Chapter 3 Lesson Plans

MathLinks 7 Pre-Planning for Chapter 3

STRAND/ORGANIZER: Shape and Space (Transformations)

General Outcome: Use direct or indirect measurement to solve problems. Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

1. Before getting started with lesson planning for Chapter 3 — Geometry and Measurement, you need to understand what skills your students have already been exposed to.

- If students in your jurisdiction have *not* completed the new grade 6 WNCP (2006) curriculum, students should have some understanding of the following outcomes from the previous grade 6 curriculum:
  - ☑ Develop, verify and apply rules or expressions for the area of rectangles.
  - ☑ Design and construct rectangles, given one or both of the perimeter and area, using whole numbers.
  - ☑ Recognize angles as being more than 90 degrees, equal to 90 degrees, less than 90 degrees, equal to 180 degrees, greater than 180 degrees.
  - ☑ Estimate and measure angles, using a circular protractor.
  - ☑ Draw and sketch an angle when the degree measure is specified.

- If students in your jurisdiction *have* completed the new grade 6 WNCP (2006) curriculum, they should have some understanding of the following:
  - ☑ Demonstrate an understanding of angles.
  - ☑ Demonstrate that the sum of the angles in a triangle equals 180 degrees and in a quadrilateral 360 degrees.
  - ☑ Develop and apply a formula for determining the perimeter of polygons, area of rectangles and volume of right rectangular prisms.
  - ☑ Construct and compare triangles based on side length and angle measurement.

2. Note that not every section within each chapter is meant to be a stand-alone lesson. In order to allow students time to experience the depth and breadth of the concept, some sections may take two or three classes to complete. The Teacher's Resource suggests time lines.

Before starting Chapter 3, read through the **Chapter Opener** (p. 80), **Key Words** (p. 80), **Math Links** (pp. 80, 88, 93, 99, 107, 115), and the **Wrap It Up!** (p. 119) which consolidates students' work on the Math Links throughout the chapter. These sections will provide a sense of how the chapter concepts are tied together and how students will be asked to apply their learning.

3. Each chapter begins with a **Foldables** feature (p. 81) that provides unique ways for students to:
- organize their learning
- keep track of Key Words and examples
- organize their thinking
- keep track of what they need to work on in the particular chapter
- reactivate learning later in the course

Foldables are exciting ways for students to engage themselves in learning. Most take approximately 10 min to make.

A materials centre at the back of the classroom can make it easier for students to produce Foldables. This centre could be as large as a table at the back of the classroom with scissors, glue, tape, and markers, or as simple as a box of materials on a handy shelf.

Most chapters have one Foldable design in the student resource and another Foldable design for vocabulary in the Teacher's Resource.

You may wish to help students stay organized and keep their Foldables for year-end reference by either:
- providing a file folder and storage box in the classroom, or
- using a page-protector pouch that students can keep in their binders. These can be purchased at a dollar store.

4. As part of your pre-planning for each chapter, review the related chapter in:
- the *MathLinks 7* student resource,
- the Teacher's Resource, which includes support for meeting the needs of all learners, a list of common errors, and scoring rubrics for the Wrap It Up!,
- the related blackline masters (BLM), which provide additional questions, scaffolding of all Math Links, a chapter test, and assessment assistance,
- the *MathLinks 7 Practice and Homework Book* which provides additional exercises and scaffolding for concepts, and

- the Teacher Centre of the *MathLinks 7* Online Learning Centre, which provides examples of student work for the challenges and tasks, scoring rubrics, additional challenges for students, and final exams.

MathLinks 7 Chapter 3, Lesson 1

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcomes:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Resource/Materials:

- BLM 3–2 Geometry and Measurement
- Get Ready (pp. 26–27 *MathLinks7 Practice and Homework Book* or alternative from the Online Learning Centre)
- protractor
- ruler
- graph paper

***MathLinks 7* Adapted Resource/Material:**

Get Ready, pp. 109–110

Starting Chapter 3

Scan the teaching notes in the Teacher's Resource before starting the chapter. Then, review the notes for each lesson as you plan it. Note that time frames can change depending on the particular mix of students.

If you do not have access to the Teacher's Resource, begin Chapter 3 by telling students that in this chapter they will work with lines, angles, and areas of triangles and parallelograms. They will start by identifying and drawing parallel and perpendicular line segments. They will then develop skills in constructing perpendicular bisectors and angle bisectors. Finally, they will apply their skills to help them develop formulas for calculating the areas of triangles and parallelograms.

Procedures/Activities/Instruction:

1. Have students complete the **Get Ready** or alternative from the Online Learning Centre. This provides both you and the students an opportunity to assess how well students know the prerequisite skills for this chapter. **BLM 3–2 Geometry and Measurement** can be used either for a preview of

measuring angles and segments for students who have strong prerequisite skills, or as remediation for after the Get Ready.

