YEAR 8 MATHEMATICS CHALLENGE

Heat 1, *Online*

Monday 27th April 2026

Melanie Chrisp, HFL Secondary Mathematics Adviser

Madeline Hyles, Secondary Team

HFL Education

THREE HEATS AND A FINAL

This is the first of three heats.

The top 15 (or so) teams from across all the heats will be invited to take part in the Final. This will be a face-to-face event, to be held in WGC on Thursday 11th June.

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. It should include the name of your school (e.g. Leventhorpe Team A).
- Don't leave any answers blank. 'Near misses' or partially correct answers may score points.

PRELIMINARIES

- Your teacher has been sent a link to an *online* sheet to record your answers. If possible, this should be updated at the end of each round.
- Teachers: please check that the link works, and enter the names of your teams during Round 1.

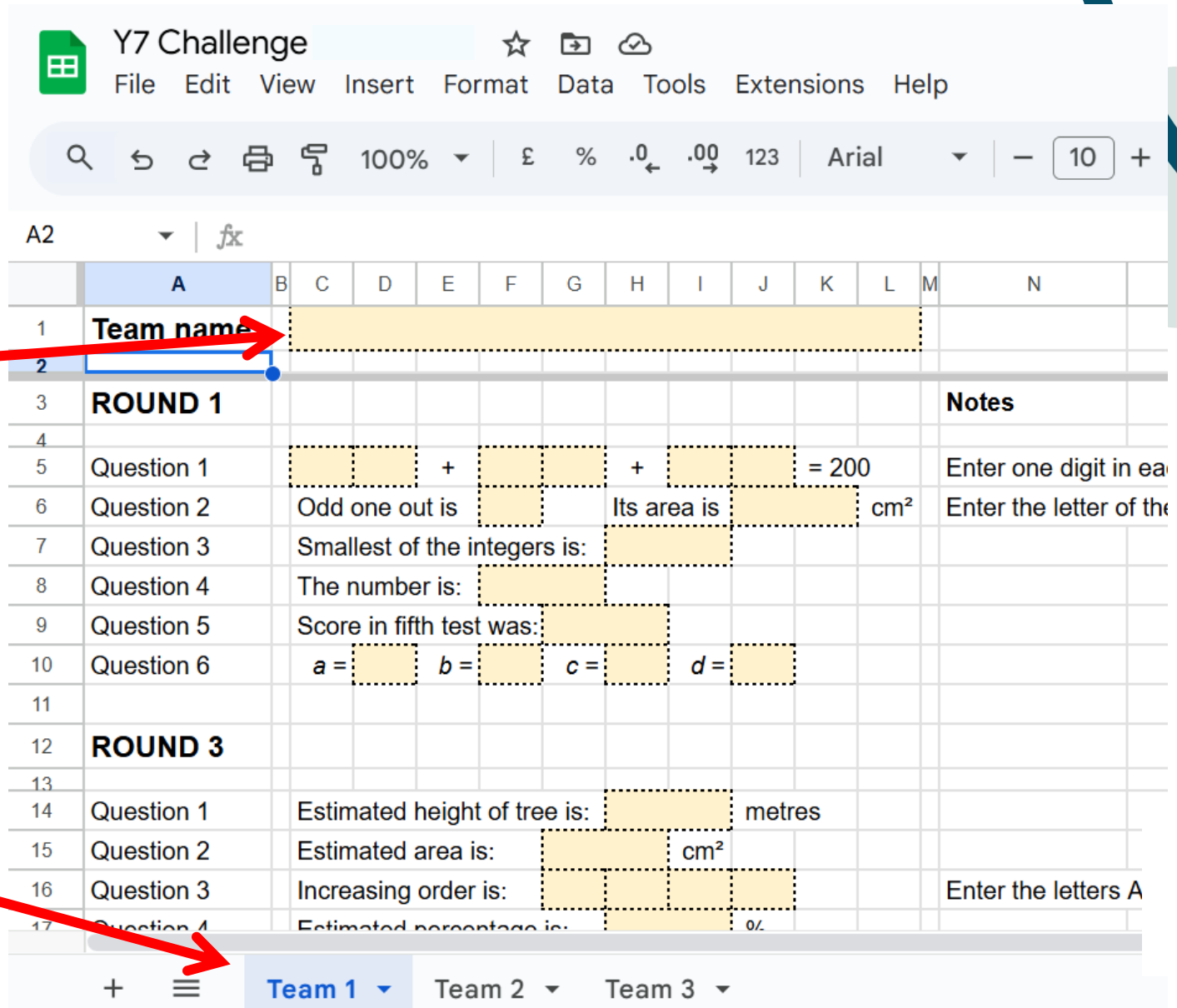
ONLINE SHEET

Enter in the yellow cells only.

