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Sites

- <https://olympiad.org.za/talent-search/past-papers/pen-and-paper/>
- <https://www.cemc.uwaterloo.ca/>
- https://cemc.uwaterloo.ca/contests/past_contests.html
- <http://www.studyopportunities.co.za/resources/Brochures/Digital-Technology-brosjure.pdf>
- <https://www.bebas.org>



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International Challenge on Informatics
and Computational Thinking

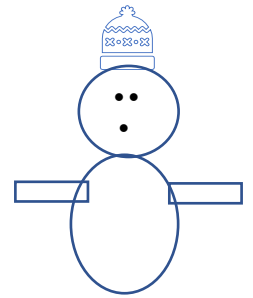
<http://www.studyopportunities.co.za/resources/Brochures/Digital-Technology-brosjure>.



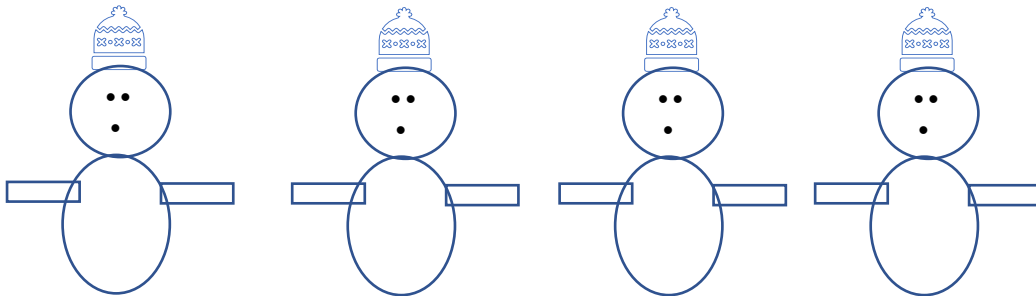
1 Rainbow Snow People (Pattern Recognition)

Each snow person man consists of 4 parts:

- A body, arms , a head and a hat
- Each part must have different colour to the other three for each of its 4 body parts.
- The only 4 colours used are colours are:
 - red, blue, green, and yellow (R , G , B , Y).



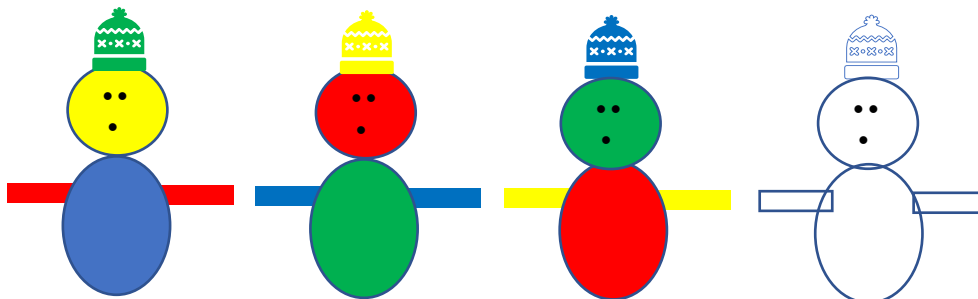
Question



- Show the 4 different colour combinations for the 4 snow people (R , G , B , Y) for each of their 4 parts (hat, head, arms, body IN THAT ORDER).

OR

Given the first 3 snow people, what are the various colours need for the 4 parts of the 'last snow person' (hat, head, arms, body IN THAT ORDER)

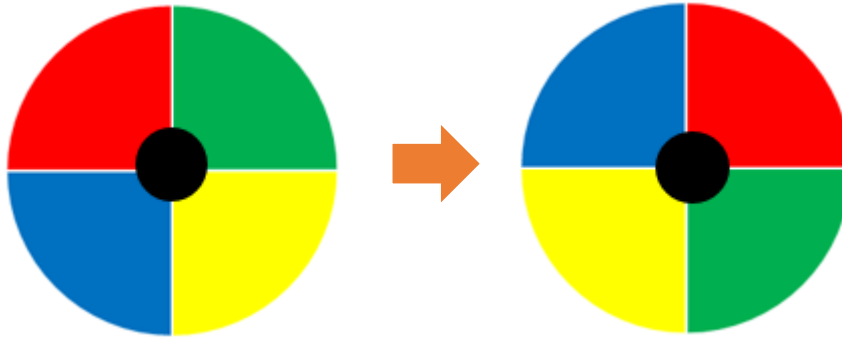
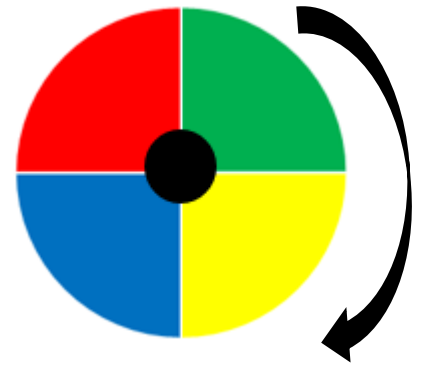


