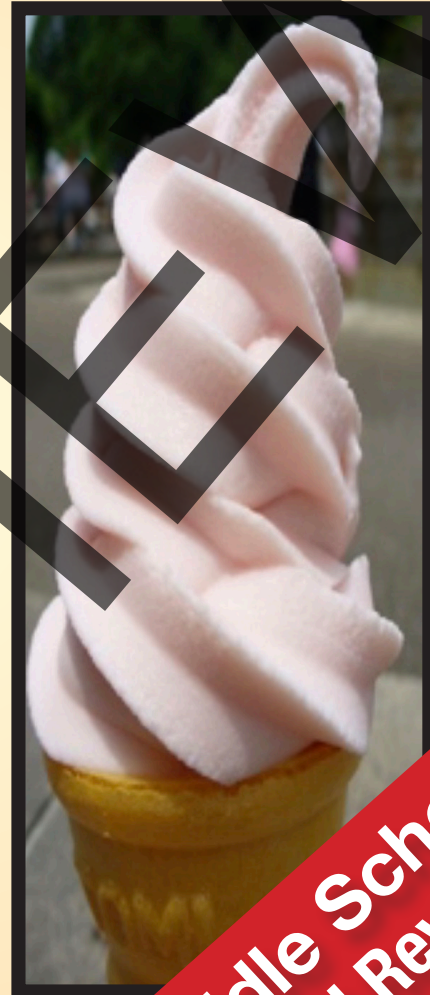


September 22nd Puzzle

# Math History-Mystery Puzzle

## Italo Marchiony Applies for Ice-Cream Cup Patent



BY DAVID B. SPANGLER  
AND KAREN S. CORDELL

Middle School  
Mixed Review

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Slides for  
PPT/Google

PowerPoint/Google™ slides are available for all puzzle clues and answers. Plus, there are slides for Extensions and Historical Notes.

# Student Page Includes an Introduction & Math Clues


**September 22 Puzzle**

Name \_\_\_\_\_

### Italo Marchiony Applies for Ice-Cream Patent

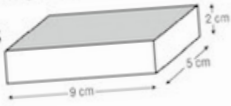
On **September 22** of the *Mystery Year*, Italian immigrant Italo Marchiony applied for a patent for his ice-cream edible ice-cream cup. Marchiony was an ice-cream push-cart vendor in New York City. His invention involved baking a waffle, and then while the waffle was still warm, he folded it in the shape of a cup with sloping sides and a flat bottom.

Here's a scoop: **National Ice-Cream Cone Day** is celebrated on September 22 in honor of Marchiony — whose invention is considered to be the official birth of the ice-cream cone.



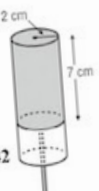
**Use the diagrams and clues to find the *Mystery Year*:**

**S4.05**




**Volume Formulas**  
Rectangular prism  
length × width × height

**S3.42**



**Cylinder**  
 $3.14 \times (\text{radius})^2 \times \text{height}$

**S3.15**



**Cone**  
 $(3.14 \times [\text{radius}]^2 \times \text{height}) \div 3$

- What is the volume of the right rectangular prism?  
(0) 87.92 cm<sup>3</sup> (1) 87.92 cm<sup>2</sup> (2) 84.91 cm<sup>3</sup>  
(3) 90 cm<sup>3</sup> (4) 90 cm<sup>2</sup>

The answer choice, (0, 1, 2, 3, or 4), is the ones digit of the *Mystery Year*.

- What is the volume of the ice-cream portion of the cylinder?

The answer choice given above with Clue 1, (0, 1, 2, 3, or 4), is the tens digit of the *Mystery Year*.

- How much more does it cost to buy 8 ice-cream cones than 4 ice-cream bars?

The answer is the hundreds digit of the *Mystery Year*.

4. Use this clue as a check on the other clues:  
*I scream, you scream,  
we all scream for ice cream.*  
Suppose in the stanza of the song, the letters c, r, e, a, m have the following values:  
 $c = 100$ ,  $r = 140$ ,  $e = 75$ ,  $a = 50$ ,  $m = 0.75$

When you find the sum of the values — based on each time each of the above five letters appears in the stanza — you will have the *Mystery Year*.

**What is the *Mystery Year* when Italo Marchino applied for his patent?**

Thousands	Hundreds	Tens	Ones	


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Math History-Mystery Puzzle: September 22

**September 22 Puzzle**

hiony applied an ice-cream waffle, and then sloping sides

ber 22 in arth of the



2.6 cm

Comes with Annotated Answer Key

...er values;  
...r ice cream.  
...e song, the letters c,  
...g values:  
 $a = 50$ ,  $m = 0.75$   
...ased on the  
...appears.  
 $(50) +$   
...Year.  
...talo  
...nc.

