CEMC at Home

Grade 9/10 - 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. Deep Blue is the first computer program to beat a human world chess champion.

B. The Harvard Mark I mechanical computer is built and is used for military purposes during World War II.

C. Sun Microsystems develops the Java programming language.

D. The ASCII is developed to create standard binary codes for 128 different characters.

E. Computers are used to determine that a perfect winning strategy does not exist for the game of checkers.

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

G. Konrad Zuse designs the Z3 electromechanical computer which is considered the first automatic programmable computer.

H. The Altair 8800 is the first personal computer to sell in large numbers.

I. A robot named Elektro is built which responds to voice commands.

J. Guido van Rossum creates and releases the Python programming language.

K. Doug Engelbart invents the computer mouse.

L. Animators create Cindy, the first human-like CGI (computer generated imagery) movie character.

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 9/10 - 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!

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

EXPONENT
POLYNOMIAL
SLOPE
PARABOLA
FACTORING
MIDPOINT
VERTEX
ARRAY
LOOP
BOOLEAN
SYNTAX
ALGORITHM
CONDITIONAL
FUNCTION
TESTING

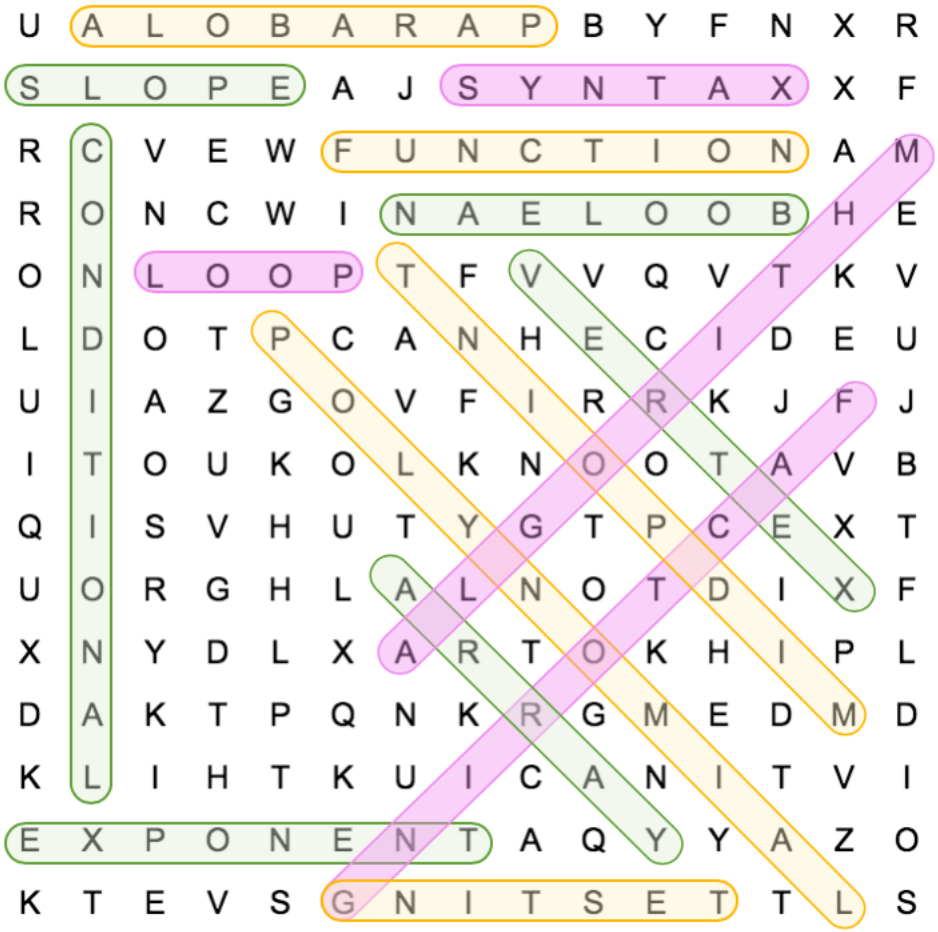
More Info:

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

CEMC at Home

Grade 9/10 - Tuesday, June 16, 2020

Can You Find the Terms? - Solution



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CEMC at Home

Grade 9/10 - Wednesday, June 17, 2020

The Standings

In a softball league with four teams, each team has played every other team 4 times.

Each team earned 3 points for a win, 1 point for a tie and no points for a loss.

