



CEMC at Home

Grade 7/8 - 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. Pong is released and becomes the first arcade game to be commercially successful.
- B. Deep Blue is the first computer program to beat a human world chess champion.
- C. The Harvard Mark I mechanical computer is built and is used for military purposes during World War II.
- D. The first email is sent. It is sent from Ray Tomlinson to Ray Tomlinson.
- E. Microsoft introduces the Windows operating system.
- F. The Altair 8800 is the first personal computer to sell in large numbers.
- G. A robot named Elektro is built which responds to voice commands.
- H. Apple announces Siri as a new feature for its products.
- I. Tim Berners-Lee posts the first picture on the World Wide Web.
- J. The first Microsoft Xbox is available for purchase.

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 7/8 - 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!

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

RATIO

VOLUME

PARALLEL

SURVEY

EXPONENT

DIAMETER

ALGORITHM

DATA

NETWORK

CRYPTOGRAPHY

DEBUGGING

VARIABLE

More Info:

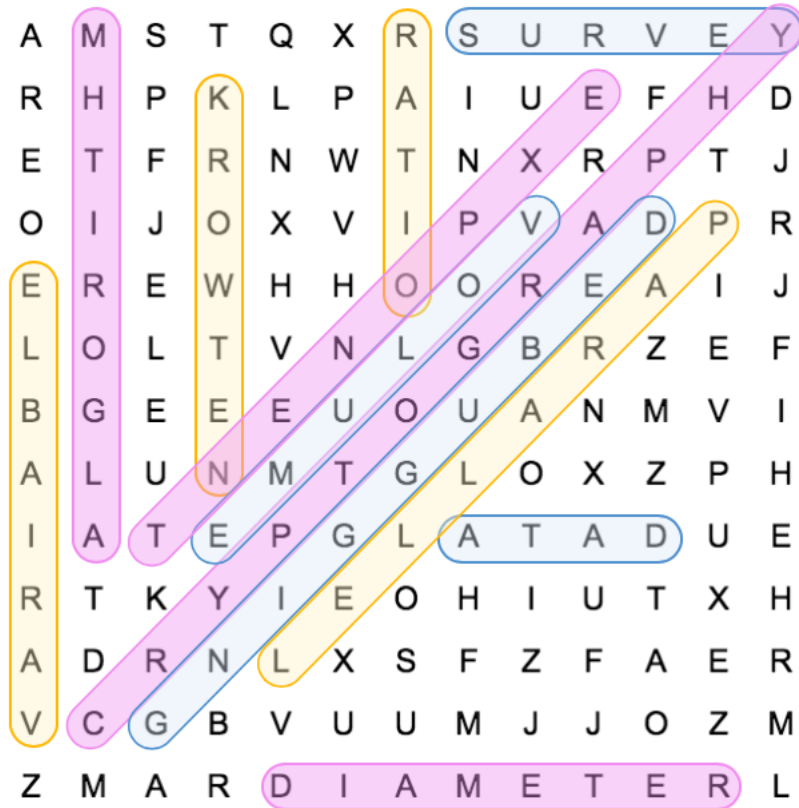
Check the CEMC at Home webpage on Wednesday, June 17 for the solution to Can You Find the Terms?



CEMC at Home

Grade 7/8 - Tuesday, June 16, 2020

Can You Find the Terms? - Solution



RATIO
VOLUME
PARALLEL

SURVEY
EXPONENT
DIAMETER

ALGORITHM
DATA
NETWORK

CRYPTOGRAPHY
DEBUGGING
VARIABLE



CEMC at Home

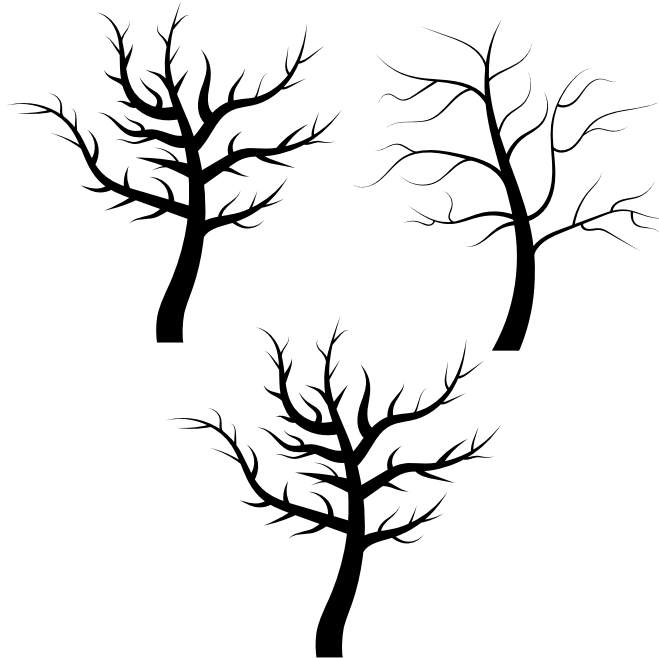
Grade 7/8 - Wednesday, June 17, 2020

Out on a Limb

There are 15 Blue Jays and 14 Orioles that wish to rest on the branches of three trees.

