

Welcome to the CIMC 2023



My name is CKROBO.
I was born a few months ago.

I need your help to adjust to your world. I would appreciate your help in solving the problems mentioned in this math contest.


You can win amazing awards for helping me.

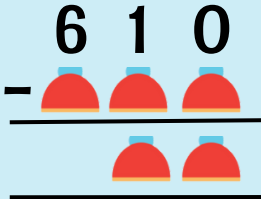
THANK YOU
• FOR YOUR •
KINDNESS

What is the value of
CKROBO's ♥?

$$\begin{array}{r} 2 \quad \heartsuit \quad \heartsuit \\ + \quad \heartsuit \quad \heartsuit \quad \heartsuit \\ \hline 9 \quad 3 \quad 2 \\ \hline \end{array}$$

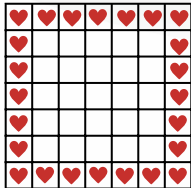
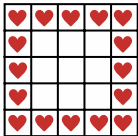


What is the value of
CKROBO's ?





Diagrams below are showing patterns of the hearts. How many hearts are there in the 20th group?



Group 1

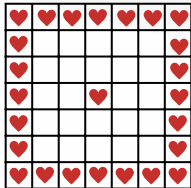
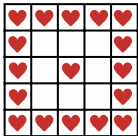
Group 3

Group 5

Group 7



Diagrams below are showing patterns of hearts. How many hearts are there in the 25th group?



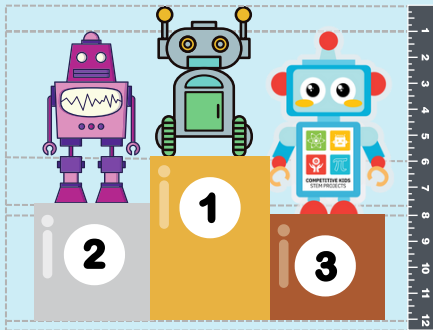
Group 1

Group 3

Group 5

Group 7

What is the height of the tallest robot?





CKROBO wrote six consecutive numbers on six separate cards, one on each card. If the sum of the smallest three numbers is 90, what is the sum of the largest three numbers?

1st

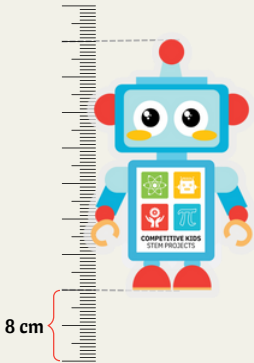
2nd

3rd

4th

5th

6th



The author of this problem is 148 cm taller than CK ROBO shown in the diagram. What is the height of the author of this problem in cm?

COST OF CKSTEM MAGNETS

$$\begin{matrix} \text{CKSTEM Magnet (Blue)} & + & \text{CKSTEM Magnet (Red)} & + & \text{CKSTEM Magnet (Blue)} & + & \text{CKSTEM Magnet (Red)} & = & 29 \end{matrix}$$

$$\begin{matrix} \text{CKSTEM Magnet (Blue)} & + & \text{CKSTEM Magnet (Blue)} & + & \text{CKSTEM Magnet (Blue)} & + & \text{CKSTEM Magnet (Red)} & + & \text{CKSTEM Magnet (Red)} & = & 39 \end{matrix}$$

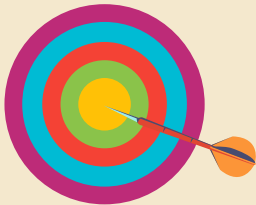
WHAT IS THE VALUE OF  ?
















Earth, Planets, and Stars!



One  is equal to 2 .

5 robots are playing a dart game. The table below shows the targets hit by a robot and the total score achieved in two attempts. Suppose the sum of scores for all 5 colours is 25. What is the total score achieved by CKROBO?



Robot	Target Hits		Total Points
			9
			10
			11
			12
			?

THE SUM OF THE 5 CONSECUTIVE WHOLE
NUMBERS IS 40.



$$6 + 7 + 8 + 9 + 10 = 40$$

$$A + B + C + D + E = 1040$$

$$E = ?$$



IF THE SUM OF 5 CONSECUTIVE WHOLE
NUMBERS IS 1040, WHAT IS THE HIGHEST
NUMBER OF THESE CONSECUTIVE NUMBERS?