The review topics include volume, operations with decimals, and more.

# The Puzzle Can be Presented as PowerPoint or Google Slides™

## Introduction

**ActiveMath** **MYSTERY** **Sept. 22 Puzzle**

**Italo Marchiony Applies for Ice-Cream Cup Patent**

**Introduction**

On **September 22** of the *Mystery Year*, Italian immigrant **Italo Marchiony** applied for a patent for his ice-cream edible ice-cream cup. Marchiony was an ice-cream push-cart vendor in New York City. His invention involved baking a waffle, and then while the waffle was still warm, he folded it in the shape of a cup with sloping sides and a flat bottom.

Here's a scoop: **National Ice-Cream Cone Day** is celebrated on September 22 in honor of Marchiony — whose invention is considered to be the official birth of the ice-cream cone.

**Use the diagrams and clues to find the *Mystery Year* when Italo Marchino applied for his patent.**



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## Clues & Answers

**ActiveMath** **MYSTERY** **Sept. 22 Puzzle**

**Italo Marchiony Applies for Ice-Cream Cup Patent**

**Extension for Clue 3** *Part 1 of 4*

What is the unit price of the **\$4.05** 

**Clue 3** How much more does it cost to buy 8 ice-cream cones than 4 ice-cream bars?

**Sept. 22 Puzzle**

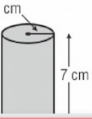
**ActiveMath** **MYSTERY** **Sept. 22 Puzzle**

**Italo Marchiony Applies for Ice-Cream Cup Patent**

**Clue 2** What is the volume of the ice-cream portion of the cylinder?

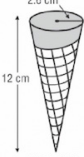
**Volume of Cylinder**  
 $3.14 \times (\text{radius})^2 \times \text{height}$

**Sept. 22 Puzzle**



**Sept. 22 Puzzle**

**\$3.15**



**Hundreds**

**Tens**

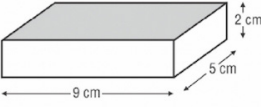
**Ones**

the *Mystery Year*.

**ActiveMath** **MYSTERY** **Sept. 22 Puzzle**

**Italo Marchiony Applies for Ice-Cream Cup Patent**

**Clue 1** What is the volume of the right rectangular prism?



**Volume of Rectangular Prism**  
length  $\times$  width  $\times$  height

(0) 87.92 cm<sup>3</sup> (1) 87.92 cm<sup>2</sup> (2) 84.91 cm<sup>3</sup>  
(3) 90 cm<sup>3</sup> (4) 90 cm<sup>2</sup>

The answer choice, (0, 1, 2, 3, or 4), is the ones digit of the *Mystery Year*.

**Ones**

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Answer screens are included but not shown here.

# Additional Slides Provide Ways to Extend Discussion

## Historical Notes

**Italo Marchiony Applies for Ice-Cream Cup Patent** Sept. 22 Puzzle

**Historical Notes**

**Patent Application**

Italo Marchiony emigrated to the United States in the late 1890s. He produced his first ice-cream cone in 1896 — seven years before seeking a patent. He was issued U.S. Patent 1,744,629 on December 15, 1903. His patent application described his invention as follows: “This invention relates to a molding apparatus, and particularly such molding apparatus as are adapted for the manufacture of ice-cream cups and the like.” His invention was so successful, that he ended up having 45 push-cart vendors selling his product in New York City.

At the time, vendors sold ice cream in a glass. Customers would lick the contents of the glass and return it to the vendor. The glass was known as the *penny lick*. Due to health concerns related to the practice, it was eventually replaced by the ice-cream cup that led to the modern ice-cream cone in New York City.

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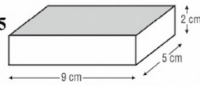
**Italo Marchiony Applies for Ice-Cream Cup Patent** Sept. 22 Puzzle

**Extension for Clue 3**

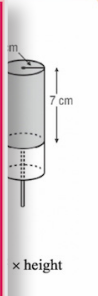
**Part 1 of 4**

What is the unit price of the ice-cream sandwich (the amount of ice-cream you get, in cubic centimeters, for \$1)?

\$4.05



**Rectangular prism**  
length × width × height



× height

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## Extensions & Answers

**Italo Marchiony Applies for Ice-Cream Cup Patent** Sept. 22 Puzzle

**Extension for Puzzle**

Consider a cylinder and a cone that have the same radius and height. How many times as great is the volume of the cylinder than the volume of the cone?

