Investigation

To enable all students to make connections between the folds made and the resulting geometric properties, provide each student with one of the following origami templates, based on level of difficulty:

- Easy: bunny, cat
- Moderate: dragon, fortune teller, mouse, dolphin, butterfly
- Difficult: iris

See showcase at: <http://www.langorigami.com/art/artmain/artmain.php4>

Pairs prepare their presentation to showcase for the class.

Consolidate Debrief Pairs → Presentation

Students present origami figure and explain the geometry they found in the unfolded shape.

Whole Class → Reflection

Use probing questions to help students make connections and consolidate their understanding of geometric properties.

Mathematical Process/Connecting/Checklist: Observe how the students communicate their understanding of how the concepts are connected.

Possible guiding prompts:

- Describe the connections you see between the paper cup and your origami design.
- How is this thinking connected to the thinking that you engaged in when you created your origami design?
- Where else are geometric properties be used in daily life?

Home Activity or Further Classroom Consolidation

1. a) Create a square from a piece of paper without using a ruler. Examine the geometry in your folds. Explain how you made the square and why you know for certain that it is a square.
 b) How is this thinking connected to the thinking that you engaged in when you created your origami design?
2. What type of profession(s) require(s) knowledge of geometric properties?

Mathematical Process Focus:
 Connecting

See TIPS4RM
 Mathematical Processes package
 p. 8

Sadako and the Thousand Cranes
 (Eleanor Coer) can also be used to introduce origami.
 ISBN #0-3999-20520-9

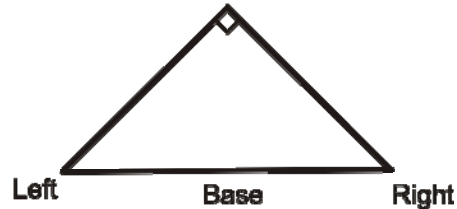
Word Wall:

- diagonal
- vertex
- right triangle
- hypotenuse
- parallel lines
- congruent triangles
- isosceles triangle
- trapezoid
- rectangle
- square
- kite

Application Differentiated Reflection

8.8.2(A): Following Instructions – Origami Paper Cup

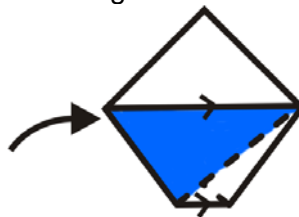
1. Fold the square along one *diagonal*, and create a crease. Be sure that one *vertex* meets the opposite *vertex*.
2. Turn the *right triangle* so that you are holding the longest side (or *hypotenuse*) your hands. We call this the base.



3. Take the vertex on the right and fold it towards the left so that the upper edge of the folded triangle is *parallel* to the base of the right triangle. Be sure that the vertex of this folded triangle touches the left side of the triangle at a single point. Make a crease.



4. Take the vertex on the left and fold it towards the right so that the upper edge of the folded triangle is *parallel* to the base of the right triangle. Be sure that the vertex of this folded triangle touches the right side of the triangle at a single point. Make a crease. You should now see two overlapping *congruent* triangles.



5. Take the top vertex of the right triangle and fold it downwards so that the crease that will form the base of folded triangle is parallel to the base of the original right triangle. Make the crease.



6. Open the paper to the first right triangle. Fold one of the congruent triangles in front and fold one to the back. Separate the paper forming the top triangle, one in the front and one in the back. Tuck each of these small triangles inside the front and back congruent triangle openings. Open up your origami paper cup!



Math Learning Goals

- Use multiple representations (physical, numerical, algebraic).
- Simplify algebraic expressions.

Materials

- overhead projector
- algebra tiles
- computer/data projector
- BLM 7.4.1, 7.4.3 (Teacher)
- BLM 7.4.2, 7.4.4

Assessment Opportunities

Minds On ...

Small Groups → Practice

Students found a relationship between the term number and the expression for the term (Day 3). Provide each group with a set of answer cards. Hold up a cue card with an expression and students match it with one of their set.

Students explain their choices.

Clear up any misunderstandings.

Whole Class → Practice

Do several examples like the following:

- What is an algebraic expression for “3 more than double a number”? (Answer: $3 + 2x$)
- Use algebra tiles to create a model for the expression. (Answer: Use the overhead to show 2 x -tiles and 3 one-tiles.)