THE PRODUCT OF THE 5 CONSECUTIVE
WHOLE NUMBERS IS 120.



$$1 \times 2 \times 3 \times 4 \times 5 = 120$$

$$A \times B \times C \times D \times E = 360360$$

$$A + B + C + D + E = ?$$



WHAT IS THE SUM OF 5 CONSECUTIVE WHOLE
NUMBERS WITH A PRODUCT OF 360360?

A REAL STEM PLUS

NUMBERS IN EACH ROW AND COLUMN REPRESENT THE SUM OF THE OBJECT'S VALUES IN THE CORRESPONDING ROW OR COLUMN. WHAT IS THE SUM OF THE OBJECTS IN THE DIAGONAL?

				14
				14
				12
				18
16	13	14	15	?

During CKSTEM's Award Ceremony, the valet parked 876 cars. 234 car owners tipped the valet \$1.00, half of the remaining car owners tipped the valet \$2.00, and the rest did not tip at all. How much money did the valet make in dollars?





YOUR PROJECT IS TO DESIGN A COUNTER THAT DECREASES BY 1 EVERY DAY UNTIL CHRISTMAS, ON 25TH DECEMBER 2023. ON CHRISTMAS, IT WILL SHOW 0. WHAT NUMBER WILL THIS COUNTER SHOW ON CANADA DAY, 1ST JULY 2023?



Canada has won the highest number of Ice Hockey medals in the last 24 Winter Olympics. Canada won less than 28 medals. Second-placed USA has won 17 medals so far. Canada's silver medal tally is double its bronze medals. The gold medal tally is two more than double its silver medals. How many ice hockey medals did Canada win so far?



BURLINGTON 38 KM
NIAGARA FALLS 107 KM
CN TOWER 93 KM

Given the blue roads and distances shown, how far is it by road, in kilometres, from CN Tower to Niagara falls?



1 2 3 4 5 6 7 8 ... 99 100



CKROBO plans to buy magnetic digits to display all numbers from 1 to 100 on a board. The digit "1" costs 1 dollar. However, the rest of the digits cost 2 dollars each. How much money does CKROBO need to spend to buy all digits required to display numbers from 1 to 100?

Yonge Street in Canada is the largest street in the world. To simplify the calculations, let's say it's 200 km long. You are the new architect, and you want to have a small gas station every 5 km and a big gas station every 25 km.

How many small gas stations will you have on Yonge street?

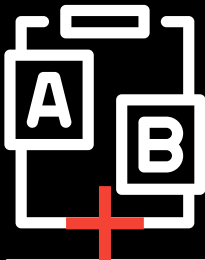


**** The actual length of Yonge street is 1,896 km.**

**WE KNOW THE
FOLLOWING ABOUT THE
TWO SPECIAL NUMBERS
GREATER THAN 1.**

- THEIR GREATEST
COMMON FACTOR
IS 1.**
- THEIR PRODUCT IS
96.**

**WHAT IS THE SUM OF
THESE TWO NUMBERS?**



COMPETITIVE KIDS STEM PROJECTS

CK ROBO's *History* Love

CK ROBO loves Canadian history. A history book he wants to buy has a listed price of \$84 plus $\frac{1}{7}$ of its listed price. He got a 50% discount on the listed price. How much did CK ROBO pay in dollars?



CKSTEM MADE A SPECIAL OFFER FOR THE MATH PRACTICE SETS TO SUPPORT STUDENTS. IF STUDENTS RETURN 3 FILLED PRACTICE TESTS, THEY CAN GET ONE NEW PRACTICE TEST FOR FREE. WHEN YOU ENROLL WITH CKSTEM, YOU GET 11 PRACTICE TESTS IN YOUR REGISTRATION KIT. WHAT IS THE LARGEST NUMBER OF CKSTEM PRACTICE TESTS YOU CAN TAKE USING THE OFFER?