2. To have some fun with students and link learning to their surroundings, give pairs of students two minutes to find as many examples of parallel and perpendicular lines as they can. You may wish to design it as a race with a prize for the winning pair.
3. You may wish to have students begin a collage of real-world uses of parallel and perpendicular lines to help link their learning to daily applications. Later, they can add examples of angles and bisectors. The collage could be a class effort where pictures are posted on a bulletin board in the classroom.

Assessment:

1. Get Ready (Assessment *for* Learning)
2. Have students complete a writing assignment in which they describe *line segment, angle, vertex,* and *area* in their own words.

MathLinks 7 Chapter 3, Lesson 2

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcomes:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Resource/Materials:

- *MathLinks 7*, pp. 80–81
- BLM 3–1 Chapter 3 Self-Assessment
- Get Ready *MathLinks 7 Practice and Homework Book*, pp. 26–27
- Sample-chapter Foldable
- stapler

Teacher's Resource Reference:

pp. 80–81

***MathLinks 7* Adapted Resource/Material:**

Get Ready, pp. 109–110

Introduction:

Have students turn to page 80 and read the **Chapter Opener** together. Read through the **What You Will Learn** and the **Key Words**. Check to see how many students can already give a definition or description for some or all of the Key Words.

Point out the airplane and that it is taking off from an airport in the picture (pp. 80–81). Discuss the characteristics of an airport including the terminal, runways, and taxi lanes. Explain the uses of these features. Keep in mind that not all students have visited an airport or flown in a plane. Photos may assist those students who have never visited one or who are very visual learners.

Read the **Math Link** and brainstorm with students what needs to be considered when designing runways at an airport (e.g., prevailing wind direction and natural and urban landscape). Discuss how the airport might look from an aerial view.

Discus why runways are long (for take off and landing), why taxi lanes are short, and why their angles vary.

Have students complete the Before section of **BLM 3–1 Chapter 3 Self-Assessment** to help them identify what Chapter 3 material they already know, understand, and can do. Have students refer to this page regularly to see whether they feel their level of understanding has changed.

Procedures/Activities/Instruction:

1. Explain the purpose of a Foldable and show students the one you have made. Identify the materials they need to make their own. As a class, complete the Foldable. Have students label it as shown on page 81, adding corresponding section titles from the student resource.
2. Having previously reviewed the Get Ready, decide whether students need any remediation prior to starting the chapter.

Assessment:

1. Get Ready (Assessment *for* Learning)
2. BLM 3–1 Chapter 3 Self-Assessment (Assessment *of* Learning)

Math Link:

Have students start a section in their logs or use the back side of their Foldable to sketch a rough idea for the airport runway system.

Foldable Entry:

Encourage students to add the following Key Words from the Get Ready to their Foldable. Have them use diagrams, illustrations, or explanations to define each word.

angle	area	line segment	protractor	vertex

MathLinks 7 Chapter 3, Lesson 3

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Identify line segments on a given diagram that are parallel or perpendicular.
- ☑ Draw a line segment parallel to another line segment and explain why they are parallel.

Resource/Materials:

- *MathLinks 7*, pp. 82–85
- 3.1 Warm-Up (Online Learning Centre)
- ruler
- protractor
- unlined paper
- right triangle (optional)
- Mira (optional)

Teacher's Resource Reference:

pp. 82–85

***MathLinks 7* Adapted Resource/Materials:**

3.1 Warm-Up, p. 111
pp. 112–114

Introduction:

Start the lesson by discussing how grids might be used to develop streets, as shown in the picture on page 82. Discuss the open-ended questions in the opening paragraph.

Procedure/Activities/Instruction:

1. Have students complete the Warm-Up questions individually or as a class.
2. Provide student pairs with the supplies listed above and have them complete the Explore, discussing the process together as they work.
3. As a class, answer the Reflect on Your Findings questions and address any discrepancies.
4. Discuss Examples 1, 2, and 3 with students. Have them do the Show You Know. Ensure students are comfortable with the varied approaches in drawing parallel and perpendicular lines.

Assessment:

1. Have students complete the Show You Know. (Assessment *for* Learning)

Foldable Entry:

Encourage students to add the following Key Words to their Foldable. Have them use diagrams, illustrations, or explanations to define each word.

parallel	perpendicular	right triangle (optional)

Encourage students to come up with a memory device to recall the difference between parallel and perpendicular. For example, *parallel* has two *ll*'s that look like parallel lines.

Learning Log:

Have students find examples of parallel and perpendicular lines in diagrams from magazines or related sources. Develop a personal collage or bulletin board display that students can add to as the chapter progresses.

MathLinks 7 Chapter 3, Lesson 4

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Identify line segments on a given diagram that are parallel or perpendicular.
- ☑ Draw a line segment parallel to another line segment and explain why they are parallel.

