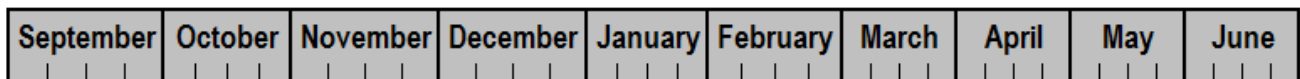
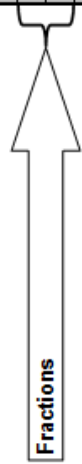


Fractions

Suggested Time: 2 Weeks



This is the first explicit focus on fractions in Grade 3, but as with other outcomes, it is ongoing throughout the year.



Unit Overview

Focus and Context

Grade 3 will be students' first formal encounter with fractions. Although students come to school with an informal awareness and exposure to fractions, their understanding is often incomplete. For example, you may hear a child express, "You got the bigger half". Fractions are used to represent parts of a whole, parts of a length, and parts of a set. In Grade 3, students will be introduced to, and explore, the parts of a whole which result when the whole has been divided into equal sized portions or 'fair shares'. It is important to use the terms whole, one whole, or simply one, to ensure that students have a common language to use regardless of the model used. Initially, students explore the fractions of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{3}$ before moving onto other proper fractions such as $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{8}$, and so on. Beginning with fractional terms such as halves, thirds, fourths, etc. and their pictorial representations, provides a bridge to the more challenging concept of the symbolic representations of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{3}{4}$, etc. Students will then be able to put a mathematical label on prior conceptions of fractions.

Math Connects

One of the best and most familiar ways to introduce students to the concept of fractions is through 'sharing' tasks. They eventually make connections between the concept of 'sharing' (fair shares) to the idea of fractional parts. It is likely that students will have heard fractional language in their everyday life, such as: half a cookie, quarter past one, half moon, one third cup of sugar, etc. Students will benefit from learning about fractions concretely, and in the context of real life. The use of models and concrete representations is essential to their understanding. It is important to use a wide variety of models so that fractions do not simply become pie pieces or pizza slices. Fractional concepts can be strengthened by linking other areas of mathematics such as geometry, money, number, and patterning. These areas play a key role in consolidating a student's conceptual understanding of fractions.

Process Standards Key

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Curriculum Outcomes

STRAND	OUTCOME	PROCESS STANDARDS
Number	3N13 Demonstrate an understanding of fractions by: <ul style="list-style-type: none"> explaining that a fraction represents a part of a whole describing situations in which fractions are used comparing fractions of the same whole that have like denominators. 	[C, CN, ME, R, V]

Strand: Number

Outcomes

Students will be expected to

3N13 Demonstrate an understanding of fractions by:

- explaining that a fraction represents a part of a whole
- describing situations in which fractions are used
- comparing fractions of the same whole that have like denominators.

[C, CN, ME, R, V]

Achievement Indicator:

3N13.1 Describe everyday situations where fractions are used.

Elaborations—Strategies for Learning and Teaching

“A fraction is a number that describes a relationship between a part (represented by the numerator) and a whole (represented by the denominator). Although you see two numbers, you have to think of one idea, the relationship.” (Small, *Making Math Meaningful to Canadian Students K-8*, 2010, p. 196). Prior to Grade 3, students have only worked with whole numbers and concepts of quantity. Students are now introduced, for the first time, to fractional parts. Students need to see and explore a variety of models of fractions with a key focus on halves, thirds, fourths, fifths, sixths, eighths, and tenths.

Pattern blocks are a very useful manipulatives when teaching fractional parts. Larger pattern blocks can be used to represent whole units and smaller pattern blocks to demonstrate the equal parts that can make up the whole. E.g., 6 green triangles make 1 yellow hexagon. The names of fractional parts are determined by the number of equal parts that make up the whole. E.g., 6 equal parts = sixths. This concrete representation of equal parts will ease the connection to the symbolic representation of $\frac{1}{6}$. From this point students can see that one green triangle is equal to one sixth of the whole, two triangles are two sixths, three triangles are three sixths, etc. With the use of concrete materials students will gain an understanding of how to identify shaded equal portions of a whole. It will be natural also, when examining a situation involving a fraction such as $\frac{1}{4}$, to show the related fraction of $\frac{3}{4}$. Always use a horizontal line when writing fractions. It may be useful to post fractional terms, symbols, and representations on a math word wall to help students with communication and reasoning.

