



# MATHS WI NAE BORDERS

This mini-competition is inspired by the annual 'Mathématiques sans Frontières' contest. 'Maths wi nae Borders' can be entered by *any* class in Scotland. The five tasks should be completed in less than two hours.

Some advice from the markers, based on previous competitions:

- Partial solutions and attempts can gain marks.
- Neat and careful work is important.
- Remember that we are looking for entries from an entire class (so as a class pick your best solution to each of the five problems).
- Many entries will include correct answers so consider how to make your entry stand out (an excellent answer might include a description of how you approached the question, any extra formulae or strategies you came across or any observations that you think are Mathematically interesting).

Send in your final version to Katie Oldfield, Maths Week Scotland Co-ordinator, National Museum of Scotland, Chambers Street, Edinburgh, EH1 1JF to arrive no later than Friday 18<sup>th</sup> October 2019.

All participating teams will receive a certificate. The winning team will receive a trophy and there will be prizes for their individual team members!

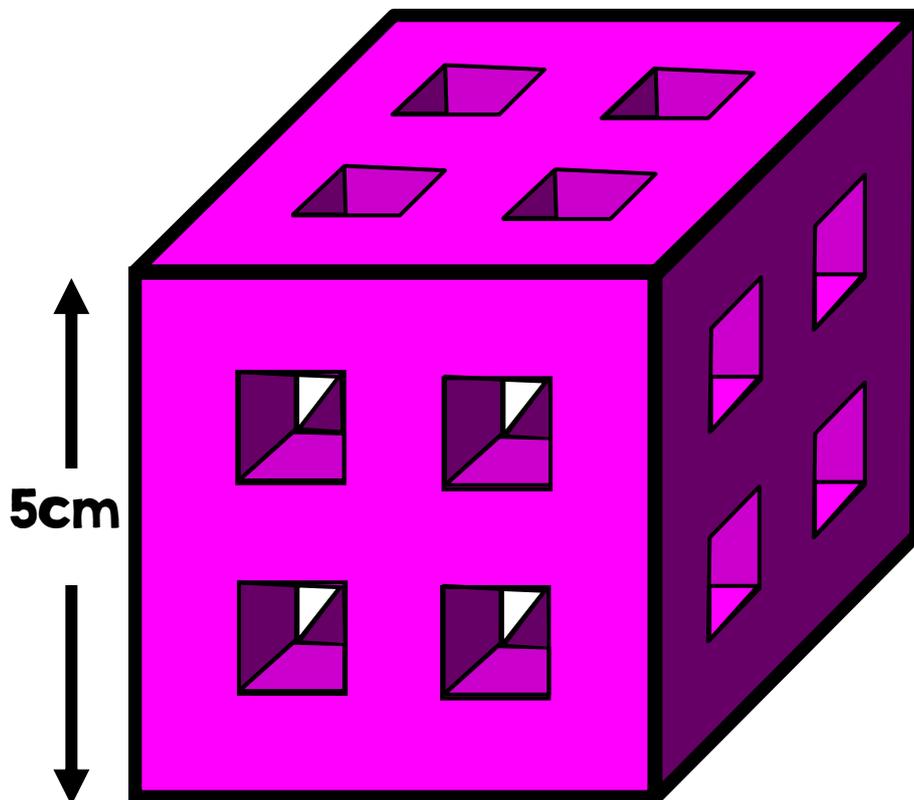


## CUBE CUTS

A wooden cube has edges with length 5 cm.

The cube has twelve holes drilled right through it. Each hole is a cuboid with a cross-section that is a square of side 1 cm.

The 12 holes are arranged in a regular way as shown.