Resource/Materials:

- *MathLinks 7*, pp. 86–88
- *MathLinks 7 Practice and Homework Book*, pp. 28–29
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–3 Section 3.1 Extra Practice
- BLM 3–4 Section 3.1 Math Link
- Foldable

Teacher's Resource Reference:

pp. 86–88

***MathLinks 7* Adapted Resource/Materials:**

pp. 115–117

Introduction:

Start the lesson by reactivating skills from the previous lesson. You may wish to have them answer questions such as:

- What is the difference between a perpendicular and a parallel line?
- Give one method for drawing a pair of perpendicular lines.
- Give one method for drawing a pair of parallel lines.

Orally review the key words placed in the Foldable.

Procedure/Activities/Instruction:

1. Review the Key Ideas on page 86. Is there anything students would like to add to their Foldable from this section?
2. Assign questions as outlined in the Assessment section below.
3. Have students begin by answering the Communicate the Ideas questions in their Math Learning Log. Collect and review students' responses for insight into students' understanding.

Assessment:

1. Have all students complete Communicate the Ideas #1 or 2, as well as #3 and 4. (Assessment *as* Learning)
2. Student assignments
   Essential: #1 or 2, 3–5, 7, 9, 11, Math Link
   Typical: #1 or 2, 3–5, 7–13, Math Link
   Extension/Enrichment: #1 or 2, 3, 4, 13–16, Math Link
   Students requiring remediation may benefit from completing **BLM 3–3 Section 3.1 Extra Practice. BLM 3–4 Section 3.1 Math Link** is available for students who require support or guidance with the Math Link.
3. Additional questions or replacement questions could be chosen from the *MathLinks 7 Practice and Homework Book* (pp. 28–29).
4. Have students use **BLM 3–1 Chapter 3 Self-Assessment** to assess how far they have progressed during this section. (Assessment *of* Learning)

Math Learning Log:

How do you know whether two lines are parallel or perpendicular?

Math Link:

If students complete the assigned question before the end of class, have them complete the Math Link on page 88. They may find having access to a computer beneficial.

MathLinks 7 Chapter 3, Lesson 5

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors and angle bisectors in the environment.
- ☑ Draw the perpendicular bisector of a line segment using more than one method and verify the construction.

Resource/Materials:

- *MathLinks 7*, pp. 89–91
- 3.2 Warm-Up (Online Learning Centre)
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–5 Section 3.2 Extra Practice
- tracing paper
- ruler
- protractor

Teacher's Resource Reference:

pp. 89–91

***MathLinks 7* Adapted Resource/Materials:**

3.2 Warm-Up, p. 118
p. 119

Introduction:

Students will now apply their skills in drawing perpendicular bisectors. Discuss the importance of perpendicular bisectors in building designs. Have students identify perpendicular bisectors in the diagram on page 89.

Procedure/Activities/Instruction:

1. Collect, orally mark, or take up the previous day's homework. Also, remind students to complete the section called What I Need to Work On in their Foldable. Samples of questions or concepts that they are having difficulty with should be listed there.
2. You may wish to review what students have done by using the Warm-Up on Teacher's Resource page 89.
3. Hand out white or tracing paper and have students complete the Explore the Math (p. 89).
4. Have students complete the Reflect on Your Findings and compare their answers with a partner. Listen to student discussions to gauge whether they have understood the big question in the Explore the Math or whether further reinforcement is needed. You may wish to ask the two questions found on Teacher's Resource page 90 to determine their level of understanding. (Assessment *for* Learning)
5. Go over both methods for solving the Example. Have them complete the methods following the diagrams in the Example. Have students do the Show You Know questions. Check that they know both methods.

Assessment:

1. Have students complete the Show You Know questions. (Assessment *for* Learning)
2. Assign **BLM 3–5 Section 3.2 Extra Practice** to students who need additional practice after the Explore.
3. Have students complete Communicate the Ideas #1–3 individually.
4. Have students update **BLM 3–1 Chapter 3 Self-Assessment**.

Foldable Entry:

Have students place the following Key Words in their Foldable. Encourage them to include diagrams and examples.

bisect	perpendicular bisector

Math Learning Log:

Have students answer this question: How do you know whether two lines are parallel or perpendicular?

MathLinks 7 Chapter 3, Lesson 6

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors and angle bisectors in the environment.
- ☑ Draw the perpendicular bisector of a line segment using more than one method and verify the construction.

Resource/Materials:

- *MathLinks 7*, pp. 92–93
- *MathLinks 7 Practice and Homework Book*, pp. 30–31
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–5 Section 3.2 Extra Practice
- BLM 3–6 Section 3.2 Math Link
- ruler
- compass or right triangle

Teacher's Resource Reference:

pp. 92–93

***MathLinks 7* Adapted Resource/Materials:**

pp. 120–122

Introduction:

Students will continue to use their skills and apply their understanding to questions related to plotting points and creating 2-D shapes.

Procedure/Activities/Instruction:

1. Review the Key Ideas (p. 92). Is there anything from this section students would like to add to their Foldable?
2. Assign questions as outlined in the Assessment section below.