Team name at the top.

Scroll down for Rounds 3 and 4.

Separate tab for each team.
(Please do **not** delete unneeded tabs.)



FORMAT OF CHALLENGE

Round 1	General Maths questions
Round 2	Memory Round
Round 3	Estimation Round
Round 4	General Maths questions

60 marks for each round

Round 1

General Mathematics Questions

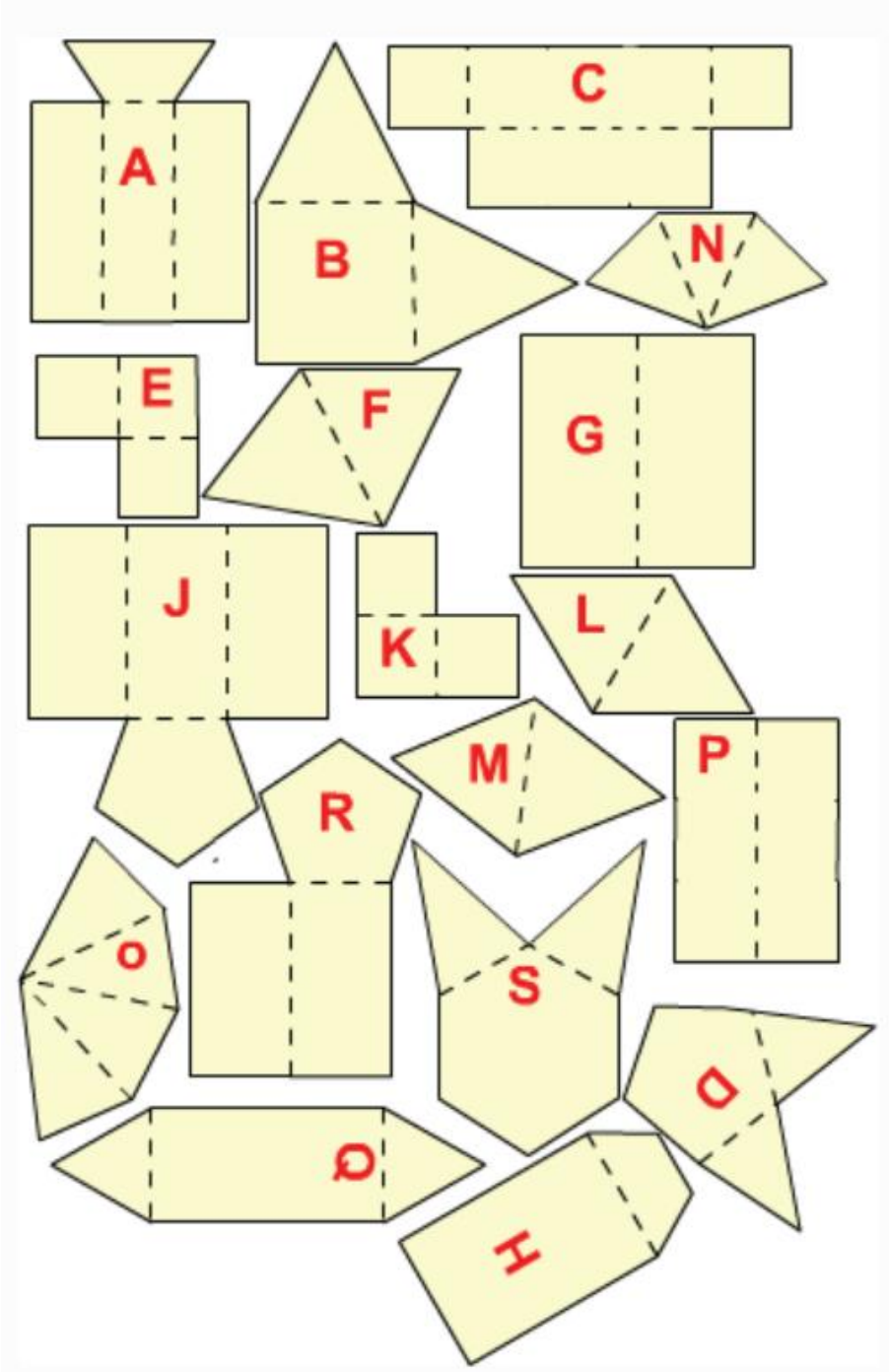
90 seconds for each question

ROUND 1, QUESTION 1

This is a selection of standard nets which have been cut into two pieces.

a) Which piece is the second half of shape Q?

b) Which piece is the second half of shape N?



ROUND 1, QUESTION 2

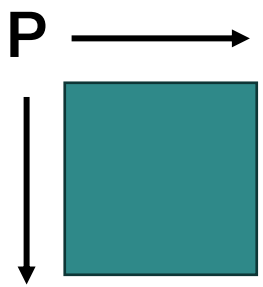
Nicola has eight number cards.
Six have numbers on, two are blank.
She wants the cards to have a range of 9 and a mean of 4.
What should she write on the two blank cards?

(Give your two answers in numerical order please)

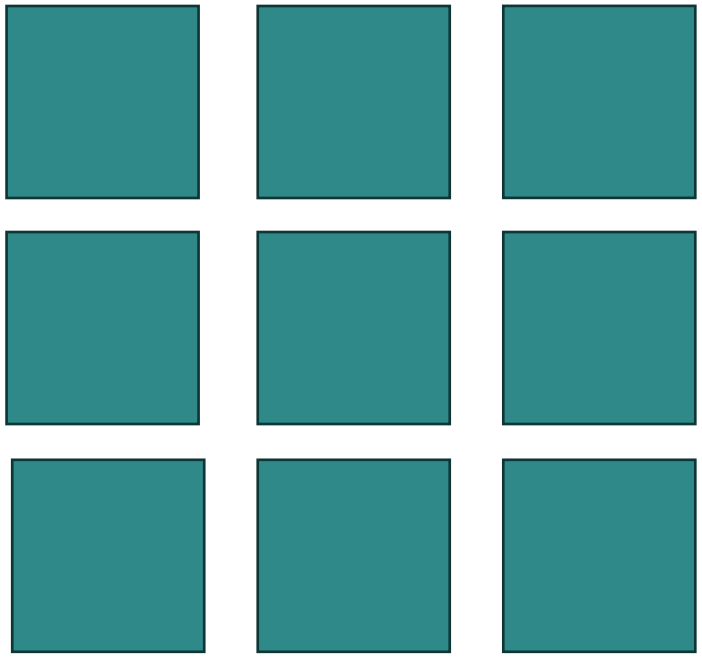
ROUND 1, QUESTION 3

In Manhattan all of the streets are arranged in grids.
The city wants to have a minimum number of policemen manning the streets.
Each policeman can see only one block at a time in each direction.
