CEMC at Home

Grade 4/5/6 - Monday, June 15, 2020

History of Computing

Computers can be found on our desks, in our pockets and even in our refrigerators! This is remarkable because modern computers have been around for less than 100 years. During this time, there has been a constant stream of new discoveries and advances in technology.

Use this online tool to arrange the following list of events in the history of computer science from earliest to most recent.

A. Tim Berners-Lee posts the first picture on the World Wide Web.

B. The top selling mobile game is Angry Birds.

C. The first email is sent. It is sent from Ray Tomlinson to Ray Tomlinson.

D. The Apple Computer Company is created.

E. The first Microsoft Xbox is available for purchase.

F. Keyboard input is introduced as a way of entering data into a computer.

G. Deep Blue is the first computer program to beat a human world chess champion.

More Info:

Our webpage Computer Science and Learning to Program is the best place to find the CEMC's computer science resources.

CEMC at Home

Grade 4/5/6 - Tuesday, June 16, 2020

Can You Find the Terms?

Can you find all of the given mathematics and computer science terms in the grid? Good Luck!

C P R O G R A M Y A V
A L G O R I T H M E K
V S O F T W A R E E E
S Z E U M I D N L U O
Y G U G W E N G G Q U
M R R I I K N P Z L T
M A V J Q A Z D U I E
E P U K I R K R O T L
T H F R A C T I O N H
R P T A Z I N K J G J
Y W C O M P U T E R S

FRACTION	ANGLE	SYMMETRY	INPUT	SOFTWARE
TRIANGLE	GRAPH	PROGRAM	COMPUTER	ALGORITHM

Note that the word "ANGLE" appears twice in the grid: once as part of the word "TRIANGLE" and a second time on its own.

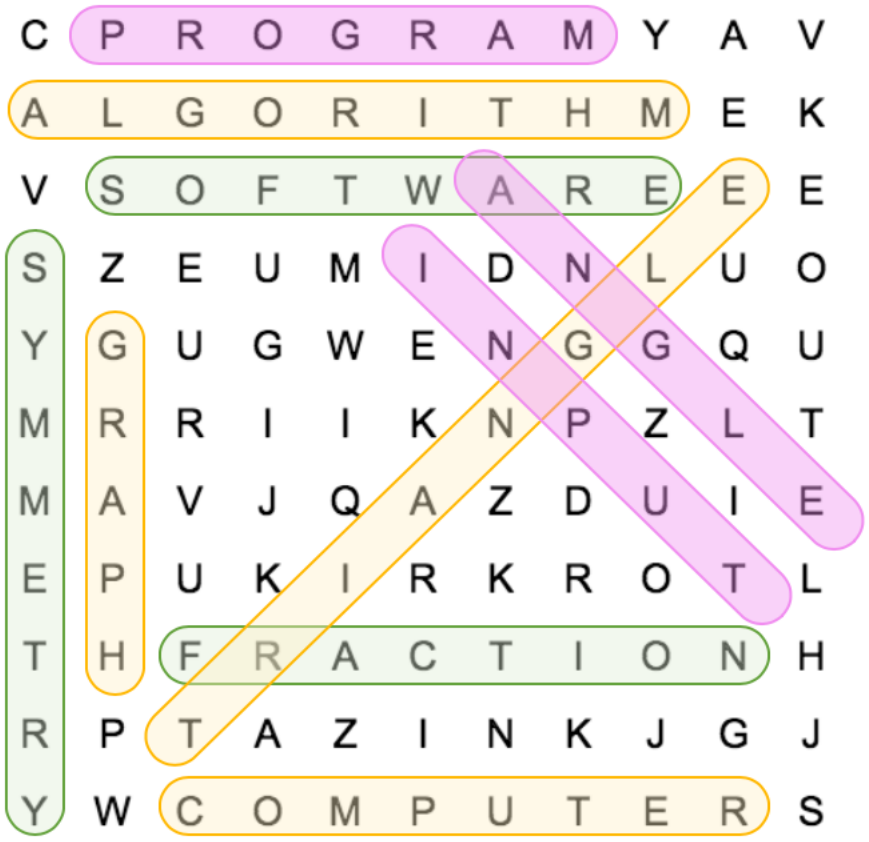
More Info:

Check the CEMC at Home webpage on Wednesday, June 17 for the solution to Can You Find the Terms?