Assessment:

1. Have all students complete Communicate the Ideas #1 or 2, plus 3 and 4. (Assessment *as* Learning)
2. Student assignments (Assessment *for* Learning)
   Essential: #4, 5, 8, Math Link
   Typical: #4, 6–9, Math Link
   Extension/Enrichment: #7, 9, 10 Math Link
   Struggling learners may benefit from completing **BLM 3–5 Section 3.2 Extra Practice** if they have not done so.
   Note: **BLM 3–6 Section 3.2 Math Link** is available for students who require some extra support or guidance with the Math Link.
3. Additional questions or replacement questions could be chosen from the *MathLinks 7 Practice and Homework Book* (pp. 30–31).
4. Have students use **BLM 3–1 Chapter 3 Self-Assessment** to assess how far they have progressed during this section.
5. Have students comment on two or three items they feel they have improved on, noting how they have improved. (Assessment *as* Learning)

Math Learning Log:

Have students explain how a sheet of lined loose-leaf paper could be used to demonstrate parallel and perpendicular lines. Ask if it could also be used to demonstrate perpendicular bisectors.

MathLinks 7 Chapter 3, Lesson 7

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

☑ Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.

Resource/Materials:

- *MathLinks 7*, pp. 94–96
- 3.3 Warm-Up (Online Learning Centre)
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–7 Section 3.3 Extra Practice
- tracing paper
- ruler
- protractor

Teacher's Resource Reference:

pp. 94–97

***MathLinks 7* Adapted Resource/Materials:**

3.3 Warm-Up, p. 123
pp. 124–125

Introduction:

This section will have students focus on angle bisectors. Discuss how carpenters need and use angles in their work. Have students look around the classroom for examples of angles. Have them find pictures of angles that are used in daily living and add them to the collection on the bulletin board.

Procedure/Activities/Instruction:

1. Collect, orally mark, or take up the previous day's homework. Also, remind students to complete the section called What I Need to Work On in their

Foldable. Samples of questions or concepts that they are having difficulty with should be listed there.

2. Have students work independently to complete the Explore. You may need to review what symbols to use to identify equal parts. If using regular white paper, have students use a fine-point marker to draw their angles as it will make the diagram more visible when the paper is folded.
3. It is important that all students are able to accurately use a protractor to measure. Also, remind students to have a sharp pencil when working with the compass.
4. You may wish to have students respond orally or in writing to the Reflect on Your Findings on page 95.
5. Examine the Example with the class. Have students complete the Show You Know. Supply **BLM 3–7 Section 3.3 Extra Practice** to students who would benefit from remediation**.**
6. Assign two of the Communicate the Ideas questions.
7. Have students place the new entries into their Foldable. Encourage diagrams.

Assessment:

1. Have students complete the Show You Know on page 96. (Assessment *for* Learning)
2. Students should be assigned any two Communicate the Ideas questions on page 97. (Assessment *as* Learning)
3. Students benefiting from remediation could complete **BLM 3–7 Section 3.3 Extra Practice**. (Assessment *for* Learning)
4. Have students comment on two or three items they feel they have improved on, noting how they have improved. (Assessment *as* Learning)

Foldable Entry:

Have students place the following Key Words in their Foldable.

acute angle	obtuse angle	angle bisector

MathLinks 7 Chapter 3, Lesson 8

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

☑ Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.

Resource/Materials:

- *MathLinks 7*, pp. 97–99
- *MathLinks 7 Practice and Homework Book*, pp. 32–33
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–7 Section 3.3 Extra Practice (if not previously used)
- BLM 3–8 Section 3.3 Math Link
- ruler
- protractor
- compass
- Mira or mirror (optional)

Teacher's Resource Reference:

pp. 97–99

***MathLinks 7* Adapted Resource/Materials:**

pp. 125–127

Introduction:

You may wish to start with a quick oral review of angle bisectors. Draw a 72° angle on the board and ask students how to bisect it. Draw a second angle with a bisector that measures 22°. Ask students for two ways to find the measure of the whole angle.

Procedure/Activities/Instruction:

1. Read the Key Ideas on page 97 aloud. Is there anything students would like to add to their Foldable from this section?
2. Assign questions as outlined in the Assessment section below.

Assessment:

1. Student assignments (Assessment *for* Learning)
   Essential: #5, 6, 8, Math Link
   Typical: #5, 6, 8, 9, 11 or 12, 13, Math Link
   Extension/Enrichment: #5, 11–15, Math Link
   Students may benefit from **BLM 3–7 Section 3.3 Extra Practice** if they have not already completed it.
   Note: **BLM 3–8 Section 3.3 Math Link** is available for students who require some extra support or guidance with the Math Link.
2. Additional questions or replacement questions could be chosen from the *MathLinks 7 Practice and Homework Book* (pp. 32–33).
3. Have students use **BLM 3–1 Chapter 3 Self-Assessment** to assess how far they have progressed during this section.
4. Have students comment on two or three items they feel they have improved on, noting how they have improved. (Assessment *as* Learning)

Math Learning Log:

Have students complete the following sentence stems:
The part I find most difficult in angle bisectors is…
The part I find the easiest about angle bisectors is…

MathLinks 7 Chapter 3, Lesson 9

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Use direct or indirect measurement to solve problems.