**SPECIAL
OFFER**

TEST



-

🍁 **Canadian National (CN) Tower is the theme for the Canadian Summer Contest 2022. The CN Tower was built by Canadian National Railways. It was completed in 1976. It took 1,537 workers 40 months to build the tower. The original cost was \$63 million.**

There are a total of 1,776 stairs and 144 flights to the top. At 553.33 m (1,815ft, 5 inches) the CN Tower held the record as the tallest building, tower, freestanding structure for over three decades. 🍁

During CN Tower Climb for Nature, a person takes 0.5 seconds per stair to climb the first 500 stairs, 1 second per stair to climb the next 822 stairs, and 2 seconds to climb each remaining stair. How many minutes does this person take to climb the 1776 stairs of the CN Tower?



DO NOT EAT LIKE BIRDS

Gray Jay is Canada's national bird. They have an overall population of 26 million & average weight of 71 grams. A human with 71 kilograms of weight needs 2000 kilo calories per day. If a Gray Jay's calorie-to-weight ratio is 24 times that of humans, how many kilo calories does a Gray Jay need per day?





THE Rule 72 OF

LENGTH OF
TIME
UNTIL VALUE DOUBLES

$$= \frac{72}{\% \text{ RATE OF GROWTH}}$$

Mr. Naresh Thakur is an Investment Advisor at RBC Wealth Management. He explains the "Rule of 72" to young investors to help them understand how much time it takes to double the money. Dividing 72 by the interest rate tells you the number of years to double your investment. As an example, if you invest 100 dollars and the interest rate is 2%, it will take $72/2 = 36$ years to make it \$200.

How many years will it take to double your \$1000 if Mr. Naresh gives you 9% on your investment?



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How many years will it take to receive \$4000 if you invest \$1000 with Mr. Naresh at the interest rate of 12%?



Canada has more lakes than the rest of the world combined

561 lakes have a surface area larger than 100 sq km

9% OF CANADA'S SURFACE IS COVERED IN FRESHWATER LAKES. IF THE SURFACE AREA OF FRESHWATER LAKES IN CANADA IS 891,900 SQ KM, WHAT IS THE SURFACE AREA OF CANADA IN MILLION SQ KM?

CKSTEM AWARD CEREMONY

CKSTEM is manufacturing customized awards this year. The cost of one award is calculated based on the area used by the rectangular sheet that fits the award. The outer blue rectangular sheet has an aspect ratio of height to width is 2 to 1.

It costs \$50 for a 300 square inch blue rectangular sheet. Costs for other sizes are in the same proportion. Suppose the CKROBO award costs \$27. What is the height of the CKROBO award in inches?



** This question is based on the real scenario for creating awards for 2023.

CKSTEM AWARD CEREMONY

CKSTEM is manufacturing customized awards this year. The cost of one award is calculated based on the area used by the rectangular sheet that fits the award. We will pay for the outer blue rectangular sheet in the diagram. CKROBO's height is 5 inches more than its width.

It costs \$50 for a 300 square inch rectangular sheet. Costs for other sizes are in the same proportion. Suppose the CKROBO award costs \$25. What is the height of the CKROBO award in inches?



** This question is based on the real scenario for creating awards for 2023.

THE YEAR 2023 IS BONDING
WITH OTHER CRAZY NUMBERS.

WHAT IS THE **RECIPROCAL** OF
THE SIMPLIFIED VALUE OF THE
FOLLOWING?



$$\left(\frac{2023}{4048}\right)^2 \times \left(\frac{20242024}{40464046}\right)^2$$



The Canadian Innovation Contest Logo on the left is reflected in the horizontal axis. Then it was rotated anticlockwise by 90° . Finally, it was reflected on the vertical axis. What does it look like after these three steps?



1



2

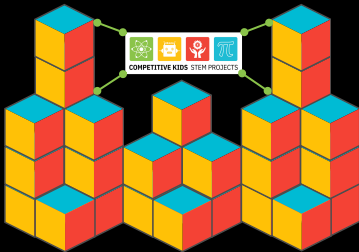


3



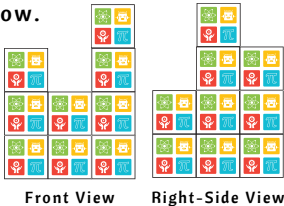
4

CKSTEM plans to build a STEM Village, as shown in the 3D model. Each tower is made of the same size cubes from the ground up. If each cube in this 3D model represents an office, how many offices are in this village?