CEMC at Home

Grade 4/5/6 - Tuesday, June 16, 2020

Can You Find the Terms? - Solution



FRACTION ANGLE SYMMETRY INPUT SOFTWARE
TRIANGLE GRAPH PROGRAM COMPUTER ALGORITHM

CEMC at Home

Grade 4/5/6 - Wednesday, June 17, 2020

We've Got Your Number!

I am a nine-digit number. I contain each digit from 1 to 9 except for the digit 8, and I contain two appearances of the digit 5. Discover what number I am by using the following clues.

- I am less than 500 000 000.
- My ten millions digit and my ones (units) digit are the same.
- The sum of my hundred millions, ten millions, and millions digits is 18.
- My thousands digit is 1.
- My ten thousands digit is one more than my hundred thousands digit.
- My ones (units) digit is equal to the sum of my hundreds digit and my tens digit.
- My hundreds digit is 3.

More Info:

Check out the CEMC at Home webpage on Thursday, June 18 for a solution to We've Got Your Number!

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 4/5/6 - Wednesday, June 17, 2020

We've Got Your Number - Solution

Problem:

I am a nine-digit number. I contain each digit from 1 to 9 except for the digit 8, and I contain two appearances of the digit 5. Discover what number I am by using the following clues.

- I am less than 500 000 000.
- My ten millions digit and my ones (units) digit are the same.
- The sum of my hundred millions, ten millions, and millions digits is 18.
- My thousands digit is 1.
- My ten thousands digit is one more than my hundred thousands digit.
- My ones (units) digit is equal to the sum of my hundreds digit and my tens digit.
- My hundreds digit is 3.

Solution:

The mystery number is **459 671 325**.

This can be reasoned from the clues in the following steps.

- Since the digit 5 occurs twice and the ten millions digit and the units digit are the same, then they are both 5. The number looks like $\_\ \underline{5}\ \_\ \ \_\ \_\ \_\ \ \_\ \_\ \underline{5}$
- Since the number is less than 500 000 000, the hundred millions digit must be 4 or less.
- Since the sum of the hundred millions, ten millions, and millions digits is 18, and the ten millions digit is 5, then the sum of the hundred millions digit and the millions digit must be 13. And since the hundred millions digit is 4 or less, the only combination that will work for the first 3 digits is 459. The number looks like $\underline{4}\ \underline{5}\ \underline{9}\ \ \_\ \_\ \_\ \ \_\ \_\ \underline{5}$
- The hundreds digit is 3, and the 5 in the ones (units) digit is the sum of the hundreds and tens digits; thus the tens digit is 2. The number now looks like $\underline{4}\ \underline{5}\ \underline{9}\ \ \_\ \_\ \_\ \ \underline{3}\ \underline{2}\ \underline{5}$
- The thousands digit is 1. The number now looks like $\underline{4}\ \underline{5}\ \underline{9}\ \ \_\ \_\ \underline{1}\ \ \underline{3}\ \underline{2}\ \underline{5}$
- All the digits have been used now except 6 and 7. Since the ten thousands digit is one more than the hundred thousands digit, they must be 7 and 6 respectively. The number we are looking for is $\underline{4}\ \underline{5}\ \underline{9}\ \ \underline{6}\ \underline{7}\ \underline{1}\ \ \underline{3}\ \underline{2}\ \underline{5}$

CEMC at Home

Grade 4/5/6 - Thursday, June 18, 2020

Games and Puzzles

The CEMC has created lots of resources that we hope you have found interesting over the last few months. We also know that there are a lot of online games and puzzles created by other organizations that make use of mathematics and logic. We've highlighted three examples below that you can explore for more mathematical fun!

Tower of Hanoi from Math Playground (https://www.mathplayground.com)

The Tower of Hanoi is a famous puzzle with wooden pegs and rings of different sizes. The goal of this puzzle is to move all of the rings to another peg using the fewest moves possible, but following certain rules. A tool is provided to help you solve the puzzle.