Specific Outcome:

SS2 Develop and apply a formula for determining the area of:
- triangles
- parallelograms
- circles.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.
- ☑ Generalize a rule to create a formula for determining the area of parallelograms.

Resource/Materials:

- *MathLinks 7*, pp. 100–104
- 3.4 Warm-Up (Online Learning Centre)
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–9 Section 3.4 Extra Practice
- grid paper or Master 8 Centimetre Grid Paper
- ruler
- scissors
- tape

Teacher's Resource Reference:

pp. 100–104

***MathLinks 7* Adapted Resource/Materials:**

3.4 Warm-Up, p. 128
pp. 129–131

Introduction:

This section will allow student to use their knowledge of areas of rectangles to develop an understanding and formulas to calculate the area of parallelogram. Allow students the opportunity to go through the Explore. The key to this lesson is allowing them to find a pattern from which to develop an understanding of the area of a parallelogram and NOT to simply be given a formula for area and shown substitution.

Procedure/Activities/Instruction:

1. Collect, orally mark, or take up the previous day's homework. Also, remind students to complete the section called What I Need to Work On in their Foldable. Samples of questions or concepts that they are having difficulty with should be listed there.
2. Have students work in pairs to complete the Explore. They will need to have a ready supply of grid paper (preferably 1-cm grid paper) available.
3. Have students share their responses to the Reflect on Your Findings questions. Allow them to develop the formula.
4. Review Examples 1, 2, and 3 (pp. 102–104). Make sure that students understand how to find the height of a parallelogram.
5. Work in small groups with students who are still having difficulty. Have them complete **BLM 3–9 Section 3.4 Extra Practice.** This scaffolded approach may assist those students experiencing difficulty in knowing where to begin with the problem.
6. Those students who have grasped the concept could move on to their Math Learning Log and respond to the Show You Know questions (pp. 102–104).

Assessment:

1. Have students complete the Show You Know questions (pp. 102–104). (Assessment *for* Learning)
2. If time permits, students could work on the Communicate the Ideas #1 and 2. (Assessment *as* Learning)
3. Students who need some remediation could complete **BLM 3–9 Section 3.4 Extra Practice** (Assessment *for* Learning) or you could use the extra questions found in the assessment boxes on Teacher's Resource pages 102–103.
4. Have students comment on two or three items they feel they have improved on, noting how they have improved. (Assessment *as* Learning)

Foldable Entry:

Have students place the following Key Words and formula in their Foldable.

parallelogram	base	height	$A = b \times h$

MathLinks 7 Chapter 3, Lesson 10

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Use direct or indirect measurement to solve problems.

Specific Outcome:

SS2 Develop and apply a formula for determining the area of triangles, parallelograms and circles.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.
- ☑ Generalize a rule to create a formula for determining the area of parallelograms.

Resource/Materials:

- *MathLinks 7*, pp. 104–107
- *MathLinks 7 Practice and Homework Book*, pp. 34–35
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–9 Section 3.4 Extra Practice
- BLM 3–10 Section 3.4 Math Link
- grid paper or Master 8 Centimetre Grid Paper or Master 9 0.5 Centimetre Grid Paper

Teacher's Resource Reference:

pp. 104–107

***MathLinks 7* Adapted Resource/Materials:**

pp. 132–134

Introduction:

You may wish to start with a quick oral review of the area of a parallelogram. Ask them to describe the similarities and differences between a parallelogram and a rectangle.

Procedure/Activities/Instruction:

1. Review the Key Ideas on page 104. Is there anything students would like to add to their Foldable from this section?

2. Assign questions as outlined in the Assessment section below.

Assessment:

1. Student assignments (Assessment *for* Learning)

Essential: #3, 5, 7, 9, 11, Math Link
Typical: #3, 5, 7, 9, 11–18, Math Link
Extension/Enrichment: #14–16, 18–20, Math Link

Struggling learners may benefit from completing **BLM 3–9 Section 3.4 Extra Practice** if they have not done so.

Note: **BLM 3–10 Section 3.4 Math Link** is available for students who require some extra support or guidance with the Math Link.

2. Additional questions or replacement questions could be chosen from *MathLink 7 Practice and Homework Book* (pp. 34–35).

3. Have students use **BLM 3–1 Chapter 3 Self-Assessment** to assess how far they have progressed during this section.

4. Have students comment on two or three items they feel they have improved on, noting how they have improved. (Assessment *as* Learning)

Math Learning Log:

Select a writing question from Teacher's Resource page 106.

MathLinks 7 Chapter 3, Lesson 11

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Use direct or indirect measurement to solve problems.

Specific Outcome:

SS2 Develop and apply a formula for determining the area of:
- triangles
- parallelograms
- circles.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle.
- ☑ Generalize a rule to create a formula for determining the area of triangles.

