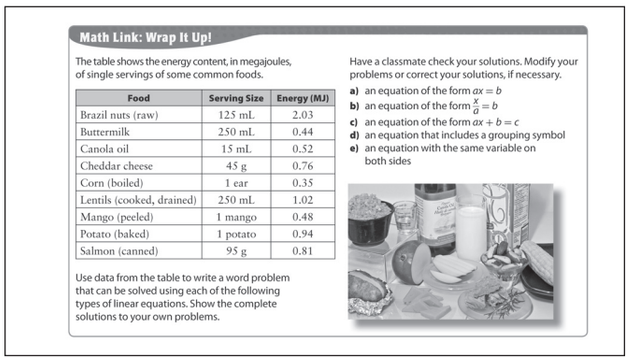
Math Link: Wrap It Up!



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The table shows the energy content, in megajoules, of single servings of some common foods.

Food	Serving Size	Energy (MJ)
Brazil nuts (raw)	125 mL	2.03
Buttermilk	250 mL	0.44
Canola oil	15 mL	0.52
Cheddar cheese	45 g	0.76
Corn (boiled)	1 ear	0.35
Lentils (cooked, drained)	250 mL	1.02
Mango (peeled)	1 mango	0.48
Potato (baked)	1 potato	0.94
Salmon (canned)	95 g	0.81

Use data from the table to write a word problem that can be solved using each of the following types of linear equations. Show the complete solutions to your own problems.

Have a classmate check your solutions. Modify your problems or correct your solutions, if necessary.

a) an equation of the form $ax = b$
b) an equation of the form $\frac{x}{a} = b$
c) an equation of the form $ax + b = c$
d) an equation that includes a grouping symbol
e) an equation with the same variable on both sides

***MathLinks 9*, page 333**

Suggested Timing
40–50 minutes

Blackline Masters
Master 1 Project Rubric
BLM 8–1 Chapter 8 Math Link Introduction
BLM 8–7 Section 8.1 Math Link
BLM 8–9 Section 8.2 Math Link
BLM 8–11 Section 8.3 Math Link
BLM 8-13 Section 8.4 Math Link
BLM 8–15 Chapter 8 Math Link: Wrap It Up!

Specific Outcomes
PR3 Model and solve problems using linear equations of the form:
- $ax = b$
- $\frac{x}{a} = b, a \neq 0$
- $ax + b = c$
- $\frac{x}{a} + b = c, a \neq 0$
- $ax = b + cx$
- $a(x + b) = c$
- $ax + b = cx + d$
- $a(bx + c) = d(ex + f)$
- $\frac{a}{x} = b,\ a \neq 0$

where a, b, c, d, e and f are rational numbers.

Planning Notes

Introduce the problem and clarify the assessment criteria. Review the requirements of the problem and make sure that students understand them.

Have students consult the Math Links that they have completed throughout the chapter to look for ideas on how to write problems that can be modelled by various forms of linear equations.

Students may be unable to write equations without having help to get started. Assist them through the process of writing a problem that can be solved using a simpler form of equation, such as $x + a = b$. They might then choose any two items in the table. For example, for a serving of cheddar cheese and a serving of Brazil nuts, subtraction shows that the energy in a serving of Brazil nuts is 1.27 MJ more than the energy in a serving of cheddar cheese. Then, show how the difference between the cheddar cheese and Brazil nuts can form the basis of a problem similar to the following: The energy in a serving of Brazil nuts is 1.27 MJ more than the energy in a serving of cheddar cheese. A serving of Brazil nuts contains 2.03 MJ of energy. How much energy is in a serving of cheddar cheese?

Ask students to use the same information from the table to write a problem in which the unknown is the energy in a serving of Brazil nuts. For example: The energy in a serving of cheddar cheese is 1.27 MJ less than the energy in a serving of Brazil nuts. A serving of cheddar cheese contains 0.76 MJ of energy. How much energy is in a serving of Brazil nuts?

You might also ask students why determining a difference from the table is a useful step in writing an equation of the form $x + a = b$.