Deep Sea Duel from NCTM (https://www.nctm.org)

You are challenged to a game where you race to find numbers that add up to a particular value.

Deep Sea Math Mystery from Math Playground (https://www.mathplayground.com)

In this puzzle you need to use logic and number sense to figure out how many seashells belong to each sea creature.

You can find other interesting mathematics related games and puzzles online. Share your favourites using any forum you are comfortable with.

CEMC at Home
Grade 4/5/6 - Friday, June 19, 2020
Relay Day - Part 1

As part of the CEMC's Canadian Team Mathematics Contest, students participate in Math Relays. Just like a relay in track, you "pass the baton" from teammate to teammate in order to finish the race, but in the case of a Math Relay, the "baton" you pass is actually a number!

Read the following set of problems carefully.

Problem 1: Two standard six-sided dice are rolled and the sum of the two top faces is calculated. What is the difference between the largest possible sum and the smallest possible sum?

Problem 2: *Replace N below with the number you receive.*
Marcia has N paper clips. Of these, 2 are pink, 1 is blue, 3 are yellow, and the rest are green. How many of Marcia's paper clips are green?

Problem 3: *Replace N below with the number you receive.*

- Atidya is 4 years older than Bharti.
- Atidya is 6 years younger than Dhruv.
- Dhruv is 9 years older than Chitra.

If Chitra is N years old, how old is Bharti?

Notice that you can answer Problem 1 without any additional information.

In order to answer Problem 2, you first need to know the mystery value of N. The value of N used in Problem 2 will be the *answer* to Problem 1. (For example, if the answer you got for Problem 1 was 5 then you would start Problem 2 by replacing N with 5 in the problem statement.)

Similarly, you need the answer to Problem 2 to answer Problem 3. The value of N in Problem 3 is the *answer* that you got in Problem 2.

Now try the relay! You can use this tool to check your answers.

Follow-up Activity: Can you come up with your own Math Relay?
What do you have to think about when making up the three problems in the relay?
Can you just find three math problems and put them together to form a relay?

In Part 1 of this resource, you were asked to complete a relay on your own. But, of course, relays are meant to be completed in teams! In a team relay, three different people are in charge of answering the problems. Player 1 answers Problem 1 and passes their answer to Player 2; Player 2 takes Player 1's answer and uses it to answer Problem 2; Player 2 passes their answer to Player 3; and so on.

In Part 2 of this resource, you will find instructions on how to run a relay game for your friends and family. We will provide a relay for you to use, but you can also come up with your own!

CEMC at Home

Grade 4 to 12 - Friday, June 19, 2020
Relay Day - Part 2

Relay for Family and Friends

In Part 1 of this resource, you learned how to do a Math Relay. Now, why not try one out with family and friends!

You can put together a relay team and

- play just for fun, not racing any other team, or
- compete against another team in your household (if you have at least 6 people in total), or
- compete with a team from another family or household by
  - timing your team and comparing times with other teams to declare a winner, or
  - competing live using a video chat.

Here are the instructions for how to play.

Relay Instructions:

1. Decide on a team of three players for the relay. The team will be competing together.
2. Find someone to help administer the relay; let's call them the "referee".
3. Each teammate will be assigned a number: 1, 2, or 3. Player 1 will be assigned Problem 1, Player 2 will be assigned Problem 2, and Player 3 will be assigned Problem 3.
4. The three teammates should not see any of the relay problems in advance and should not talk to each other during the relay.
5. Right before the relay starts, the referee should hand out the correct relay problem to each of the players, with the problem statement face down (not visible).
6. The referee will then start the relay. At this time *all three players* can start working on their problems.

   Think about what Player 2 and Player 3 can do before they receive the value of N (the answer from the previous question passed to them by their teammate).
7. When Player 1 thinks they have the correct answer to Problem 1, they record their answer on the answer sheet and pass the sheet to Player 2. When Player 2 thinks they have the correct answer to Problem 2, they record their answer to the answer sheet and pass the sheet to Player 3. When Player 3 thinks they have the correct answer to Problem 3, they record their answer on the answer sheet and pass the sheet to the referee.

8. If all three answers passed to the referee are correct, then the relay is complete! If at least one answer is incorrect, then the referee passes the sheet back to Player 3.