(Can give answers as multiple-choice combinations if you wish e.g. **RBGY**)

2 Spinning Colour Wheel! (Modular Arithmetic)

Every time you press the button on the middle of the colour wheel, the colours rotate one place (clockwise like the hands on a clock).

So, after one turn it rotates as shown below:



Question:

If we push the button FIVE more times, what would the wheel look like?



A



B



C



D

Enter the answer (A, B, C or D) >> (D)

3 Pet Sudoku

Matrices










Xola is asked to fill a box with different shapes. The box has 9 sections.

There are only TWO Rules:










- There must be only one of the same shapes in each row.
- There must be only one of the same shapes in each column.

Question:










Which of the following boxes is correctly filled (A, B, C, D)?










A

B

C

D

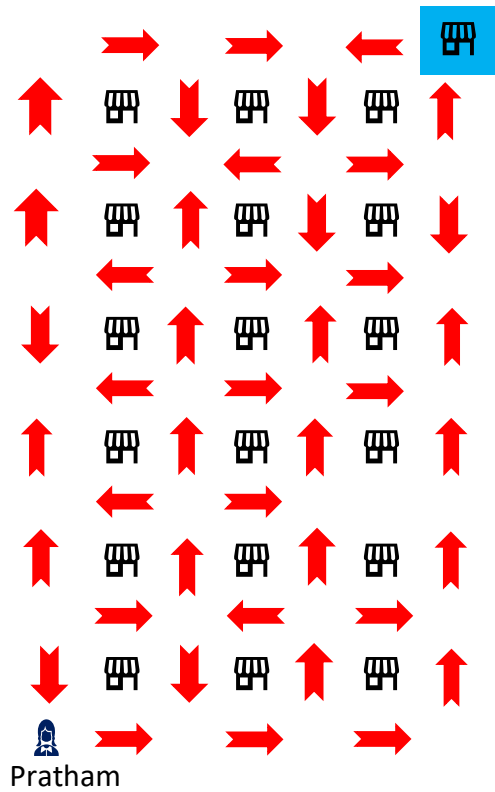
C

4 Get to class quickly (Optimisation and 'reverse' engineering')

- Xela High School has 19 classrooms.
- To help prevent crowding in the corridors they added direction arrows for the learners to follow.
- The learners have to follow the arrows; they cannot go in a direction 'against the arrows'.
- Each arrow takes indicates 1 minute of walking
- Pratham must make her way from the bottom left corner to her next classroom at the top right of the diagram

Question:

What is the shortest time (in minutes) for the Pratham to reach her next class?

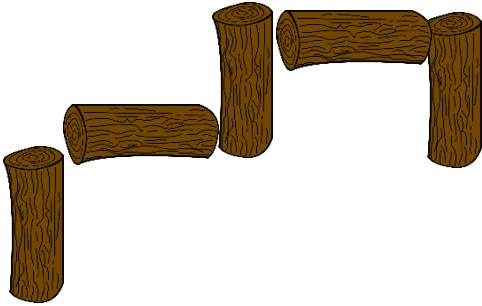


- A. 15
- B. 20
- C. 45
- D. None of the above

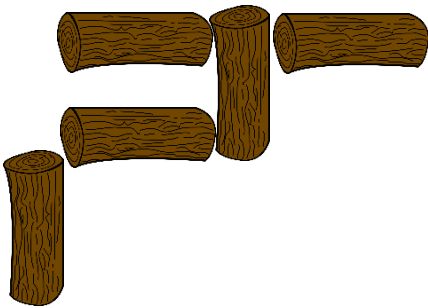
Enter the answer (A, B, C or D) >>

5 Log Art

Gretchen found five logs in her yard She arranged them flat on the ground as follows:

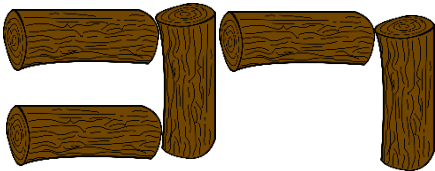


Sipho, her friend visited and when Gretchen was not looking, moved the right-most log as follows:

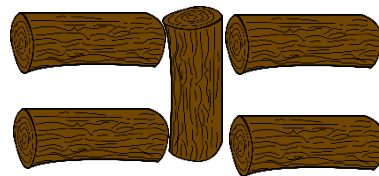


Sammy popped around and also decided she wants to make one more change to the current layout. Moving only one log, which shape can Sammy **not** make from the current layout made by Siphos ?

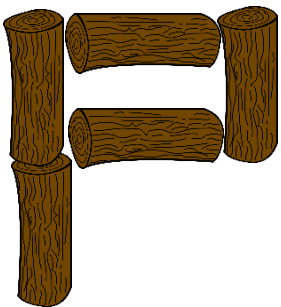
A



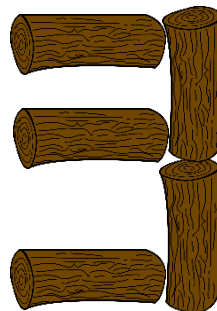
B



C



D



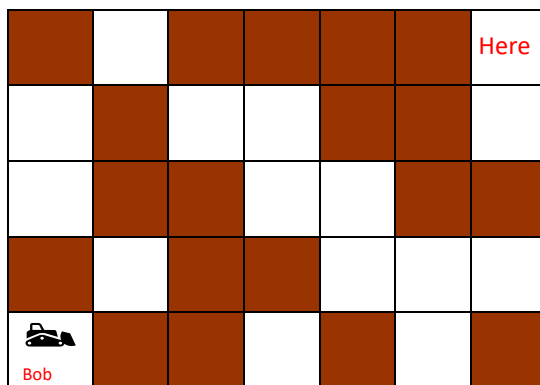
6 Bob the Bulldozer driver

- An old abandoned warehouse consists of rooms (the 'empty squares') and brick walls.
- Bob the bulldozer driver can knock down walls
- BUT - he can only drive **horizontally or vertically**, not diagonally.

Question:

What is the **least/fewest number of walls** that Bob must knock move from the room bottom left corner to the one in the top right corner?

Write down the path with Up, Down, Left and Right commands!

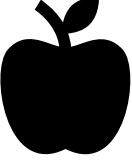
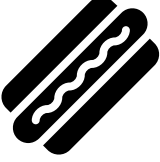




- A. 3
- B. 4
- C. 5
- D. 6
- E. None of the above are correct

8 My Spaza!

















(Step-wise Refinement)

The local spaza is running special on four food types:

			
Apple	Boerewors Roll	Chicken Leg	Doughnut

In the grid below:

- the numbers in the column on the far right are the total of the 'values' of the food symbols in that row
- the numbers in the bottom row right are the total of the 'values' of the food symbols in that column
- each of the same symbols such as the apple etc always also have the same value.

				28
				30
				20
				16
?	19	20	30	

What value should replace the question mark below the first column (on the left)?

- A. 25
- B. 21
- C. 23
- D. 31
- E. None of the above are correct

Hint: You have to work out what each of the symbols are 'worth' i.e. their respect 'values' or 'combined'.

9 Fill it up (optimisation)

Gretchen made **47 litres** of orange juice at home and now she needs to put it in bottles to take it to school for a party.

She has access to several (hundreds of) empty bottles of different sizes namely:

- 1, 2, 4, 8, 16 and 32 litres



What is the use the **least number** of bottles she must use to fill up the **47 litres** of orange juice (with all of the bottles having to be **full**)?

Choose the correct answer:

- 3
- 4
- 5
- 6
- None of the above are correct.

10 Spot the difference(s)

How many differences are there between Image A and Image B below?