Students will likely have an awareness of the fraction $\frac{1}{2}$ and possibly others such as $\frac{3}{4}$ and $\frac{1}{3}$. Discuss, with students, their prior knowledge of these familiar fractions and brainstorm where they may occur in everyday life, e.g., moon, pizza, chocolate bars, sharing with a sibling, cake, gas tanks, etc.

Working in groups, ask students to brainstorm examples of everyday situations where fractions are used. Set a time limit of ten minutes, then come together as a class and have groups take turns offering examples to be recorded for a master class list of everyday fractional situations. Discuss. The book *Fraction Fun* by David Adler can be used as an introduction to fractions. This book provides situations where fractions are used in everyday life and teaches the concepts of numerator and denominator through “pizza math”.

(continued)

 General Outcome: Develop Number Sense

Suggested Assessment Strategies

Journal

- Provide students with the following prompt:
Write about and draw something from your daily life that you divide into equal parts. (3N13.1)

Portfolio/Presentation

- Students ask family members about situations when they use fractions. Make lists and share them with the class. (3N13.1)

Resources/Notes

*Math Makes Sense 3***Launch:** At the Pizza Shop

TG pp. 2 - 3

Lesson 1: Exploring Equal Parts
3N13

TG pp. 4 - 6

(Lessons 1 and 2 may be combined)

Additional Activity:

Covering Shapes

TG: p. v, 35 and 36

**Children's Literature
(not provided):**Adler, David. *Fraction Fun*
ISBN 9780823413416**Additional Reading (provided):**Small, Marion (2008) *Making
Math Meaningful to Canadian
Students K-8.* pp.195 - 209

Strand: Number

Outcomes

Students will be expected to

3N13 Continued

Achievement Indicators:

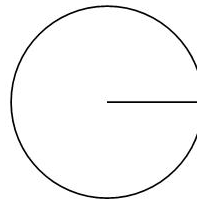
3N13.1 Continued

3N13.2 Cut or fold a whole into equal parts, or draw a whole in equal parts; demonstrate that the parts are equal; and name the parts.

3N13.3 Sort a given set of shaded regions into those that represent equal parts and those that do not, and explain the sorting.

Elaborations—Strategies for Learning and Teaching

As a follow up activity, provide students with two circle templates of different colours that have a marked line for cutting to the middle on each. Fit circles together using the slits to create a sliding circle wheel that can form different fractions. Students can display fractions of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, and $\frac{3}{4}$ on their own circle wheel pizza representations.



Provide students with pre-cut paper strips. Begin by asking them to demonstrate a $\frac{1}{2}$ fold and to mark the sections identifying the fractional parts using the fractional term ‘half’. Using a new strip, ask them to repeat that step but to also fold a second time to create $\frac{1}{4}$ and label the new strip. Repeat this activity for $\frac{1}{3}$ and $\frac{1}{8}$, be sure to label the parts and reinforce that the folds are always equal in size.

Set up a display of food items that have been shared equally and unequally, e.g., apple, banana, cookie, cracker, slice of bread, cheese, etc. Invite students to view the items to determine which ones have been shared equally and which ones have not. You may wish to provide them with a recording chart for their responses.

Fair Shares	
Equal Parts	Unequal Parts
- banana - slice of bread	- cookie

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

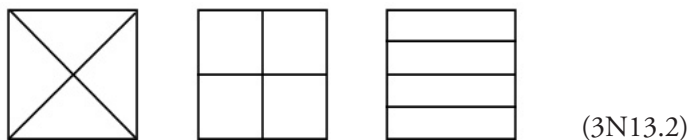
- Ask the student what fraction would suggest a “fair share” if 4 children are sharing an apple. What if 3 children are sharing an apple?
Is a half a lot or a little? Explain.
If you are really hungry and want a large piece of cake, would you cut the cake into thirds, fourths, or tenths? (3N13.2)

Journal

- Provide students with the following prompt: Why does it not make sense to say the “bigger half”? When might you hear someone talk about one half? (3N13.2)

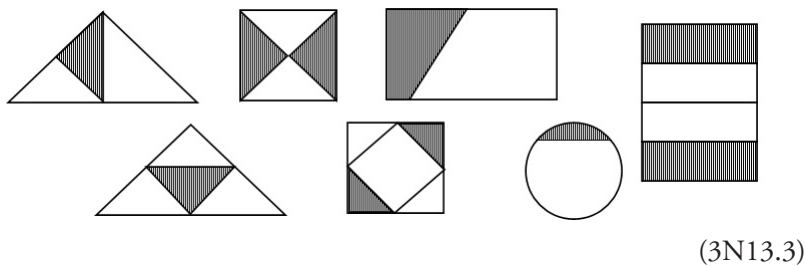
Performance

- Give students a square piece of paper and ask them to show fourths by folding. Have the students compare their fourths. Are they the same shape? Are they all really fourths?