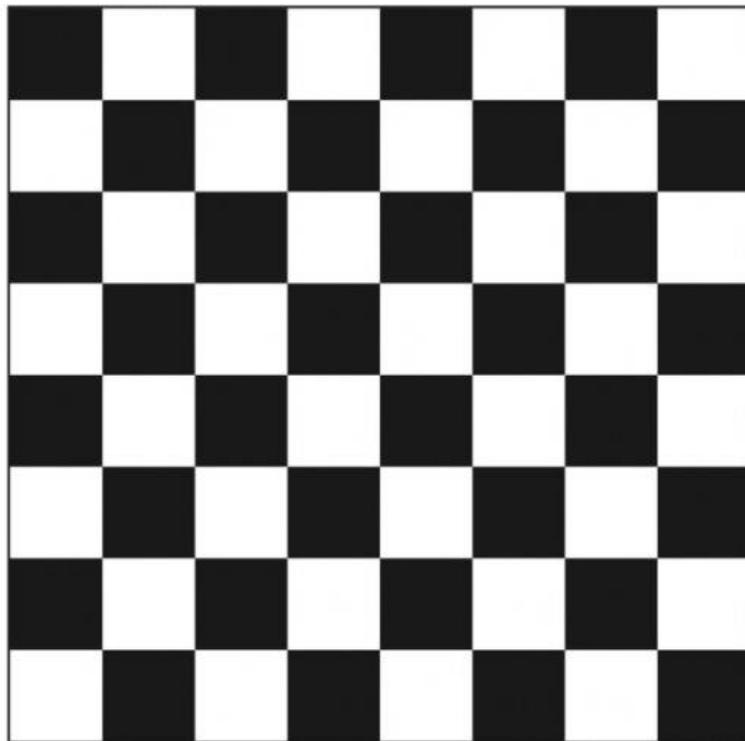
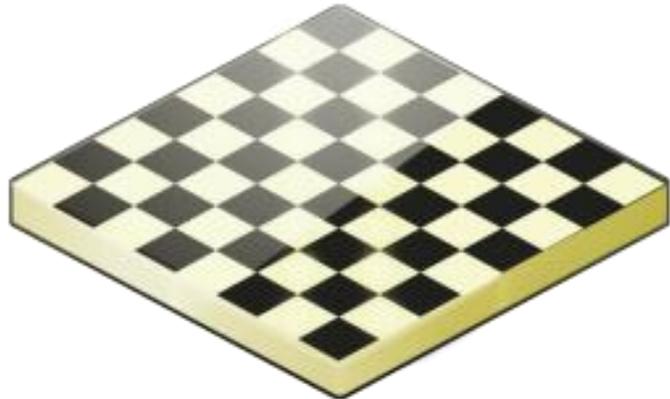
Calculate the volume of wood remaining after the drilling!



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## CHESS CIRCLE

Chess is quite popular in some circles.



**a) Draw a chess board where each edge measures 16cm.**

**b) Draw the largest circle you can on the board which doesn't go through any black squares.**

**c) Work out the area of your circle.**

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## CAKE CONFUSION

At a birthday party, 10 pals sit round the table, about to tuck into the 18 cupcakes lying out on a massive plate.

Logan lifts the plate but doesn't take any. Instead he passes it to one of his neighbours who takes any. The plate's passed right round the table. A body who gets the plate takes any cupcake and passes it to the next of their neighbours. Logan notices the plate changes direction twice as it's passed round the table. The plate gets back to Logan who takes the last one.

How many folk ate just any cake? How many ate two? How many ate three?

Explain your answer!



Give your answer to this question in Gaelic or Scots using a minimum of 30 words.



Gus cò-là-breith a chomharrachadh, tha 10 caraidean a' suidhe timcheall a' bhùird, deiseil airson 18 cèicichean a th' air am beulaibh air truinnsear mòr ithe! Tha Logan a' togail an truinnseir ach chan eil e a' toirt leis cèic. An àite sin, tha e a' toirt an truinnseir do aon de na nàbaidhean aige agus tha an nàbaidh a' gabhail cèic. Tha an truinnsear air a chur timcheall a' bhùird gu lèir. Ged as bith cò gheibh an truinnsear, tha iad a' toirt leotha cèic agus a' toirt an truinnseir gu nàbaidh eile.

