CEMC at Home

Grade 7/8 - Monday, June 1, 2020

Contest Day 5

Today's resource features a question from one of the recently released 2020 CEMC Mathematics Contests, along with a question from one of our past contests.

2016 Gauss Contest, #16

Each of $\square$, $\triangle$ and $\blacklozenge$ represents a non-zero number. If $\square = \triangle + \triangle + \triangle$ and $\square = \blacklozenge + \blacklozenge$, then $\square + \blacklozenge + \triangle$ equals

(A) $\square + \triangle$

(B) $\blacklozenge + \triangle + \triangle + \triangle + \triangle$

(C) $\blacklozenge + \blacklozenge + \square$

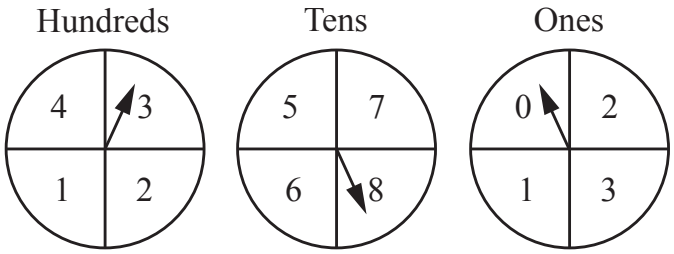
(D) $\triangle + \triangle + \triangle + \blacklozenge + \blacklozenge$

(E) $\blacklozenge + \blacklozenge + \blacklozenge + \triangle + \triangle$

2020 Gauss Contest, #22

Three spinners are shown below. The spinners are used to determine the hundreds, tens and ones digits of a three-digit number. How many possible three-digit numbers that can be formed in this way are divisible by 6?

(A) 11 **(B)** 16 **(C)** 22 **(D)** 12 **(E)** 9



More Info:

Check out the CEMC at Home webpage on Monday, June 8 for solutions to the Contest Day 5 problems.

CEMC at Home

Grade 7/8 - Monday, June 1, 2020
Contest Day 5 - Solution

Solutions to the two contest problems are provided below.

2016 Gauss Contest, #16

Each of $\square$, $\triangle$ and $\blacklozenge$ represents a non-zero number. If $\square = \triangle + \triangle + \triangle$ and $\square = \blacklozenge + \blacklozenge$, then $\square + \blacklozenge + \triangle$ equals

(A) $\square + \triangle$

(B) $\blacklozenge + \triangle + \triangle + \triangle + \triangle$

(C) $\blacklozenge + \blacklozenge + \square$

(D) $\triangle + \triangle + \triangle + \blacklozenge + \blacklozenge$

(E) $\blacklozenge + \blacklozenge + \blacklozenge + \triangle + \triangle$

Solution:

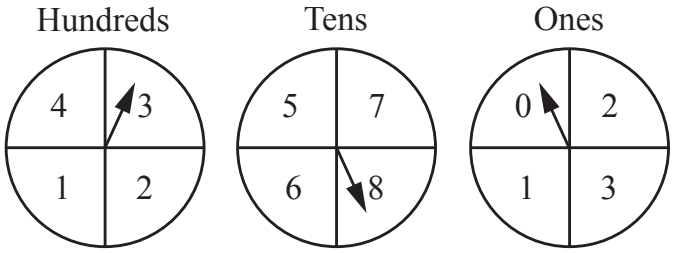
Since $\square = \triangle + \triangle + \triangle$, then by adding a $\blacklozenge$ to each side we get $\square + \blacklozenge = \blacklozenge + \triangle + \triangle + \triangle$.
Since $\square + \blacklozenge = \blacklozenge + \triangle + \triangle + \triangle$, then by adding a $\triangle$ to each side we get that $\square + \blacklozenge + \triangle = \blacklozenge + \triangle + \triangle + \triangle + \triangle$.
(Can you explain why each of the other answers is not equal to $\square + \blacklozenge + \triangle$?)

ANSWER: (B)

2020 Gauss Contest, #22

Three spinners are shown below. The spinners are used to determine the hundreds, tens and ones digits of a three-digit number. How many possible three-digit numbers that can be formed in this way are divisible by 6?

(A) 11 **(B)** 16 **(C)** 22 **(D)** 12 **(E)** 9



See the next page for a solution to the second contest problem.

Solution:

A number is divisible by 6 if it is divisible by both 2 and 3.
To be divisible by 2, the three-digit number that is formed must be even and so the ones digit must be 0 or 2.
To be divisible by 3, the sum of the digits of the number must be a multiple of 3.
Consider the possible tens and hundreds digits when the ones digit is 0.
In this case, the sum of the tens and hundreds digits must be a multiple of 3 (since the ones digit does not add anything to the sum of the digits).
We determine the possible sums of the tens and hundreds digits in the table below.
The sums which are a multiple of 3 are circled.