Paper and Pencil

- Ask students to sort various shapes that show equal and unequal parts shaded by cutting them out and gluing them onto a piece of paper. Ask students to explain in writing how they sorted the shapes.



Resources/Notes

Math Makes Sense 3

Lesson 1 (Cont'd): Exploring Equal Parts

3N13

TG pp. 4 - 6

Children’s Literature:

Feely, Jenny. *Fair Shares* (provided with Grade 2 implementation)

Strand: Number

Outcomes

Students will be expected to

3N13 Continued

Achievement Indicator:

3N13.4 Represent a given fraction concretely or pictorially.

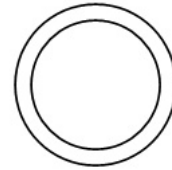
Elaborations—Strategies for Learning and Teaching

Pattern blocks can be used to model how some blocks are fractions of other blocks. E.g., a blue rhombus is $\frac{1}{3}$ of the yellow hexagon. Ask students to use their pattern blocks to represent what you have shown them. Reinforce the concept that one blue rhombus shows $\frac{1}{3}$ of the yellow hexagon because it takes 3 of these pattern blocks to cover one of the yellow hexagons, so one blue rhombus covers $\frac{1}{3}$. You may also wish to discuss how the remaining fraction represents the rest of the whole. E.g., the remaining two blue rhombi represent $\frac{2}{3}$ of the yellow hexagon.

Invite students to find another example of the blocks that show $\frac{1}{3}$ (the green triangle is $\frac{1}{3}$ of the red trapezoid). Discuss with students how it is possible that both the blue and green blocks can represent $\frac{1}{3}$ (because the block that is the whole is different for each).

Prior to this activity, you may wish to read *Pizza Pizzazz* by Carol A. Losi from the Hello Reader Scholastic Series. Students working in pairs or individually. Provide them the following pizza template and directions:

You are making a pizza for yourself and 7 friends. You have a choice of 4 toppings: pepperoni (P), mushrooms (M), olives (O), and cheese (C). Your friends choose the following toppings:



Alice: cheese

Shawn: pepperoni, cheese

Sarah: pepperoni, mushrooms, cheese

Tim: mushrooms, olives

Muhammad: olives, cheese

Rebecca: cheese, pepperoni

Jonathan : cheese, pepperoni, mushrooms

Your choice: _____

Use a ruler to divide the pizza into 8 equal parts. Use the letter symbols to represent the different topping choices of your friends. Ask students the following questions:

What fraction of the pizza will have cheese?

What fraction of the pizza will not have olives?

Write 3 fraction questions about your pizza. Exchange your pizza and questions with another student/group.

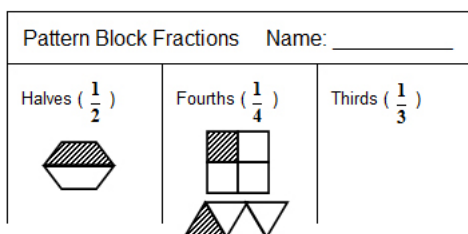
Note: This activity can be tiered down by reducing the number of friends to 3 or 4 and the pizza fraction to thirds or fourths.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

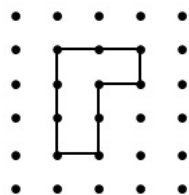
- Using geoboards, allow students to explore various ways to represent halves and fourths. (3N13)
- Ask students to use pattern blocks or other manipulatives to make multiple shapes that represent equal parts for halves, thirds and fourths. They can record their designs by tracing the blocks onto a recording sheet as seen below. You may extend this activity by asking for fifths, sixths, eighths, etc.



(3N13.4)

Presentation

- Provide pairs of students with the following design on dot paper. Tell them that this shape is $\frac{1}{2}$ of a whole shape. What could the whole shape look like? How many different possibilities can you find? Ask students to present their findings to the class. Invite them to create similar problems to challenge other groups, using geoboards.