An architect need to make a model of unit cubes. It has a square base of 3 unit cube width. Front and right-side views of this model are shown below.

What a minimum number of blocks does the Architect need to create a model, as shown in the front and right view?



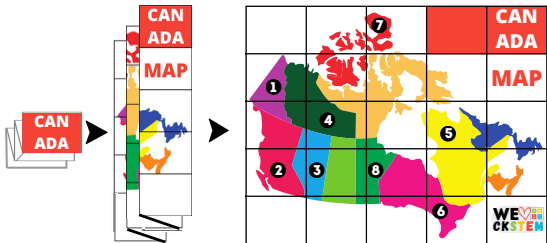
HINT: Create a TOP View

Cylindrical metal rods of diameter 10 mm are bent to form a chain's circular links. If each link has an outer diameter of 50 mm, what is the length of a 20-link chain in cm when fully stretched?

$$1 \text{ cm} = 10 \text{ mm}$$



The daughter of the author of this question marked 8 places she wanted to visit in Canada on the map. She then refolded the map and placed it back on the table as it was. In what order did the numbers stack from top to bottom when the map was fully folded? Provide the order as a 8-digit number.

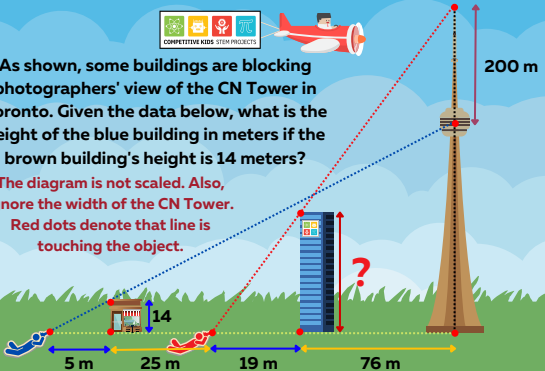




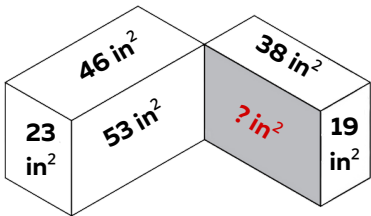
As shown, some buildings are blocking photographers' view of the CN Tower in Toronto. Given the data below, what is the height of the blue building in meters if the brown building's height is 14 meters?

The diagram is not scaled. Also, ignore the width of the CN Tower.

Red dots denote that line is touching the object.



Using the given areas, find the area of the shaded rectangle.

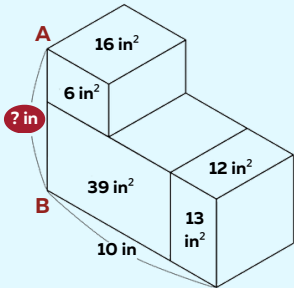


TOP
TIPS



YOU CAN SOLVE THIS USING
WHOLE NUMBERS ONLY!

Using the
given length
and areas,
find the
missing
length of AB?

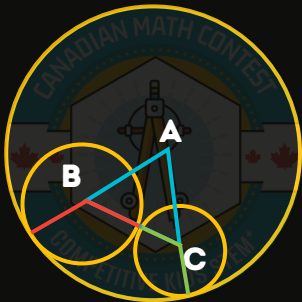


TOP
TIPS



YOU CAN SOLVE THIS USING
WHOLE NUMBERS ONLY!

**ROTATING THE
RADI
OF THE
SMALLER CIRCLES,
WE CAN SEE THAT
THE PERIMETER OF
THE TRIANGLE IS
EQUAL TO TWICE
THE RADIUS OF THE
BIGGER CIRCLE.
THIS MEANS OUR
RADIUS IS 24.**



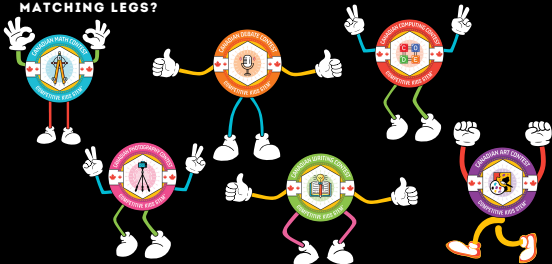
The four circles represent circular paths. The four bikers started at 9 am. Each person chose a different circle, one at the rate of 4 km an hour, another at the rate of 6 km an hour, another at the rate of 8 km an hour, and the fourth at the rate of 10 km an hour. They agreed to ride until they all met at the center, from where they started. The distance around each circle was exactly one-half of a km.