So one policeman can see a maximum of four blocks if he stands at a crossroads.

e.g.



This policeman can see two blocks but there are two blocks out of sight



What is the minimum number of policeman needed to man a 3 x 3 section of the city?

ROUND 1, QUESTION 4

What is 20% of 30% of 40% of £50?

ROUND 1, QUESTION 5

In this addition, *H*, *E*, *S*, *T* and *B* represent different digits.

$$\begin{array}{cccc} & H & E' & S \\ + & T & H & E \\ \hline B & E & S & T \end{array}$$

Work out the digits represented by *H*, *E*, *S*, *T* and *B*.

ROUND 1, QUESTION 6

In a car park one quarter of the cars are blue.
Another blue car arrives.
One third of the cars in the car park are now blue.

How many cars are in the car park in total now?

End of Round 1

Please finalise your answers, and pass them to your teachers for entry onto the *online* answer sheet.

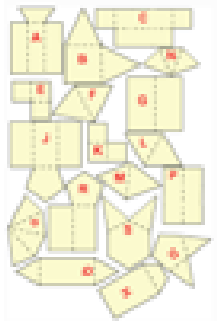
ANSWERS TO ROUND 1

ROUND 1, QUESTION 1

This is a selection of standard nets which have been cut into two pieces.

a) Which piece is the second half of shape Q?

b) Which piece is the second half of shape N?