[Collecting Terms.ppt](#)

[Algebraic Equations.ppt](#)

The activity Cue Cards is designed to give students practice in creating algebraic expressions from words.

Set a date with students for a proficiency test on simplifying algebraic expressions.

Action!

Whole Class → Presentation

Use electronic presentations Collecting Terms Using Algebra Tiles, and Expanding and Simplifying Algebraic Expressions.

Pairs → Practice

Students complete BLM 7.4.2.

Learning Skill (Work Habits)/Observation/Rating Scale: Observe and record how students work to complete the assignment.



Consolidate Debrief

Whole Class → Connecting

Use Debrief Notes to consolidate learning and make connections between numerical, algebraic, and graphical models (BLM 7.4.3).

Home Activity or Further Classroom Consolidation

Complete worksheet 7.4.4 We’re All Correct!

How can you determine if two expressions are equivalent?

Students may need additional practice questions.

Application



Mathematical Process Goals

- Identify multiple representations for an expression (relationship in words, algebraic expression, table of values, graph).

Materials

- overhead projector
- algebra tiles
- computer/data projector
- BLM 7.4.1(A)

Assessment Opportunities

Minds On... Whole Class → Practice

Provide each student with one cue card (BLM 7.4.1(A)).

Students circulate to find the three other students who share equivalent representations.

Ask: How do you know your representations are equivalent?

Mathematical Process/Representing/Checklist: Observe and record how students work together to compare representations and complete the assignment.

Small Groups → Practice

Do several examples like the following:

- What is an algebraic expression for “3 more than double a number”?
(Answer: $3 + 2x$)
- Use algebra tiles to create a model for the expression.
(Answer: Show 2 x -tiles and 3 one-tiles.)

Mathematical Process Focus:
Representing

See TIPS4RM Mathematical Processes package p. 9.

There are four representations: relationship in words, equation, table of values, graph (BLM 7.4.1(A)).

Action! Whole Class → Presentation

Use electronic presentations Collecting Terms Using Algebra Tiles, and Expanding and Simplifying Algebraic Expressions.

Pairs → Practice

Students complete TIPS4RM BLM 7.4.2.

Consolidate Debrief Whole Class → Connecting

Consolidate learning and make connections between numerical, algebraic, and graphical models using TIPS4RM BLM 7.4.3.

Home Activity or Further Classroom Consolidation

Complete TIPS4RM worksheet 7.4.4: We’re All Correct!

How can you determine if two expressions are equivalent?

Application

Students may need additional practice questions.

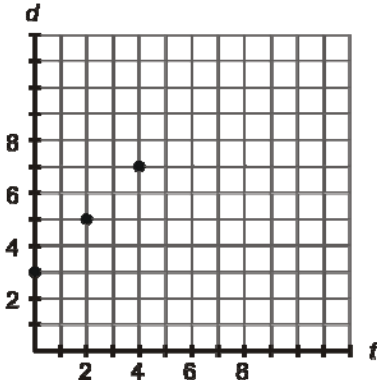
7.4.1(A): Representations of Algebraic Models – Cue Cards

Purpose

- To practise matching representations

Method

- There are four set of cards. Students each get one card.
- Students circulate to find the other three representations of their scenario.

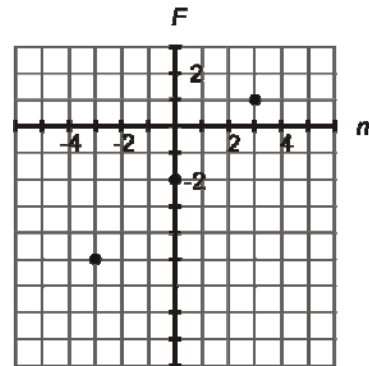
<p>A depth (d) of 3 cm of snow had already fallen. It is snowing at a rate of 1 cm per hour (t).</p>	<table border="1" data-bbox="1047 604 1193 829"><thead><tr><th>t</th><th>d</th></tr></thead><tbody><tr><td>0</td><td>3</td></tr><tr><td>2</td><td>5</td></tr><tr><td>4</td><td>7</td></tr></tbody></table>	t	d	0	3	2	5	4	7
t	d								
0	3								
2	5								
4	7								
$d = 3 + t$									