Volume of a Cylinder:  $\pi \cdot r^2 \cdot h$

Volume of a Cone:  $\frac{(\pi \cdot r^2 \cdot h)}{3}$

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# Teacher Notes Provide More Tips & Slide Minis at Point of Use

Slide Minis

Solution Strategies

Math Notes

of paper is the height, and this is multiplied by the area of the base to find the volume. Thus, the volume of a cylinder can be algebraically described by the familiar formula,  $V = B \cdot h$ . (Editorial Note: We have used the term "cylindrical treat" for this type of ice cream to avoid the use of a brand name.)

**Clue 3 Solution** The ice-cream cones cost \$3.15 each. The ice-cream bars cost \$4.05 each. The cost of 8 ice-cream cones is  $8 \cdot \$3.15$ , or \$25.20. The cost of 4 ice-cream bars is  $4 \cdot \$4.05$ , or \$16.20. So, the cost of 8 ice-cream cones is \$25.20 - \$16.20, or \$9 more than the cost of 4 ice-cream sandwiches. Thus, the hundreds digit is 9.

**Extension for Clue 3** The unit price for an item is the cost per unit of measure for the item. In terms of the three types of ice cream in the puzzle, one way to state the unit price is to calculate the price per cubic centimeter of ice cream. Another way is to find how much ice cream you get for \$1 among each of the three types of ice cream to solve the following problem:

Which of the three types of ice cream shown in the puzzle provides the most ice cream for your money?

One way to solve the problem is to divide the volume of each item by its price. We can use the volumes already found for the ice-cream bar and the cylindrical treat. However, we still need to find the volume of the ice-cream cone.

Unit price for the ice-cream cone is  $\frac{90 \text{ cm}^3}{22.3 \text{ cm}^3} = 4.03$

## Sept. 22: TEACHER NOTES Marchiony Ice-Cream Cup Patent

**Introduction** Students solve math clues to find the *Mystery Year*. PowerPoint/Google slides are available for all Clues and answers. Plus, there are slides for Extensions and Historical Notes as indicated at the right. The optional URL links that appear in these Teacher Notes were active at the time of publication. Enjoy!

**CCSS:** MP4 (Model with Mathematics), 5.MD.5.b, 8.G.9, 5.NBT.7, 6.SP.4, 6.EE.2.c, 7.EE.4.

**Topics:** volume of a right rectangular prism, make a frequency table  
**Mystery Year:** 1903

**Clue 1 Solution** The formula for the volume of a rectangular prism is  $V = B \cdot h$ , where  $B$  stands for the area of the base. The area of the base of the ice-cream sandwich is  $9 \cdot 5$ , or  $45 \text{ cm}^2$ . So, the volume is  $45 \cdot 2$ , or  $90 \text{ cm}^3$ .

**Math Note:** Volume is the amount of space inside a 3-dimensional object. It is measured in cubic units, such as cubic centimeters ( $\text{cm}^3$ ) or cubic inches ( $\text{in}^3$ ). Volume is also referred to as *capacity*.

Another formula for the volume of a rectangular prism is  $V = B \cdot h$ , where  $B$  stands for the area of the base. The area of the base of the ice-cream sandwich is  $9 \cdot 5$ , or  $45 \text{ cm}^2$ . So, the volume is  $45 \cdot 2$ , or  $90 \text{ cm}^3$ .

A *prism* is a 3-dimensional solid with two congruent, parallel polygons as bases. A *rectangular prism* is a prism with two congruent, parallel rectangles as bases. A *right rectangular prism* is a rectangular prism where the angles between the base and sides are right angles. So, all six faces are rectangles.

An example of a rectangular prism that is not a right rectangular prism is shown at right. It is called an *oblique* rectangular prism because its sides are slanted. Its two bases are rectangles, but the remaining four (lateral) faces are parallelograms. Note that although the bases are parallel, one is not directly above (or below) the other. To find the height (blue segment), you would likely have to use the Pythagorean Theorem.

**Clue 2 Solution** The formula for volume of a cylinder is  $V = \pi \cdot r^2 \cdot h$ , where  $3.14$  is used for  $\pi$ ,  $r$  stands for the radius, and  $h$  stands for its height. So, the volume of the ice-cream portion of the cylindrical treat (where you slide the stick up to eat more) is found as follows:  $V = 3.14 \cdot (2)^2 \cdot 7 = 3.14 \cdot 4 \cdot 7$ , or  $87.92 \text{ cm}^3$ . Answer choice (0) provides the correct answer, so the tens digit of the *Mystery Year* is 0.

**Math Note:** A *cylinder* is like a prism except the bases are generally circles rather than polygons. In a *right circular cylinder*, the bases are circles, and a perpendicular line segment can be drawn from the center of the base circles. For most situations, when we refer to a cylinder, we mean a right circular cylinder.

When thinking about volume of a cylinder, you may want students to imagine layers of circular paper stacked from the bottom base to the top base. The number of layers

Math History-Mystery Puzzle: Sept. 22

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