Q = G N = D
(5 marks for each)

ROUND 1, QUESTION 2

Nicola has eight number cards.
Six have numbers on, two are blank.
She wants the cards to have a range of 9 and a mean of 4.
What should she write on the two blank cards?

3 and 10
(5 marks for each)

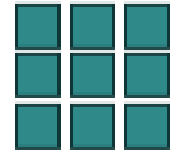
ROUND 1, QUESTION 3

In Manhattan all of the streets are arranged in grids.
The city wants to have a minimum number of policemen manning the streets.
Each policeman can see only one block at a time in each direction.
So one policeman can see a maximum of four blocks if he stands at a crossroads.

e.g. P

This policeman can see two blocks but there are four blocks out of sight

What is the minimum number of policeman needed to man a 3 x 3 section of the city?



8

ROUND 1, QUESTION 4

What is 20% of 30% of 40% of £50?

£1.20

ROUND 1, QUESTION 5

In this addition, *H*, *E*, *S*, *T* and *B* represent different digits.

	H	*E*	*S*	
+	*T*	*H*	*E*	
B	*E*	*S*	*T*	

Work out the digits represented by *H*, *E*, *S*, *T* and *B*.

H=4, E=2, S=6, T=8, B=1
(2 marks for each)

ROUND 1, QUESTION 6

In a car park one quarter of the cars are blue.
Another blue car arrives.
One third of the cars in the car park are now blue.

How many cars are in the car park in total now?

9

Round 2

Memory Round

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 **artists**) will not see the poster. The observers must describe the poster from memory, and the artists 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 poster will be shown on the screen. The artists must go into a different room, so they cannot see it.

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

Artists can draw at any time during the whole period.

ROUND 2

Hint for the observers

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 artists

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

Final Note: ignore any colours…. Your poster should be in black and white only

ROUND 2

Note to supervising teachers

Each showing of the poster will be preceded by a 30-second warning, so that the observers can get themselves into position.

At the end, the finished poster should be photographed or scanned and sent in by e-mail.

(E-mail address to follow at end of round.)

ROUND 2

Pencils and rubbers only. No rulers or other drawing equipment.

You now have one minute to decide who will be the observers and who will be the artists ... and to get into position!

ROUND 2

Poster about to be displayed for the first time.

$\frac{a}{b}$???

$\frac{\alpha}{\beta}$???

Rational & Irrational Numbers

A **Rational Number** is a number that can be written as a fraction.
It CAN be a decimal or a negative number.

Examples: 5, -2, 3.6, $\sqrt{36}$

An infinite decimal can still be a rational number as long as it can be written as a fraction...

0.3333333333... = $\frac{1}{3}$ OR 0.123123123... = $\frac{123}{1000}$

An **Irrational Number** is a number that CANNOT be written as a fraction.

If it is changed to a decimal, it would go on for ever with no repeating pattern.

Examples:

0.517658..., -2.5641895..., $\sqrt{12}$

Famous Irrational Numbers

Pi = π = 3.14159.... used to calculate dimensions in circles

Imperfect Square Roots known as 'Surds': $\sqrt{2}$, $\sqrt{3}$,

Euler's Number, e, used to calculate population growth: e = 2.718....

Phi = φ = 1.618.... known as the Golden Ratio

Round 2

Memory Round

ROUND 2

Second viewing of poster coming up!

$\frac{a}{b}$???

$\frac{\alpha}{\beta}$???

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Memory Round

ROUND 2

Third viewing of poster coming up!

$\frac{a}{b}$???

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Round 2

Memory Round

ROUND 2

Fourth and final viewing of poster coming up!

$\frac{a}{b}$???

$\frac{\alpha}{\beta}$???

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Round 2

Memory Round

ROUND 2

Time’s up!

Everyone should now come back into the main room.

Please photograph or scan the finished poster, and e-mail it to:

madeline.hyles@hfleducation.org

End of Round 2

A reminder of the e-mail address to send the finished posters to:

madeline.hyles@hfleducation.org

Round 3

Estimation Round

90 seconds for each question

ROUND 3, QUESTION 1

Estimate $\sqrt{40}$ to one decimal place.