(3N13.4)

Student-Teacher Dialogue

- Ask the student to describe how to find $\frac{1}{3}$ of a strip of paper. (3N13.4)

Resources/Notes

Lesson 3: Fractions of a Whole

3N13

TG pp. 11 – 14

Children’s Literature
(not provided):

Losi, Carol A. *Pizza Pizzazz*
ISBN 9780439304733

Strand: Number

Outcomes

Students will be expected to

3N13 Continued**Achievement Indicator:**

3N13.5 Identify common characteristics of a given set of fractions.

Elaborations—Strategies for Learning and Teaching

Provide many opportunities to explore and discuss fractions orally before the symbols are introduced. Continue to use, for example, the “one of three equal parts” language and help students connect the language with its symbol. This is the first time that fractions are presented symbolically. Fractions such as $\frac{1}{3}$, $\frac{2}{5}$, and $\frac{4}{10}$, are relatively easy for students to read since familiar ordinal language is used for the denominator of each – third, fifth, and sixth. Point out to students, however, that $\frac{1}{2}$ is read one “half” (not one “second”) and that $\frac{1}{4}$ may be read either one fourth or one quarter. Note: The money application of “4 quarters make a whole dollar” can be conveniently presented in this connection.

Some chocolate bars are made up of 12 equal blocks that can provide an opportunity to teach fractions. Depending on the nutrition policy in your school, you may wish to read the book, *The Hershey's Milk Chocolate Fractions Book* by Jerry Pallotta, and complete the following activity:

Provide a template of a chocolate bar to each student. As you read, ask students to follow the directions given in the book such as breaking (cutting) the bar into twelve equal sections. As each new fraction is introduced, students will demonstrate it with their chocolate bar and record the fraction.



The book, *Apple Fractions* by Jerry Pallotta may also be used to provide a connection between the visual, the word and the symbolic representations for fractions.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Paper and Pencil

- Group fractions in a set that have common characteristics. Using the terms numerator and denominator, ask students to tell how fractions are alike. E.g.,

$$\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{1}{8}, \frac{4}{10}, \frac{3}{8}, \frac{4}{5}, \frac{1}{2}$$

E.g.,

$\frac{1}{3}, \frac{1}{8},$ and $\frac{1}{2}$ all have the same numerator.

$\frac{2}{5}, \frac{3}{5},$ and $\frac{4}{5}$ all have the same denominator.

$\frac{1}{8}$ and $\frac{3}{8}$ have the same denominator.

$\frac{3}{5}$ and $\frac{3}{8}$ have the same numerator. (3N13.5)

Student – Teacher Dialogue

- Ask the student to tell why, whenever you see a representation of $\frac{1}{3}$, there is always a $\frac{2}{3}$ associated with it. (3N13.5)

Journal

- Ask students to use pictures, numbers and words to explain the relationship between $\frac{1}{4}$ and $\frac{3}{4}$. (3N13.5)

Resources/Notes

*Math Makes Sense 3***Lesson 4:** Naming and Writing Fractions

3N13

TG pp. 15 - 17

Game: Three in a Row

TG p. 18

Additional Activity:

Three-Colour Designs

TG: p. v and 40

Children's Literature (not provided):

Pallotta, Jerry. *The Hershey's Milk Chocolate Fractions Book*
ISBN 9780439135191

Pallotta, Jerry. *Apple Fractions*
ISBN 0-439-38901-1

Strand: Number

Outcomes

Students will be expected to

3N13 Continued

Achievement Indicators:

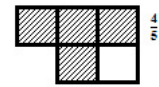
3N13.6 Name and record the fraction represented by the shaded and non-shaded parts of a given region.

3N13.7 Identify the numerator and denominator for a given fraction.

3N13.8 Model and explain the meaning of numerator and denominator.

Elaborations—Strategies for Learning and Teaching

Ask students to use grid paper to represent a fraction. Ask them to name the fraction, and identify and explain the meaning of numerator and denominator. E.g., in the picture below, the fraction represented is $\frac{4}{5}$. The 4 is the numerator because it tells how many parts of the shape are coloured. The 5 is the denominator because it tells how many equal parts the whole shape is divided into.



Provide students with a chart of flags, as shown. Ask them to identify the fraction represented by the shaded and non-shaded regions of the flags.