Resource/Materials:

- *MathLinks 7*, pp. 108–112
- 3.5 Warm-Up (Online Learning Centre)
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–11 Section 3.5 Extra Practice
- grid paper or Master 8 Centimetre Grid Paper
- ruler
- scissors

Teacher's Resource Reference:

pp. 108–112

***MathLinks 7* Adapted Resource/Materials:**

3.5 Warm-Up, p. 135
pp. 136–138

Introduction:

This section will allow student to use their knowledge of areas of rectangles to develop an understanding and formulas to calculate the area of triangles. Allow students the opportunity to go through the Exploration. The key to this lesson is allowing them to find a pattern from which to develop an understanding of the area of a triangle from what they know of a rectangle and NOT to simply be given a formula for area and shown substitution.

Read through the introduction on page 108 as a class. Discuss whether anyone has heard of Palliser's triangle. Ask questions such as, "Why do you think it is called a triangle?" or "What are some ways you could determine the area?"

Procedure/Activities/Instruction:

1. Collect, orally mark, or take up the previous day's homework. Also, remind students to complete the section called What I Need to Work On in their Foldable. Samples of questions or concepts that they are having difficulty with should be listed there.
2. Have students work in pairs to complete the Explore. They will need to have a ready supply of graph paper (preferably 1-cm grid paper) available.
3. Have students share their responses to the Reflect on Your Findings. Allow them to develop the formula. Have them share their approaches and their results.
4. Review Examples 1, 2, and 3 (pp. 110–112). Ensure that students know that the base and height of a triangle are related to the base and height of a rectangle.
5. Work in small groups with students who are still having difficulty. Have them complete **BLM 3–11 Section 3.5 Extra Practice.** This scaffolded approach may assist those students who need direction on where to begin with the problem. You may also wish to assign questions found in the assessment boxes in the Teacher's Resource (p. 111).

Assessment:

1. Have students complete the Show You Know questions (pp. 110–111). (Assessment *for* Learning)
2. If time permits, students could work on the Communicate the Ideas #1–2 or 2–3. (Assessment *as* Learning)
3. Students who need some remediation could complete **BLM 3–11 Section 3.5 Extra Practice** (Assessment *for* Learning) or the extra questions found in the assessment boxes in the Teacher's Resource (p. 111).
4. Have students comment on two or three items they feel they have improved on, noting how they have improved. (Assessment *as* Learning)

Foldable Entry:

Have students place the formula for the area of a triangle in their Foldable.

$$A = b \times h \div 2$$

MathLinks 7 Chapter 3, Lesson 12

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Use direct or indirect measurement to solve problems.

Specific Outcome:

SS2 Develop and apply a formula for determining the area of:
- triangles
- parallelograms
- circles.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle.
- ☑ Generalize a rule to create a formula for determining the area of triangles.

Resource/Materials:

- *MathLinks 7*, pp. 113–115
- BLM 3–1 Chapter 3 Self-Assessment
- BLM 3–11 Section 3.5 Extra Practice
- BLM 3–12 Section 3.5 Math Link
- Master 8 Centimetre Grid Paper
- ruler
- scissors

Teacher's Resource Reference:

pp. 114–115

***MathLinks 7* Adapted Resource/Materials:**

pp. 139–142

Introduction:

You may wish to start with a quick oral reactivation of students' knowledge of the area of a triangle. Ask them to describe the similarities and differences between the areas of a rectangle and a triangle.

Procedure/Activities/Instruction:

1. Review the Key Ideas on page 112. Is there anything students would like to add to their Foldable from this section?
2. Assign questions as outlined in the Assessment section below.

Assessment:

1. Student assignments (Assessment *for* Learning)
   Essential: #4, 6, 8, 10, 12, Math Link
   Typical: #4, 6, 8, 10, 11, 13–15, Math Link
   Extension/Enrichment: #14–19, Math Link
   Struggling learners may benefit from completing **BLM 3–11 Section 3.5 Extra Practice** if they have not done so.
   Note: **BLM 3–12 Section 3.5 Math Link** is available for students who require support or guidance with the Math Link.
2. Additional or replacement questions could be chosen from *MathLinks 7 Practice and Homework Book* (pp. 36–37).
3. Have students use **BLM 3–1 Chapter 3 Self-Assessment** to assess how far they have progressed during this section. Have students comment on two or three items they feel they have improved on, noting how they have improved. (Assessment *as* Learning)

MathLinks 7 Chapter 3, Lesson 13

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Use direct or indirect measurement to solve problems. Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS2 Develop and apply a formula for determining the area of:
- triangles
- parallelograms
- circles.

SS3 Perform geometric constructions, including:
- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle.
- ☑ Generalize a rule to create a formula for determining the area of triangles.
- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.
- ☑ Generalize a rule to create a formula for determining the area of parallelograms.
- ☑ Illustrate and explain how to estimate the area of a circle without the use of a formula.
- ☑ Apply a formula for determining the area of a given circle.
- ☑ Solve a given problem involving the area of triangles, parallelograms and/or circles.
- ☑ Describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors and angle bisectors in the environment.
- ☑ Identify line segments on a given diagram that are parallel and perpendicular.
- ☑ Draw a line segment parallel to another line segment and explain why they are parallel.
- ☑ Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.