ROUND 3, QUESTION 2

In June the 2026 FIFA World Cup kicks off.

48 teams will take part.

Group Stage: Initially there are 12 groups of 4 teams who play each team in their group.

Knock Out Stage: 32 teams then progress to the knock-out round, where they stay on if they win, or leave if they lose.

The last two teams remaining play a final match, and the two runners up play a game for 3^{rd}/4^{th} place.

Estimate the total number of matches that will take place.

ROUND 3, QUESTION 3

Historically the Great Pyramid of Giza in Egypt was the tallest man-made structure, and it held this title for more than 3800 years, when Lincoln Cathedral was constructed in 1311.

The tallest building in the world currently is Burj Khalifa in Dubai.

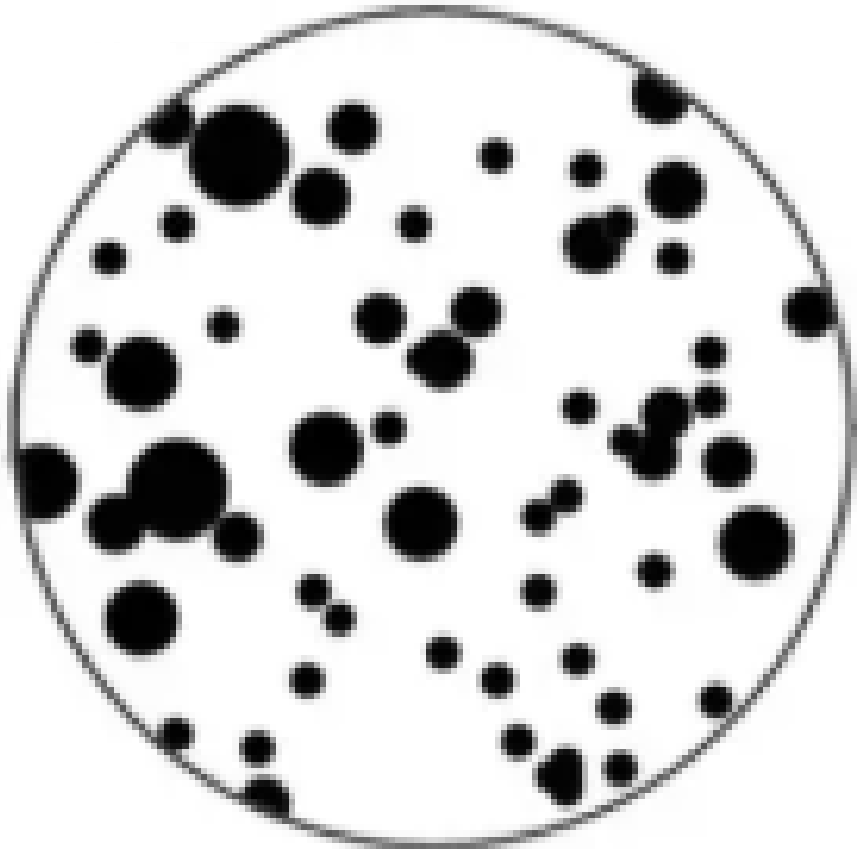
The Great Pyramid of Giza was approximately 147 metres tall originally. Estimate the height of Burj Khalifa.
(Bigger picture coming!)

ROUND 3, QUESTION 3

The Great Pyramid of Giza was approximately 147 metres tall originally. Estimate the height of Burj Khalifa.

ROUND 3, QUESTION 4

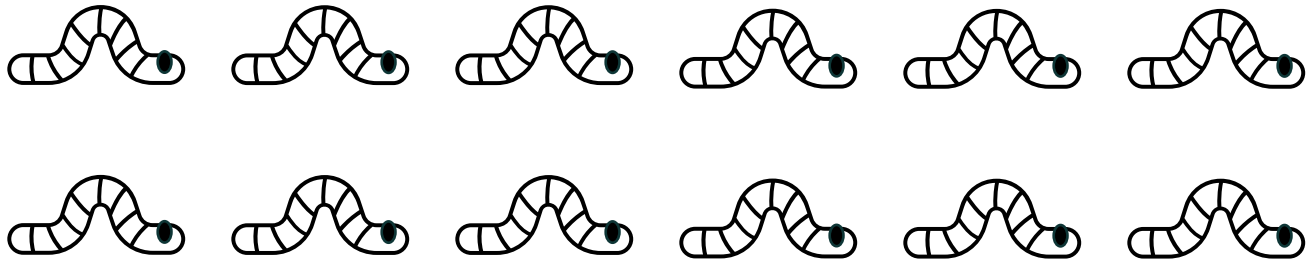
Estimate the percentage of the area of the circle that is shaded.