The Tens Digit

The Hundreds Digit

100s \ 10s	5	6	7	8
1	(6)	7	8	(9)
2	7	8	(9)	10
3	8	(9)	10	11
4	(9)	10	11	(12)

When the ones digit is 0, the possible three-digit numbers are: $150, 180, 270, 360, 450$, and 480.
Consider the possible tens and hundreds digits when the ones digit is 2.
In this case, the sum of the tens and hundreds digits must be 2 less than a multiple of 3 (since the ones digit adds 2 to the sum of the digits).
When the ones digit is 2, the possible three-digit numbers are: $162, 252, 282, 372$, and 462.
The number of three-digit numbers that can be formed that are divisible by 6 is 11.

ANSWER: (A)

CEMC at Home

Grade 7/8 - Tuesday, June 2, 2020

Famous Mathematicians

Throughout human history, many mathematicians have made significant contributions to the subject. These important historical figures often lead fascinating lives filled with interesting stories. Four of these mathematicians are listed below.

Pythagoras	He was a Greek mathematician and philosopher who is best known for discovering the Pythagorean theorem.
Sophie Germain	She was a French mathematician who grew up at a time when women were not allowed to attend universities. Her best known work is in number theory and applied mathematics.
Carl Gauss	At an early age, he added up the numbers from 1 to 100 in only a few seconds. He contributed to many fields in mathematics including algebra, number theory, and geometry.
Ada Lovelace	She contributed significantly to the field of computer science. She is also considered by many to be the first computer scientist to write a computer program.

Choose two of these four mathematicians and for each one you choose:

1. Look up information about the mathematician online. Find a new fact about them that you find interesting and share what you find with friends or family.
2. Are there any mathematical words or ideas connected to this mathematician that sound familiar to you? Try to write down three to five of these words.
3. If you had the chance to go back in time and meet this mathematician, what question would you ask them?

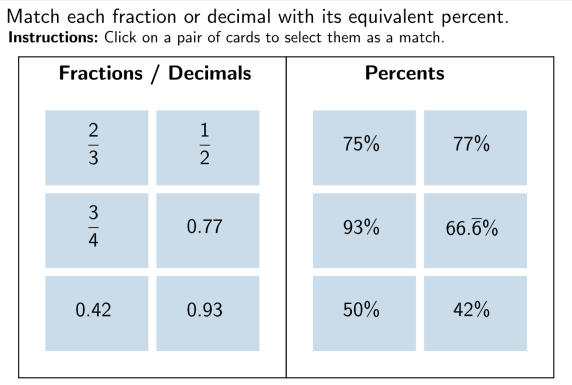
More Info: The CEMC Gauss Math Contest is named in honour of Carl Gauss.

CEMC at Home

Grade 7/8 - Wednesday, June 3, 2020
Interact with Mathematics

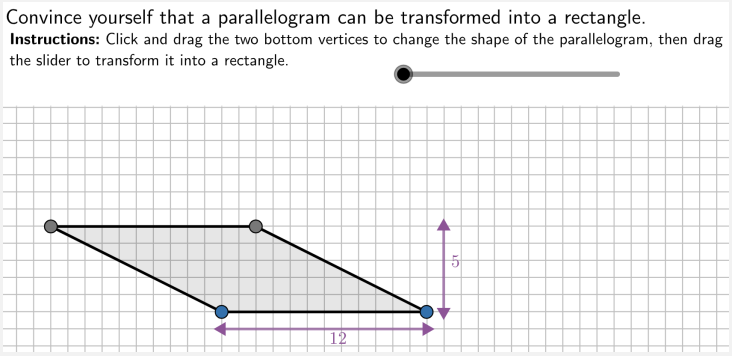
Technology can help us make mathematical discoveries and learn about mathematical objects. Three online examples of this from different areas of mathematics are featured below.

Matching Game: Match decimals and fractions with their equivalent percentages.



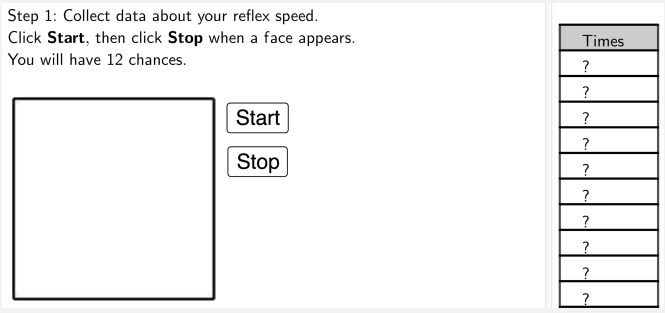
Link to App: https://www.geogebra.org/m/wRkzDXHP

Parallelogram Exploration: Explore how to transform a parallelogram into a rectangle.



Link to App: https://www.geogebra.org/m/x6VYxpHp

Reflex Speed: Test your reflex speed by playing a game. Display the data collected in a histogram.