☑ Draw the perpendicular bisector of a line segment using more than one method and verify the construction.

Resource/Materials:
- *MathLinks 7*, pp. 116–117
- *MathLinks 7 Practice and Homework Book*, pp. 38–39
- BLM 3–1 Chapter 3 Self-Assessment
- Foldable
- ruler
- right triangle
- compass
- protractor

Teacher's Resource Reference:
pp. 116–117

***MathLinks 7* Adapted Resource/Materials:**
pp. 143–145, 149

Introduction:
Students are now at the chapter review, which serves as a self-assessment tool.

Procedure/Activities/Instruction:
1. You will need to decide how you wish students to approach chapter reviews. These reviews are opportunities for students to verify that they have mastered the concepts and identify any areas of weakness prior to Assessment *of* Learning taking place. There are a number of approaches that could be used, including:
   - Have students use the notes they have been recording under What I Need To Work On in the Foldable to help them select questions within the review.
   - Have students complete at least one related item from each section.
   - Have students review their assignments, identify areas of weakness, and select review questions accordingly.
   - You, the teacher, could select the questions to be completed by the class or individual students.

2. Extra practice could also come from:
   - Link It Together or Vocabulary Links found in the *MathLinks 7 Practice and Homework Book* (pp. 38–39)
   - Key Word Builder (p. 149 of the Adapted resource)
   - additional material available in the Teacher Centre of the Online Learning Centre.

Assessment:

1. Chapter 3 Review (Assessment *for* Learning)
   Assignments should be completed within the class time in order to allow students to get assistance.
2. After the review, students may wish to update **BLM 3–1 Chapter 3 Self-Assessment**.

Foldable Entry:

Encourage students to use the terminology in the Foldable. As they do the review, they could note what areas in the What I Need to Work On section they now understand. This is a good opportunity for them to note their personal growth.

MathLinks 7 Chapter 3, Lesson 14

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space

General Outcome: Use direct or indirect measurement to solve problems. Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS2 Develop and apply a formula for determining the area of:
- triangles
- parallelograms
- circles.

SS3 Perform geometric constructions, including:
- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle.
- ☑ Generalize a rule to create a formula for determining the area of triangles.
- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.
- ☑ Generalize a rule to create a formula for determining the area of parallelograms.
- ☑ Illustrate and explain how to estimate the area of a circle without the use of a formula.
- ☑ Apply a formula for determining the area of a given circle.
- ☑ Solve a given problem involving the area of triangles, parallelograms and/or circles.
- ☑ Describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors and angle bisectors in the environment.
- ☑ Identify line segments on a given diagram that are parallel or perpendicular.
- ☑ Draw a line segment parallel to another line segment and explain why they are parallel.
- ☑ Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.

☑ Draw the perpendicular bisector of a line segment using more than one method and verify the construction.

Resource/Materials:
- *MathLinks 7*, pp. 118–119
- BLM 3–13 Chapter 3 Test
- grid paper, Master 8 Centimetre Grid Paper, or Master 9 0.5 Centimetre Grid Paper
- Foldable
- compass
- protractor

Teacher Resource Reference:
pp. 118–119

***MathLinks 7* Adapted Resource/Materials:**
pp. 146–147

Introduction:
Students are now at the practice test. This could serve as a final self-assessment tool or as a summative tool. (Assessment *of* Learning)

Procedure/Activities/Instruction:
1. You will need to decide how you wish students to approach the practice test. Practice tests are opportunities for students to verify that they have mastered the concepts and identify any areas of weakness prior to Assessment *of* Learning. Provide students with a number of questions that they can comfortably do in one class. Choose at least one question for each concept, skill, or process.
2. If the practice test is not used as an Assessment *of* Learning (summative), then you may wish to use **BLM 3–13 Chapter 3 Test** or items from the computerized assessment bank (CAB) for this purpose.
3. When students complete the chapter test, they can begin to complete the **Wrap It Up!** (p. 119).

Assessment:
1. Chapter 3 Practice Test (Assessment *for* Learning or Assessment *of* Learning) Assignments should be completed within the class time in order to allow students to get assistance.
2. **BLM 3–13 Chapter 3 Test** (Assessment *of* Learning)
   Essential questions include #1–6, 9–13.

Foldable Entry:
As for the chapter review, encourage students to use the Foldable for the terminology, and to note their areas of personal growth.

MathLinks 7 Chapter 3, Lesson 15

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space **Wrap It Up!**

General Outcome: Use direct or indirect measurement to solve problems. Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS2 Develop and apply a formula for determining the area of:
- triangles
- parallelograms
- circles.