ROUND 3, QUESTION 5

The vegetable patch in Charlie's allotment measures 6m x 10m.

Charlie tested a patch 25cm x 25cm and found 12 worms.



Estimate the total number of worms in the vegetable patch.

ROUND 3, QUESTION 6

Earlier in the challenge, you saw this sum:

$$\begin{array}{r} H\ \ E'\ \ S \\ +\ T\ \ H\ \ E \\ \hline B\ \ E\ \ S\ \ T \\ \hline \end{array}$$

Estimate the number of minutes since it first appeared on the screen.

End of Round 3

Please finalise your answers, and pass them to your teachers for entry onto the *online answer* sheet.

ANSWERS TO ROUND 3

ROUND 3, QUESTION 1

Estimate $\sqrt{40}$ to one decimal place.

6.3 (10 marks)
(6.2 or 6.4 = 6 marks)

ROUND 3, QUESTION 2

In June the 2026 FIFA World Cup kicks off.

48 teams will take part.

Group Stage: Initially there are 12 groups of 4 teams who play each team in their group.

Knock Out Stage: 32 teams then progress to the knock-out round, where they stay on if they win, or leave if they lose.

The last two teams remaining play a final match, and the two runners up play a game for 3rd/4th place.

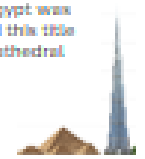
Estimate the total number of matches that will take place.

104 (10 marks)
(+/- 4 matches = 6 marks)

ROUND 3, QUESTION 3

Historically the Great Pyramid of Giza in Egypt was the tallest man-made structure, and it held this title for more than 3800 years, when Lincoln Cathedral was constructed in 1311.

The tallest building in the world currently is Burj Khalifa in Dubai.



The Great Pyramid of Giza was approximately 147 metres tall originally. Estimate the height of Burj Khalifa. (Bigger picture coming!)

828m
(815-841m allowed)

ROUND 3, QUESTION 4

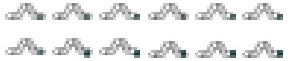
Estimate the percentage of the area of the circle that is shaded.

18-22%

ROUND 3, QUESTION 5

The vegetable patch in Charlie's allotment measures 6m x 10m.

Charlie tested a patch 25cm x 25cm and found 12 worms.



Estimate the total number of worms in the vegetable patch.

11520 worms
(11500-11540 allowed)

ROUND 3, QUESTION 6

Earlier in the challenge, you saw this sum:

```
  H E S
+ T H E
-------
B E S T
```

Estimate the number of minutes since it first appeared on the screen.