How many minutes did they ride before they all met at the center?



COMPETITIVE KIDS STEM PROJECTS

CKSTEM IS PREPARING AN AD CAMPAIGN FOR ITS WORLD-FAMOUS CANADIAN INNOVATION CONTESTS. WE HAVE 6 CONTEST LOGOS, 5 PAIRS OF DIFFERENT COLOUR LEGS, AND 4 PAIRS OF DIFFERENT SHAPES OF HANDS TO DESIGN THIS CAMPAIGN. HOW MANY COMBINATIONS CAN BE MADE USING ONE LOGO, ONE PAIR OF MATCHING HANDS AND ONE PAIR OF MATCHING LEGS?



$$\text{METS} = 4 * \text{STEM} + 3$$

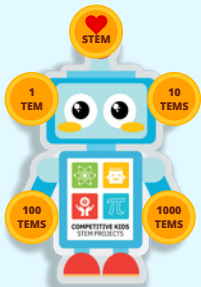
STEM is a 4-digit number.

METS is also a 4-digit number by reversing the order of STEM. Please help CKROBO find the sum of all such values of S where $\text{METS} = 4 * \text{STEM} + 3$.

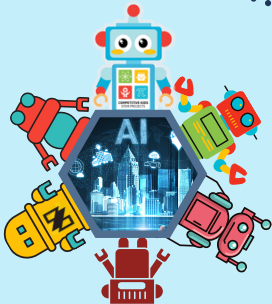


TEMS for STEM

CKROBO introduced a new decimal currency called TEMs for STEM education. This currency has coins for 1 TEM, 10 TEMs, 100 TEMs, and 1000 TEMs. A robotics course this year costs 2023 TEMs. How many different ways is it possible for you to pay for this course in exact coinage?



CK ROBO's Conference




CK ROBO is co-hosting an AI Conference with Nydia ROBO. To interact with others at a hexagon AI conference table, CK and Nydia ROBOs decided not to sit next to each other during the conference. How many different ways can all 6 ROBOs sit together? All sides of the table are identical.

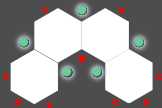


A BIASED COIN

CKROBO has a biased coin, which flips heads with probability p , and tails with probability $1 - p$. He plays a game with the coin, which goes as follows; he starts with the number 1, and every time he flips tails, he adds 2 to his number. Every time he flips heads, he adds 3 to his number. After he flips 3 heads in total, the game ends. If the expected value of his number is 34, find $\frac{1}{p}$.



20 tables, made in the Canadian Innovation Contest Logo shape , are arranged in the pattern shown below. People want to use dual monitors. Hence, they can only sit in places where they can access two sides, as indicated by the green dots. What is the maximum number of people with dual monitors who can sit in this arrangement?



SERIAL CIRCUITS



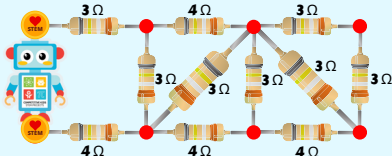
$$\begin{aligned}\text{Total Resistance} \\ &= r_1 + r_2 \\ &= 2 + 2 \\ &= 4\ \Omega\end{aligned}$$

PARALLEL CIRCUITS



$$\begin{aligned}\text{Total Resistance} \\ &= r_1 * r_2 / (r_1 + r_2) \\ &= 3 * 6 / (3 + 6) \\ &= 2\ \Omega\end{aligned}$$

Examples on the left show how to calculate the resistance of serial and parallel circuits. CKROBO has the following circuit inside his body. This circuit is made of a series of serial and parallel circuits. What is the total resistance of this circuit which keeps CKROBO active?



Congratulations on finishing!

I hope you enjoyed solving last year's problem. I look forward to seeing you in this year's contest.

Keep practicing till then. We have posted hundreds of questions for you to try!