Working in small groups, ask students to look up international flags in encyclopedias, atlases, or online. Ask them to find at least three flags (or one per group member) that are divided into fractional parts (fair shares).

Provide them with index cards to reproduce the flags and ask them to write some facts about the flags origin or history. They will also identify the fraction represented by the flag. Ask them to present their findings to their classmates.

Fraction Flags		Name: _____	
Flag	Shaded Parts	Non-Shaded Parts	
	_____	_____	
	_____	_____	
	_____	_____	

When discussing the symbolic form of fractions, explain that the top number (numerator) tells how many shares or equal parts we have. The bottom number (denominator) tells how many equal parts the whole has been divided into. E.g., if the denominator is a 4, it means the whole is divided into 4 equal parts. To assist with clarity of meaning, always write fractions with a horizontal bar. E.g., $\frac{4}{10}$ not 4/10.

General Outcome: Develop Number Sense

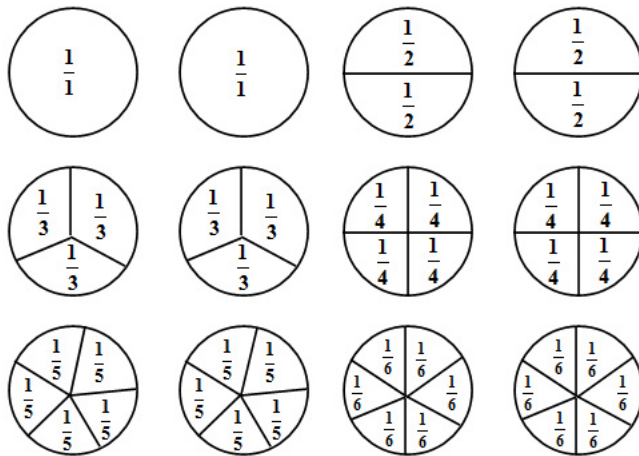
Suggested Assessment Strategies

Performance

- Using a ruler, ask students to create their own fraction flag on an index card. Remind them to be aware of using equal shares when designing their flag. They will decide what colours to use for the design of the flag. Ask them to give their flag a name (e.g., “Flag of Fifths”) and identify the fraction represented by each colour on the back of the index card. If you choose, they can tape their flags to a wooden stick or straw and display them on their desks using small lumps of clay.

(3N13.6)

- Roll a Fraction - Provide students with 2 number cubes and game boards that displays fraction pies, as seen below.



Demonstrate the rules of play for the game and display/provide the directions for future reference.

- Take turns rolling the number cubes and making fractions from the two numbers. Be sure to place the smaller number as the numerator. For example, if you roll 3 and 4, the fraction is $\frac{3}{4}$.
- Based on that fraction, colour in pie slices on your game board. For $\frac{3}{4}$, you would colour in three slices of a pie that is cut in fourths.
- As you play, colour in all available slices. The first player to colour in all of the slices on all of their pies wins!

(3N13.7)

Resources/Notes

*Math Makes Sense 3***Lesson 4 (Cont'd):** Naming and Writing Fractions

3N13

TG pp. 15 - 17

Strand: Number

Outcomes

Students will be expected to

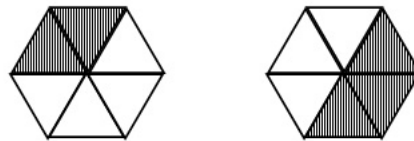
3N13 Continued**Achievement Indicator:**

3N13.9 Compare given fractions with the same denominator, using models.

Elaborations—Strategies for Learning and Teaching

Discuss with students that if two fractions have the same denominator, the fraction with the greater numerator represents the larger piece of the whole. If the denominators of two fractions from the same whole are the same, then the parts are the same.

Students will be familiar with the symbols for greater than and less than (< and >) and will now use these symbols when comparing fractions with the same denominator. Pattern blocks can be used to demonstrate this concept. E.g., The yellow hexagon can be used to represent a pizza and the small green triangles to represent the slices. Ask the students: If John ate $\frac{2}{6}$ of the pizza and Gina ate $\frac{3}{6}$ of the pizza, who ate the most pizza? Ask students to model their answers using the pattern blocks and record the fraction symbols showing which is greater and less than. Discuss with students how they know.



$\frac{2}{6} < \frac{3}{6}$ because
two sixths is less
than three sixths

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

- Ask the student to give an example of how one fourth of something could mean getting a lot, and how one fourth of something could mean getting a very small amount.