± 2 mins

Round 4

General Mathematics Questions

90 seconds for Questions 1 to 3

2 minutes for Questions 4 to 6

ROUND 4, QUESTION 1

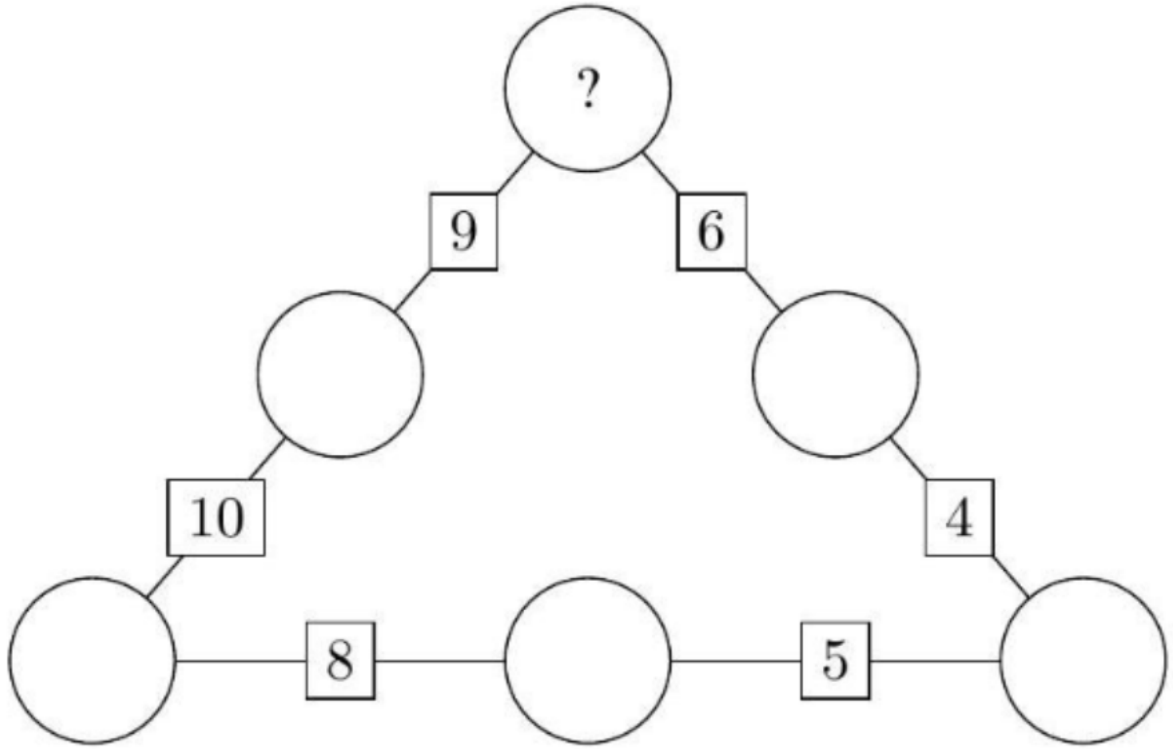
Work out the value of this expression:

$$\frac{\sqrt{16\sqrt{81}}}{\sqrt{81\sqrt{16}}}$$

ROUND 4, QUESTION 2

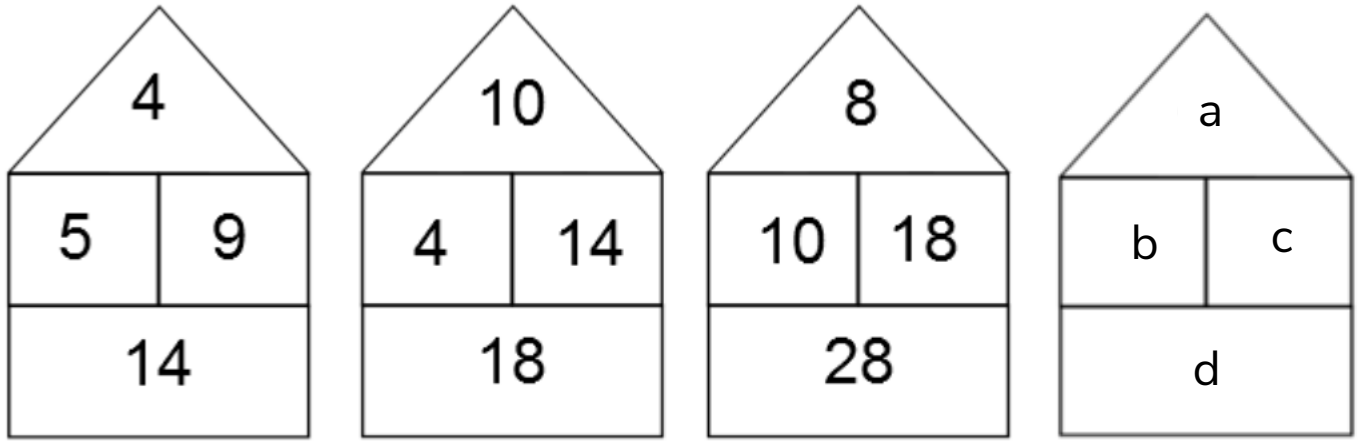
In the arithmagon below, the circles must be filled with the digits 1-6 (no repeats) so that each square is the sum of the two circles either side.

What digit must be placed in the top circle to make this example work?



ROUND 4, QUESTION 3

These Beach Hut's are generated using their two middle numbers. The Beach Huts also form a sequence.
Can you work out the next Beach Hut in the pattern?



