YEAR 7 MATHEMATICS CHALLENGE

Final, Oak Room (Hertfordshire Development Centre) Wednesday 19th April 2023

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HOUSEKEEPING

• Fire alarm and exits

• Toilets



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• Use of mobile phones

• Refreshments

FORMAT OF CHALLENGE

- Round 1 General Maths questions
- Round 2 Memory Round
- Round 3 Estimation and Problem-Solving Round
- Round 4 General Maths questions

60 marks for each round



FIRST OF ALL ...

74 teams took part over four heats. The top-scoring 19 teams have been invited to this final.

The mean score for all 74 teams in the heats was 152. The mean score for the 19 teams selected for the Final was 187. So, whatever happens:





PRELIMINARIES

- You should have pens or pencils, rubbers, and rough working out paper only.
- No calculators, no measuring equipment, and no use of computers, phones, Internet etc!
- Decide on a team name, which should include the name of your school. Include the team name on all the Answer Sheets you hand in.



PRELIMINARIES

• Don't leave any answers blank. 'Near misses' or partially correct answers may score points.



 Where necessary, make sure you include the correct units. If you forget to do this, you will not gain full marks for the question, even if the numerical answer is correct.



Round 1

General Mathematics Questions

90 seconds for each question

HFI

The factors of 6 sum to 12. 1 + 2 + 3 + 6 = 12

There are **two numbers** whose factors sum to **18**.

What are the two numbers?

This number machine involves two operations.



What are the two operations?

Suppose you have three ordinary dice: one blue, one red and one black.



Each dice is numbered from 1 to 6 in the usual way.

All three dice are rolled and the numbers are added.

How many ways are there of getting a total of 6?

Here is a kite. The broken line is a line of symmetry.

The height of the kite is 14 cm and its width is 11 cm.



What is the area of the kite?

$66\frac{2}{3}\%$ of a number is **560**.

What is $62\frac{1}{2}\%$ of the same number?

Here is the **starting position** of four arrows.

A 'move' consists of rotating any A 'move' consists of rotating any **three** of the arrows through 180°.





The aim is to get all four arrows The aim is to get all iopointing downwards.

What is the smallest number of 'moves' needed to do this?

End of Round 1

HFL

ANSWERS TO ROUND 1









Round 2

Memory Round

HFL

ROUND 2

We are going to show a mathematical poster to two members of the team (the **observers**).

The other two members of the team (the **scribes**) will not see the poster. The observers must describe the poster from memory, and the scribes must draw it.

The observers are not allowed to draw the poster, or make notes when they are looking at the poster.

When describing the poster, observers must use words only. They are not allowed to draw anything, or use their hands in any way.

ROUND 2

The observers will have **four** chances to view the poster.

30 seconds to view
2 minutes to go and describe
30 seconds to view
2 minutes to describe
30 seconds to view
2 minutes to describe
30 seconds to view

2 minutes to describe

Scribes can draw at any time during the whole period.



<u>Hint for the observers</u>

Don't try to memorise the entire poster at once. The poster is in a number of sections, so focus on one or two parts at a time.

Note to the scribes

Place your piece of paper in **landscape** orientation (i.e. the same way up as the screen you are currently looking at).

Round 2

Memory Round

HFL

End of Round 2

HFL







Round 3

Estimation and Problem-Solving

HFL

Estimate the floor area of the Oak Room.

(Assume the floor is a rectangle.)



Estimate the mass of the bag of rice.



Estimate the length of this route from Paris to Berlin.

Make exactly four prime numbers using the digits 1, 2, 3, 4, 5 and 6.

You must use each of the six digits exactly once.

All four of the prime numbers must be less than 100.

These six counters have been placed on a 3 by 3 square board.

Each counter is exactly in the middle of a square.

No three counters lie on the same straight line.

Show how this can be done:

- with 8 counters on a 4 by 4 grid
- with 10 counters on a 5 by 5 grid

Here is a shape drawn on a centimetre-square dotty grid.

This shape has an area of 6 cm². There are two dots inside the shape.



Draw shapes with area 6 cm² which have 0, 1, 3, 4, and 5 dots inside.

(The vertices of your shapes must all be at one of the dots on the grid.)

End of Round 3

HFL

ANSWERS TO ROUND 3



















Round 4

General Mathematics Questions

90 seconds for Questions 1 to 4 2 minutes for Questions 5 and 6

HFL

64 is a square number, and ends with the digit **4**.

What digits can a square number <u>never</u> end in?

(List all the possible answers.)

ROUND 4, QUESTION 2 16 19 28 26 20 2 6 ...

In this sequence, the rule to obtain the next number is:

multiply the ones digit by 3 and add the tens digit.

(a) If the first term in the sequence was 35, what would be the third term?

(b) If the third term in the sequence was 19, what could the first term have been?

Adrian took three spelling tests in September. His mean score for those three tests was **12**.

Adrian took five more spelling tests in October.

His mean score for all eight spelling tests was **15**.

What was the mean score for the spelling tests Adrian took in October?

Here are five fractions.



Get as close as you can to $\frac{2}{3}$ by adding some of the fractions.

You do not have to use all five fractions. You may not use any of the fractions more than once. List the fractions you have used on the Answer Sheet.

There are 19 teams in today's final, and four members in each team.

Suppose every team member in the room shook hands with every other team member, including those in their own team.

How many handshakes would take place?



This shape is a pentagram.

It has five lines of symmetry.

Find the size of the angle marked **p**, in degrees.

End of Round 4

HFL

ANSWERS TO ROUND 4



Marking in progress

Results imminent!

Firstly, well done to all!



Well done to all!



The results are ...

Thank you for taking part.

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