(3N13.9)

Journal

- Provide students with the following situation:

A giant cookie is a dessert choice on a restaurant menu. Would you rather have $\frac{4}{5}$ of the cookie for your dessert, or $\frac{2}{5}$?

Using pictures, numbers and words, explain your thinking.

(3N13.9)

Resources/Notes

Math Makes Sense 3

Lesson 5: Comparing Fractions

3N13

TG pp. 19 – 21

Strand: Number

Outcomes

Problem Solving Strategy:
Use a Model

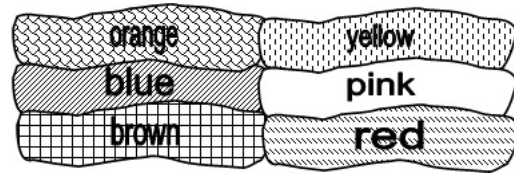
Elaborations—Strategies for Learning and Teaching

Previously, students have been introduced to the strategies of ‘Use a Pattern’, ‘Make an Organized List’, ‘Solve a Simpler Problem’, ‘Work Backward’, ‘Guess and Check’, ‘Make a Chart’, and ‘Use a Model’.

Strategy Focus - Use a Model - This strategy is similar to ‘Act it Out’; however, with this strategy, students solve problems using concrete materials available to them. Young children often benefit from using their senses. This strategy allows students to manipulate materials to ‘see’ possible solutions to the problem.

Consider the following tasks which encourage students to incorporate the ‘Use a Model’ strategy with models:

- Emma folded her t-shirts and put them in two stacks in her drawer. She put the brown shirt under the blue shirt. She put the red shirt on the right side of the brown shirt. She put the orange shirt on top of the blue shirt. Finally, Emma put the pink shirt between the red and the yellow shirt. Where did Emma put each t-shirt in her drawer? Use multi-link cubes to solve the problem and represent the solution using a coloured illustration.



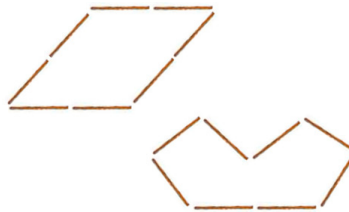
- Jacob folded a square piece of paper in half and then folded it in half again. What will Jacob see when he unfolds the paper? Is there more than one possibility?

General Outcome: Develop Number Sense

Suggested Assessment Strategies

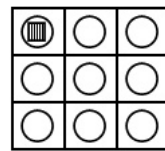
Presentation

- Present students with the following problems
 - A pretzel company has hired you to design a new logo for their package. They want the logo to show 8 pretzel sticks arranged to make the outline of a polygon. What are some possible logo designs you can create for the pretzel company using all 8 of the pretzel sticks? Remind them that a polygon has at least three straight sides. See possible examples below. (Actual pretzel sticks or toothpicks can be used for this task). As an extension, you may wish to have the students select their favourite design and create an actual package cover or front, giving the product a name, slogan, and colour. Students can present their designs to the class.

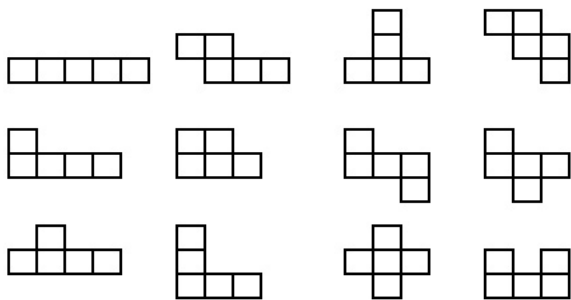


Performance

- Tell students: There are 9 hamburgers on a grill. One hamburger has cheese on it. Put cheese on 5 more hamburgers on the grill, but be sure to leave 1 hamburger without cheese in each row and in each column. Which hamburgers can you put cheese on? Use two-sided counters, with yellow representing the burger with cheese, and red representing the burger without.



- How many different ways can you arrange 5 squares in a single shape so that at least 1 full side of a square touches another full side? Ask students how many different ways they may use small cubes (from the base-ten materials), multi-link cubes, or square tiles to assist in solving this problem. Answer:



12 ways

Resources/Notes

Math Makes Sense 3

Lesson 6: Strategies Toolkit

TG pp. 22 - 23