SS3 Perform geometric constructions, including:
- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle.
- ☑ Generalize a rule to create a formula for determining the area of a triangle.
- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.
- ☑ Generalize a rule to create a formula for determining the area of parallelograms.
- ☑ Illustrate and explain how to estimate the area of a circle without the use of a formula.
- ☑ Apply a formula for determining the area of a given circle.
- ☑ Solve a given problem involving the area of triangles, parallelograms and/or circles.
- ☑ Describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors and angle bisectors in the environment.
- ☑ Identify line segments on a given diagram that are parallel and perpendicular.
- ☑ Draw a line segment parallel to another line segment and explain why they are parallel.
- ☑ Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.

☑ Draw the perpendicular bisector of a line segment using more than one method and verify the construction.

Resource/Materials:
- *MathLinks 7*, p. 119
- Master 1 Project Rubric
- BLM 3–14 Chapter 3 Wrap It Up!

Teacher Resource Reference:
pp. 118a–119a

***MathLinks 7* Adapted Resource/Materials:**
p. 148

Introduction:
Students will now complete the work of their airport runway design. It will be important that they use their mathematical language from the chapter in their one-page report.

Procedure/Activities/Instruction:
1. Decide and communicate how much class time students will have to complete this, and how much needs to be completed at home.
2. Read through the Wrap It Up! and discuss some possible designs that students could do. Read through the guidelines and the steps with students. Clarify any questions. Remind them that the Math Links they did in each of the previous lessons will assist them with their design. In addition, **BLM 3–14 Chapter 3 Wrap It Up!** provides guidance for students who need some extra assistance with the necessary process and steps.
3. It is important that students understand how they will be graded. Review the holistic rubric for the question. You could use the version on Teacher's Resource page 119a, or cut off the right column and work with students to complete the expected outcomes for each level. Completing the Specific Question Notes with students allows them to identify what key criteria distinguish each level, and also allows you to guide them to those criteria that should be considered for each level. Every student should receive a copy of the scoring rubric for reference.

Assessment:
1. Use **Master 1 Project Rubric** for this Assessment *of* Learning.

Foldable Entry:
Encourage students to use their Foldable to help them use appropriate mathematical terminology.

MathLinks 7 Chapter 3, Lesson 16

Time: 40–50 min

STRAND/ORGANIZER: Shape and Space **Game/Challenge**

General Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

Specific Outcome:

SS3 Perform geometric constructions, including:

- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors.

Achievement Indicators:

- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle.
- ☑ Generalize a rule to create a formula for determining the area of a triangle.
- ☑ Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.
- ☑ Generalize a rule to create a formula for determining the area of parallelograms.
- ☑ Illustrate and explain how to estimate the area of a circle without the use of a formula.
- ☑ Apply a formula for determining the area of a given circle.
- ☑ Solve a given problem involving the area of triangles, parallelograms and/or circles.
- ☑ Describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors and angle bisectors in the environment.
- ☑ Identify line segments on a given diagram that are parallel and perpendicular.
- ☑ Draw a line segment parallel to another line segment and explain why they are parallel.
- ☑ Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.
- ☑ Draw the perpendicular bisector of a line segment using more than one method and verify the construction.

Resource/Materials:

Math Games	Challenge
• *MathLinks 7*, p. 120 • Master 8 Centimetre Grid Paper • ruler • tracing paper	• *MathLinks 7*, p. 121 • BLM 3–15 Pool Table • ruler • compass or right triangle (optional) • protractor

Teacher Resource Reference:
pp. 120–121a

***MathLinks 7* Adapted Resource/Materials:**
pp. 150–151

Introduction:
The game allows students to use their skills in drawing perpendicular and parallel lines in a game (maze) scenario.

The Challenge in Real Life allows students to demonstrate how to draw the perpendicular line segment, how to measure the resulting angle, and how to measure the angle at which a ball leaves the rail as it applies to the game of pool.

Procedure/Activities/Instruction:
Math Games

1. Read through the game with students. Discuss similar games students may have played. You may wish to share the history of famous mathematician Leonhard Euler on Teacher's Resource page 120.
2. Have students design the game and have a partner of equal ability solve it.

Challenge in Real Life

1. Read through Bank Shots in the Game of Pool as a class. Discuss how the game is played and why the side rails are important in the game.
2. If you use this challenge for Assessment *of* Learning, it is important that students understand how they will be graded. Review the holistic rubric for the challenge. You could use the version on Teacher's Resource page 121a, or cut off the right column and work with students to complete the expected outcomes for each level. Completing the Specific Question Notes with students allows them to identify what key criteria distinguish each level and also allows you to guide them to those criteria that should be considered for each level. Every student should receive a copy of the scoring rubric for reference.

Assessment:
You may decide to let students choose one activity or the other, depending on the type of assessment you are looking for.

- Math Games (Assessment *for* Learning)
- Challenge in Real Life (Assessment *of* Learning or Assessment *for* Learning)

Foldable Entry:
Encourage students to use their Foldable to help them use appropriate mathematical terminology.