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Year 7 **Mathematics Challenge** Final Hertfordshire Development Centre Wednesday 24th April 2019



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Preliminaries

- If there is more than one team from your school, decide who will be Team A and who will be Team B.
- Make sure you write your team name on each Answer Sheet.
- Units are important! Correct answers with incorrect or missing units will not get full marks.
- Pens/pencils only. No calculators or measuring equipment.



The Five Rounds

- Round 1 General Maths questions
- Round 2 Memory Round
- Round 3 Problems and Puzzles

Break

Round 4 Estimation Round

Round 5

General Maths questions

60 marks for each round.

Round 1 General Mathematics Questions







$\frac{m}{6} - \frac{n}{5} = \frac{4}{15}$

m and *n* are positive integers. What are they?





In this sequence, each term is the **difference** between the previous two terms.

22 19 3 16 ...

If the sequence is continued, how many terms in the sequence will equal **3**?





This diagram shows a regular pentagon inside an equilateral triangle.



Work out the angle marked *x*.





Aisling and Beatrice share some sweets in the ratio **7:3**.

Aisling gives 3 of her sweets to Beatrice.

The ratio is now **5:3**.

How many sweets did they each have at the start?



This diagram is not drawn to scale.

All the angles in are right-angles.



What is the perimeter of the shape?





Alicia plays football for her school team.

Last term, they played some games against other school teams.

If her team had scored **7 more** goals, the mean number of goals they scored per match would have been **4**.

If her team had scored **8 fewer** goals, the mean number of goals would have been **1**.

How many goals did Alicia's team score last term?

End of Round 1

Round 1 ANSWERS







$\frac{m}{6} - \frac{n}{5} = \frac{4}{15}$

m and *n* are positive integers. What are they? Possible answer: *m* = 4, *n* = 2





In this sequence, each term is the **difference** between the previous two terms.

22 19 3 16 ...

If the sequence is continued, how many terms in the sequence will equal **3**?





Question 3

This diagram shows a regular pentagon inside an equilateral triangle.



Work out the angle marked *x*.

Answer: 24°





Aisling and Beatrice share some sweets in the ratio **7:3**.

Aisling gives 3 of her sweets to Beatrice.

The ratio is now **5:3**.

How many sweets did they each have at the start?

Answer: Aisling 28, Beatrice 12



This diagram is not drawn to scale.

All the angles in are right-angles.



What is the perimeter of the shape?

Answer: 32 cm



Question 6

Alicia plays football for her school team.

Last term, they played some games against other school teams.

If the team had scored **7 more** goals, their mean number of goals per match would have been **4**.

If the team had scored **8 fewer** goals, their mean number of goals would have been **1**.

How many goals did Alicia's team score last term?

Answer: 13

Memory Round

We have a hidden mathematical poster.

Two members of your team (the **observers**) are allowed to come and look at the poster.

They must then go back and describe it for the other two people (the **scribes**) to draw.

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.

The observers will have four chances to view the poster.

30 seconds to view
2 minutes to describe

After this, the team must hand their poster in immediately, with their team name on it.

Only ONE sheet must be handed in per team.

You now have one minute to:

- decide who will be the observers and who will be the scribes;
- find pencils, rubbers and anything else you might need;
- decide on tactics!

Memory Round

Round 2 ANSWER





Round 3 Problems and Puzzles

You should have:

- Two copies of the Problems Booklet
- 12 multilink cubes
- 18 plastic counters
- cards numbered 1 to 9
- a hexagonal grid.

There are 20 problems in the booklet, **A** to **T**.

Solve as many as you can.

When you think you have answered a problem, come to have it checked.

- 3 points if it is right first time.
- 2 points if it is right second time.
- 1 point if it is right third time.



Bonuses

Blue to blue

10 points

Yellow to yellow

8 points

20 + 10 = 30

When you come to have an answer checked:

- we will only tell you if it is right or wrong. If it is wrong, you will have to work out why.
- bring your hexagonal grid, so we can record your score.

Incorrect or missing units will mean an answer is **wrong**.