Each of the trees will have at least 4 Blue Jays and 2 Orioles in its branches. However, no tree may have more Orioles than Blue Jays in its branches.

Determine the largest number of birds that can be in one tree.



More Info:

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

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 - Wednesday, June 17, 2020

Out on a Limb - Solution

Problem:

There are 15 Blue Jays and 14 Orioles that wish to rest on the branches of three trees.

Each of the trees will have at least 4 Blue Jays and 2 Orioles in its branches. However, no tree may have more Orioles than Blue Jays in its branches.

Determine the largest number of birds that can be in one tree.

**Solution:**

Since each tree contains at least 4 Blue Jays and 2 Orioles, let's start by putting this minimum number of Blue Jays and Orioles in each tree.

Tree 1	Tree 2	Tree 3
4 Blue Jays, 2 Orioles	4 Blue Jays, 2 Orioles	4 Blue Jays, 2 Orioles

The number of Blue Jays not yet in a tree is $15 - 4 - 4 - 4 = 3$.

The number of Orioles not yet in a tree is $14 - 2 - 2 - 2 = 8$.

To produce the greatest number in a tree, as many as possible of the remaining birds should be put in one particular tree. Let's start by putting all of the remaining Blue Jays in Tree 1. Then we have

Tree 1	Tree 2	Tree 3
7 Blue Jays, 2 Orioles	4 Blue Jays, 2 Orioles	4 Blue Jays, 2 Orioles

Let's put as many Orioles in Tree 1 as possible. Since Tree 1 cannot have more Orioles than Blue Jays, we can put at most 5 more Orioles in Tree 1. Now we have

Tree 1	Tree 2	Tree 3
7 Blue Jays, 7 Orioles	4 Blue Jays, 2 Orioles	4 Blue Jays, 2 Orioles

The number of Orioles that are still not in a tree is $14 - 7 - 2 - 2 = 3$.

We cannot place any of these Orioles in Tree 1 because then there will be more Orioles than Blue Jays in that tree. Can we place these in the remaining two trees? We can place 2 in Tree 2 and 1 in Tree 3. So we have

Tree 1	Tree 2	Tree 3
7 Blue Jays, 7 Orioles	4 Blue Jays, 4 Orioles	4 Blue Jays, 3 Orioles

Therefore, the largest number of birds that can be in one tree is 14.



CEMC at Home

Grade 7/8 - 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!

[Deep Sea Math Mystery](https://www.mathplayground.com) 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.

[Square It](https://nrich.maths.org) from NRICH (<https://nrich.maths.org>)

Race to be the first to make a square in a grid. Can you develop a strategy to win the game?

[Factor Game](https://www.nctm.org) from NCTM (<https://www.nctm.org>)

Challenge another person or the computer in this strategy game involving factors of positive integers.

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



CEMC at Home

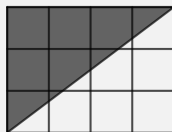
Grade 7/8 - Friday, June 19, 2020

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: Twelve 1 unit by 1 unit squares form a rectangle, as shown. What is the area of the shaded region?

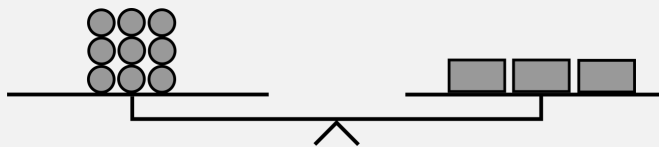


Problem 2: Replace N below with the number you receive.

In a sequence of numbers, the first term is 3. Each term after the first is determined by multiplying the previous term by 2 and then adding 1. For example, the second term is $2 \times 3 + 1 = 7$ and the third term is $2 \times 7 + 1 = 15$. What is the value of term N ?

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

In the diagram, an equal-armed balance is shown. The mass of each circle is N grams. The rectangles all have the same mass. What is the mass (in grams) of one rectangle?



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:

- 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.

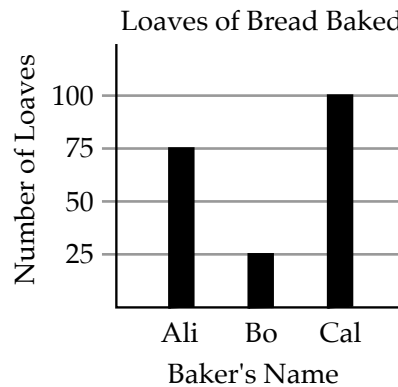
Choose a problem so that each player is comfortable with the level of their question. The level of difficulty of each question is represented using the following symbols:

-  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.
- 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?

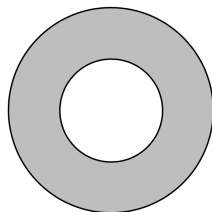


Problem 1

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 ?