Meeting Student Needs

- Have students consider foods that are traditional to different cultures, including their own. For example, nutritional values are available for many traditional First Nations and Inuit foods.
- Students may not recognize the unit MJ in the table. This unit is a metric unit of energy, the megajoule, which is one million joules. Students may be more familiar with food energy being measured in Calories. 1 Cal $\approx$ 4.18 kJ, so 1000 Cal $\approx$ 4.18 MJ. Thus, there are about 239 Cal/MJ.

Gifted and Enrichment

- Students could focus on discovering types of equations that are particularly difficult, and then develop procedures to solve those types of problems. They can then share their strategies with classmates.

Answers

Math Link: Wrap It Up!

Examples:

a) One serving of canned salmon contains 0.81 MJ of energy. How much energy is in half a serving? Let E = energy in half a serving. $2E = 0.81$, $E = 0.405$ MJ

b) One serving of cheddar cheese has 0.76 MJ of energy. How much energy is in two servings? Let E = energy in two servings and s = energy per serving, $\frac{E}{2} = 0.76$, $E = 1.52$ MJ

c) A potato dish required one serving of cheddar cheese and provides a total of 2.64 MJ of energy. How many potatoes are in this dish? Let p = the number of potatoes. $0.94p + 0.76 = 2.64$, $p = 2$

d) One serving of a snack requires 45 g of cheddar cheese and 30 g of crackers. Four servings contain 6.7MJ of energy. How much energy do the crackers provide per serving? Let c = energy of crackers per serving. $4(c + 0.76) = 6.8$, $c = 0.94$ MJ

e) A recipe calls for the same number of servings of corn and mango. The energy provided from the mango is 0.39 MJ more than the energy provided by the corn. How many servings of each does the recipe require? Let n = the number of servings required. $0.35n + 0.39 = 0.48n$, $n = 3$ servings

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 nutritional values of foods and how mathematics can be used to compare them. It is important for students to explain their reasoning and recognize the strategies they are using. **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this Wrap It Up!. Page 456 in this TR provides notes on how to use this rubric for the Wrap It Up!	• You may wish to have students review the work they have completed in the Math Links in the introduction and sections 8.1, 8.2, 8.3, and 8.4 before they begin. • If students have not completed the Math Links, you may wish to provide them with **BLM 8–1 Chapter 8 Math Link Introduction**, **BLM 8–7 Section 8.1 Math Link, BLM 8–9 Section 8.2 Math Link, BLM 8–11 Section 8.3 Math Link**, and **BLM 8–13 Section 8.4 Math Link**. • You may wish to have students use **BLM 8–15 Chapter 8 Math Link: Wrap It Up!**, which provides scaffolding for the chapter problem wrap-up. • Some students may need assistance in getting started to write equations. Provide a sample model that they can use to create a similar problem using any other value from the table. You may wish to start with the following example: One serving of Brazil nuts contains 2.03 MJ of energy. How much energy is in half a serving? (Let E = energy in half a serving. $2E = 2.03$, $E = 1.015$ MJ) • Some students may find it easier to write the equation and then generate a word problem around it. • Encourage students to look back over word problems that they have already solved and use them as models to generate ones with values from the table. Some possible suggestions may be #3 and 15 in section 8.1; #13 and 15 in section 8.2; #12 and 17 in section 8.3; and Examples 1 and 2 in section 8.4.

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
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 response with one missing context or one error in solving • provides a complete solution with a context not reflective of the equation presented • provides a complete and correct solution to parts b) to e), with an incorrect or omitted part a)
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 complete parts a), b), and one of parts c), d), or e), and makes a correct start to one remaining part • provides correct and complete solutions to two of parts c), d), and e) • provides partially correct solutions to all parts of the question with some contexts evident in some parts of the question Note: Students may provide five equations correctly solved but there must be some attempt at a context for at least one of the questions to obtain a 3.
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: • correctly completes parts a) and b), with a correct start to one remaining part • provides a correct and complete part c), d), or e) • writes four equations matching four parts of the question and correctly solves them but there is no context given
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: • provides a correct initial start or a complete part a) or b) • writes and solves two equations correctly but does not provide a context for the equation