Tha Logan a' mothachadh gu bheil an taobh anns a bheil an truinnsear a' dol timcheall a' bhùird air atharrachadh dà thuras fhad 's a tha e air a bhith a' dol timcheall. Tha an truinnsear a' tighinn air ais gu Logan agus 's urrainn dha a' chèic mu dheireadh ithe. Cia mheud duine a dh'ith dìreach aon chèic? Cia mheud a dh'ith dà chèic? Cia mheud a dh'ith trì cèicichean?

Minich do fhreagairt!

## CALENDAR CONUNDRUM

**Archie:** Pick a number on the calendar. Make sure it's completely surrounded by eight other numbers (left, right, above, below and four diagonally).

**Levi:** Ok. I'll go for 11.

**Archie:** Now, add up your number and all the others round about it.



**Levi** starts to add up 3,4,5,10,11,12,17,18,19...

**Archie** (straight away): It's 99.

**Levi** (after a few more seconds): Yeah, you're right.

**Archie:** Impressed?

**Levi:** It might have been a fluke. What about if I had picked 20?

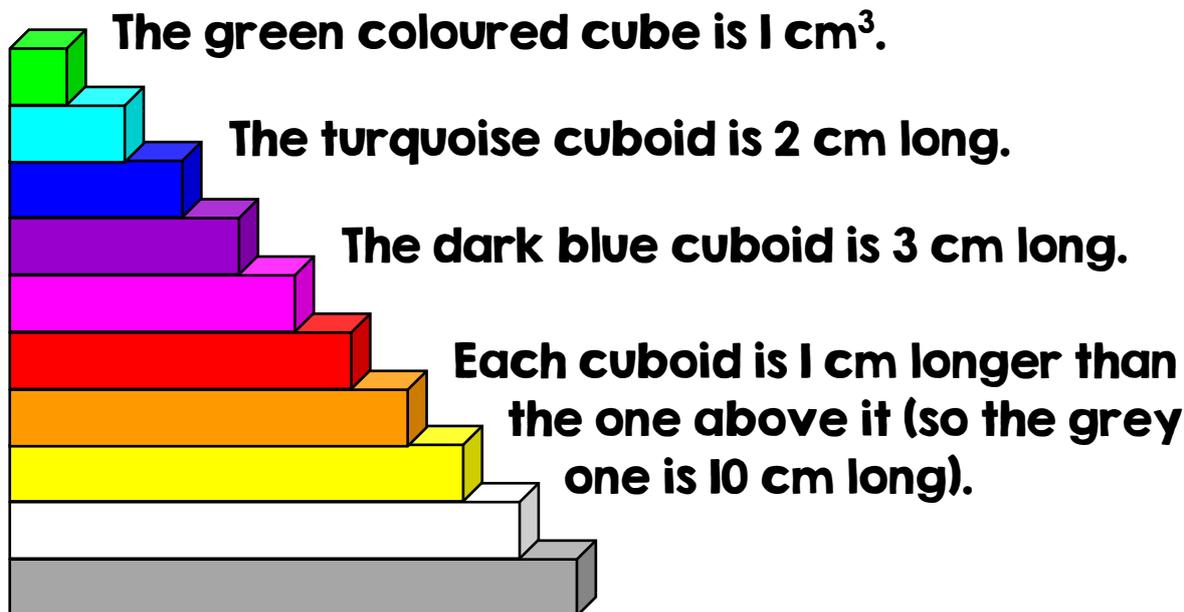
**Archie:** Then the total would have been 180.

**Levi** (checks by adding 12,13,14,19,20,21,26,27,28): That's amazing. How are you doing this?

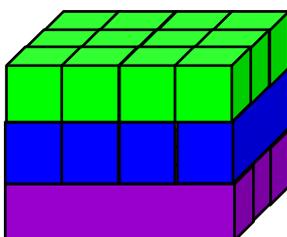
**Explain how Archie is able to predict the total so quickly straight after he is told the middle number.**

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## COLOURED CUBOIDS



This cuboid is made using 19 blocks and a different colour for each layer:



- three of the purple 4 cm long cuboids
- four of the dark blue 3 cm long cuboids
- twelve of the green 1 cm long cubes.

What is the smallest number of blocks that would be needed to create a 10 layer cuboid where each layer is a different colour?