Hand in your hexagonal grids at the end, with your team name on it.

Round 3 Problems and Puzzles

End of Round 3

End of Round 3



Round 4 Estimation Round

Question 1



Estimate the height of the Leaning Tower of Pisa.

(Do not include the flagpole.)

Question 2

Round 4



How many lids full of water it would take to fill the container?



Question 3

Place the 5 items in order, from lightest to heaviest.









What is the <u>total</u> mass of all five items (plus the bag)?





How many tealight candles could be fitted onto your table?

(They must be arranged in a square array, and not overhang the edge of the table.)







To the nearest second, estimate how long the picture of the London Eye is displayed.



End of Round 4

Round 4 ANSWERS



Question 1



Estimate the height of the Leaning Tower of Pisa.

(Do not include the flagpole.)

Answer: 56 m

Question 2

Round 4



How many lids full of water it would take to fill the container?

Answer: 98



Question 3

Place the 5 items in order, from lightest to heaviest





Question 4

What is the <u>total</u> mass of all five items (plus the bag)?



Question 5

How many tealight candles could be fitted onto your table?

(They must be arranged in a square array, and not overhang the edge of the table.)



Answer: 882

Question 6

To the nearest second, estimate how long the picture of the London Eye is displayed.



Answer: 39 seconds

Round 5 General Mathematics Questions





Question 1



| Mark | Number of students gaining each mark | | | | | |
|------|--------------------------------------|--------|--------|--------|--------|--|
| | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | |
| 1 | 1 | 3 | 5 | 1 | 5 | |
| 2 | 3 | 3 | 3 | 2 | 2 | |
| 3 | 7 | 3 | 3 | 3 | 1 | |
| 4 | 3 | 3 | 2 | 4 | 2 | |
| 5 | 1 | 3 | 2 | 5 | 5 | |

Match each pie chart to one of the tests.





X and Y are positive integers greater than 30.

The Highest Common Factor of X and Y is 21.

The Lowest Common Multiple of X and Y is 210.

What are X and Y?

Question 3

What values of *a* and *b* make all three of these expressions equal to each other?



Question 4

Here is a parallelogram.



Work out the length marked s.





$3^{-} + 3^{-} + 3^{-} = 3^{12}$

Find positive integers which could go into the yellow boxes to make this statement correct.

Question 6



Here are two overlapping rectangles, *P* and *Q*.

The overlap has been shaded green.

- The green area is $\frac{2}{3}$ of rectangle *P*.
- The green area is $\frac{3}{4}$ of rectangle Q.

What fraction of the **whole diagram** has been shaded green?

End of Round 5

Round 5 ANSWERS





Question 1



| Mark | Number of students gaining each mark | | | | | |
|------|--------------------------------------|--------|--------|--------|--------|--|
| | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | |
| 1 | 1 | 3 | 5 | 1 | 5 | |
| 2 | 3 | 3 | 3 | 2 | 2 | |
| 3 | 7 | 3 | 3 | 3 | 1 | |
| 4 | 3 | 3 | 2 | 4 | 2 | |
| 5 | 1 | 3 | 2 | 5 | 5 | |

Match each pie chart to one of the tests.

Question 2

X and Y are positive integers greater than 30.

The Highest Common Factor of X and Y is 21.

The Lowest Common Multiple of X and Y is 210.

What are X and Y?

Answer: 42 and 105

Question 3

What values of *a* and *b* make all three of these expressions equal to each other?

Answer: a = 3, b = 8

Question 4

Here is a parallelogram.



Work out the length marked s.

Answer: 15 cm





$3^{11} + 3^{11} + 3^{11} = 3^{12}$

Find positive integers which could go into the yellow boxes to make this statement correct.

Question 6

Answer



Here are two overlapping rectangles, *P* and *Q*.

The overlap has been shaded green.

- The green area is $\frac{2}{3}$ of rectangle *P*.
- The green area is $\frac{3}{4}$ of rectangle Q.

What fraction of the **whole diagram** has been shaded green?

Well done to all



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