Math Link: Wrap It Up!
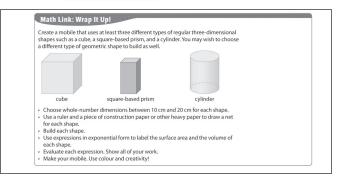
***MathLinks 9*, page 123**

Suggested Timing
80–100 minutes

Materials
- ruler
- construction paper or other heavy paper
- scissors
- tape and/or glue
- coat hangers, wire, fishing line
- coloured pencils and markers
- other materials for making a mobile

Blackline Masters
Master 1 Project Rubric
BLM 3–1 Chapter 3 Math Link Introduction
BLM 3–6 Section 3.1 Math Link
BLM 3–9 Section 3.3 Math Link
BLM 3–11 Section 3.4 Math Link
BLM 3–13 Chapter 3 Math Link: Wrap It Up!

Specific Outcomes
N1 Demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by:
- representing repeated multiplication using powers
- using patterns to show that a power with an exponent of zero is equal to one
- solving problems involving powers.

N2 Demonstrate an understanding of operations on powers with integral bases (excluding base 0) and whole number exponents.

N4 Explain and apply the order of operations, including exponents, with and without technology.

Planning Notes

As a class, read the instructions. You may wish to brainstorm some other shapes that could be used (e.g., triangular prisms). Explain to students that they need to use the correct formulas for surface area and volume calculations. Students need to show all of their work, including substitution and proper order of operations. This work can be included on a separate sheet of paper.

Meeting Student Needs
- Revisit the information about Alexander Calder in the chapter opener to guide students to think about mobile designs.
- You may wish to suggest to students that they add symbols, art, or designs from their own cultural background to their mobile.

Gifted and Enrichment
- Once students have completed their mobiles, ask if their mobiles would still balance if the same shapes were filled with something (e.g., foam insulation) and the paper removed. Challenge them to predict which side would be heavier, then to calculate, and then to do it.

Common Errors
- Some students may use the wrong formulas for surface area and volume.

R_x Provide references to assist students in recalling the formulas. For each formula, have students draw a diagram of the shape, label the dimensions with the appropriate variables, and then match the variables on their diagram with the variables in the formula. Building on their understanding of the formulas will help them to recall them.

- Some students may apply incorrect order of operations.

R_x Coach students on the proper order of operations and the separation of the numerical coefficient from the power.

Assessment	Supporting Learning
Assessment *of* Learning	
Math Link: Wrap It Up! This chapter problem wrap-up gives students an opportunity to demonstrate their understanding of simplifying exponential expressions with the proper use of order of operations. It is important for students to show step-by-step solutions and appropriate formulas for their chosen shapes. **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this Wrap It Up! Page 168 in this TR provides notes on how to use the rubric for this Wrap It Up!	• You may wish to have students review the work they have completed in the Math Links in the introduction and in sections 3.1, 3.3, and 3.4 before they begin. • If students have not completed the Math Links, you may wish to provide them with **BLM 3–1 Chapter 3 Math Link Introduction**, **BLM 3–6 Section 3.1 Math Link**, **BLM 3–9 Section 3.3 Math Link**, and **BLM 3–11 Section 3.4 Math Link**. • You may wish to have students use **BLM 3–13 Chapter 3 Math Link: Wrap It Up!**, which provides scaffolding for the chapter problem wrap-up.

The chart below shows the **Master 1 Project Rubric** for tasks such as the Wrap It Up! and provides notes that specify how to identify the level of specific answers for the project.

Score/Level	Holistic Descriptor	Specific Question Notes
5 **(Standard of Excellence)**	❑ Applies/develops **thorough** strategies and mathematical processes making **significant** comparisons/connections that demonstrate a **comprehensive** understanding of how to develop a complete solution ❑ Procedures are **efficient and effective** and may contain a **minor mathematical error** that does not affect understanding ❑ Uses **significant** mathematical language to explain their understanding and provides **in-depth** support for their conclusion	• provides a complete and correct solution Note: If the only error is in choosing a dimension outside the given parameter but all remaining work and resulting mobile is correct, then the paper is scored a 5.
4 **(Above Acceptable)**	❑ Applies/develops **thorough** strategies and mathematical processes for making **reasonable** comparisons/connections that demonstrate a **clear** understanding ❑ Procedures are **reasonable** and may contain a **minor mathematical error** that may hinder the understanding in one part of a complete solution ❑ Uses **appropriate** mathematical language to explain their understanding and provides **clear** support for their conclusion	Demonstrates one of the following: • provides a complete and correct response to the problem with one error in either volume or surface area • provides a complete solution to the problem with a consistent error in the application of order of operations, which is carried through the problem • provides a complete and correct solution to the problem, with weak justification

3
(Meets Acceptable)
	❑ Applies/develops **relevant** strategies and mathematical processes making **some** comparisons/connections that demonstrate a **basic** understanding
	❑ Procedures are **basic** and may contain a **major error or omission**
	❑ Uses **common** language to explain their understanding and provides **minimal** support for their conclusion
		Demonstrates one of the following:
		• correctly completes bullets 1, 2, and 3, and completes bullets 4 and 5 for:
		  – the surface area for all shapes correctly
		  – the volume for all shapes correctly
		  – the volume and surface area, based on incorrect or missing bullets 2 and 3
		• provides complete and correct answers only, with no supporting formulas and work

2 **(Below Acceptable)**	❑ Applies/develops **some relevant** mathematical processes making **minimal** comparisons/connections that lead to a **partial solution** ❑ Procedures are **basic** and may contain **several major mathematical errors** ❑ Communication is **weak**	Demonstrates one of the following: • provides the nets for three shapes; units are within the parameters and shapes are constructed • identifies three shapes and dimensions and has initial calculations of surface area and/or volume; formulas are shown and evaluation is correct; little evidence of nets; shapes are not constructed
1 **(Beginning)**	❑ Applies/develops an **initial start** that may be **partially correct** or could have led to a correct solution ❑ Communication is **weak or absent**	Demonstrates one of the following: • identifies three shapes and all or some of the dimensions; nets may be started • provides a correct initial start to any part