The total accumulated points were:

Lions	22
Tigers	19
Mounties	14
Royals	12

How many games ended in a win and how many games ended in a tie?

More Info:

Check out the CEMC at Home webpage on Thursday, June 18 for a solution to The Standings.

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 9/10 - Wednesday, June 17, 2020

The Standings - Solution

Problem:

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The total accumulated points were:

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Tigers	19
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How many games ended in a win and how many games ended in a tie?

Solution:

We begin by calculating the total number of games played. Since each team played every other team 4 times, each team played $3 \times 4 = 12$ games. Since there are four teams, a total of $\frac{4 \times 12}{2} = 24$ games were played. We divide by 2 since each game is counted twice. For example, the Lions playing the Tigers is the same as the Tigers playing the Lions.

In games where one team won and one team lost, one team earned 3 points and the other 0 points, so a total of 3 points were awarded. In games that resulted in a tie, both teams earned 1 point, so a total of 2 points were awarded.

If there were 0 ties, then 24 games would result in $24 \times 3 = 72$ points being awarded. However, $22 + 19 + 14 + 12 = 67$ points were actually awarded in all of the games. Since a total of 3 points were awarded when there was a win and a total of 2 points were awarded when there was a tie, every point below 72 must represent a tie. Since $72 - 67 = 5$, there must have been 5 ties. Since 24 games were played, $24 - 5 = 19$ games resulted in a win.

Therefore, there were 19 games that ended in a win and 5 games ended in a tie.

We should check that there is a combination of wins, ties and losses that satisfies the conditions in the problem. Indeed, one possibility is:

Team Name	Wins	Ties	Losses	Total Points
Lions	7	1	4	22
Tigers	6	1	5	19
Mounties	3	5	4	14
Royals	3	3	6	12
TOTALS	19	10	19	67

Notice that in the chart there are a total of 10 ties. That means that 5 games ended in a tie and a total of 10 points were awarded for ties.

CEMC at Home

Grade 9/10 - 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 lots 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!

Fraction Game from NCTM (https://www.nctm.org)

To make moves in this game, you need to use logic and number sense involving fractions.

The Remainders Game from NRICH (https://nrich.maths.org)

Use your knowledge of remainders to figure out a mystery number.

Slitherlink Puzzles by Krazydad (https://krazydad.com)

In a Slitherlink Puzzle, you connect horizontally or vertically adjacent dots to form a meandering path that forms a single loop, without crossing itself, or branching.

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

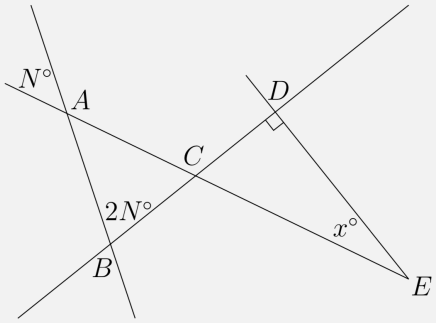
CEMC at Home
Grade 9/10 - Friday, June 19, 2020
Relay Day - Part 1

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: Let A be the number of multiples of 5 between 1 to 2020 inclusive and B be the number of multiples of 20 between 1 and 2020 inclusive. What is the value of $10A \div B$?

Problem 2: *Replace N below with the number you receive.*
Four line segments intersect in points A, B, C, D, and E, as shown. The measure of $\angle CED$ is $x°$. What is the value of x?



Problem 3: *Replace N below with the number you receive.*
Armen paid \$190 to buy movie tickets for a group of N people, consisting of some adults and some children. Movie tickets cost \$5 for children and \$9 for adults. How many children's tickets did he buy?

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?

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.

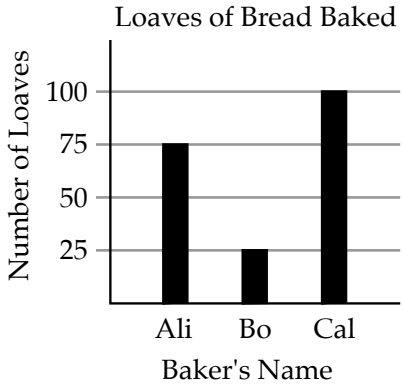
   Choose a problem so that each player is comfortable with the level of their question. The level of difficulty of each question is represented using the following symbols:

   - ● 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?

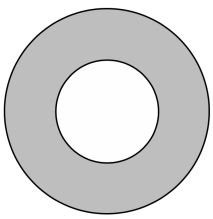


Problem 1 ■

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?