9. At any time during the relay, the players on the team can pass the answer sheet back and forth between them, as long as they write nothing but their current answers on it and do not discuss anything. (For example, if Player 2 is sure that Player 1's answer must be incorrect, then Player 2 can pass the answer sheet back to Player 1, silently. This is a cue for Player 1 to check their work and try again.)

See the next page for a relay for family and friends! This includes instructions for the referee. You can also come up with your own relays to play. You can find many more relays from past CTMC contests on the CEMC's Past Contests webpage.

Sample answer sheets are provided below for you to use for your relays if you wish.

Answer Sheets:

Problem 1 Answer	
Problem 2 Answer	
Problem 3 Answer	

Problem 1 Answer	
Problem 2 Answer	
Problem 3 Answer	

Problem 1 Answer	
Problem 2 Answer	
Problem 3 Answer	

Problem 1 Answer	
Problem 2 Answer	
Problem 3 Answer	

Relay For Three

Instructions for the Referee:

1. Multiple questions at different levels of difficulty are given for the different relay positions.
   - Assign one of the first three problems (marked "Problem 1") to Player 1.
   - Assign one of the next three problems (marked "Problem 2") to Player 2.
   - Assign one of the last three problems (marked "Problem 3") to Player 3.

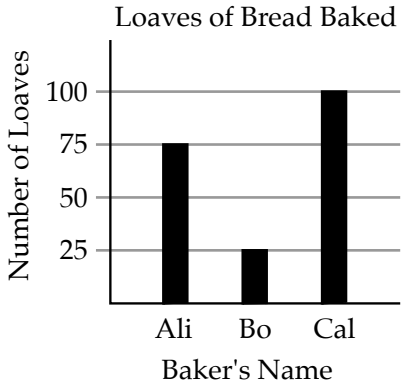
   Choose a problem so that each player is comfortable with the level of their question. The level of difficulty of each question is represented using the following symbols:

   - ● These questions should be accessible to most students in grade 4 or higher.
   - ■ These questions should be accessible to most students in grade 7 or higher.
   - ◆ These questions should be accessible to most students in grade 9 or higher.
2. Use this tool to find the answers for the relay problems in advance.

Relay Problems (to cut out):

Problem 1 ●

The graph shows the number of loaves of bread that three friends baked. How many loaves did Bo bake?

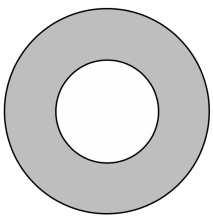


Problem 1 ■

An equilateral triangle has sides of length $x + 4$, $y + 11$, and 20. What is the value of $x + y$?

Problem 1 ◆

In the figure shown, two circles are drawn. If the radius of the larger circle is 10 and the area of the shaded region (in between the two circles) is 75π, then what is the *square* of the radius of the smaller circle?



Problem 2 

Replace N below with the number you receive.
Kwame writes the whole numbers in order from 1 to N (including 1 and N). How many times does Kwame write the digit '2'?

Problem 2 

Replace N below with the number you receive.
The total mass of three dogs is 43 kilograms. The largest dog has a mass of N kilograms, and the other two dogs have the same mass. What is the mass of each of the smaller dogs?

Problem 2 

Replace N below with the number you receive.
The points $(6, 16)$, $(8, 22)$, and (x, N) lie on a straight line. Find the value of x.

Problem 3 

Replace N below with the number you receive.
You have some boxes of the same size and shape. If N oranges can fit in one box, how many oranges can fit in two boxes, in total?

Problem 3 

Replace N below with the number you receive.
One morning, a small farm sold 10 baskets of tomatoes, 2 baskets of peppers, and N baskets of zucchini. If the prices are as shown below, how much money, in dollars did the farm earn in total from these sales?

Basket of Tomatoes:	\$0.50
Basket of Peppers:	\$2.00
Basket of Zucchini:	\$1.00

Problem 3 

Replace N with the number you receive.
Elise has N boxes, each containing x apples. She gives 12 apples to her sister. She then gives 20% of her remaining apples to her brother. After this, she has 120 apples left. What is the value of x?