Fill in the correct numbers for a, b, c and d in the yellow boxes on your online answer sheets

ROUND 4, QUESTION 4

5 years ago Anita was 5 times as old as her son.

In 5 years her age will be 8 less than three times her son's age at that time.

How old are Anita and her son currently?

ROUND 4, QUESTION 5

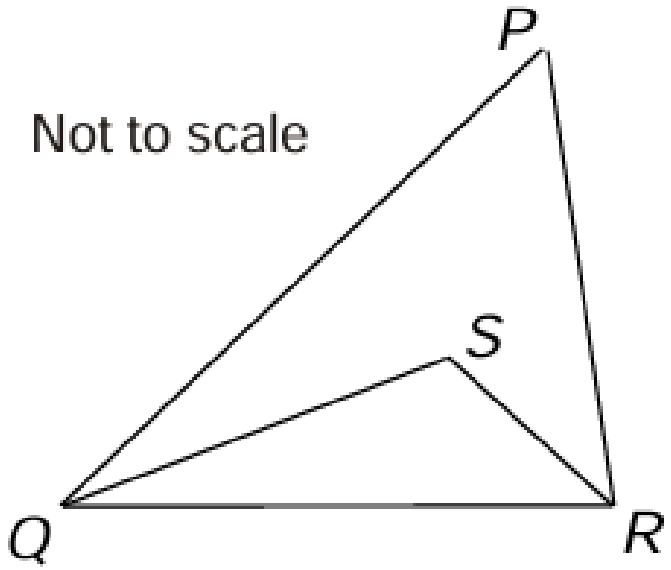
A **palindrome** is a number that reads the same forwards and backwards. For example, 12321 is a palindrome.

N is the smallest three-digit integer which is not a palindrome itself, but is found by adding three distinct two-digit palindromes together.

What is the number N?

ROUND 4, QUESTION 6

In the triangle PQR below, Angle QPR = 40°.
The angle bisectors of Q and R meet at S (as shown).



Work out the size of the obtuse angle QSR.

End of Round 4

Please finalise your answers, and pass them to your teachers for entry onto the *online answer* sheet.

ANSWERS TO ROUND 4

ROUND 4, QUESTION 1

Work out the value of this expression:

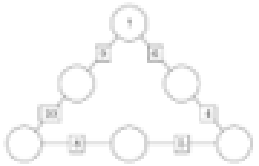
$$\frac{\sqrt{16\sqrt{81}}}{\sqrt{81\sqrt{16}}}$$

$\frac{2}{3}$

ROUND 4, QUESTION 2

In the arithmagon below, the circles must be filled with the digits 1-8 (no repeats) so that each square is the sum of the two circles either side.

What digit must be placed in the top circle to make this example work?



5

ROUND 4, QUESTION 3

These Beach Hut's are generated using their two middle numbers. The Beach Huts also form a sequence.

Can you work out the next Beach Hut in the pattern?

Fill in the correct numbers for a, b, c and d in the yellow boxes on your online answer sheets

a=20, b=8, c=28, d=36
(b&c = 2 marks each,
a&d = 3 marks each)

ROUND 4, QUESTION 4

5 years ago Anita was 5 times as old as her son.

In 5 years her age will be 8 less than three times her son's age at that time.

How old are Anita and her son currently?

Anita = 35yrs Son = 11yrs
(5marks each)

ROUND 4, QUESTION 5

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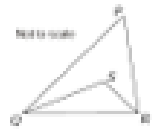
N is the smallest three-digit integer which is not a palindrome itself, but is found by adding three distinct two-digit palindromes together.

What is the number N?

110
(lots of sums give this:
11+33+66, 22+33+55 etc

ROUND 4, QUESTION 6

In the triangle PQR below, Angle QPR = 40.
The angle bisectors of Q and R meet at S (as shown).



Work out the size of the obtuse angle QSR.

110°

$\frac{a}{b}$???

$\frac{\alpha}{\beta}$???

Rational & Irrational Numbers

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Well done to all!

The results are ...

Thank you for taking part.

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Monday 27th April 2026

Melanie Chrisp, HFL Secondary Mathematics Adviser

Madeline Hyles, Secondary Team

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