7.4.1(A): Representations of Algebraic Models – Cue Cards (continued)

An elevator starts at Parking Level 2 below the main floor and moves up 1 floor at a time.

n	F
-3	-5
0	-2
3	1

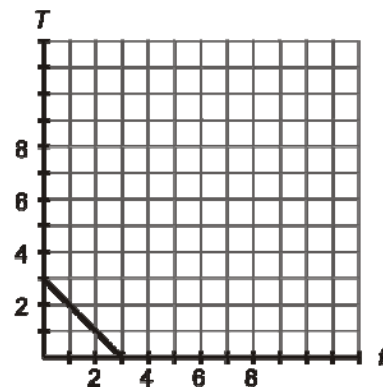
$$F = -2 + n$$



The temperature (T) starts at 3°C and drops at a rate of 1° per hour (t).

t	T
0	3
1	2
2	1

$$T = 3 - t$$

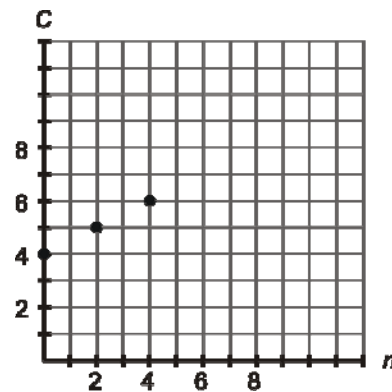


7.4.1(A): Representations of Algebraic Models – Cue Cards (continued)

A newsletter costs (C) \$4 plus
\$.50 per copy (n).

n	C
0	4
2	5
4	6

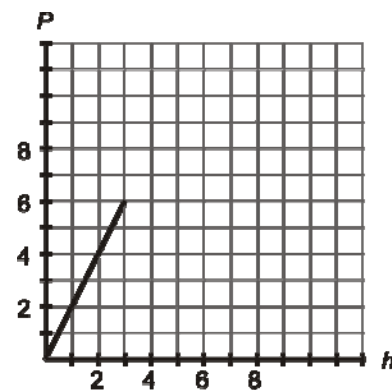
$$C = 4 + 0.5n$$



Overtime pay (P) is calculated as double the
number of hours worked (h).

h	P
0	0
1	2
3	6

$$P = 2h$$

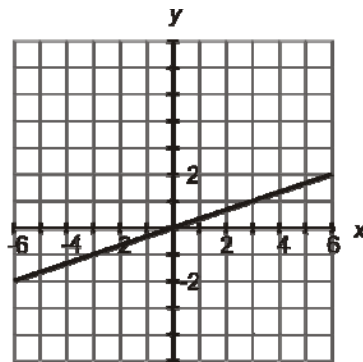


7.4.1(A): Representations of Algebraic Models – Cue Cards (continued)

The relationship between
two numbers (x and y) is
 y is one third of x .

x	y
-3	-1
3	1
6	2

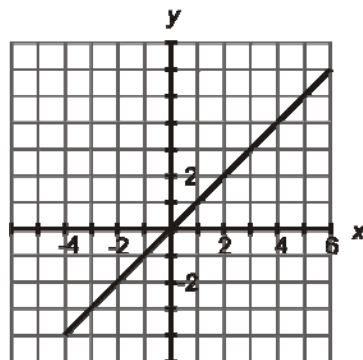
$$y = \frac{1}{3}x$$



One number y is equal to another number x .

x	y
-2	-2
0	0
2	2

$$y = x$$

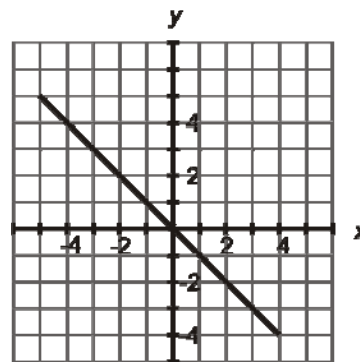


7.4.1(A): Representations of Algebraic Models – Cue Cards (continued)

One number, y , is the negative
of another number x .

x	y
-3	3
0	0
3	-3

$$y = -x$$



Video rental (R) is \$5 plus
\$2 per video (v).

v	R
0	5
1	7
2	9

$$R = 5 + 2v$$