Link to App: https://www.geogebra.org/m/CpQ45m57

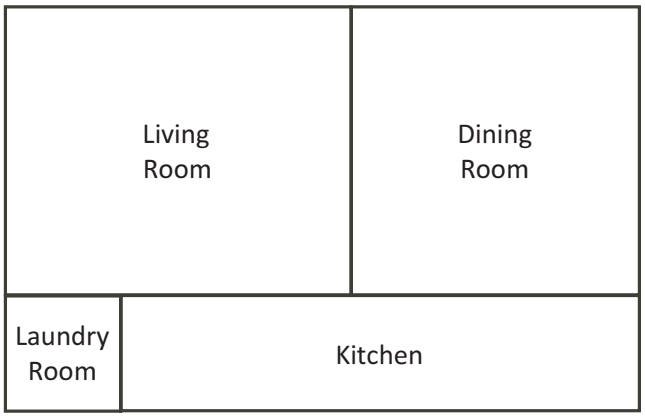
More Info: CEMC courseware lessons feature hundreds of interactive mathematics applications.

CEMC at Home

Grade 7/8 - Thursday, June 4, 2020

Kitchen Sized

The rectangular floor plan of the first level of a house is shown in the following diagram.



Both the laundry room and the dining room are square with areas of 4 m^2 and 25 m^2, respectively. The living room is rectangular with an area of 30 m^2.

Determine the area of the kitchen.

More Info:

Check out the CEMC at Home webpage on Friday, June 5 for a solution to Kitchen Sized.

This CEMC at Home resource is a past problem from Problem of the Week (POTW). POTW is a free, weekly resource that the CEMC provides for teachers, parents, and students during the school year. POTW is wrapped up for the current school year and will resume on September 17, 2020. To subscribe to POTW and to find more past problems and their solutions visit:
https://www.cemc.uwaterloo.ca/resources/potw.php

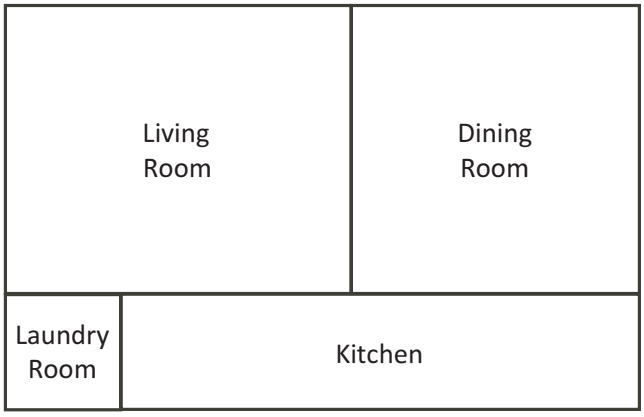
CEMC at Home

Grade 7/8 - Thursday, June 4, 2020

Kitchen Sized - Solution

Problem:

The rectangular floor plan of the first level of a house is shown in the following diagram.



Both the laundry room and the dining room are square with areas of 4 m^2 and 25 m^2, respectively. The living room is rectangular with an area of 30 m^2.

Determine the area of the kitchen.

Solution:

Let the width of a room be the vertical dimension on the diagram. Let the length of a room be the horizontal dimension.

The dining room is a square and has an area of 25 m^2. Its length and width must both be 5 m since Area $= 5 \times 5 = 25$ m^2. The width of the dining room and living room are the same. So the width of the living room is 5 m. But the area of the living room is 30 m^2 so the length of the living room is 6 m since Area $= 5 \times 6 = 30$ m^2.

The laundry room is a square and has an area of 4 m^2. Its length and width must both be 2 m since Area $= 2 \times 2 = 4$ m^2. The width of the laundry room and kitchen are the same. So the width of the kitchen is 2 m.

Now the length of the whole house can be calculated in two ways. We will equate these two expressions to find the length of the kitchen.

$$\begin{aligned} \text{Length of Laundry Room} + \text{Length of Kitchen} &= \text{Length of Living Room} + \text{Length of Dining Room} \\ 2 + \text{Length of Kitchen} &= 6 + 5 \\ 2 + \text{Length of Kitchen} &= 11 \\ \text{Length of Kitchen} &= 9 \text{ m} \end{aligned}$$

Since the width of the kitchen is 2 m and the length of the kitchen is 9 m, the area of the kitchen is $2 \times 9 = 18$ m^2.

CEMC at Home

Grade 7/8 - Friday, June 5, 2020

Math and CS in the News

Most weeks, our CEMC Homepage provides a link to a story in the media about mathematics and/or computer science. These stories show us how important mathematics and computer science are in today's world. They are a great source for discussions.

Using this article from Phys.org, think about the following questions. (URL also provided below.) Don't worry if you don't understand some of the higher level math discussed in the article.

1. Describe in your own words what it means for a Rubik's Cube to be *scrambled*.
2. What are some situations in life where randomness is important?
3. Research some strategies for solving a Rubik's Cube.
4. Predict the future: According to various online sources, the current record for solving a $3 \times 3 \times 3$ Rubik's Cube is 3.47 seconds for a human and 0.38 seconds for a robot. How do you think technology will help break these records in the future?

URL of the article:
https://phys.org/news/2020-01-hard-scramble-rubik-cube.html

More Info:

A full archive of past posts can be found in our Math and CS in the News Archive. Similar resources for other grades may also be of interest.