YEAR 8 MATHEMATICS CHALLENGE

Final, Oak Room (Hertfordshire Development Centre) Thursday 22nd June 2023

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David Cook, Lead Primary Mathematics Adviser

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 ...

70 teams took part over four heats. The top-scoring 18 teams have been invited to this final.

The mean score for all 70 teams in the heats was 161. The mean score for the 18 teams selected for the Final was 192. So, whatever happens:

CONGRATULATIONS!



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

Here is part of a linear sequence.



(The difference between consecutive terms is the same each time.)

What number goes in the box marked *B*?

Jade is taking a series of mental arithmetic tests.

After **4** tests, her mean score was **7.5**. After **5** tests, her mean score was **9.4**.

How many marks did Jade score in the fifth test?

Here are five number cards.



The cards are used to make a five-digit number.

How many different numbers can be made?

There are 25 students in a class.

Here are 5 statements about the class.

Α	44% of the students are girls.
В	16% of the students are left-handed.
С	68% of the students come to school by bus.
D	86% of the students study Spanish.
Е	96% of the students were present at school last Friday.

Which of these statements **cannot** be true? Give a reason for your answer.



Use the facts given in the diagram to work out the length of the diagonal AC.

Here is a number machine.

input
$$-+12$$
 $\times 2$ $\div 5$ output

Craig puts an input number through the machine. The output is 10 times bigger than the input.

What input number did Craig choose?

End of Round 1

HFL

ANSWERS TO ROUND 1

an integer



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 number of your tabletops it would take to cover the entire floor area of this room.

(Assume the floor and table-tops are both rectangles.)



Estimate the number of pumpkin seeds in the bag.

(Please do not open the bags.)



Imagine a hemispherical bowl full of water.

When **full**, the depth of water is 10 cm



Estimate the depth of water when **half** of the water has been removed.



(Note: diagram is for illustration only. Not drawn accurately.)

Boris says that Keir tells lies.

Keir says that Nicola tells lies.

Nicola says that both Boris and Keir tell lies.

Who is lying and who is telling the truth?

In the diagram, the letters represent towns. The lines represent the roads between the towns. The numbers show the length of each road in miles.

Find the **shortest route**, starting and ending at **A**, which travels along each road **at least once**.

On the Answer Sheet, use the boxes to write down the sequence of towns visited. You will not need to use all the boxes. For example:





This grid contains nine digits.

Reading from left to right, you get three square numbers.

Reading from top to bottom, you also get three square numbers.



Find as many other ways as you can to do this.

(Square numbers starting with a zero are not allowed.)

End of Round 3

HFL

ANSWERS TO ROUND 3

ROUND 3, QUESTION 1

Estimate the number of your tabletops it would take to cover the entire floor area of this room.

(Assume the floor and table-tops are both rectangles.)

ROUND 3, QUESTION 2



Estimate the number of pumpkin seeds in the bag.

(Please do not open the bags.)

ROUND 3, QUESTION 3



water is 10 cm

10 cm

Estimate the depth of water when half of it has been removed.

full of water.



(Note: diagram is for illustration only. Not drawn accurately.)

290 ± 40

ROUND 3, QUESTION 4

Boris says that Keir tells lies. Keir says that Nicola tells lies. Nicola says that both Boris and Keir tell lies.

Who is lying and who is telling the truth?

Boris and Nicola are lying; Keir is telling the truth.

1050 ± 100

ROUND 3, QUESTION 5

In the diagram, the letters represent towns. The lines represent the roads between the towns. The numbers show the length of each road in miles.

Find the **shortest route**, starting and ending at A, which travels along each road at least once.

On the Answer Sheet, use the boxes to write down the sequence of towns visited. You will not need to use all the boxes. For example:





216 miles

6.53 cm ± 0.25 cm

ROUND 3, QUESTION 6

This grid contains nine digits.

Reading from left to right, you get three square numbers.

Reading from top to bottom, you



also get three square numbers.

Find as many other ways as you can to do this.

(Square numbers starting with a zero are not allowed.)

1	2	1	
2	8	9	
1	9	6	

4	4	1	
4	0	0	
1	0	0	

9	6	1
6	7	6
1	6	9

1	6	9
6	7	6
9	6	1

1	2	1
2	5	6
1	6	9

4	4	1
4	8	4
1	4	4

7	2	9	
2	5	6	1
9	6	1	

8	4	1	
4	8	4	
1	4	4	

8	4	1	
4	0	0	
1	0	0	

3	6	1	
6	7	6	
1	6	9	

1	4	4	
4	8	4	
4	4	1	

5	2	9
2	5	6
9	6	1

Round 4

General Mathematics Questions

90 seconds for Questions 1 to 5 2 minutes for Question 6

HFL

The large square is tiled with squares of two different sizes.

What fraction of the diagram is shaded?

(Give the answer in its simplest form.)



Write down four consecutive positive integers, greater than 10, so that:



Here is a sketch of a trapezium.

The co-ordinates of three vertices are given.

Two of the interior angles are right-angles, as shown.

The diagram is not to scale.



What is the area of the trapezium? (Do not worry about units for this question.)

Given that
$$x = \frac{3}{4}$$
 ...

... place these expressions in ascending order, starting with the smallest.

A x^2 **B** x **C** x^3 **D** $x^2 + x$ **E** $x^3 + x^2$

At a party, a large bowl contains red sweets and yellow sweets.

There are 2 red sweets for every 5 yellow sweets.

99 red sweets are added to the bowl.

Now, there are 5 red sweets for every 7 yellow sweets.

How many yellow sweets are there in the bowl?



ABCD is a rhombus made from four triangles.

Triangle *BPQ* is equilateral. The other three triangles are isosceles.

The diagram is not to scale.

Work out the size of the angle marked \boldsymbol{x} .

End of Round 4

HFL

ANSWERS TO ROUND 4

ROUND 4, QUESTION 1

The large square is tiled with squares of two different sizes.

What fraction of the diagram is shaded?

(Give the answer in its simplest form.)

<u>9</u> 112

ROUND 4, QUESTION 4 Given that $x = \frac{3}{4}$ place these expressions in ascending order, starting with the smallest. **A** x^2 **B** x **C** x^3 **D** $x^2 + x$ **E** $x^3 + x^2$

ROUND 4, QUESTION 2

Write down four consecutive positive integers, so that:



<mark>(e.g.) 62, 63, 64, 65</mark>

ROUND 4, QUESTION 5

At a party, a large bowl contains red sweets and yellow sweets.

There are 2 red sweets for every 5 yellow sweets.

99 red sweets are added to the bowl.

Now, there are 5 red sweets for every 7 yellow sweets.

How many yellow sweets are there in the bowl?





<mark>110</mark>





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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