Image A



Image B

- A. 3
- B. 2
- C. 1
- D. 0**
- E. None of the above are correct

11 Own the land

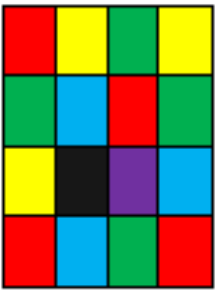
(Pattern recognition and decomposition)

A farmer wants to sub-divide a square piece of land into 16 equal size plots give them to local NGOs.

His only restrictions are that:

- no NGO may own more than THREE pieces of the land
- no NGO may own any land that is adjacent in any way to any other land they have i.e. they can never move from one piece of their land to another without going through someone else's land first

Four proposals (colour-coded according to NGO) have been put forward



A



B



C



D

Which of these proposals will be acceptable to the farmer based on the restrictions she made?

- A. A
- B. B
- C. C
- D. D**
- E. None of the above are correct.

12 Election time!

(Algorithms and Sorting)

- 1 A class has chosen FIVE class captains for the year for their class, with each one getting a turn.
- 2 These five chosen class captains are:
Bulelwa, Terence, Gabriel, Harriet and Luthando
- 3 The class must now decide in which order these captains must serve, as there is only ever one class captain at a time.
- 4 The class come up with the following requirements:
 - Terence must serve before Bulelwa
 - Terence must serve before Harriet
 - Harriet must serve before Luthando
 - Harriet must serve before Gabriel
 - Luthando must serve before Gabriel

What is one order in which the pupils will serve as class captain from first to last)?

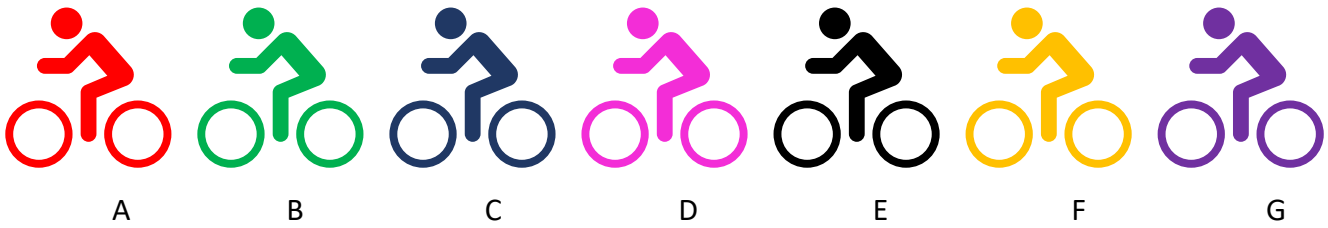
- (A) Terence, Harriet, Luthando, Gabriel, Bulelwa
- (B) Terence, Bulelwa, Harriet, Luthando, Gabriel
- (C) Terence, Gabriel, Harriet, Luthando, Bulelwa
- (D) Terence, Bulelwa, Luthando, Harriet, Gabriel
- (E) None of the above are correct

Hint: Just abbreviate them as B, G, H, L and T and write them down and 'swop' as needed'

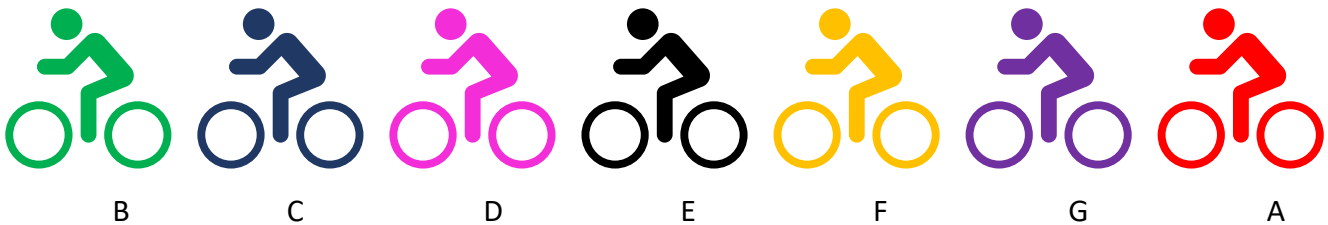


13 Switch the cyclist

(Arrays and one-off errors)



- Team cyclists often ride one behind another to increase their overall performance
- Seven cyclists are travelling right to let in a team as shown above.
- Each cyclist has a label to track them (A to G)
- After every minute the person at the front of the line e.g. 'A' moves back to end of the line (with all the other moving up as shown).



- Which cyclist will be at the front of the line, a **total of 9 minutes after the race started?**

- (A) A
- (B) C**
- (C) E
- (D) G
- (E) None of the above

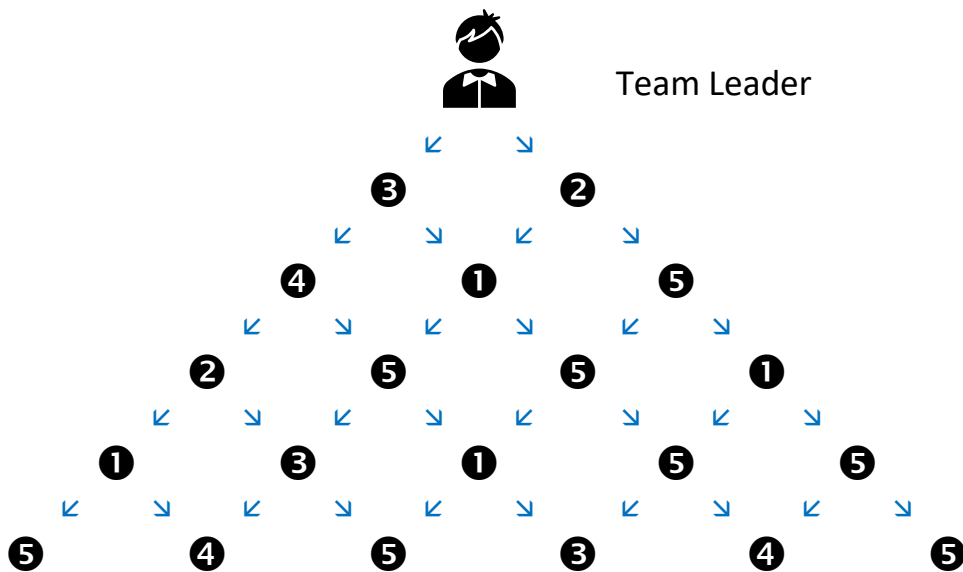
Bonus Question!!

Which of these rides would be first over the line if the race was one hour long? **C**

14 Catching the clues

('Binary' Trees and Optimisation)

- Your class has decided to have a treasure hunt at school as part of a team-building exercise.
- The class is divided into several teams and each team chooses a team leader to gather as many clues as possible BEFORE the treasure hunt starts.
- These clues are in envelopes and only the teacher knows how many clues are in each envelope.
- There are between 1 and 5 clues in each envelope
- Each team leader starts at the 'top of the diagram'.
- The team leader can only go in the direction of an arrow, they cannot go 'sideways' or ways or 'back'.
- Every circle represents an envelope and shows the number of clues in it (which only the teacher can see).



What is the maximum number of clues any one team leader can gather?

- (A) 19
- (B) 20
- (C) 21
- (D) 22
- (E) None of the above

15 Simple Elimination



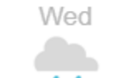


(‘Overlapping conditions’)

Mr Gibson’s class wants to have a lesson outside on the school field as they have been so good!
Mr Gibson agreed but noted that this can only happen if all the following criteria are met:

- It cannot be raining of course .
- There cannot be a LO class busy doing Physical Education on the field.
- One cannot go if the grass on the field is being cut.

Mr Gibson was told that the grass is being cut on Tuesday and Friday. The LO department said that Mrs Cabela has booked the field for Phys Ed on Friday and Mr Pillay has booked the field for Monday for his LO class.

Mr Gibson ‘Googled the weather’ for next week and received the following information:

Monday	Tuesday	Wednesday	Thursday	Friday
 23° 16°	 24° 17°	 22° 14°	 25° 17°	 26° 17°

What day should Mr Gibson take his class out to the field?

- (A) Tuesday
- (B) Wednesday
- (C) Thursday
- (D) Friday
- (E) None of the above are correct

Hint: Draw up a table of Days of the week and the **THREE** conditions that must be met

Bonus question : What other day(s) might be the most suitable to use if Mr Gibson can get a teacher to postpone their LO lesson?

